

# “VERS UNE MÉTAMUSIQUE”: XENAKIS, SIEVE THEORY AND CULTURAL PLURALITY

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## ABSTRACT

Among the well-known essays of Iannis Xenakis, “Vers une métamusique” is unusual for its desire to situate theory within a historical context. In multiple presentations during the mid-1960s, Xenakis linked his theory of Sieves, a theory enabling the construction of complex symmetries, to the pre-modern sources of the European tradition, non-western musics and the music of his Greek heritage. With the theories of Aristoxenos and the ancient Greeks, the musical practice of the Byzantine church and ethnomusicology, Xenakis marshaled an unforgiving critique of the contemporary avant-garde, which he viewed as mired in the confines of serialism and the revisionist perspectives of contemporary musicology.

Xenakis’ argument in “Vers une métamusique” engages a wide variety of history, personalities and music theory. My essay examines Xenakis’ sources, in particular the writings of Jacques Chailley and the Chrysanthine tradition of the Byzantine church, to reconstruct the social context of his argument. This context extends to the varied presentations Xenakis made concerning his theory, which he saw as relevant to the legacy of Olivier Messiaen, as an encompassing universality for the musics of the planet, and as a purge for the atrophy of the western tradition. Excavating this background to “Vers une métamusique” enables us to review Xenakis’ engagement with the musical discourse of the time and evaluate his critical judgments. From this perspective, I hope to reveal some of the motivations and convictions that underlie Xenakis’ philosophy of music and his theory of Sieves.

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Music theory, which has taken on increasing importance in the last century, does not often show the traces of its development. Arnold Schoenberg, for example, sought to keep his twelve-tone method a secret, and only when he feared being viewed as an imitator of Josef Matthias Hauer, did he reveal the theory to a group of his students.<sup>1</sup> Iannis Xenakis’ theories have been well studied as abstractions, yet relatively little has been done in the way of historiography, to connect Xenakis’ thinking to the specific circumstances of his life and European culture after the second world war.

It is with this perspective that I turn here in my examination of his essay from the mid-1960s, “Vers une métamusique.” This essay was presented in a couple of initial versions before being published in its final form in the French journal *La Nef* in 1967.<sup>2</sup> Its theoretical concern is Xenakis’ conception of Sieves, which can be seen as a universal method for the construction of scales of arbitrary complexity. As Xenakis observes:

Sieve theory... is applicable to any other sound characteristics that may be provided with a totally ordered structure, such as intensity, instants, density, degrees of order, speed, etc.... This method can be applied equally to visual scales and to the optical arts of the future.<sup>3</sup>

As such, the presentation of his innovative theory in “Vers une métamusique” culminates by demonstration: Xenakis concludes his essay by using the mathematics of set theory to construct a variety of scales: the Western chromatic scale; a Byzantine scale consisting of a disjunct chromatic and diatonic tetrachord; the Indian classical Audava-Sampurna scale with its pentatonic ascent and heptatonic descent; and finally, a non-octaviating scale of the type imagined by Edgard Varèse.

To reach this level of generality, Xenakis locates his theory in the systems of the ancient Greek theoreticians which

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<sup>1</sup> See Arnold Schoenberg, “Schoenberg’s Tone-Rows,” in *Style and Idea*, Leonard Stein, ed., Berkeley: University of California Press, 1985, [12: 213].

<sup>2</sup> Iannis Xenakis, “Vers une métamusique,” *La Nef* 29, 1967, [20: 117-40]. This essay has been reprinted and translated many times. See the extensive bibliography compiled by Makis Solomos at <<http://www.iannis-xenakis.org>>.

<sup>3</sup> Xenakis, *Formalized Music: Thought and Mathematics in Composition*, Stuyvesant, NY: Pendragon Press, 1992, [17: 199].

have both inspired, and been misinterpreted by, the European tradition. He also argues for the continuity of his theory in Byzantine music, which makes direct claims on ancient Greece, and suggests the general applicability of Sieves to other musical cultures. A look at Xenakis' relation to these theoretical traditions is my focus here. In his essay, Xenakis offers summaries of how these theories organized harmonic space. Because his analysis challenged then-contemporary views, he also offers critical commentary on the state of ancient Greek and Byzantine musical scholarship. In my consideration of both traditions, I will include examples of each of these facets of Xenakis' argument.

