

“A FORM THAT OCCURS IN MANY PLACES” CLOUDS AND ARBORESCENCE IN *MYCENAE ALPHA*

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ABSTRACT

In interviews, Iannis Xenakis discusses archetypal shapes, which find expression across the different arts and sciences; this paper presents an analysis of how two of the most prominent shapes Xenakis mentions, clouds and arborescence, have deep salience in his electronic work *Mycenae Alpha* (1978). This piece was the first to be completed using the UPIC system, whose graphic is so conducive to thinking in terms of visual shapes and symbols, and a comparison of spectrographic images to the UPIC score pages reveals strategies Xenakis used to explore the territory between these ideal forms, fragmenting linear aspects of the piece towards more cloudlike elements. This analysis shows the relevance of these archetypal shapes at levels ranging from basic material, to formal organization, to the social and philosophical context of this piece and its place as the centerpiece of the *Polytope de Mycènes*.

1. CLOUDS AND ARBORESCENCE

In a 1989 interview with Bálint András Varga, Iannis Xenakis comments on some of the connections between his musical thought and his interests in other areas, and pondering the recurring shapes that bridge these different fields, he states, “I believe that [this] is what is lacking today: a theory about shapes. Perhaps in twenty, thirty, forty years’ time, fundamental shapes will be classified, along with their applications and expressions in different fields of observations and production.” (Varga, 1996, p. 207) He expresses the belief that these archetypal shapes, “are everywhere at various levels, forms corresponding to some inner necessity.” (Varga, 206) Two of the most prevalent shapes, which Xenakis describes and returns to repeatedly, are those of *clouds* and the branching structures, which he calls *arborescences*. Moreover, it is clear that these images have both concrete and abstract connotations for Xenakis.

A cloud, in Xenakis’s words, is “a form that occurs in many places,” and he cites numerous examples from nature, including cloudlike configurations of insects, people or other animals, as well as clouds of vapor. Continuing, with respect to his compositional concerns and the construction of cloud-like events in his music, he cites his turn to “ideas and techniques used in science – probabilities and the statistical approach.” (Varga, 206-7) The stochastic methods and outside-time structures that Xenakis is justly famous for developing, clearly arose in support of this cloudlike archetype. In the creation of such clouds Xenakis replaces causal determination with procedures derived from probability theory and statistics—one

of his earliest innovations. Pieces from the 1950s, such as *Pithoprakta* (1956) and *Achorripsis* (1957), are classic examples of structures designed almost exclusively from such pointillistic cloudlike textures. With respect to the phenomenon of arborescence, he states, “Another fantastic shape is that of trees. Arborescences. Veins and nerves have that shape. Lightning has it. All software is based on a tree-like construction. This is another widespread form.” (Varga, 207) And in an earlier interview, he talks about these structures more abstractly, from a generative standpoint:

We start out of a point in space. This can be pitch versus time space or any other. In order for it to exist the point has continually to repeat itself. In this way a line is formed which can have any shape. Any point on the line can also reproduce itself and bring about an arborescence. In this way, eventually a bush comes about... This can occur freely but also according to rules and can become as complicated as lightning or the veins in the body.

And he concludes that “the idea of arborescence is closely linked to causality, repetition and consequently variation.” (Varga, 88) Thus arborescence is also connected to the idea of continuity, linear motion and growth; to Markov chains, to glissandos, and the random-walk textures where the continuation is based on aspects of the current state and disjunctures are limited. Pieces like *Mikka* (1971) and *Evryali* (1973) come to mind as typical of this aspect of Xenakis’s thought.

