

# GLISSANDI AND TRACES A STUDY OF THE RELATIONSHIP BETWEEN MUSICAL AND EXTRA-MUSICAL FIELDS

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## Abstract

The glissandi, like the sound mass and the arborescences, embody the Xenakian idea of an underlying unity between music, architecture and mathematics. Their analogy with the curved lines also allows considering them as sonic traces – of motion, of gesture or of time itself. This analogy further leads to relate them to the notions of writing, writing mark, sign or impress, as discussed in various contexts by Jacques Derrida, Daniel Charles, Costin Miereanu and Ivanka Stoianova. The multiple connotations of Xenakis’ glissandi actually show the complex ramifications of an original musical approach built in the 1950’ on extra-musical conceptual foundations. This paper points out the relation between xenakian musical thinking and a general morphology which also refers to an ontological vision and to a cosmology.

## 1. The universality of shapes

The equivalency postulated by Xenakis between glissando and line clearly shows the unity between music, architecture and mathematics. Yet the glissandi also may be considered as a sonic expression of another notion, that of trace, which in a way implies the line. As any trace refers to the force or to the action which generates it, by construing the glissandi as traces I will point out various factors which can be at their origin. This starting point will lead me to discuss, besides the notion of line, those of motion, gesture, writing mark, sign or impress. I shall begin this paper by evoking the universe of archetypical shapes or morphologies, as described by Xenakis, a universe which includes the glissandi as well as their analogues.

Mathematics	Physics	Music, Architecture
non-being, zero, nothing	empty space	silence, obscurity
point (abstract being)	elementary particle (concrete being)	individual sound, flash-light (sonic being, visual being)
series of points discrete space	series of punctual events discontinuous matter	scales, sieves musical rhythm, visual rhythm <i>Couvent de La Tourette</i>
straight line, curve spiral, ellipse	wave, border random walk	glissando, sine sound graphic contour, ray of light
incurved space	continuous matter, flow	sound projection, cluster of glissandi <i>Pavillon Philips</i>
complex morphologies topologies	clouds, molecular crowds galactic nebula, turbulences	mass sound, sound synthesis <i>arborescences, Polytopes</i>

Table 1

One of Xenakis’ seminal ideas was to conceive sonic shapes – a kind of sonic *gestalts* – analogous to the visible ones and to refer them to abstract morphological models. Xenakis identifies such archetypes everywhere: “in space, in the earth, in the fauna, in the society”. He consequently calls for the foundation of a “general morphology” treating about shapes common to various fields such as mathematics, logic, physics, chemistry, biology, palaeontology, sociology [26:17]. His underlying idea is that of a universality “founded, guided, directed by and towards the shapes

and the architectural design” [24:14]. The musical structures he imagines – his glissandi, mass sound and *arborescences* – give a sonic appearance to archetypical morphologies such as straight or curved lines, incurved surfaces, clouds or tree-like shapes.

The preceding synoptic table (see Table 1) brings together a number of correspondences suggested by Xenakis’ musical, architectural and theoretical work. It associates the abstract field of mathematics, the concrete physical world and the realm of visual and sonic shapes. In this frame, the glissandi illustrate the idea that the world of geometrical figures, that of natural forms and that of artistic representations are analogous. On the first line of this table I placed the notions of non-being, nothing, silence and obscurity, in order to suggest that Xenakis’ perception of the archetypical morphologies is related to a cosmological and ontological vision. This vision appears to be founded on the xenakian idea of a “union of Parmenides and Heraclitus”, which suggests the possibility to conciliate the Parmenidian philosophy, focused on the notion of Being, and the Heraclitian philosophy, focused on the Becoming.

