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Xenakis' Early Works: From "Bartókian Project" to "Abstraction"

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Before his first known piece (*Metastaseis*), Xenakis composed some works which are called here the "early works." This article[1] analyzes three of these works, *Zyia* (1952), *Anastenaria 1. Procession to clear waters* (1953) and *Anastenaria 2. The Sacrifice* (1953) to show that: 1) They have a "Bartókian project": they use four elements borrowed from Greek popular music: a) melodies b) particular polyphonies c) asymmetrical meters d) form by juxtaposition. But these elements are stylized, even, one could say, "formalized." 2) They already have some elements of the "abstract" style which will characterize Xenakis from *Metastaseis* and on: a) use of the golden section b) combinatory processes c) beginnings of composition with masses.

KEYWORDS: Xenakis, contemporary music, popular and contemporary music, continuity in musical history

I. Xenakis' "Early" and "First" Compositions

During the "*coup d'état*"[2] which, with *Metastaseis* (1953–1954) and *Pithoprakta* (1955–1956), bypassed the serial avant-garde – an avant-garde that was proclaiming that "any composer out of the field of serial research is *useless*" (Boulez 1966 [1952]: 271) – thanks to the invention of radically new and "abstract" techniques, Iannis Xenakis appeared as an *ex nihilo* creator. The perspective of a *tabula rasa*, with which Xenakis simulates "amnesia," is certainly part of his theoretical intention.[3] His musical output, however, partially negates this perspective. In the framework of the present article, it would be difficult to defend this opinion in relation to the whole of post-1945 musical history. I will only try to defend it in relation to Xenakis' own evolution, limited to his earliest works.

Metastaseis, this revolutionary piece which caused a scandal at the 1955 Donaueschingen Festival, was considered, until recently, Xenakis' first work. An article by François-Bernard Mâche discussed the existence of older compositions, the here-called "early works."[4] The catalogue of these pieces, composed between 1949 and 1953, is, as established by Mâche (1988: 78–79):

(1) thirteen short compositions for piano (1949–1950);
(2) *Suite* for piano (1950–1951);
(3) *Theme and consequences* for piano (1951);
(4) *Double Zyia* for violin and cello (1951, a transcription of the previous work);
(5) *Zyia* for voice, male choir, flute, and piano, based on a poem which relates the ancestral fights of the Greek people (1952);

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(6) *Triple Zyia* for voice, flute, and piano (1952, a transcription of the previous work);
(7) *Three poems* for reciter and piano (1952);
(8) *The dove of peace* for voice and mixed choir (1953);
(9) *Stamatis Katotakis, table song* for voice and male choir (1953);
(10) *Anastenaria 1. Procession to clear waters* for mixed choir, male choir, and orchestra (1953);
(11) *Anastenaria 2. Sacrifice* for orchestra (1953).

At the time of their composition, none of these works were premiered, with the possible exception of *Double Zyia* (Mâche 1988: 79).[5,6]

At first sight, these compositions differ radically from the style introduced by *Metastaseis*. Only the last one (*Sacrifice*), composed just before *Metastaseis*, is based on the "abstract" idiom, which, according to Xenakis, characterizes his "first" works (i.e. those dating from *Metastaseis* on): it is entirely based on a mechanism I shall analyze later. The others belong to the period when Xenakis had not yet mourned the passing of his Greek roots, despite his French exile. Their global style is determined by a project that I will define as "Bartókian project." The gap, therefore, between the "early" and the so-called "first" compositions, between Bartókian and abstraction, seems huge.

Nevertheless, I will try to show that there is a relative continuity between them by analyzing elements of two other early compositions, elements that already belong to the abstract style. The first of these works, *Zyia*, shows

> the first sign of a dawning of the level of exigence required by a European composer of the 1950s for his work. While remaining infused with Greece, this piece shows, not without a certain awkwardness, the signs of a preoccupation with form of an entirely different order. (Mâche 1988: 81)

The second, *Procession to clear waters*, was composed just before *Sacrifice*. The manuscript includes an analysis by Xenakis in which he declares that:

> it is a completely free and new creation and is based on the whole popular musical tradition of the Greek people. The composer is totally unaware of the authentic music of the cult [of Anastenaria[7]]: transforming thus completely the references to demotic music,[8] *Procession to clear waters* adopts the abstract style.

II. The "Bartókian Project"

In 1955, the second of Xenakis' two Greek articles appeared in *Επιθεωρηση τεχνης* [*Epitheorisi technis*] (Xenakis 1955b; also in Xenakis forthcoming).[9] Its title, "Problems of Greek musical composition," and its content show the aim of his early works: as Mâche stated in reference to the *Suite* for piano of 1950–1951, the young composer had "the ambition to be for Greece was Bartók was for Hungary" (Mâche 1988: 80).