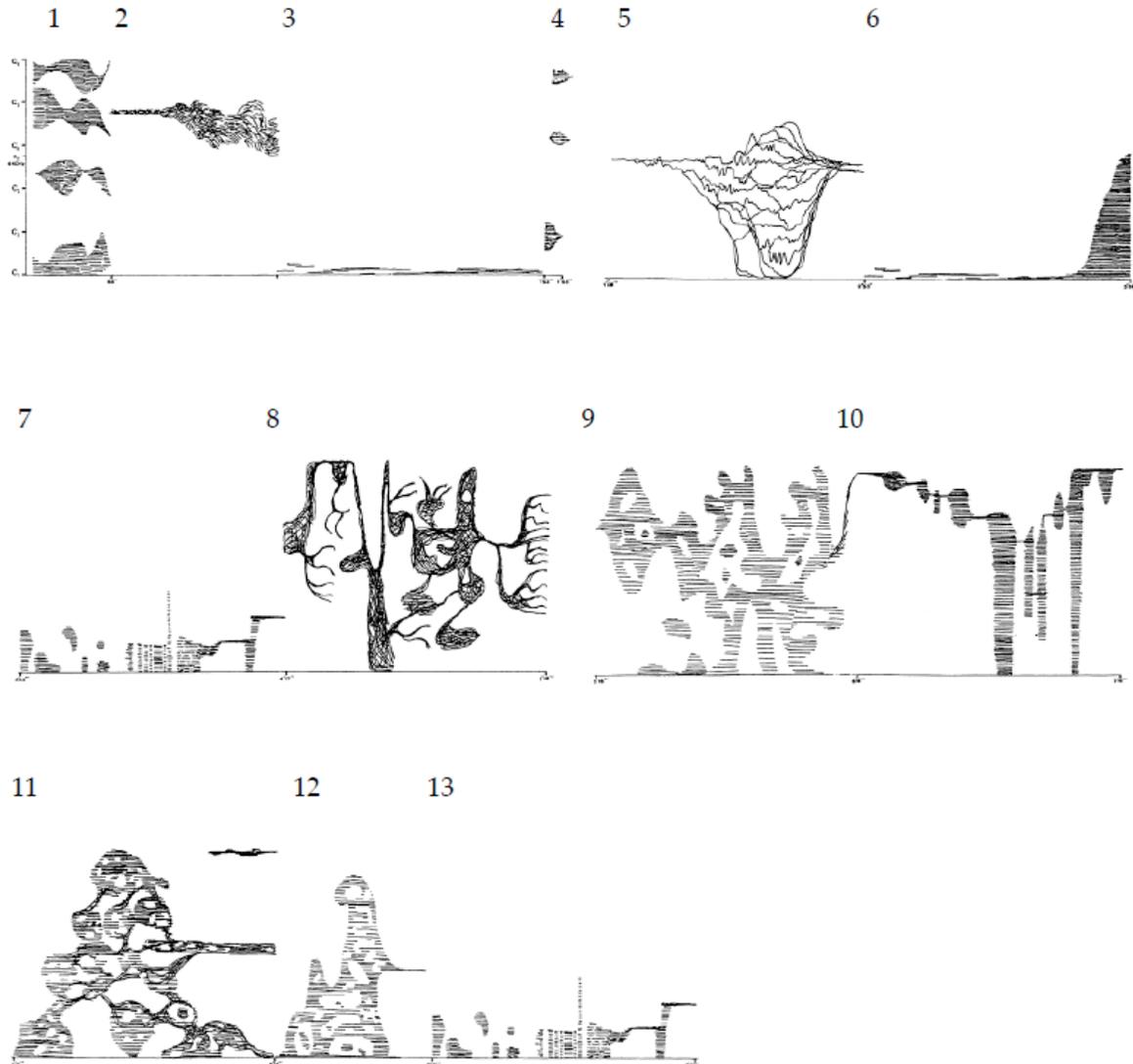
<i>Clouds:</i>	<i>Arborescence:</i>
Points arranged in families or populations	Points arranged into lines and branches
Understanding through statistical analysis	Understanding through deductive reasoning
Stochastic and probability functions	Markov chains and random walks
Outside-time structures	Temporal progression, growth, causality

Example 1: Connotations and expressions of the two archetypical states

Both clouds and arborescences have particular salience in Xenakis’s electronic work *Mycenae Alpha* (1978). While these shapes are seemingly opposed, during his move towards more explicit use of arborescence in the 1970s, Xenakis did indeed acknowledge that they are “distantly related,” (Varga 88) and in *Mycenae Alpha* he explored the possible connections between these archetypical shapes. Significantly, this piece was the first to be completed using the UPIC system (Unité Polyagogique Informatique du CEMAMu) whose graphic interface is so conducive to thinking in terms of visual shapes and symbols. The following analysis shows the relevance of these two fundamental shapes at a number of different levels, from that of the formulation of basic sonic material to the large-scale formal organization of the entire composition.

