a journal of the Society for Music Theory

Volume 6, Number 1, January 2000

Texture in Penderecki's Sonoristic Style

Danuta Mirka

KEYWORDS: Penderecki, sonorism

ABSTRACT: In his so-called "sonoristic" period of the early 1960s—represented by pieces such as *Threnody*, *Fluorescences*, *Polymorphia*, and others—Penderecki employed a compositional system whose axiomatic concept was not a single sound, but the sound matter in its totality. Distinct states of this sound matter were governed by two relatively independent systems: (1) a basic system which ruled the texture of sound masses and (2) a timbre system governing their sound color. Categories of the basic system are a few binary oppositions concerning pitch, time, and loudness: spatial mobility vs. immobility, temporal mobility vs. immobility, spatial continuity vs. discontinuity, temporal continuity vs. discontinuity, high vs. low register, loud vs. soft dynamics. These categories account for the morphology of the basic system because a combination of terms chosen from individual categories generates an inventory of units in Penderecki's sonoristic style. The same set of categories also determines syntax, as the temporal order of units in the course of musical narration is ruled by the internal logic of individual binary oppositions. Categories of the timbre system are in turn metal, wood, and leather—materials of which the sound sources of traditional musical instruments are most often made—forming a ternary opposition. The timbre system underlies the wealth of new musical tools as well as eccentric playing techniques on traditional instruments called for by the composer.

---

[1] Penderecki's music of the 1960s, known in Poland under the name of "sonorism" and represented by such famous pieces as *Threnody-To the Victims of Hiroshima*, *Polymorphia* or *Fluorescences*, is based on a compositional system of a very particular sort. Its particularity lies in the fact that the axiom here is not a concept of a single sound event, but of sound matter taken in its totality—*en masse*, so to say. As a consequence, this system governs relations not between individual sounds but between sound masses. These relations are qualified in respect of texture and timbre. Accordingly, Penderecki's sonoristic system consists of two subsystems: one that rules texture of sound masses and that I call "basic system," and the other that accounts for their timbres which is called by me "timbre system." In what follows, I will concentrate on the basic system alone.

I. CATEGORIES

[2] The basic system concerns three of the four parameters of auditory perception: loudness, pitch, and time. On those parameters, categories of the basic system are founded, each of them established by a binary opposition (see **Table 1**).

[3] Opposition between spatial continuity and discontinuity denotes here a relation between bands and individually discernible points on the perceptual axis of pitches. Temporal continuity vs. discontinuity is an opposition between lasting sounds and momentary impulses as, respectively, sections and points on the temporal axis. Spatial mobility means a perception of pitch change, and temporal mobility is tantamount to rhythm in traditional musical terminology. To understand the way in which these categories operate within the system, it is necessary to examine their inner logical structure.

[4] The binary oppositions listed in the table take shape as either contradiction or contrariety. Contradiction is an opposition which classifies every possible phenomenon under either of its opposite terms, *tertium non datur*. Mathematically, it can be thus modeled as a relation between a given set and its complement (**Figure 1**). This type of opposition is represented by spatial continuity vs. discontinuity, temporal continuity vs. discontinuity, spatial mobility vs. immobility, temporal mobility vs. immobility. Contrariety, on the other hand, forms an opposition in which *tertium datur*, that is, which allows for phenomena to be classified under neither term of the opposition itself. In Penderecki's basic system, it is represented by high vs. low register (because there also exists middle register) and loud vs. soft dynamics (because dynamics can also be medium). The mathematical model of contrariety is thus a relation of two sets, each of them belonging to the complement of the other (**Figure 2**).

[5] However, the figures just presented are not quite adequate models of Penderecki's categories. This is so since both contradictions and contrarieties of the basic system are relations of fuzzy, and not classical, logic and therefore should be modeled by fuzzy, and not ordinary, sets.[(1)] In fuzzy sets, the discrimination between their elements and non-elements is obscured. Classical cases of fuzzy sets are thus designated by terms of both contrarieties: high vs. low register and loud vs. soft dynamics. Clearly, one cannot indicate any single frequency value at which low register ends or at which high register starts. Similarly, there is no such a thing as an upper intensity border of soft dynamics or a lower intensity border of loud dynamics. Rather than border-lines, we have here border-zones of values that—in different contexts—can be classified as either belonging or not belonging to a given set within an individual category (**Figure 4**).