At the time, Xenakis was living in Paris, where the musical avant-garde had merged into serialism, rejecting not only tonal music or Bartók, but even Schoenberg, since its only acceptable reference to the past was Webern.[10] So one could have thought that Xenakis was turning to the past. But this assumption would not be correct: his early musical production as well as the above-mentioned article are related to the events which forced him to leave his country in 1947. Thus, a short overview of the composer's preceding years is not inappropriate to this study.

From 1940 to 1947, Xenakis' life was mostly governed by the evolution of

Greek political life. During that time, he studied at the Athens Polytechnic (he graduated in 1946 as a civil engineer) and took some music lessons (harmony, counterpoint) with Aristotelis Kountourov, a Greek musician from Georgia. But, his intense involvement in the Resistance took up more and more of his time. In 1941, he became a member of E.A.M. (a left-wing organization and by far the most important of all Greek resistance movements) and of K.K.E. (the Greek communist party), and went into the unarmed resistance which was organized in Athens against the German occupation. During the "Events of December 1944," when the British occupation began, Xenakis took up arms to fight against the English troops. He was seriously wounded. After the Varkizas Agreement (which should have prompted a reconciliation but was not respected by the right wing which, holding power in Athens with the help of the British troops, was mostly composed of former collaborators of the Germans), he was called up to the "national" army (created to fight the left-wing movement) from which he fled. He went underground and continued political action. Finally, in September 1947, he left illegally for France through Italy. In 1975, on the occasion of his first return to Greece, Xenakis recalled:

> The decision to leave, I had taken before. Just before the Liberation, in 1945, I had a discussion with friends [. . .] I informed them that I had decided to stop political action because I was a musician. I wanted to continue music, that I had put aside, and for me there was no other solution. I didn't know what kind of music I would make, I just wanted to live with music, with making music, with studying continually, not only with listening to it. The important fact was that I had decided that to be a person I had to make music. Otherwise I wouldn't be anything. It was a real passion, an interior one, which came slowly to the surface, it wasn't something given *a priori*. (Xenakis 1976: 375; also Xenakis, forthcoming)

But in France, Xenakis didn't immediately give up the ideals that had led him to exile. In fact he gave up their political component, but not their cultural one, which was not far removed from so-called "socialist realism," though not, of course, in its caricatured "Zhdanovian" manifestation. Xenakis' thought, up to *Sacrifice*, sought its inspiration in the music of the "people:" thus his concern with the "Bartókian project," even if, in Paris, he then had the occasion to listen to the music of composers turning toward the highest degrees of abstraction.

At the same time, Xenakis' "Bartókian project" already had an abstract nature. As we know, in contrast to the so-called "national schools" of the twentieth century, Béla Bartók was not content to use fossilized popular elements mixed with old-fashioned (Romantic) harmonies. In his music, the local element plays a *structural* role while aiming overall for a modern style. Xenakis expressed a similar opinion in his article, "Problems . . ." (1955), even though he didn't refer to Bartók. He rejected the Greek "national school" in order to avoid "the mistakes of some composers – like Kolomiris or Petridis[11] – who took Greek melodies but dressed them up with such harmonic, polyphonic, and instrumental German clothes of the nineteenth century, that their Greek character was destroyed" (Xenakis 1955b: 188). And, he added that the Greek composer has to "search for expressive and structural means in demotic and church [Byzantine] music on the one hand and in the avant-garde discoveries of European music on the other" (Xenakis 1955b, 188).

To accomplish this aim, Xenakis borrowed four elements from demotic music, elements that are analyzed in the composer's same article (Xenakis 1955b: 187–

188): its "incomparable melodies;" the two- or three-voice polyphonies from Ipeiros and the harmonies with parallel fourths of the lyre from Euxinian Pont; the asymmetrical (complex) meters; and the forms, characterized by juxtaposition, of the Cleftian songs.[12] It will be instructive to examine how these elements are treated in *Zyia* and *Procession to clear waters*.

As for the melodies, it is apparent that Xenakis reduced this element to the research of new scales – a reduction which would be decisive for his later evolution.[13] In *Zyia*, the soprano sings a clear melody but the choral and instrumental parts tend to consist primarily of scales. The same for *Procession*. An extract from *Zyia* is enough to illustrate this phenomenon (figure 1). From measure 312, the piano and the flute play continuous sixteenth-notes in a uniform movement (8 notes up, 8 notes down) that creates an original non-octaviating scale.[14] At the same time, the patterns are continuously transposed and superimposed. The research into new scales shows an obvious influence from Messiaen, but it is also a concern Xenakis developed of his own accord to which he would come back to later with the "universality" of his "sieve theory."