## 2. Line and motion

According to Xenakis, the mastering of the line represents one of the first conquests of the human intelligence [23:17]. He also notices that all the shapes are built on this primordial element which literally fascinates him<sup>1</sup>. The correspondence between music and architecture, as he conceives it, actually is founded on the universality of line. “Composing music, he remarks, amounts to lay a series of points on a line” [1:17], so often the first thing he does when facing the blank sheet is drawing. Xenakis even invented a machine, the UPIC, which is able to convert graphics in sounds. While the glissando is the sonic equivalent of a line, drawing lines also take an important part in Xenakis’ original stochastic approach on sound synthesis. In his last electronic works the sound synthesis, considered as a dynamic process, is thought up by means of geometrical figures – a series of “polygonal variations” – which represent the becoming of sound. Works like *Terretektorh*, *Nomos Gamma*, *Persephassa* and *Windungen* illustrate another case: that of lines which figure the trajectories of the sound in the room of the concert hall. The notion of line actually implies that of motion, so Xenakis remarks that the particular shape of a glissando depends on the speed of a hypothetical sound point that continuously moves within an imaginary pitch-time space.

This remark opens the way for construing the glissando as a trace left by a sound particle engaged in a continuous movement. A similar reasoning led Kandinsky to define the line as “the trace of a moving point, then its product” [12:65]. The initial unison engendering the first glissandi in *Metastaseis* – a musical figure which reappears in *Empreintes* – could then illustrate the definition of sound by Giacinto Scelsi: “the very first movement of the immovable”. The ensuing slight ascent initiated by a single violin also recalls the infinitesimal slope which is designed in the writings of Epicure by the word *ekklisis* and in those of Lucretius by the word *clinamen*. The whole progression of the glissandi forming the first section of *Metastaseis* could result from such a primordial inclination supposed to be at the origin of the universe and of life. This progression figures the sonic trace of a cosmogenetic process which accomplishes itself in the last section of the work. Then the glissandi symmetrically return to unison, that is to nothingness, giving to the whole work the aspect of a close entity. This end evokes the Parmenidian vision of an immobile and eternal Being rather than the Heraclitian vision of the Becoming.

The Xenakian approach will however evolve, thus in *Mikka*, a short piece for violin, the glissando clearly suggests the motion. In this work the form and the speed of the glissando are determined by a probabilistic model utilized for calculating the trajectories of elementary particles. These trajectories are inspired by a particular kind of motion, the random walk, which distinguishes itself by its unpredictability. The virtually uninterrupted glissando played by the violinist represents the sonic equivalency of the imaginary trace left by an elementary particle which brutally changes its direction as a result of random collisions with gas molecules. With its erratic trajectory wavering between low and the high register of the violin, the glissando of *Mikka* also could be regarded as a metaphor of wandering. As such it could be referred to the *nomadisme* discussed by Gilles Deleuze and Felix Guattari.

The glissandi of *N’shima*, much different from both those of *Metastaseis* and *Mikka* as they imply the human voice, evoke another kind of motion. Perhaps their signification is to be inferred from the meaning of the title. In Hebrew, **נְשִׁימָה** means, according to the context, breathe but also movement of the soul. Both meanings, especially the second, refer to an immaterial, invisible and even inaudible (or hardly audible) movement. As sonic traces of such an immaterial movement, the glissandi receive a spiritual connotation which has to be understood in the broader context of an aesthetic and stylistic shift. For Xenakis such a shift occurs in the late sixties and it could be related to the revival of an archaic Greek vein, as showed by *Oresteia*. One can notice that in a later work also bearing a Hebrew title, *Shaar* (*Gate*), the glissandi could also be associated with a spiritual experience.