[6] As regards contradictions, the reason for their fuzziness lies in the fact that they—as all the categories of Penderecki's basic system—are perceptual, and not acoustical. And, even if acoustically it is always possible to classify a given sound under one term of a given contradiction, it might often be impossible for a listener to decide unequivocally how—in the framework of this opposition—to classify a sound phenomenon just perceived. For instance, glissando is a spatially mobile phenomenon. But if its speed is being gradually reduced, then, at some point, the listener will hesitate whether it is still a glissando or rather a long-lasting—and thus spatially immobile—pitch. Its classification will thus vary, depending on the context and aural abilities of the listener. As a result, again, the border-line between opposite terms will turn into a border-zone whose elements are neither univocally included in nor excluded from the neighboring sets (**Figure 3**).

[7] The border zone enables a transition between opposite terms. But, beside transition, there exist also further possibilities of mediation for every binary opposition. Both opposite and mediative terms of Penderecki's categories are listed in **Table 2** below, separately for contradictions and contrarieties.

[8] As shown in the table, mediation of a contradiction can be accomplished by means of a *border-zone term*, represented graphically by several shades of gray in Figure 3 above. On the other hand, mediation of a contrariety is possible owing to a *neutral term* comprising intermediary values in Figure 4. Furthermore, both contradiction and contrariety can be mediated by a simultaneous occurrence of values characteristic for positive and negative terms (*complex term*) as well as by sound masses exposing a mixture of values evenly spread upon the whole range of a given category (*total term*). Because Table 2 contains also abbreviated symbols of terms, it can be treated as a handy list of explanations for later analytical samples.

II. MORPHOLOGY

[9] On the paradigmatic axis, the categories established by binary oppositions account for the morphology of the basic system. This is so because a combination of their terms generates an inventory of elementary syntactical units in Penderecki's sonoristic style. I call such units *segments*. Every segment is thus a combination of terms chosen from all the individual categories. Consequently, to define a segment, it is necessary (and enough) to specify its component terms. One example of such a definition is given in **Figure 5**.

[10] Because there are six categories altogether, each of them modeled as a relation of sets within a one-dimensional space, segments as syntactical units of Penderecki's basic system are objects of a six-dimensional space. And because every term of a given category is represented not by a single point, but by a set which, moreover, is fuzzy, every segment admits an infinite number of variants as its concrete realizations. Segments are thus to be conceived as *types of texture*, and hence invariant, abstract entities. Their variants may display considerable differences as to sound contents inasmuch as these differences do not threaten constitutive terms of a given segment. One variant of the segment just shown is the final cluster of *Threnody—To the Victims of Hiroshima* (**Example 1**).

[11] Knowing all the terms of all the binary oppositions of the basic system, one can combine them to obtain a full list of

segments accessible in Penderecki's sonoristic style. If there were only opposite terms available in each category, the basic system could be graphically illustrated by the "rosette" shown in **Figure 6**.

[12] Individual segments would be represented by all the hexagons to be found within the rosette, and their total number would be 64 ($=2^6$). The rosette would also exhibit paradigmatic relationships between segments. Since every opposite term of any category forms its own vertex, the higher the number of common vertices between hexagons, the closer the relationship of segments represented by them. In reality, however, the total number of segments actually at Penderecki's disposal in his sonoristic pieces is much higher and their paradigmatic relationships much more complicated than suggested by the rosette due to mediative terms that occur within every category. The presence of mediative terms means that the logical relations between terms in frameworks of individual categories can take several, logically varied shapes: not only that between two opposite terms, but also between one opposite and one mediative term, as well as between two different mediatives. In each case, the relationship between segments containing a given pair of terms is also different.

III. SYNTAX

[13] The same set of categories, which on the paradigmatic axis underlies the morphology of the basic system, on the syntagmatic axis, determines its syntax, that is, the temporal order of segments in the course of a musical narration. In Penderecki's sonoristic style, this order is ruled on the level of individual categories. In the course of a piece, the succession of terms representing a given category is allowed to assume a shape of sequences serving as either a *presentation* or a *mediation* of the binary opposition characteristic of a that category. Presentation of the opposition consists in a directly contrasting juxtaposition of its opposite terms (**Figure 7a**). In the case of mediation, one or more mediative terms is inserted between the opposite terms (**Figure 7b**). From here it follows that a prohibited sequence of terms is a return to an initial opposite term, be it positive or negative, after a mediative term or a chain of such terms has occurred (**Figure 7c**).