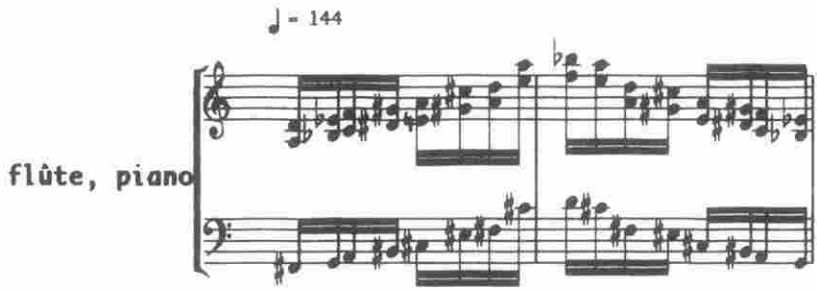

Figure 1
***Zyia*, mm. 348–349 (reduction).**

The polyphonies from Ipeiros are applied clearly to *Procession*, evident right at the first entrance of the mixed choir, here limited to female voices (figure 2). It is important to note that Xenakis' rendering of these polyphonies do not precisely correspond to his analysis of them in his "Problems . . ." article. For example, in the second voice part (the first sings the melody and the third is based on a pedal), the second voice should

> sing the under-tonic with cadences to the perfect fourth from below or with cadential rising to the tonic. Since it is usually built from melodies in the mode of D, the second voice [should] form a dissonance of a tone with the first. (Xenakis 1955b: 187)

This may be why, in his introductory analysis of the score, he writes that the mixed choir uses "harmonies that observe the laws of polyphonies from Ipeiros and Dodecanese but also introduces deviations."[15] As for the parallel fourths, which imitate the lyre from Euxinian Pont, they abound in *Procession*: "the instruments which don't support the two choirs play short melodies that remind one of the lyre's accompaniments from Minor Asia," writes the composer in the same introduction. In pp. 8–9 of the handwritten score (figure 3), three elements fit together: the second violins and the violas imitate this lyre; the

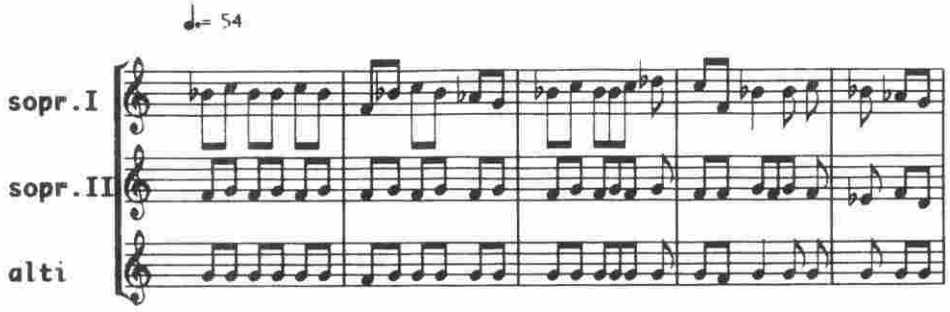

Figure 2
Procession to the clear waters, p. 1, mixed choir.

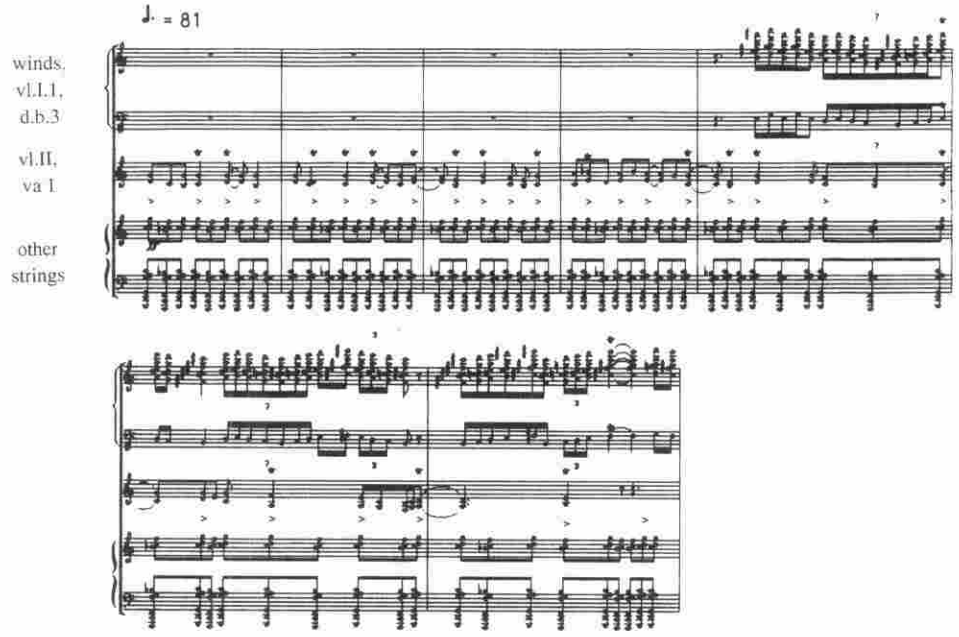

Figure 3
Procession to the clear waters, pp. 8–9 (reduction).

strings of the lower stave repeat a chord (or its transposition one tone lower) composed of fourths and fifths; the other instruments, also in parallel fourths or fifths, play a melody with rhythmic changes.

