The Modal Palindrome –
A Structural Matrix and A Generative Mechanism

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Abstract: - Generative symmetry is a fundamental issue of the musical language. This paper investigates the polysemic of the palindrome-modal systems, aiming to evidence their matrical-structural and generative-syntactic potential values. The foundation of our argument consists in some representative works by composers Anatol Vieru and Mircea Chiriac, whose conceptual strategies focus on interdeterminism and the fusion of sonorous elements within the macrotemporal binome: syntagmatic-paradigmatic.

Key Words: - symmetry, palindrome, matrix, mode, generative syntax, geometric harmony, Chiriac, Vieru

The word palindrome comes from Greek, where 'palin' means 'again' and 'dromos' means 'path'. Originated in the School of Alexandria, having the Greek poet Sotades of Keroneea (Thrace, 3rd century B.C.) as a hypothetical author, the palindrome is introduced as a formulation built around a centre of symmetry – a mirroring process which reflects the principle of identity (irreversibility) according to which: 'left-right' = 'right-left'. Let us mention, in this sense, the famous Latin palindrome SATOR AREPO TENET OPERA ROTAS, whose symmetry axis is represented by the letter N in the middle of the palindromic word TENET.

To generalise, let us demonstrate that “any palindrome x having an even length 2n can be conceived as the result of the concatenation of its prefix having the length n with the mirror image of this prefix. If the palindrome x has the odd length 2n+1 and y is the prefix of n length of palindrome x, then we get x = ycy'', where y'' is the mirror image of y, and c is the term of rank n+1 of x." [3]. Hence there is a relation of determination between the palindromic structure and the mirroring principle, their common denominator being the phenomenon of symmetry.

Another organic (natural) connection occurs between palindromes and periodicity, and one of the best areas of manifestation is music, specifically modal structures based on strings. Composer Anatol Vieru [5] developed and applied, to his own works, a compositional algorithm based on the string of prime numbers (the Sieve of Eratosthenes). Investigating the chronogenesis of the musical opus, Vieru notes that the product of prime numbers is capable of generating palindromes (called 'non-retrogradable blocks' by Messiaen – rhythmic aggregates that read the same by recurrence: {5,3,2,7,2,3,5}).

As grounds for demonstration, let us take the product of 5 and 7, which can be expressed by means of a rectangle having the dimensions 5 and 7, respectively:

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     1  2  3  4  5
    1     x     y
    2     c     d
    3     e   f   g
    4     d     e
    5     c     b
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Drawing successive diagonals from one corner of the rectangle and 'ricocheting' off every side, we notice that all 35 cells of the rectangle can be intersected in one line. For instance, the line starting in a5 will have the following direction: (a5,b4,c3,d2,e1), (f1,g2), (g3,f4,e5), (d5,e4,b3,a2), (a1), (b1,c2,d3,e4,f5), (g5), (g4,f3,e2,d1), (c1,b2,a3), (a4,b5), (c5,d4,e3,f2,g1). Thus, for the itinerary between a5 and g1 the string of cycle lengths is 52341514325, a palindromic sequence where the sum of the terms is 35. Moreover, we notice that the structure of this palindrome includes the structures {5,5,5,5,5,5} and {7,7,7,7,7}.

On the same grounds, Anatol Vieru analyses the palindromes obtained by multiplying 5 by 7 by 4; 7 by 11, and so on, elaborating generative matrices (genuine rhythm studies) which he makes
use of in his works Soroc (Deadline), Odă tăcerii (Ode to Silence) or Cvartetul de coarde nr. 6 (The String Quartet no. 6).

Starting from the generative prerogatives of the palindrome-modal matrices, the composer Mircea Chiriac succeeds in clearing up globally an entire symphonic opus, all the three parts of the Concerto for orchestra being circumscribed to this strategic concept.

Part I is prefaced by a short Introduction (bars 1-13) which displays a matrix-structure able to manage the entire musical evolution.

The pith of the introductory step is concentrated in a complex theme (see Fig. 2) of binary morphology (a+b) which explores exhaustively the resources of the generative symmetry. In this context, segment a (bars 1-4) develops the principles of the translation symmetry into a cellular-motivic algorithm of the sequential type generated by the complementarity of the melodic-harmonic levels under the incidence of the relations existing between the microstructures x, y, z within the α module. Although the cellular binomial {x+y} sustains a proposta that suggests the occurrence of a quasi-autonomous formulation, the responsive (harmonic) complement z amplifies triadically the α thematic module rendering it (through integration) structurally and semantically relevant to a full extent.

Once identified, the determinations of the expositional incipit converge towards this triply-sequential grid:

\[ a = \{x + (y+y1) + z\} + \]

\[ a1 = \{x' + (y'+y1') + z'\} + \]

\[ a2 = \{x'' + (y''+y1''+y1v'+y1v) + z''\} \]

If the principles of the translation symmetry have governed the articulation of the morphological and syntactic levels, the modal system of the first thematic segment is owed to the mirror symmetry which generates palindromic structures with axis-sound or with axis-interval (see Fig. 3).

As can be observed, the sonorous material of the thematic matrix is organised in an organic corpus of intonational systems located symmetrically around some axes, palindrome-modal entities corresponding to the three sequential modules: a, a1 and a2.