## 3. The trace of time

Curves, Kandinsky remarked, already contain surfaces. One can see this observation as implying that there is an intermediary dimension between the curve line and the plane. Some of Xenakis’ glissandi, for example those of *Shaar*, “draw” sonic figures which in a way exceed the first dimension yet without reaching the second one. A fractal curve, according to the definition given by Benoît Mandelbrot, the father of fractal geometry, represents such an astonishing

<sup>1</sup> Xenakis qualifies the straight line as “the most fascinating thing from the point of view of its speed, of its direction and of its continuity” [25:108].

figure, as it lies somewhere between the first and the second dimension, that is between the line and the plane<sup>2</sup>. By giving a rational foundation to such a paradoxical dimension, fractal geometry validates both Kandinsky's insight and Xenakis' sonic figures. I actually suggest that glissandi such as those of *Shaar* evolve on a fractal dimension, for they are the audible trace of fractal curves drawn in the pitch-time space. The presence of time as one dimension of the pitch-time space imagined by Xenakis further allows interpreting the glissandi as being the sonic trace of time itself. In turn, time, a reputedly ambiguous and irrational notion, can thus be apprehended as the vector of a particular kind of fractality.

The glissandi of *Metastaseis* could also illustrate a fractal dimension which is set between the plane and the volume. Like the incurved surfaces of the *Philips Pavillon* – their visual equivalent – they hold an inner tension which pushes the plane to engender a volume. Xenakis admits having imagined the *Philips Pavillon* essentially as a two-dimensional architecture, following in this respect a model which he identifies in ancient architectural conceptions. This pre-eminence of the plane was also noticed in relation with his project of a “cosmic city”, where the third dimension rather appears as a u-topic extension of the plane. According to French philosopher Louis Marin, the shell-like structures imagined by Xenakis express the tension of a volumetric architecture which “liberates itself from the plane”. Actually they *are* the surface, in which the plane becomes irrelevant and finishes by “annulling itself” [14:77].

Since both space and time admit the same underlying structural order, then in Xenakis' view time can be assimilated to a series of points forming a straight line [27:98-101] [23:10]. A similar view was expressed by Kandinsky, who also compares time to a straight line [12:107]. One also can mention in this respect Gilles Deleuze's philosophical insight on the straight line viewed as a “pure representation of time”<sup>3</sup>. Husserlian phenomenology represented by authors like Maurice Merleau-Ponty, Vladimir Jankélévitch or Jean Toussaint Desanti rejects however such an analogy. According to Desanti, “nobody can exhibit time” because “while we perceive or see anything according to time, time itself cannot be seen”. Time exists then “only as pure escape” [10].

The glissandi belie this standpoint: they in a way exhibit time, by making audible the trace of its flow. They capture time; they hold it and they tame it, so they prevent it from completely and inexorably escaping our understanding. One can nevertheless refer to Husserlian phenomenology and define the glissandi as sonic figures allowing the objectifying of the time flow. Borrowing a notion developed by Daniel Charles, I would say that they are “images to be heard”. Such an image, Daniel Charles remarks, is “prior to any definition of music as a metaphor of time – then necessarily prior to any theory which assimilates the image with a copy or a representation”. It does not exist “*in time*”, since it is itself “made up *of time*”<sup>4</sup>. In this phenomenological context, the contiguous entities that are the glissandi also illustrate the idea of an “extending present instant”, as formulated by Carl Dahlhaus: “by means of the retention, a kind of extending present instant arises. The time point, that is the present instant, extends itself forming a line”<sup>5</sup> [4:76].

To conclude this chapter on the glissando viewed as a trace of time, I shall compare the glissandi with the notion of *grammè* (line), as discussed by Jacques Derrida in his *Grammatology* [9:68-70]. Derrida distinguishes two kinds of lines, according to the nature of the points that compose them. If the points exist as autonomous entities – *en acte* –, then the line could be defined as a “series of arrests”. Thus it could not represent time, because each instant relates to the time flow otherwise than each point relates to the line<sup>6</sup>. In return, if each point exists only potentially [*en puissance*], that is if the existence of each point depends on the existence of the whole line, then time can be assimilated to a line (*grammè*). I guess the glissandi of *Metastaseis* rather pertain to this second possibility. They illustrate then the correspondence established by Xenakis between “outside-of-time categories” which imply a frozen time actually reduced to space and “in-time categories” which concede to time a phenomenological aspect. If a moving point is supposed to engender a line (a visible trace), then a moving sound-point engenders a glissando (an audible trace). In other words, while the first creates a space, the second engenders a particular time.