In the field of rhythm, Xenakis' early works are often characterized by repetitions of the same value (cf. figures 1 and 2). This technique, which evokes neoclassicism, would later allow Xenakis, through the superposition of different subdivisions, to substitute the notion of density for the notion of rhythm. He also often uses asymmetrical meters (for instance, 7/8), a reference to demotic music. But unlike this source, Xenakis continuously changes the subdivisions of these meters, as does Bartók (as with the 7/8 meter, which, in a

well-known Greek dance, is always 3+2+2, but can be mutated as 3+2+2 / 2+3+2 / 2+2+3, etc.). In the strings of figure 3 (the lower stave), it is the accents that create the impression of asymmetrical meters: the technique here is closer to Stravinsky's *Rite of Spring* than to Bartókian or Balkan music.

The last element, the form, needs no special commentary since the model borrowed by Xenakis from demotic music is very simple: he refers to the juxtapositional form found in the Cleftian songs. But one should note that, unlike the other three (except perhaps for the use of scales which has links to the subsequent sieve theory), this element would become a constant characteristic of Xenakis' music. All of his works (with the exception of some of the very late pieces from the 1990s, which are monolithic) consist in juxtaposition of different formal unities – Xenakis ignores the idea of development. This technique is synonymous with the spatialization – in an abstract sense – of the musical work (cf. Solomos 1998), a phenomenon that has very important consequences for the definition of Xenakis' music, but which lies outside the framework of this article.[16]

III. Abstraction

Let us turn back to the young Xenakis so as to study his evolution from the "early" to the "first" works. Abstraction began to emerge there: the last early piece, *Sacrifice*, is a very abstract one, though it belongs to the same project as the Bartókian *Procession*. The gap between the two, however, even if it seems without precedent in musical history, is it really so huge? It is obvious that with *Sacrifice* and *Metastaseis*, Xenakis implemented radical innovations, and that, as in a bet, failure would have condemned him to review his claims for abstraction. Nevertheless, abstraction was prefigured in the "Bartókian project."

The early works are indeed partly abstract. While speaking about the elements that Xenakis borrowed from demotic music, I used the word "model." His early thought doesn't differ in its essence from later on, and it is certainly more abstract than Bartók's: he defines demotic music as a model, as an abstract structural outline which belongs to a foreign conceptual domain; then, he transfers and produces this model so as to produce his music. In *Zyia* and *Procession*, the elements of demotic music are stylized, or, one could say, "formalized," even if not yet referring to the mathematical sense of this word. In other words, the process is already one of abstraction, even if the models belong in music and not, as with the "first" Xenakis, in physics or mathematics. The fact that the early Xenakis was already introducing "licences," that sometimes he deviated from the model of demotic music, is symptomatic. As is well known, when he borrowed models from the scientific field, he would always introduce deviations during their transfer to music so as to distinguish between science and art, in spite of their "alloy."[17]

In addition, Xenakis' early pieces already use techniques very different from those of the "Bartókian project," techniques that prefigure the abstract ones of *Sacrifice* and the "first" works. We will analyze three of them: Golden Section, combinatorial processes, and composition with masses.

The Golden Section, in the form of the Fibonacci series, is already present in *Zyia*. Like Bartók, Xenakis produces rhythms with the series: 1, 2, 3, 5, 8, 13, etc. The piece begins with a repeated note accented in the sequence: 13, 8, 5, 3, 2, 1, 2,

3, 5, 7, and 11, the numbers 7 and 11 surely being deviations (figure 4). I shall analyze later another part of *Zyia* composed with combinations of pitches in relation to the first elements of these series.