In accordance with his understanding of ancient Greek theory, and especially the writings of Aristoxenos, Xenakis organizes his presentation into a four part hierarchy: tone, the various genera of tetrachord, scale, and mode. In doing so, he accounts for the fundamental definitions that are expressed in the next higher order. The smallest musically valid intervals and consonances are organized into the tetrachord which has fixed outer notes and two movable inner notes. The shadings of position of these inner notes determine its intonation, either enharmonic, chromatic or diatonic. Tetrachords are conjoined by tone into the larger Greater Perfect System, delimiting pentachords and octachords over a span of two octaves. Finally, the melodic particularizations of this system through mode or key complete this outside-time system.

As is often the case with theories, this order reflects the conceptual hierarchy of the system, but doesn't necessarily reflect the evolutionary development of ancient Greek theory. Martin West points out that the Greater Perfect System, "was the outcome of long efforts to accommodate the various modal scales in a unified system, and to define their mutual relationships."<sup>4</sup> West's argument is that these ancient Greek outside-time structures grew from a systematization of their in-time modal practice. Andrew Barker develops this idea, albeit in a very general way, in the introduction to his volume of translations of the ancient theorists.<sup>5</sup> Barker argues that from the seventh century, Greeks were familiar with regional melodic styles, and instead of being combined into a single undifferentiated mélange, they retained their names: Lydian, Dorian and the like, and were used for distinct emotional and aesthetic effects. By the fifth century, the influence of abstract harmonic theory and the practical requirements of modulating between these *harmoniai* led to their orderly transformation within the larger system described by Xenakis.

By Aristoxenos' time, analysis in terms of *harmoniai* was outmoded. The systems of *tonoi*, and for later theorists *tropoi*, took its place. This is Xenakis' quaternary order, a very difficult issue in ancient Greek theory. The idea of *tonoi* underwent its own evolution, moving from a mode-like concept to one resembling key. The earlier modal concept of *tonoi* mapped rotations of an intervallic structure onto a fixed, cyclical pitch space. Later Greek conceptions theorized the *tonoi* as transpositions of one intervallic structure to different pitch levels somewhat like keys. Barker suggests the increasing importance of the *aulos* as a musical instrument in spurring this change. Having a substantial range and flexible modulation, the impact of the *aulos* was such that Aristoxenos mentions no stringed instruments at all in his treatise.

Xenakis' presentation of ancient Greek theory challenged an accepted musicological view that selectively interpreted and valued its achievements insofar as it contributed to the development of the European musical tradition. Xenakis cites Jules Combarieu, whose standard work, *Histoire de la Musique*, first published in 1913, deplored Hucbald of Saint-Amand for a slavish obedience to the theories of antiquity.<sup>6</sup> Combarieu's critique reflected a conventional viewpoint of the early 20<sup>th</sup> century, as Rembert Weakland explained in his 1956 essay on Hucbald.<sup>7</sup> Weakland reviews the scholarship that by 1914 had stripped Hucbald of the authorship of both *De Alia Musica* and the *Musica Enchiriadis*, preserving his authorship solely of the *De Institutione Harmonica*. As the *Enchiriadis* text was seen by the scholars of the time as a founding document of polyphonic theory, the divorce of Hucbald's authorship left him with claim only to an "unimportant" early work.

Recent scholarship has revised Combarieu's judgment. Hucbald is now seen as having brilliantly synthesized ancient Greek music theory (which had been recently "imported" by scholars such as Alcuin of York) with the practical tradition of Western Plainchant. In doing so, Hucbald's *De Institutione Harmonica* moved away from the Platonism of the Boethian quadrivium and established the practice of music as the object of music theory, which remains the Western paradigm.<sup>8</sup> Although Xenakis holds to a view of Gregorian chant that argues for a continuity with Greco-

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<sup>4</sup> See Martin West, *Ancient Greek Music*, Oxford: Clarendon Press, 1992, [16: 223].

<sup>5</sup> See Andrew Barker, ed., *Greek Musical Writings, Volume II: Harmonic and Acoustic Theory*, Cambridge: Cambridge University Press, 1989, [1: 17-27].

<sup>6</sup> See Jules Combarieu, *Histoire de la musique: des origines au debut du XXe siècle*, vol. 2, Paris: Librairie Armand Colin, 1920, [4: 224].

<sup>7</sup> See Rembert Weakland, "Hucbald as Musician and Theorist," *The Musical Quarterly*, 42/1 (Jan 1956) [14: 66-84].