#### 4. Trace and gesture

The gesture, in a sense which applies to Xenakis' approach, can be defined as an elementary manifestation of a subjective attitude or will. As such, it is immanent to musical creation, as Nietzsche suggested by remarking that “in a

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<sup>2</sup> According to Mandelbrot, the length of a fractal curve is infinite while its surface is null. This paradoxical figure is also described as “more bulky than a line” but “more slender than a surface” [13:12].

<sup>3</sup> Like Xenakis, Deleuze associates the straight line to the idea of time ordering. Thus, in his view the straight line “displays the before, the during and the after”, as it is capable to “gather” the three moments in “the simultaneity of its a priori synthesis” [6:376].

<sup>4</sup> This sentence of Daniel Charles includes a quotation from Victor Zuckerkandl, *Sound and Symbol: Music and the External World*, Princeton, Princeton University Press, 1969 [3:178].

<sup>5</sup> Jacques Derrida also remarks that the sequence, endlessly repeated, formed by the three instants of the consciousness of the time flow that are, according to Husserl, the retention, the protention and the recalling, implies their perfect contiguity [8:98].

<sup>6</sup> Derrida explains that the instant should not be identified to a point for it cannot arrest the time, it cannot engender neither end it. Thus, since it belongs to time, it cannot represent a limit [9:69].

general way, every gesture parallels a sound”<sup>7</sup>. Xenakis evokes the notion of gesture in a context which associates visual and sonic elements as components of a multimedia performance implying an acoustical space – that of the “cinematic stereophony” – but also an abstract mathematical space. In an early writing called *Notes sur un “geste électronique”* [*Notes on an “electronic gesture”*], he explicitly establishes a connection between music, gesture and space: “Music grows to a ‘real gesture’ [...] for it is capable to govern the mathematical space with its abstract relations, which thus become magnificently perceptible to the ear without passing through the vision or through technological devices” [28:163]. In the same text Xenakis employs the term “acoustical line” in order to design the trajectory of sound in the acoustical space.

The glissando, as a geometrically determined line, pertains to such a mathematical space. Moreover, it represents one of the most characteristic xenakian gestures. Makis Solomos thus describes the beginning of *Metastaseis* as “the inevitable accomplishment of a gesture” [19:155]. In the context of this paper I would suggest that the glissandi of *Metastaseis* could be further regarded as the audible traces of a primitive gesture bearing a cosmological connotation. They show Xenakis’ demiurgic sight, his powerful will to create a universe *ex nihilo*. Bending the sonic surfaces and volumes engendered by the glissandi thus metaphorically amounts to moulding the space-time of the universe. The morphogenesis, considered as a dynamic process, refers then to a cosmogony, as suggested by the following excerpt from *Formalized Music*, which is titled “Ontology”:

*“An empty Universe. Small fascies of waves, the beginning and the end of which coincide (Time inexistent), perpetually initiating themselves. Nothingness absorbs, creates. It engenders the Being”.*

In this quite poetical fragment recalling the sober language of pre-Socratic philosophy, the waves, which appear to be at the origin of the Being, could be paralleled to the glissandi.