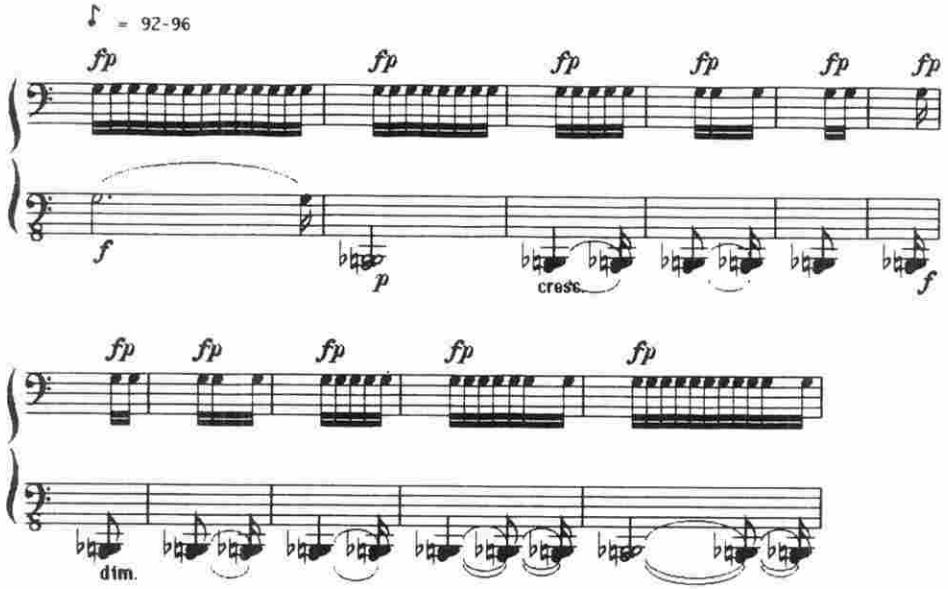

Figure 4
Zyia, opening.

The Golden Section interested Xenakis because it establishes the idea of *proportion*. In the introduction to the manuscript of *Sacrifice*, the composer states:

> The golden section constitutes one of the biological laws of growth. It appears in the proportions of the human body. [. . .] The musical durations are created by muscular stimulations which activate the human limbs. It is obvious that the movements of these limbs tend to happen with durations that are proportional to their sizes. As a consequence, durations which are in the Golden Section proportions are more natural for the movements of the human body.

Xenakis' interest in the idea of proportion results in part from his other activity during that period, architecture. The influence of Le Corbusier, who invented a system of proportions (the "Modulor"), was surely important (cf. Le Corbusier 1950, 1955[18]). An important role was also played by some of what Xenakis was reading at that time, including *On Growth and Form*, by D'Arcy Thompson, and the writings of Matila Ghyka on the Golden Section.[19] So it is perhaps natural that the young composer's interest in proportion led him later to a generalized definition of the artist as being a creator of "new, abstract and free forms" (Xenakis 1979: 13).

The second abstract element of the early works is that which, in *Pithoprakta*, led to the introduction of probabilities. This revolutionary method may appear to be an *ex nihilo* inspiration. But it was preceded by a technique which links serial-like methods with probabilities: combinatorial processes. In his article "La crise de la musique sérielle," Xenakis (1955c) criticizes serialism by defining the series as "a succession of objects of finite number," concluding that "combinatory calculation

is but a generalization of the serial principle" (Xenakis 1955c: 41). He proposed, therefore, to replace simple combinatorial serial technique with more complex calculations. Indeed, a complex combinatorial technique appears in *Metastaseis* (mm. 104–202) which, in a way, "generalizes" serialism. But the first examples of combinatorial technique in Xenakis's music are actually found in *Zyia* and *Procession*.

In these two works, the popular-like melodies seem forced and artificial, as if they were produced by pure combinations of notes. As mentioned before, the idea of melody was less important than the research into scales. Moreover, in *Zyia* there is a strange extract, completely removed from the "Bartókian project." At measure 116, the melodies of the soprano and choir stop and the music becomes very sober: the piano begins to repeat a cluster and three notes, the durations of which correspond, counted in sixteenth-notes, to the first four numbers of the Fibonacci series (1, 2, 3, 5). For fifty bars the music is nothing but this (figure 5 shows the beginning). At measure 165, Xenakis adds two new notes, associated with longer durations (8 and 13, corresponding to the continuation of Fibonacci series), and the combinatorial process continues.

Procession enriches this technique. In his analysis of the score, Xenakis says about the transformations of the mixed choir that, "It first grows and then shrinks to end up on page 27 in permutations of four sounds." The huge polyphony of pp. 27–32 is indeed the result of combinatorial processes. The choir is divided into ten voices entering one after the other, each singing the same melody (or its transposition at the 3rd or 4th) in a perpetual movement of eighth-notes. This melody is made up of permutations of four notes (F[sharp], A, B, C, or the above-mentioned transpositions);[20] taking one bar as a unit, we have a succession of twenty-two permutations.[21]

The third element that led to Xenakis' abstract style is related to the previous one. The introduction of probabilities – prefigured in combinatorial processes – necessitated a new conception of composing and listening to music: a conception based on musical masses. Xenakis also criticized serialism by pointing out a contradiction between its compositional technique, which obeys a "linear polyphonic logic," and its sonic result, which is "surface, mass" (Xenakis 1955c: 41–42).[22] So, he proposed to compose directly with masses. *Metastaseis* introduced this innovation. Here too, we may have the impression that, with this work, Xenakis implemented radical innovations. Again, however, the beginnings of this technique can be found in his early pieces.