2. MYCENAE ALPHA: FORM AND MATERIAL

The graphic UPIC score of *Mycenae Alpha*, Example 2,¹ shows predominantly arborescent material, while the form itself is a constellation of a variety of musical events of varied durations, with little development or connection between sections, thus tending towards disjunction. In spite of this seeming contradiction between branchlike material and cloudlike structure, there are several ways in which Xenakis fragments the linear material generated by the arborescences into more cloudlike structures, and conversely where he implies loose connections between separate points within the form.



Example 2: UPIC Score of *Mycenae Alpha* with Section Labels

¹ This example is adapted from the UPIC score as reproduced in Iannis Xenakis, "Mycenae – Alpha 1978," *Perspectives of New Music* 25/1-2 (1987), 12-15.

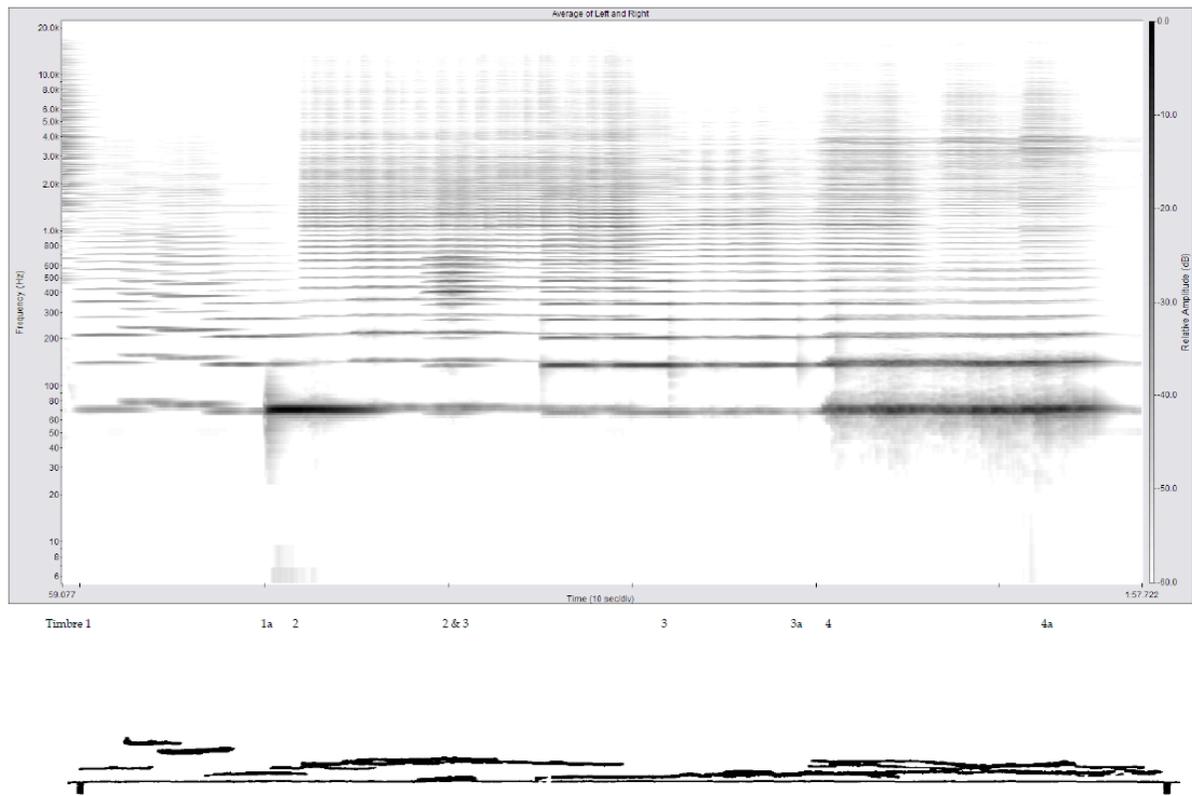
The piece is made up of thirteen discrete segments, each corresponding to one of Xenakis's UPIC designs. Both Agostino Di Scipio (1998, pg. 222) and James Harley (2002, pg. 51 and 2004, pg. 115) have noted that the limitations of the early version of the software make for a sectional work where transitions are generally abrupt. There are, however, a few connections to be found between the individual sections. Sections 7 and 13 contain identical shapes, although they span different durations: Section 7 is just 24 seconds long, while 13, the final section, is expanded to just over a minute. The design of Section 3 is repeated in Section 6, but given a radically different ending. Sections 11 and 12 have similar contours, but are not exact repetitions—and to my ear, due to a notable shift in timbre, abrupt return to the low register, as well as an accelerated timeframe, Section 12 sounds quite distinct.