Semiotics offers a different perspective, defining the trace as the diagram of a “plural gesture”. According to Costin Miereanu, it concedes to the trace the capacity to retain the various avatars of a gesture, which can be visual, sonic, conceptual, corporal, sacral, etc [16:60]. This semiotic approach authorizes the emergence of new forms of art, heterogeneous and autonomous, which relate nevertheless to a unique original gesture. The trace is then acknowledged as an expression of a “deviant gesture” which allows the artistic creativity to rebound freely, as in a kind of ricochet, between the sonic and visual fields [17:26-28]. One could be tempted to construe Xenakis’ glissandi and their corresponding graphical and architectural shapes as different embodiments of such a plural or deviant gesture. In this case the xenakian approach would be close to that of John Cage, in the work of whom the trace bears “a permanent possibility of deviation and ramification”, for “it carries a gesture which can be considered as indicating different actualizations” [21:184-189]. Yet, Xenakis deplores the imprecision of the graphical notations which take the place of the traditional score. He also denounces the composers who abandon their prerogatives in favour of the performer. Actually, unlike Cage’s graphics, his glissandi follow from an authoritarian gesture which is neither plural nor deviant.

Such a gesture perfectly comes to fit, according to the circumstances, the sound, the light or the concrete. It can also manifest itself simultaneously in musical and architectural forms, as in Xenakis’ multimedia works – one of which bearing the suggestive title *Geste de lumière et de son* [*A gesture of light and sound*]<sup>8</sup>. However, there’s no question of “translating” a sonic gesture in a visual one, since both of them result from an abstract archetypal gesture. Xenakis’ double work of a composer and of an architect actually shows that, by passing from the domain of the visible to that of the audible (or inversely), the gesture doesn’t need to disguise itself, for both visible and audible shapes are inherent to it. Glissando and line, audible trace and visible trace, music and architecture, are thus related to a same initial gesture. The glissando could then illustrate the notion of figure as Ivanka Stoianova defined it: “an engraved statement engendering a trace”. Considered as a sonic figure, a glissando exists then out of any notion of language [20:108-109]. Rather, the only language to which it could be related is that described by Daniel Charles: a “silent language [...] opposed to communication, which does not intimate to the writing marks to encode anything” [2:13].

## 5. Writing mark and impress

According to Daniel Charles, as a graphical representation the musical writing marks tend to build an image which is parallel to music. Thus, he remarks, “one has to accept that the graphical representation could never be only a musical sign, that is only a sign of anything else than itself, allegory or heterology, simple metaphor of the sonic universe. It is more than a re-presentation: it makes music present. Then one has to see it as being, in a way, similar to music itself, as the neumes were, long ago” [2:9]. The graphics showing the trajectory of the glissandi in some of Xenakis’ scores, for example in *Mikka*, share with the neumatic notation the fact of being the double of the music. Placed above the staff, parallel to the notes, they clearly illustrate the equivalency between the ordinary musical notation and what Xenakis calls the “Cartesian notation” [5:5] – that is the graphical representation of sounds in a pitch-time space. The time, assimilated to a spatial dimension, is thus seen as a support – a “blackboard”, as Xenakis calls it – on which each sonic event is supposed to leave a trace of its passage.

<sup>7</sup> Quoted by Ivanka Stoianova [21:200].

<sup>8</sup> A recent selection of Xenakian texts edited and commented by Sharon Kanach, including a rich iconography, provide an interesting insight on this work as well as on the other Xenakian musical-architectural projects [28].

As I have already remarked, the glissando, considered as a trace, refers to an abstract substratum. Liable to affect various fields and various perceptual areas, this substratum precedes any particular form of notation. It can manifest itself, for instance, in the form of grooves on a rock. Xenakis actually compared the musical work to a rock of a complex form bearing drawings engraved on its surface and inside of it. These drawings, he pursues, “can be deciphered in many ways, none of which being better or more true than the other” [24]. However, the ideal medium liable to receive and to engrave the impress of the glissandi could be that of *χώρα* [*chôra*], a cosmogonic space described by Plato in *Timeus*. It designs an intermediary region which is placed between the intelligible universe and the sensible one, according to Plato’s distinction. *Chôra* was compared with the clay, or with a plastic receptacle for “potential traces” or for “genetic impress”, a kind of mould which receives and makes visible the marks of a cosmogonic labour proper to the demiurge [15:33].