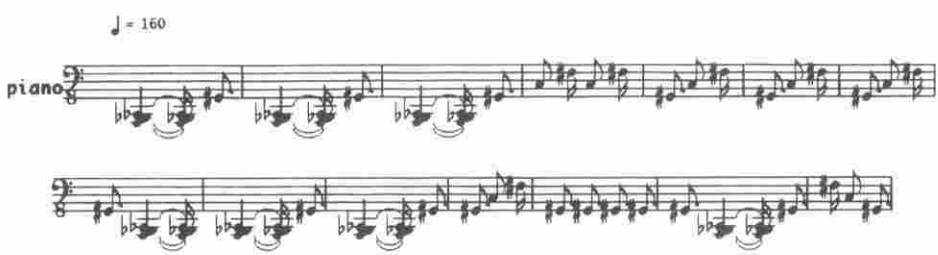

Figure 5
Zyia, **mm. 116–129.**

In *Zyia*, Xenakis rediscovered (after Charles Ives) the principle of non-polyphonic superimposition. In fact there are few superimpositions, but each musical entity has its own characterization: a quasi-traditional melody for the soprano; five-note aggregates evoking oriental music, in asymmetrical meters, for the choir; sonic experiments (new scales, combinatory processes) for the piano. The principle of superimposition is more systematic in *Procession*: "The whole work is based on the principle of superimposition. Each figure [*personnage*[23]] keeps its own character and therefore its own melodic, harmonic, and rhythmical character," states Xenakis in his analysis of the piece. From p. 38 of the score and onwards, the three "figures" of the piece are treated like independent layers put one over the other: the male choir sings in the manner of a *cantus firmus*; the mixed choir combines three notes in a perpetual movement of eighth-notes; the instruments not supporting the two choirs progress with parallel fourths.

Subdivisions of instruments or voices appear in *Procession* that prefigure the radical string subdivisions of *Metastaseis*. The division of the choir into ten voices on pp. 27–32 has already been mentioned. One can add two examples of subdivisions of the strings. On p. 9, fifteen lines progress in parallel fourths. On pp. 12–14, Xenakis superimposes eight lines (on nine staves: Violin I.1 and Violin II.1 have the same music), which progress through a systematic parallelism by going up or down. The result is a huge, uniformly moving cluster (figure 6 shows the first note of each line), a technique which prefigures Xenakis' late works, where there is a reduction of masses to clusters.

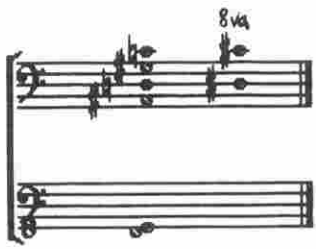

Figure 6
***Procession to the clear waters*, p. 12, measure 3, starting note of each melodic line.**

Use of the three elements – the Golden Section (Fibonacci series), combinatorial processes, the beginnings of composition with sound masses – which coexist with references to demotic music, show how Xenakis' early works prefigure his first works. But in *Sacrifice*, composed just before *Metastaseis*, a radical abstraction clearly appears. This piece (completed 28 July 1953, as noted in the manuscript, and dedicated to Messiaen[24]) shows the most radical element of abstraction, the research into mechanisms or, one could say, the definition of musical composition as the invention of systems that could be automated.

The whole composition (with a duration of about 5 minutes) is based on a single idea, which leads to the construction of a huge mechanism. There are only eight pitches, each of fixed register (see figure 7). The durations, counted in sixteenth notes, correspond to the first eight numbers of the Fibonacci series (1, 2, 3, 5, 8, 13, 21, 34). At first, each pitch is always played with the same duration according to this logic: the lowest with the longest rhythm, the highest with the

Figure 7
Pitches of *Sacrifice*.

shortest, etc. After measure 38, the pitches exchange their durations: E, G, Bb, and F[sharp] slow down progressively and then go faster and faster according to a nonlinear progression. The A[flat] slows down quickly and then goes faster and faster (again, in a nonlinear way); the B changes duration in an unpredictable way; C and A go faster and faster, also according to a nonlinear progression. Figure 8 outlines the whole evolution of the mechanism, showing (in bold) the durations through which the pitches are cycled and the number of their repetitions (for example, the lowest pitch, E, is played eight times in the