[14] Presentation of the opposition between high and
low register is shown in **Example 2**. This example brings about an impressive amalgam of sounds produced by several quasi-musical tools as well as by atypical techniques of playing traditional musical instruments.[(2)] In rehearsal number 94, low register is represented originally by jarring sounds of rattle (Rgl) and guiro, glass bar (Vtr) and sheet metal (Ltr) rubbed with files, pieces of iron (Frro) and wood (Lgn) sawed with hand-saws, and the piano (Pfte) whose lowest string is rubbed with a triangle rod. These non-instrumental noises are subsequently joined by trombones, horns and tubas playing their lowest possible notes of indefinite pitches. The high register in number 95 combines definite pitches of flutes, oboes, and vibraphone with sounds of two triangles, flexatone, piano strings excited with wire brushes, and stringed instruments played between bridges and tailpieces. In number 96, apart from the unusual sound effects known already from number 94, one finds a technique of bowing cellos and double basses on their bridges and tailpieces. Finally, in number 97, the composer introduces an electric bell (Cmp. elttr.) and whistles with high, sharp sounds (Ftti) whose squeaks merge with highest possible notes of strings.

[15] In the above example, segments form a simple succession. This, however, is not always the case. In Penderecki's sonoristic pieces it happens quite often that segments overlap or impose on one another. **Example 3** shows an imposition of as many as three segments, which takes place in the central section of *Polymorphia* (38–45). Seen from the angle of the opposition between spatial mobility and immobility, this section begins with a negative term: spatial immobility results from repetitions of an atypical technique of playing stringed instruments that consists of striking the fingerboard with the palm of the hand. Transition is accomplished by a gradual introduction of more and more instruments as well as progressive differentiation of their articulatory effects required by the composer: tapping soundboards with fingertips, tapping the desk with the bow or the chair with the nut, *legno battuto* between bridge and tailpiece, and highest possible notes played *pizzicato*. This transitory passage represents a mediation of the binary opposition in question. After the maximal impression of spatial mobility is established in number 43, there occur lasting plies of highest possible notes in violins, violas, and cellos (44), as well as a whole-tone cluster in contrabassi (45). All these sound phenomena are spatially immobile and represent a new segment imposed onto the earlier percussive effects. This new segment, in its turn, breaks down into two: one representing high register (vn, vl, vc) and the other located in low register (vb).

[16] Imposition of segments may result in splitting the musical narration of a given passage into two or more parallel threads. This happens when superimposed segments form longer chains that run along the main thread of narration. And yet, it need not always be clear which chain forms the main, and which one the subordinate thread. Sometimes the parallel chains are

coordinate. Some other time, the originally leading chain drives into a dead end, giving way to the hitherto overshadowed thread of narration. Still another time, two or three threads of either equal or different importance merge into each other, running back into a unified stream of music. How to play out such passages of split musical narration, is every time a matter of strategy assumed by the composer. The two following examples demonstrate two different strategies used by Penderecki in *Fluorescences* and in *Polymorphia*. **Example 4** from *Fluorescences* exhibits a diversity of string playing techniques known already from the previous musical example (Example 3), which establish spatial mobility straight from the beginning of rehearsal number 45. At number 47, however, a new, spatially immobile segment occurs, represented by winds playing with stops and pistons. After a break (50), this new segment is continued by repetitions of the winds' highest possible notes. Thus far, spatial mobility is attributed to strings and spatial immobility to wind instruments. But at number 55 an unexpected switch happens: winds suddenly take over the spatially mobile segment by playing *staccato* pitches that cover the whole sound space, while strings change to spatial immobility represented by chords repetitions. Because these last chords are played in low register, the spatially immobile segment at the same time skips from positive to negative term of the opposition "high vs. low register."

[17] Whereas in the foregoing example the two chains of segments are kept clearly separated, **Example 5** shows how two threads gradually merge into one another. From the viewpoint of the opposition "temporal mobility vs. immobility," both threads represent the latter, negative term, though realized in different ways. In violins, the temporal immobility results from maximal density of repeated impulses *pizzicato*, which precludes any perception of rhythmic patterns. In violas, cellos and contrabassi the momentary chords, originally separated by more than three-second breaks, are perceived as mutually unrelated, single impulses. Yet the temporal intervals between them are gradually shortened, which results in a transition from temporal immobility to mobility in this thread of musical narration. A parallel transition happens also in violins, even if temporal intervals between maximally dense impulses remain equal. In reality, this passage is based on a particular compositional trick and gives interesting proof of Penderecki's intuitions about processes of sound perception. It makes use of the fact that successive sounds become more discernible as their frequency changes (thus repeated sounds are the hardest to hear individually). Therefore, the impression of a gradual increase of time-spans between individual *pizzicato* sounds arises not owing to the progressive enlargement of physical time-span values, but through gradual acceleration of glissando. As a result of their parallel transitions, the hitherto separated threads of music fuse into one segment at rehearsal number 37.