As an utterance of a primitive gesture, the glissandi finally refer to the idea of a “primordial trace”, as discussed by Jacques Derrida. As such, they could pertain to the writing down of a difference which is “more ancient than the being itself”, a difference which is “even more unthought-of than that between the being and the existing”. The primordial trace, Derrida pursues, is “actually unthinkable, for it is nor perceptible neither imperceptible: it is so much covered and hidden that it cannot leave any trace”. Yet, if nevertheless a difference finally subsists between the being and the existing, it is due to what Derrida calls “the trace of the trace”, in other words, it is due to “the trace which is left by the effacement of the trace” [9:76-77]. Moreover, explains Derrida, it should not be contradictory to think together the trace in itself and the trace left by its own effacement. I guess one can identify a similar distinction when considering the double nature of the glissandi. On the one hand, they can be defined as a kind of self-generating traces which also continuously efface themselves. On the other hand, as objectified entities engraved in our memory, they retain the trace, which is then preserved and exposed to our mental view.

The glissandi appear then as signs of a peculiar writing, which is to be considered without of the history of musical notation, without of any stylistic or linguistic connotation<sup>10</sup>. As for the plastic receptacle where they engrave their traces – this mould which could be also compared to the “background noise” prior to any signification, as discussed by Michel Serres [18] – it appears capable to receive the “primitive trace” evoked by Derrida. Before becoming a shape, remarks Derrida, the primitive (or archetypical) trace experiences a transitory stage, during which it has the status of an impress. One can place at this stage the emergence of the first differences, which can be of a spatial nature (that is graphically perceived) and of a temporal nature (that is acoustically perceived). Thus, concludes Derrida, the pure trace actually is “the difference itself”, which is to be defined as “the creation of a shape”. Although, the trace is at the same time “the engraved being of the impress” [9:91-95]. I guess the glissando, as a sonic trace, refers to these notions of impress and difference such as Derrida put them forward. Seen as an impress, then it is supposed to form the articulation of a primitive difference which opens the way to both ideas of appearance and signification. To put this idea otherwise, the origin of the glissando thus can be identified to the origin of the signification, both of them being “prior to the distinction between the different perceptive categories, prior to the sound as far as to the light”. Before its sonic or visual design – that is, before *Metastaseis* and the *Philips Pavillon* – the trace actually pertains to a domain “which is not ideal rather than real, which is not intelligible rather than sensible, neither a sheer signification rather than an opaque energy” [9:93-95].

## Conclusion

The various analogies discussed here between glissandi and traces show the complex ramifications of an original musical approach built in the 1950’ on extra-musical conceptual foundations. By considering Xenakis’ glissandi as traces, I thus pointed the relationship between musical thinking and the notions of time, motion, shape, gesture, language or impress. This relationship further refers to an ontological vision, to a cosmology and to a general morphology.

The glissandi of *Metastaseis* mark a turning-point in the recent musical history, when music detached itself from several notions and ideas to which it was associated during the last centuries: language, rhetoric, the representation of human feelings, emotions or affects, the search for the beauty. In turn, it joined concepts like that of archetypical morphologies evolving in an abstract space, or that of pure sound – to which music actually more and more tends to identify itself.

One notices however that in Xenakis’ last works the glissandi almost disappear in favour of a relatively more traditional musical writing. Yet, these works do not completely break with the Xenakian musical approach of the fifties, of which, in a way, they “keep the trace”. So glissandi’s ultimate trace, the most ineffable and the most lasting, could be that left by their passage in the musical history of the twentieth century.

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<sup>9</sup> The distinction made by Derrida [9:78] between *être* and *étant* refers to Heidegger’s distinction between *Sein* and *Dasein*. Also, the idea of a primordial trace (*trace originnaire*) follows from the heideggerian term *frühe Spur*.

<sup>10</sup> Célestin Deliège [7:19] is right when doubting that the traditional notion of writing could be applied to Xenakis’ music.

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