<sup>8</sup> See, for example: Calvin Bower, "The transmission of ancient music theory into the Middle Ages," pp. 149-61 and David Cohen, "Notes, scales, and modes in the earlier Middle Ages," [3: 338], both in *The Cambridge History of Western Music Theory*, Thomas Christensen, ed., Cambridge, Cambridge University Press, 2002.

Roman antiquity that is now discredited, he does see the era as focal in the development of the European musical tradition which left the richness of antiquity behind to pursue its own concerns.

In this pursuit, Xenakis remarks that “scholars have been looking through the lens of the Gregorian chant and its modes, which have long since ceased to be understood.”<sup>9</sup> In his desire to revisit a moment in the Western tradition prior to the development of polyphony, Xenakis cites musicologist Jacques Chailley who was almost alone in challenging then-current scholarship that sought to interpret ancient Greek theory from the perspective of the European tradition. Chailley’s essay “Le myth des modes grecs,” published in 1956, traces the evolution of this revision by classical scholars and the “gregorianists” back through Mersenne to Zarlino and Glarean, and finally to Boethius. Significantly, Chailley credits non-Western civilizations and the work of ethnomusicologists for preserving these modal systems over the centuries of European neglect. The final paragraph of his essay concludes:

This conception, moreover, is neither so mysterious, nor so remote as one would think. It has been conserved up to the present, but it is neither in our theories nor in the analogy to the Middle Ages that one will find its survival: It is in the living musical traditions of civilizations different from ours and that, thanks to ethnomusicology, we are able day by day to better understand.<sup>10</sup>

Chailley’s argument concerning the modal practice of the ancient Greeks enabled Xenakis to see how the Western diatonic scale had become dominant in Europe, in turn leading contemporary scholars to reinterpret ancient Greek practice in light of this dominance. In retracing this evolution, Xenakis came to understand Greek theory’s common connections to other musical cultures. Chailley’s remark on “living musical traditions of civilizations different from ours” perhaps also confirmed Xenakis’ conviction about the value of contemporary Byzantine practice, at that time mostly neglected by Western scholarship.

Observing that Byzantine music has best preserved the musical structures of ancient Greece, Xenakis summarizes contemporary church practice by citing the pedagogical treatise of Avraam Euthymiadis, published in 1948. Euthymiadis’ work fits within the Chrysanthine musical tradition, which had its beginnings in the 1820s during the struggle for independence. Xenakis lays out the four orders: tone, tetrachord and genera, scale and finally mode, noting both similarities and differences from ancient Greek theory.

Xenakis devotes a large part of his summary to Byzantine scales. Although he claims that the idea of scales was still fairly obscure to the ancient Greeks, we have seen that these concepts actually began to evolve as early as the fourth century. But the richness of the Chrysanthine repertoire of scales is what is most significant for Xenakis. Taking the basic units of tone and tetrachord, and exploring their combination along a continuum, rather than a closed, cyclic pitch space, Xenakis presents three structures used in Byzantine practice. One is the diapason system which is kin to the European diatonic and the Greek Greater Perfect System, forming octaves through a conjunction of tetrachord and tone. The second is the *trochos*, or scales resulting from a conjoint organization of pentachords and third, the *triphony*, which abandons the octave as a fixed sound through stacked tetrachords. Permitting also mixed genera, this Byzantine outside-time system is seen by Xenakis to be “richer and more universal... than all the impoverished conceptions of medieval and modern times.”<sup>11</sup>

Where did this richness come from? Certainly it is based on ancient Greek ideas, but this living tradition of music extends from the early Christian era, beyond the collapse of both the Byzantine and Ottoman Empires to the present day. The complex dynamics of this musical tradition can only be suggested, but Xenakis provides a window. In “Vers une métamusique,” Xenakis remarks on the absorption of the Byzantine enharmonic genera by the diatonic, speculating that this must have taken place during the first centuries of Christianity. He says that “this simplification is curious and it would be interesting to study the exact circumstances and causes” of the absorption.<sup>12</sup> Although Xenakis appears to have kept up with the scholarly literature on Byzantine music, he was apparently unaware that this absorption occurred not some 1500 years ago, but was decreed by the Greek Orthodox Church in 1881. The Patriarchal Commission of Ioakeim III, a group of eight musicians, priests and mathematicians, met to revise and formalize the practice of music under the “New Method.” One outcome of the Commission’s work was the deliberate alteration of the Chrysanthine enharmonic tunings, producing an imitation of Ptolemy’s Ditioniaion, or the old Pythagorean diatonic scale. In the course of their work, the Commission revised many of the Chrysanthine tunings: diatonic, chromatic and enharmonic.