Thus, the piece reflects an opposition of more cloudlike designs, where individual moments are meaningful only with respect to their general statistical environment, and the arborescent designs, which feature more explicit linear connections among the various sonic events. The UPIC system is most conducive to the creation of arborescent designs. In fact, according to Henning Lohner, on the microcompositional level, "... you can either draw continuously or set points that are then automatically connected by the computer along the time axis." (Lohner, 1986, pg. 46) Thus the computer system itself is somewhat biased towards both periodic wave forms and linear motion, and quite different from a granular synthesis approach that would represent the cloudlike archetype. Despite this bias, there are several strategies—although many of them absent from the UPIC score itself—that Xenakis uses to disrupt the more the linear aspects of the piece, and push it, at times, towards more cloudlike organization.

A closer examination of Sections 3 and 6 reveals several non-linear transformations within what seem like the most linear sections of the original UPIC score. Section 3 contains at least four distinct timbres, as shown in Example 3, (consisting of a spectrograph of the section with the corresponding UPIC score underlain below, and stretched to match the timeframe of the spectrograph).²

- Timbre 1 is a harmonic spectrum, with strong odd-numbered partials.
 - Timbre 2 is significantly and abruptly noisier, due to an increase in upper-partial activity.
 - Timbre 3 is distinct from either Timbre 1 or 2, with less upper-partial activity than Timbre 2 and more strength in the lower partials. Moreover, Timbre 3 begins in conflict with Timbre 2 and as these overlap between 1'18" and 1'32", contradicting the notion of a succession from one to the other, and emphasizing their differences.
 - Timbre 4 is also noisy, but with a unique area of upper partials from that emphasized in Timbre 2 or 3.
- Finally, what I have labeled as subdivisions of these basic timbres represent less abrupt changes—Timbre 1a, concentrates all its intensity into the fundamental, but is still very similar to Timbre 1; Timbre 3a is softer, with fewer overtones, and Timbre 4a is shifted slightly higher.

² The spectrographs used in this and the following examples were generated using the Spectra Plus FFT Spectral Analysis System (Campbell, CA: Sound Technology, Inc., 1998) and from the CD, "Xenakis, UPIC, Continuum: Electroacoustic & Instrumental works from CCMIX Paris," (New York: Mode CD 98/99, 2001).