[18] Of course, compositional strategies apply not only to sections of a split narration, but also to single chains of segments. Because every segment is defined by a combination of all its terms, a change of one term suffices to change a segment. But one can also change terms of more than one category when moving from one segment to another. The higher the number of changing terms, the higher and hence more general also the level of segmentation. The hierarchy of segmentational levels constitutes a syntagmatic counterpart of the earlier discussed problem of paradigmatic relationships of segments. Obviously, the closer the kinship between two consecutive segments, the lower the level of segmentation established by moving from one of them to the other. And conversely, the lower the kinship (hence higher the contrast between them), the higher also the level of segmentation so established. In a given piece or a section thereof, the composer may give preference either to minimal changes (hence operating mostly on the lowest level of segmentation) or to striking contrasts (while operating on the highest segmentational levels). In the former case, the result will be a smoothness and fluency of musical narration, in the latter, narration agitated and explosive.

[21] Still another area of compositional strategies concerns relations between categories. Basically, of course, individual categories are mutually independent, but the composer may create artificial dependences between them by linking some of their terms into more or less permanent configurations. One example of such a configuration is to be found in the section of *Fluorescences* played earlier, where high register is each time combined with soft dynamics and low register with loud dynamics (Example 2).

[20] Finally, a compositional strategy may also aim to create dependences between categories on the one hand and individual levels of segmentation on the other. This happens when the composer makes some categories act mostly on lower and others mostly on higher hierarchical levels. In such cases, one can speak of a hierarchy of categories assumed for a given piece or a section thereof, hence also of higher and lower level categories. While categories of lower levels account for local nuances of a piece, higher-level categories are responsible for its overall formal layout as comprehended by a listener. For example, in *Fluorescences* a strong impression of a tripartite ABA form arises owing to the category "spatial mobility vs. immobility" which changes only twice in the course of the piece. An individual listener may understand this form quite otherwise, however, if the listener concentrates on another category or shifts attention between different categories as the piece unfolds. The analytical diagrams of this and other Penderecki's pieces, included in my book (Mirka 1997), can thus be

seen as their particular maps, summing up all the possible routes the listener can take across the music.

[21] My most immediate aim was to explain how Penderecki had dealt with texture and, consequently, how a music theorist should deal with the texture of Penderecki's sonoristic pieces. A further question is whether this explanation tells us something valuable about how to deal with texture in general. Certainly, texture and timbre are the two aspects of music in which systematic analytical approach is still missing. Perhaps the system of Penderecki, elaborated as his method of composition—both the basic system just discussed and the timbre system left aside from this discussion—may give some new impulses to methods of musical analysis.

Danuta Mirka
Department of Composition, Conducting and Music Theory
Music Academy
ul. Wojewodzka 33
40-025 Katowice
Poland
mirka@kuria.gliwice.pl

Footnotes

1. For more information about fuzzy sets and logic see Didier Dubois and Henri Prade, *Fuzzy Sets and Systems: Theory and Applications*, Mathematics in Science and Engineering 144 (New York: Academic Press, 1980). Broader discussion of fuzzy sets in Penderecki can be found in Danuta Mirka, "Young Penderecki and Fuzzy Sets," in Ioannis Zannos (ed.), *Music and Signs: Semiotic and Cognitive Studies in Music* Proceedings of the 5th International Symposium on Systematic and Comparative Musicology, Berlin, September 10–14, 1997 (Bratislava: ASCO Art and Science, 1999).
Return to text

2. Unusual means of sound generation are very characteristic of Penderecki's early scores. In this connection, early critics of Penderecki accused him of a humbug intention to shock the audience. As I have demonstrated, however, the new musical accessories and techniques of articulation were necessitated by the timbre system—the other half of the compositional method used by Penderecki in the 1960s. See Danuta Mirka, *The Sonoristic Structuralism of Krzysztof Penderecki* (Katowice: Akademia Muzyczna, 1997).
Return to text

Copyright Statement

Prepared by Brent Yorgason and Tahirih Motazedian, Editorial Assistants