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<sup>9</sup> Xenakis, “Towards a Metamusique,” English translation of “Vers une métamusique,” in Xenakis, *Formalized Music*, [17: 183].

<sup>10</sup> Jacques Chailley, “Le myth des modes grecs,” *Acta Musicologica*, XXVIII/IV (Oct-Dec 1956) [2: 163].

<sup>11</sup> Xenakis, “Towards a Metamusique,” in *Formalized Music*, [17: 189].

<sup>12</sup> Xenakis, “Towards a Metamusique,” in *Formalized Music*, [17: 187-8]. In fairness, diatonicism did largely supplant the enharmonic on an evolutionary basis, but this occurred between the fourth and second centuries B. C., and not during the early Christian era as Xenakis speculates. See West, *Ancient Greek Music*, [16: 164-6].

Since then, not only Euthymiadis, but many others have revised the Commission's work in turn.<sup>13</sup>

A comparison of this evolution tracks the increasing independence of Church culture from the Ottomans.<sup>14</sup> The most significant instance is found in the diatonic interval of the third, which in the 1820s had a ratio of 27/22. Frank Desby remarks that this ratio "is the one reported by Henry George Farmer as the 'neutral third' or 'wusta' introduced by the Baghdad instrumentalist Zalzal... as the second or middle finger of the lute."<sup>15</sup> This neutral third lies midway between the major and minor third of our tempered scale. The third of Euthymiadis, which Xenakis cites in his essay, has a much wider ratio of 5/4, or a just-tuned major third. The evolution, then, of the Byzantine diatonic tuning from the 1820s to the 1950s shows a turn, if not toward a more Hellenic ethos, at least away from a Turkish one.

Xenakis ends his presentation of the Byzantine system with a lunge at the European tradition of scholarship, explicitly as embodied in Egon Wellesz' *History of Byzantine Music and Hymnography*, the first major study of medieval Byzantine chant published in 1949. Xenakis might have been provoked by reading Wellesz' introduction: "Investigations into [Byzantine] music did not seem to have any prospect of success at the beginning of the nineteenth century.... This... explains, in part, the disinclination of students, writing on the history of music, to carry out investigations into a remote subject which, like all branches of Byzantine art during the greater part of the nineteenth century, lay outside the general interests of the period, and seemed therefore doomed to failure."<sup>16</sup> This seems an unusual statement for a century that recognized the artistic achievements of ancient Greece through Lord Elgin's purchase of pieces of the Acropolis in 1802 or Karl Friedrich Schinkel's classically inspired design for the Schauspielhaus in Berlin, for example. But Wellesz' comment is indicative of a European selectivity that viewed Greece as a repository of ancient culture in preference to the contemporary vernacular of the Greek people and their church.

Complementing this European view of Byzantine musical scholarship is the Eastern view of the West. The Archimandrite monk and acknowledged founder of the Chrysanthine tradition, Chrysanthos of Madytos, assessed not only ancient Greek theory and earlier Byzantine tradition, but his contemporary situation as a music teacher. Chrysanthos' theories accommodated an ecclesiastical music not completely free of Ottoman influence. As such, his followers were quick to assign Arabic, Turkish and Persian names to his system.<sup>17</sup> Looking toward the West, Chrysanthos' recognized and adapted the Guidonian system of solmization to his theory. This and his simplification of Byzantine notation, which enabled the mechanical printing of Church music, are modernizations that look toward the European Enlightenment.

The rise of Greek national cultural aspirations in the mid-nineteenth century induced other musical advances toward Europe. Anthimos Nikolaides and John Chaviaras, *psaltes* in two Orthodox churches in Vienna, published traditional hymns in Western harmonies, leading to the excommunication of the practice in 1846. The popularity of European harmony finally led to the establishment of a four-part choir in Athens Cathedral in 1870. The next year saw the establishment of the Athens Conservatory of Music, one of whose professors, Alexander Catacouzenos, pursued methods of harmonizing Byzantine melodies by European methods.