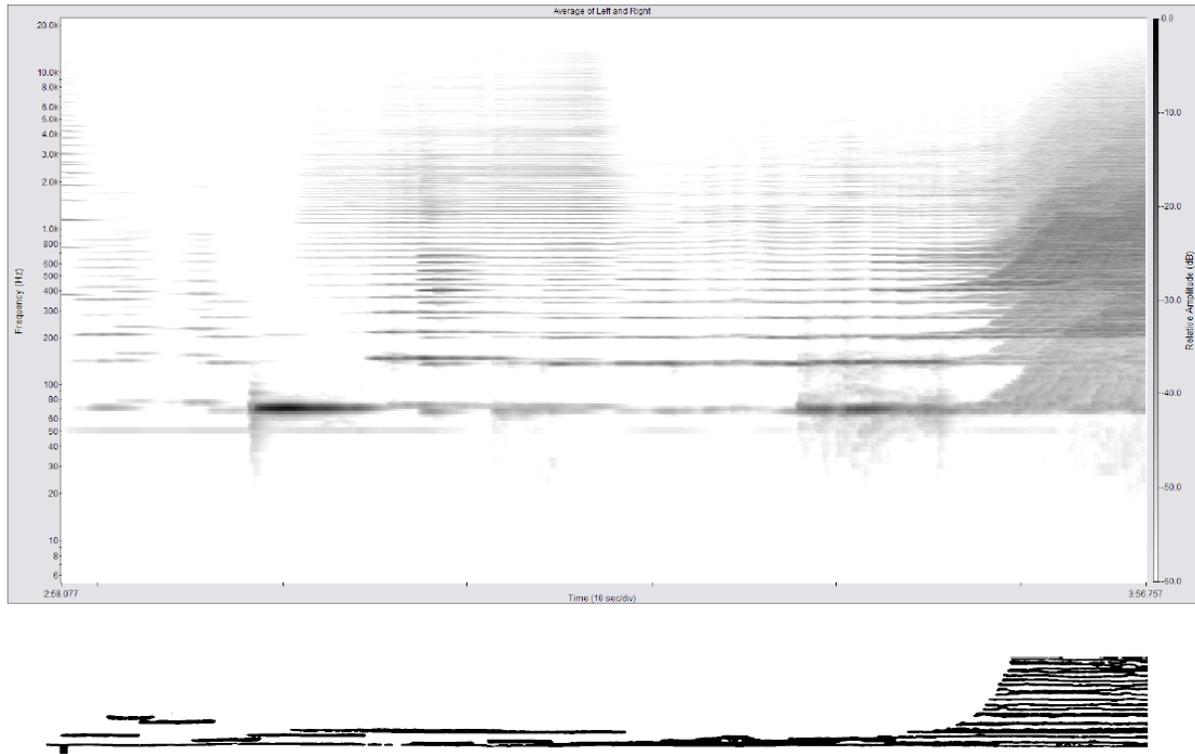
Example 3: *Mycenae Alpha*, Section 3, spectrograph and score

The prominent changes between timbres are often abrupt, and seldom predictable from the UPIC score itself. Instead of appearing in a developmental succession or clear pattern of growth, they are grouped into loose families that come and go, and each timbre has little influence on those that follow. While this section appears on the page to be the most linear and pitch-focused part of the piece, the approach to timbre dramatically undercuts this interpretation.

Several other aspects of the composer's realization of the score page for this section also belie the linear appearance of the score. While glissandi are often a feature of pure arborescence, the slight inflections of the opening soon give way to beating created by the overlapping of closely spaced fundamentals. As two lines come closer together the individual voices are subsumed, supplanted by the beating, emphasizing individual points at different speeds; these beats are multiplied by the addition of upper partials, and as they proliferate (for example at the end of Section 6) the texture becomes a mass of statistical noise.