bars	E	G	Bb	Ab	F#	B	C	laA
1	**34**x8							
3		**21**x13	**13**x16					
8				8x23				
11						3x64		
20					5x34			
23							2x38	1x42
38	**21**x3							
41		**13**x1						
45	**13**x2							
46			8x1					
47		5x17						
48	8x13		3x33	2x12				
63	1x16	2x22			3x1		5x8	
64				5x5	2x8			
65								8x8
73	8x1	5x1		2x1	5x5		2x10	1x19
74	34x1	21x1	13x1	8x3				
76	1x25	2x35	3x30					
77					1x19	2x28	3x20	
78				5x3				
79								5x4
87					5x4	3x5	2x5	1x3
89	34x1		13x1	8x1				
90		21x1						
92	1x17	2x9	3x5	5x4	8x5	13x5	21x5	34x4
93			21x1					
95		13x1						
96	34x3	21x4	8x1	3x1				
97			13x3					
99				8x1				
103			8x1			8x1		

Figure 8
Mechanism of *Sacrifice*.

beginning with a duration of 34 sixteenth-notes; then, from measure 38, it is played three times with a duration of 21 sixteenths, etc.).[25] The horizontal lines of the figure divide the piece into parts according to the evolution of the mechanism.

Sacrifice is an algorithm, and it suffers from the rigidity of its mechanism: the system is too simple and its evolution is not interesting enough.[26] Only the next two works, *Metastaseis* and *Pithoprakta*, would manifest abstraction in a more engaging manner. *Metastaseis* does not use only one idea, but several, which are juxtaposed one onto another, creating thus a form by juxtaposition. In addition, the idea always dominates the system: the mechanisms are subservient. Finally, the ideas of *Metastaseis* are very interesting and original: massive *glissandi* realized in several ways (mm. 1–33, 86–103, 310–336, 317–end), completely new in the history of music; a huge cluster (mm. 34–85), also exhibiting a radical modernity; the superimposition of volumes (mm. 202–309) that only Ives and Varèse had realized before. Only the above-mentioned serial-like extract (mm. 104–201) is not completely original in its sonic effect.

With *Pithoprakta*, the art of composition as a perpetual invention of systems becomes brilliant, maybe because the mechanisms are now defined as processes thanks to the use of a new technique of progressive transformation. Xenakis created a music that breaks with the static character of serialism (and also with his own early works in their most abstract, as seen with *Sacrifice*). In *Metastaseis*, *glissandi* are the only elements that have an evolution. In *Pithoprakta*, only one of the twelve sections is static (mm. 122–171). Four parts, in a linear progression, are defined by a progressive transformation of sonic states (mm. 14–51, 60–104), register (mm. 122–179), or both (mm. 231–250). The other sections, although they are static in their global form, can be interpreted as processes thanks to the nonlinear evolution of one dimension: density (mm. 0–13, 105–211), register (mm. 52–59, 208–230), internal texture of a cluster (mm. 180–199), melodic line (mm. 200–207), or spatialization (mm. 250–268).[27]

The comparison between *Sacrifice* on one side and *Metastaseis* and *Pithoprakta* on the other shows that, in Xenakis's music, abstraction – the research of an automated mechanism – becomes interesting when the idea dominates the mechanism. Curiously enough, the composer's subsequent evolution seems like a regression. The radical proposition of *Achorripsis* (1956–1957) – "What is the minimum of logical constraints necessary for the construction of a musical process?" (Xenakis 1963: 33, Xenakis 1992: 16) – led to the algorithm of the works called *ST* (1956–1962), reintroducing the domination of the system and evoking *Sacrifice*, though produced with more advanced means. But this phase was also the last of Xenakis' research into pure mechanisms, systems where the idea disappears.[28] Beginning with *Herma* (1961), his works bring back the domination of the idea.

Acknowledgements

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Scores

Zyia (1952), for soprano, 5 tenors, flute and piano. Paris: Éditions Salabert.

Anastenaria 1. Procession to clear waters (1953), for mixed choir (9 sopranos, 6 altos, 6 tenors, 9 basses), male choir (15–20 baritones) and orchestra (3 flutes, 2 oboes, 2 English horns, B[flat] clarinet, bass clarinet, 2 bassoons, 4 horns, 2 trumpets, trombone, 10 violins I, 10 violins II, 6 violas, 6 cellos, 6 double basses, percussion: bongos, 4 congas, triangle, xylophone, timpani, tam-tam, bass drum). Unpublished.

Anastenaria 2. Sacrifice (1953), for orchestra (piccolo, flute, oboe, English horn, B[flat] clarinet, bass clarinet, bassoon, contra-bassoon, 2 horns, 2 trumpets, trombone, tuba, piano, 8 violins I, 8 violins II, 6 violas, 6 cellos, 4 double basses, percussion: tambourine, timpani, cymbal, jeux de timbres, celeste, xylophone). Unpublished.