Perhaps in reaction, Ioakeim's Commission of 1881 sought to normalize ecclesiastical practice. In 1903, the Athens Conservatory established a school of Byzantine music, appointing Constantine Psachos as director.<sup>18</sup> Psachos' scholarly and cultural views on Byzantine music ran afoul of European scholars with the publication of his *He parasemantike tes byzantinis mousikes* in 1917. His assertion that Byzantine melodies had never changed, only their notation, prompted a refutation by Wellesz' colleague, Henry J. W. Tillyard which, as Miloš Velimirović states in his survey of Tillyard's life work "offended the emotional attitude of the Greeks." Velimirović's perspective seems to preserve these attitudes:

To this day, there are almost insuperable obstacles for a modern and critical historian in attempting to establish communications with the Greeks, for the term 'Byzantine' has different connotations to each of

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<sup>13</sup> See Frank Desby, "The Modes and Tuning in Neo-Byzantine Chant," PhD. Dissertation, University of Southern California, 1974, [7: 258].

<sup>14</sup> See Charles Turner, "Iannis Xenakis' "Vers une métamusique: The Social Context of a Musical Theory," in the *Proceedings of the International Symposium Iannis Xenakis*, Anastasia Georgakis and Makis Solomos, ed.s, Athens: University of Athens, 2005, [8: 39-40].

<sup>15</sup> Desby, "Modes and Tuning," [7: 159].

<sup>16</sup> Egon Wellesz, *A History of Byzantine Music and Hymnography*, Oxford, Clarendon Press, 1962, [15: 11].

<sup>17</sup> Desby, "Modes and Tuning," [7: 228].

<sup>18</sup> This discussion of the Byzantine music of the 19<sup>th</sup> century is generally indebted to Katy Romanou, trans., "Great Theory of Music by Chrysanthos of Madytos," Masters' Thesis, Indiana University, 1973, [11: xxxv-vii].

the discussants, and makes it a special kind of exercise in futility.<sup>19</sup>

Xenakis' sentiment towards Wellesz reflects the contemporary and opposing attitude of Byzantine scholars such as Velimirović. Xenakis grants exception, however, to "the specialists in the music of the Far East, who have always remained in close contact with musical practice and, dealing as they were with living music, have been able to look for a harmony other than the tonal harmony of the twelve semitones," citing Alain Daniélou, Mantle Hood and Tran Van Khé in a footnote.<sup>20</sup> Xenakis' sentiment is echoed, as we have seen, in his desire to build bridges between cultures and in his receptiveness to Chailley's judgments on the survival of mode. As Peter Jeffery observed in 1992, "the adoption of ethnomusicological perspectives in medieval musicology has been advocated for at least thirty years, and such perspectives have consistently been a feature of Eastern European scholarship, where folk and classical music have always been regarded as equally worthy of attention."<sup>21</sup>

This perspective is a primary one for Xenakis. As his friend François-Bernard Mâche has remarked, Xenakis early in his musical career had the ambition to be for Greece what Bartók had been for Hungary.<sup>22</sup> This necessity to assimilate both folk tradition and European modernism is the subject of his essay "Problems of Greek Musical Composition," published in a Greek music journal after the premiere of his landmark work, *Metastaseis*, at the 1955 Donaueschingen Festival.<sup>23</sup> By the time of the publication of "Vers une métamusique" in *La Nef* in 1967, Xenakis had contributed to a number of UNESCO-sponsored projects, most notably an international music symposium held in Manila in 1966 where he presented an early version of his essay.<sup>24</sup> That year, Xenakis had also contributed to the journal *The World of Music*, celebrating its expansion through the combined forces of UNESCO's International Music Council and the International Institute for Comparative Music Studies and Documentation. In it, Daniélou, the Director of the IICMSD, established the mission of the journal "to inform its readers on the different conceptions of musical language, to contribute towards a better understanding of musical values, and to establish a real cooperation on the cultural level between the continents."<sup>25</sup>

This symbiosis of Xenakis is perhaps best demonstrated by the proceedings of an IICMSD conference entitled "Creating a Wider Interest in Traditional Music" and held in Berlin in June of 1967. There, both Daniélou and Tran presented papers on the importance of traditional musics and the issue of cultural plurality or synthesis. Chailley moderated many of the group discussions and roundtables. Although Xenakis was not listed as an attendee, José Maceda, who had organized the Manila conference of the year before, made this remark:

I mainly mentioned in my paper that in the Philippines we played aboriginal, native music together with music of other kinds. What were these other kinds? Ravel and Xenakis. We are only placing musics of two kinds in the same programme. One is very primitive, the other very modern. This creates a situation of ambivalence, if you wish, one thing is very old and the other very modern. But you asked me why? Well, for one thing, both are living musics.<sup>26</sup>

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<sup>19</sup> Miloš Velimirović, "H. J. W. Tillyard, Patriarch of Byzantine Studies," *The Musical Quarterly*, 54/3 (Jul 1968) [13: 342].