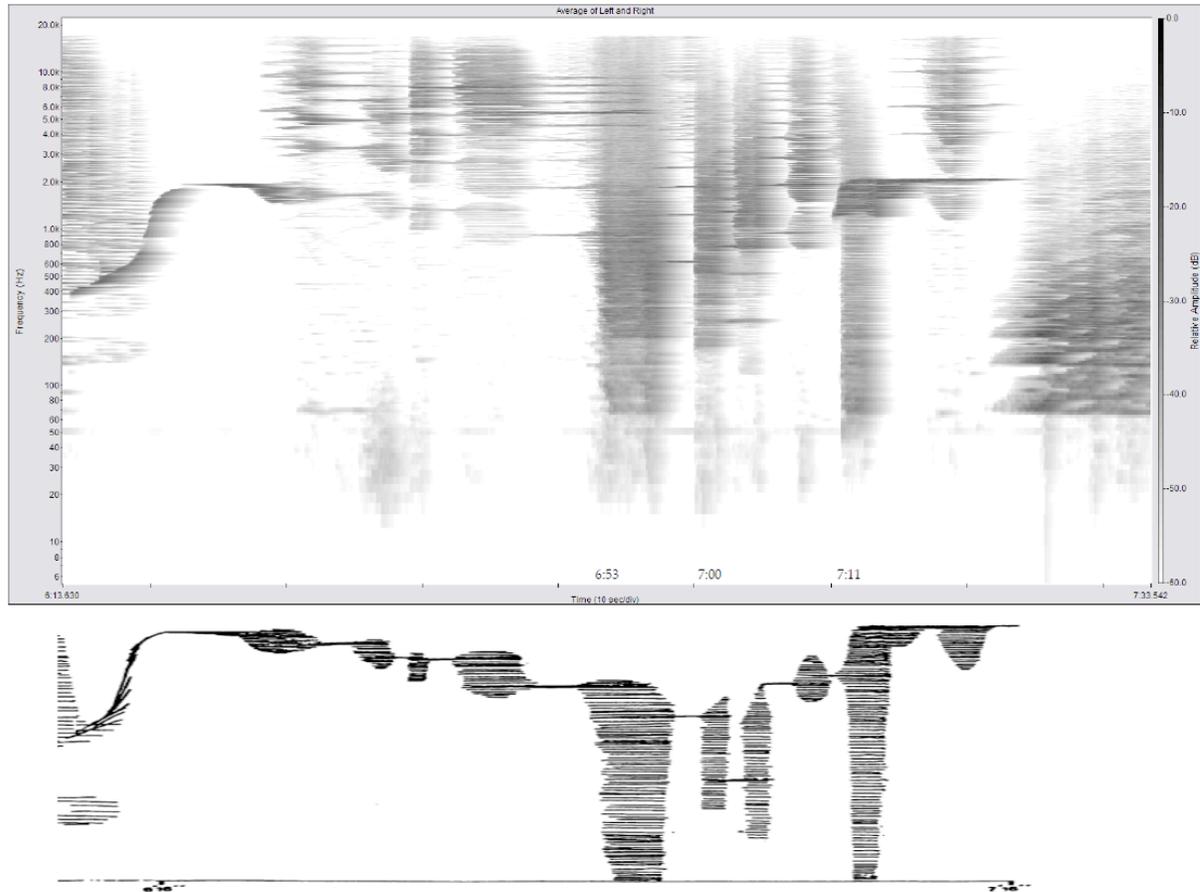
The dynamic envelopes seem to work in tandem with this beating effect, creating a pulsation that divides each timbral family into independent attack patterns that have a greater aural prominence one would imagine from just the simple sustained lines seen in the score. Section 6 (Example 4) carries this even

farther; the dynamics in general are softer than in Section 3 and begin to fragment the lines shown in the UPIC score even more thoroughly, cutting off many of the indicated entrance and exit points.



Example 4: *Mycenae Alpha*, Section 6, spectrograph and score

Xenakis employs yet another procedure that blends arborescence and clouds, and relates to his philosophical approach to time. Examples of this procedure are found throughout *Mycenae Alpha*, but are particularly notable in Section 10, shown in Example 5. This section begins with cascading contours perceptible as linear motions, but these become increasingly steep changes that eventually lead to a bifurcation of material into steady lines and sudden explosive clouds of noise. The transition here is quite audible; the opening figures seem like a typical arborescence, consistent with its depiction in the UPIC score, but as the section progresses, the events at 6:53, 7:00, and 7:11 sound much more like a polyphony between pure sustained pitches and distinct clouds of noise, which take on an interruptive character. Here, the lines seem to exist in opposition to the clouds, rather than developing into and out of them.