Notes

1. A French, much more developed version of this article is Solomos, M. (2001b).
2. With this expression, François-Bernard Mâche (1981: 155) is referring to Xenakis' famous article "The crisis of serial music" (Xenakis 1955c; cf. Xenakis 1994: 39–43).
3. In 1963, Xenakis wrote: "In this chapter we shall begin by imagining that we are suffering from a sudden amnesia. We shall thus be able to re-ascend to the fountainhead of the mental operations used in composition and attempt to extricate the general principles that are valid for all sorts of music" (Xenakis 1963: 185; cf. Xenakis 1992: 155).
4. Nouritza Matossian (1981: ch. 2) had already referred to Xenakis' early compositions. But their first full mention was made by Mâche (1988). For a review of these works, see also Solomos (1996: 16–21) and Mâche (1988: 78–79).
5. According to Matossian (1981: 62), *The dove of peace* won a prize in the International Youth and Student Festival for Peace and Friendship, Bucharest, August 1953.
6. *Zyia* was premiered in 1994, and *Triple Zyia* in 1998. The trio is recorded under the name *Zyia* on Salabert Harmonia Mundi (SCD 9603).
7. According to Xenakis' initial plan, *Procession to clear waters*, *Sacrifice*, and *Metastaseis* belonged to a trilogy based on the Thracian cult of Anastenaria. But, most likely before composing *Metastaseis*, he discarded this plan.
8. Demotic music is a generic term for the Greek popular musical tradition.
9. The other Greek article is Xenakis 1955a (also in Xenakis forthcoming).
10. See Boulez's (1966 [1952]) by-now historical article.
11. Manolis Kalomiris (1883–1962) is considered the leader of the (Athenian) "national school." Petros Petridis (1892–1977) is another composer of this tendency.
12. Popular songs composed during the Ottoman occupation of Greece.
13. The generalization of *glissando* in *Metastaseis* extends this reduction: one could say that Xenakis substitutes the *glissando* for the scale in the same way that, in his early works, he substituted the pure scale for the melody.
14. Based on the Indian mode, Sâbhapantovarâli, according to Mâche (1988: 81).
15. The French word used by Xenakis (in his handwritten analysis of the score) that I translate by "deviations" is *licences*.
16. For a definition – partially related to this phenomenon – of Xenakis' works as successions of what I call "sonorities," see Solomos (1993: chs 3, 9–11), and Solomos (1996: ch. 5). In addition, see Solomos (1994).
17. I deal with the question of these deviations – which are often just errors in calculation or in transferring to music – in Solomos (2001a).
18. In the later book, the famous architect includes a short analysis by Xenakis of the beginning of *Metastaseis* because of its use of the Golden Section (Le Corbusier 1955: 341–344). And, in one of his first published articles, Xenakis explains the *Modulor* (Xenakis 1957).
19. For insight into the readings of the young Xenakis, see Matossian (1981: ch. 2).
20. On p. 30, a G appears inside the tetrachord F[sharp]–C, which also has consequences for the two transpositions. Thus it is more likely a deviation than an error.
21. The succession of permutations does not seem to obey a particular law. If we number the four notes from lowest to highest, the twenty-two permutations are: 432124 / 432144 / 432124 / 321243 / 212432 / 124432 / 144321 / 234432 / 212342 / 123212 / 123434 / 444232 / 124232 / 123232 / 124432 / 4322*1 / 432124 / 321234 / 432124 / 432144 / 321234 / 321432 (the sign * indicates the note G).
22. The notion of "mass" was already present in the aesthetic of Edgard Varèse. Varèse also criticizes the notion of "linear polyphony" under the name of "linear counterpoint" (Varèse 1986 [1936]: 91)
23. The word *personnage* belongs to Messiaen's terminology, taken from his discussion of *personnages rythmiques* (cf. Halbreich 1980: 148).
24. According to Matossian (1981: 90), Messiaen made a positive judgment of *Sacrifice*.
25. Notice that there are three "deviations." Because they are so few, I conjecture that they are "errors." This is why they are not mentioned in figure 8. At mm. 89 and 103 for the B[flat], and at m. 103 for the B, the score indicates a duration of eleven sixteenth-notes. I have made an approximation to the nearest contextual rhythm.
26. "In spite of the differentiation created by the combinations of durations – which already work

like "clouds" of variable density – the piece is a little bit schematic and static, as if, in a symbolic manner, the most sacred moment of the rite of passage imposed the death of the man of popular music and a purification through the fire of mathematics" (Mâche 1988: 86–88).

27. For a detailed analysis of *Pithoprakta*, see Solomos (1993: ch. 12).
28. The recent computer program, GENDYN, and the pieces *Gendy3* (1991) and *ST709* (1994) – where the pure research of a mechanism dominates – are the only exceptions in Xenakis' subsequent evolution.