<sup>20</sup> Xenakis, "Towards a Metamusique," in *Formalized Music*, [17: 191].

<sup>21</sup> Peter Jeffery, *Reevisioning Past Musical Cultures: Ethnomusicology in the Study of Gregorian Chant*, Chicago: University of Chicago Press, 1992, [9: 4].

<sup>22</sup> François-Bernard Mâche, "L'ellenismo di Xenakis," in *Xenakis*, Enzo Restagno, ed., Torino: EDT/Musica, 1988, [10: 80].

<sup>23</sup> Xenakis, "Problèmes de composition musicale grecque," in *Présences de Iannis Xenakis*, Makis Solomos, ed., Paris: Centre de documentation de la musique contemporain, 2001, [18: 11-4].

<sup>24</sup> Xenakis, "Structures Hors-temps," in *The Musics of Asia: papers read at an International Music Symposium*, Manila: UNESCO, 1966, [19: 152-173].

<sup>25</sup> Alain Daniélou, "Introduction," *The World of Music*, 9/1, 1967, [6: 4].

<sup>26</sup> Alain Daniélou, ed., *Creating a Wider Interest in Traditional Music*, Berlin, International Institute for Comparative Music Studies and Documentation, 1967, [5: 103].

## REFERENCES

- [1] Barker, Andrew, ed. *Greek Musical Writings*. 2 vols. Cambridge: Cambridge University Press, 1989.
- [2] Chailley, Jacques. "Le myth des modes grecs." *Acta Musicologica* 28, no. 4 (1956) 137–63.
- [3] Christensen, Thomas, ed. *The Cambridge History of Western Music Theory*. Cambridge: Cambridge University Press, 2002.
- [4] Combarieu, Jules. *Histoire de la musique: Des origines au debut du XXe siècle*. 2 vols. Paris: Librairie Armand Colin, 1920.
- [5] Daniélou, Alain, ed. *Creating a Wider Interest in Traditional Music*. Berlin: International Institute for Comparative Music Studies and Documentation, 1967.
- [6] Daniélou, Alain, ed. *The World of Music*. Basel: International Music Council (UNESCO) and International Institute for Comparative Music Studies and Documentation, 1967-1991.
- [7] Desby, Frank. "The Modes and Tuning in Neo-Byzantine Chant." PhD. Dissertation, University of Southern California, 1974.
- [8] Georgaki, Anastasia and Makis Solomos, ed.s. *Proceedings of the International Symposium Iannis Xenakis*. Athens: National and Kapodistrian University of Athens, 2005.
- [9] Jeffrey, Peter. *Reenvisioning Past Musical Cultures: Ethnomusicology in the Study of Gregorian Chant*. Chicago: University of Chicago Press, 1992.
- [10] Mâche, François-Bernard. "L'ellenismo di Xenakis." In *Xenakis*. Enzo Restagno, ed. Torino: EDT/Musica, 1988, pp. 77-93.
- [11] Romanou, Katy. "Great Theory of Music by Chrysanthos of Madytos: Translated by Katy G. Romanou." Masters' Thesis, Indiana University, 1973.
- [12] Schoenberg, Arnold. "Schoenberg's Tone-Rows," in *Style and Idea*. Leonard Stein, ed. Berkeley: University of California Press, 1985, p. 213.
- [13] Velimirović, Miloš. "H. J. W. Tillyard, Patriarch of Byzantine Studies." *The Musical Quarterly* 54, no. 3 (1968) 341-51.
- [14] Weakland, Rembert. "Hucbald as Musician and Theorist." *The Musical Quarterly*, 42/1 (Jan 1956) 66-84.
- [15] Wellesz, Egon. *A History of Byzantine Music and Hymnography*. Oxford: Clarendon Press, 1962.
- [16] West, Martin Litchfield. *Ancient Greek Music*. Oxford: Clarendon Press, 1992.
- [17] Xenakis, Iannis. *Formalized Music: Thought and Mathematics in Composition*. Stuyvesant, NY: Pendragon Press, 1992.
- [18] — — —. "Problèmes de composition musicale grecque." In *Présences de Iannis Xenakis*, Makis Solomos, ed. Paris: Centre de documentation de la musique contemporain, 2001.
- [19] — — —. "Structures Hors-temps." In *The Musics of Asia: papers read at an International Music Symposium*. Manila: UNESCO, 1966: 152-173.
- [20] — — —. "Vers une métamusique." *La Nef* 29, no. 1 (1967) 117-40.