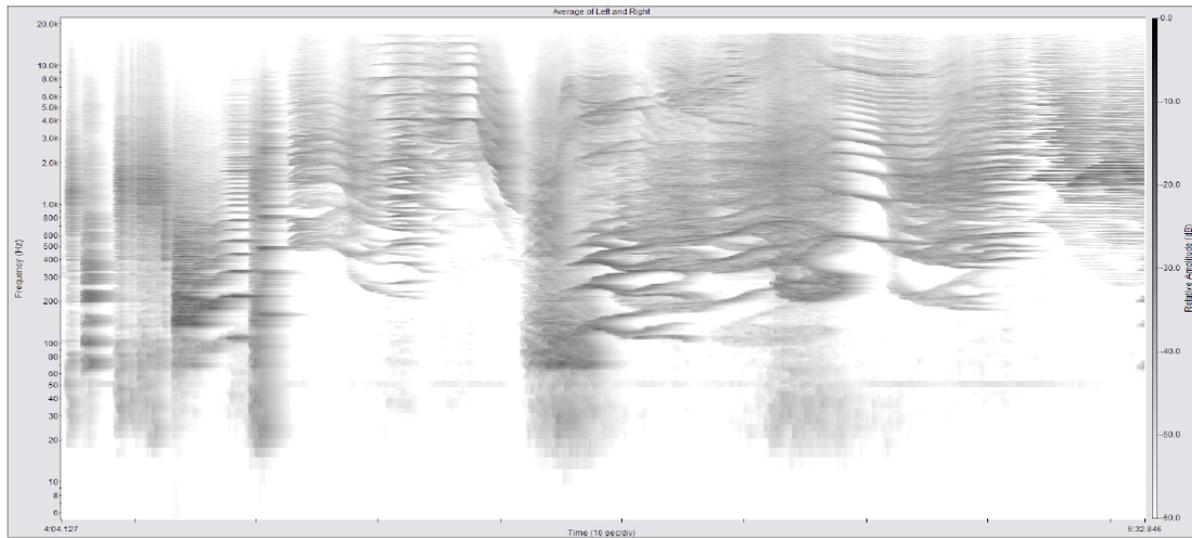


Example 5: *Mycenae Alpha*, Section 10, spectrograph and score

The technique by which Xenakis achieves this result involves a temporal contraction of events—when the vertical spread from narrow to wide happens over a longer period of time the linear contour remains, but when it is compressed into an extremely short time span, it is lost and the lines of sound (arborescences) are converted into clouds.

Another related technique by which Xenakis achieves this transformation of arborescence into cloud—one that defies standard temporality—involves a spatialization of the dimension of time. We see a vivid instance of this in Section 8 (Example 6, and especially the second shape in the UPIC score, drawn in the upper register) in which the direction of arborescence bends backwards in time. This cannot be understood as a purely linear development in time, but rather as another, more spatial, multidimensional, or outside-time development that helps mediate between Xenakis’s two archetypal shapes. Here, the beginning of the

linear structure, as heard, is clouded over, and does not coincide with the implied beginning of the notated figure.³



Example 6: *Mycenae Alpha*, Section 8, spectrograph and score

3. CONCLUSIONS

The two basic shapes discussed (cloud and arborescence) are fundamental to Xenakis's thought—both musical and otherwise. He was never satisfied to employ either one exclusively in a composition, but like many of the great scientists and philosophers of the 20th Century, was interested in exploring the dialectical tension between them. Thus, when analyzing a work such as *Mycenae Alpha* simple reliance on the UPIC score is misleading—showing predominantly the arborescence in the piece, but not revealing the work's more cloudlike aspects.

As is widely known, *Mycenae Alpha* is part of a larger work, the *Polytope de Mycènes*, a large scale spectacle involving the recitation of ancient texts, along with shows of lights and music, including *Mycenae*

³ It is interesting to compare this with Xenakis's "Concerning Space, Time, and Music" in *Formalized Music*, especially his remarks about Richard Feynman's speculation of a positron being a "temporal retrogression" of an electron (Xenakis, 1992, p. 257).

Alpha and many of Xenakis's other Greek-themed works.⁴ The *Polytope*, too, exhibits many cloud-like features which extend well beyond the confines of a musical score: the spacing of performing forces across many physical locations, including audience participants and herds of goats wearing specially crafted bells. The recurring Greek texts come from different authors, writing in different dialects, and through the mouths of different characters, some resumed after musical interruptions, others not. While the story of the house of Atreus is a constant background to this, the story is never presented as a linear narrative, but rather it works as a cloud of fragments gathered around the same theme. Moreover, it is not a stretch to read Xenakis himself into this same line of interpretation. With his return to Greece after years of exile, each point in the landscape must have been rich with possible meanings and associations from across time, from the personal, to the historical, to the mythological; and yet any attempt to follow one of these threads of continuity would surely come up against inevitable fragmentation. These piecemeal clues require the mindset of an archeologist, examining the shards of a culture from outside time, and attempting to reconnect the lines of its story, its cause and effect. I find much the same process at work in *Mycenae Alpha*, and find that using these archetypal forms as a starting point helps express aspects of this work and its approach to time, and help reveal the beautiful resonances it has with other areas of Xenakis's life and work.

4. REFERENCES

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⁴ More information about the structure and presentation of the *Polytope* can be found in Part 4 of *Music and Architecture* (Xenakis, 2008) and in articles by Maria Anna Harley (1998) and Philipp Oswalt (2002).