Fig. 2, bars 1-4, p. 3/PG

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of the *Concerto*.

Corroborating these two general references, we discover that the translation symmetry of the melodic level (accurately reflected into the relation of the union-modes *a*, *a1* and *a2*) is systematically doubled by the non-retrogradable bilateral symmetry of each structure.

The modules *a+a1* have an identical modal structure: \{1,1,1,1/2,1,1,1,1\} – palindrome of cardinality 11, resulting from the union of the sub-modes: \{x+(y+y2)\}U\{z\}, and: \{x’+(y’+y1’)\}U\{z’\}, respectively. They form around the tritonic axis C-F#4, thus establishing a relation of complementarity modulo 12 (see the vertical arrows that indicate the sounds-symmetrical difference).

In exchange, the module *a2* (the second sequence, amplified) possesses a reversal of levels, in that the palindrome of cardinality 11 \{1,1,1,1/2,1,1,1,1\} is attributed to the submode \{x’’+(y’’+y2’+y1’’+y1’’v)\}, while the submode \{z’’\} is reduced to a palindrome of cardinality 4 (a type \(a\), segment \(\gamma\) geometric structure). Evidently, the union of the two sub-motivic entities engages the total chromatic.

In this context of generalised symmetry, it is appropriate to develop a few considerations on the modal-harmonic structure of the cellular triad \{z→z’→z’’\}.

As underlined in the beginning of our analysis, this significantly contrasting sub-motivic entity occurs in a responsive manner, justifying its adherence to the thematic matrix (induced by the conjunction of the cells \(x+y\)) by the complementary-harmonic function.

Contrary to the minimal appearances induced by the reductive path of the descant, the harmonic complex of the \(z\) cells reflects the symmetrical arrangement [2] on structures of chordal layers \(a\) \[4\]– \(\beta\), \(\gamma\) and \(\delta\) segments –, materialised either in the palindrome-submodes of cardinality 10 having reversed extremes: \{1,1,1,2/1,1,1,1\} – for the cells \(z→z’\), or in the palindrome-submode of cardinality 4 having identical extremes: \{3/5/3\} – for cell \(z’’\) (see Fig. 4).

The rigour of the thematic construction in Introduction directs all the advancing processes in *Part I*, moulded in the form of classical *sonata*.

From this perspective, the *Exposition* (bars 14-50) begins with a theme derived from the first segment of the Introduction.

**Fig. 5**

**T1** distinguishes itself by a particular significance. When we assert this we have in view the relevance of the concision and the austerity of expression due to the incisive motif \(q\) (structure \(a\), segment \(\gamma\)), on the one hand, and especially the perfect analogy with the leitmotif of the *Patricide* (Laius) in George Enescu’s opera, *Œdipe*. Both here and there, the geometric structure of segment \(\gamma\) predisposes to a certain ‘rhetoric of ambiguity’ due to the ‘contradictory' interval of diminished octave (8-). This remarkable expression of the strained expectation face to the unpredictable and/or the imminence (considering it, obviously, in connection with the semantics of the Enescian leitmotif) is potentiated by Mircea Chiriac by juxtaposing conjointly two \(a\) microstructures, segments \(B\ \gamma\) and \(G\ \gamma\) [1].

The modal synthesis of *T1* – the motifs \(q-q1\) – points out the consistency in applying the principles of generative symmetry launched (strategically) in the original sector, as the detailed structure of the axial branches (upper layer-lower layer) – related to the sonorous substance deduced from the process of virtual union – demonstrates
that the two cellular-thematic microstructures belong to the reference modes $1:2 \ (B \gamma)$ and $2:1 \ (G \gamma)$, respectively.

However, the generative mechanism induced by the palindromic matrix acts strategically on the syntagmatic axis establishing macro-temporal correspondences. By analogy, the geometric-harmonic latencies mentioned in Part I are multiply hypostatised in a polyphonic-imitational agglomeration which marks the beginning and the development of Part III.

Thus, the segment between bars 6-12 offers in the first stage one of the most edifying examples of cellular-motivic processing of a pre-serial nature, as the composer – in keeping with the modal algorithm based on palindromic symmetry – creates a true 'mosaic' of microstructural permutations potentiated polyphonically by imitative stretto.

Designed horizontally (in arpeggio), these entities, which are generically dissipated in the quasi-totality of Part III of the Concerto, are partitions of the $\alpha$ chord, more precisely, $\gamma$ segments whose union leads to a modal palindrome of cardinality 10.

The observation of a similar context (bars 25-30) highlights the organic connection between these microcellular units and the modal matrix of the theme (the $\beta z+z'$ motif), and the material of the juxtaposed segments unites in a modal palindrome (of modal palindromes) of cardinality 8 (see the intersection of the two submodes, the density of each being 6). It is equally important to note that the instance of variational labour to which we are referring holds a multiple syntactic functionality, in this case being a counterpoint of the theme in the Chorus.

The modal-palindromic morphogenesis is polysemous and dissipative, and the harmonic paradigm merely confirms the level of complexity attained by the generative symmetry.

To make things clearer, we shall go back to Part I of the Concerto where $T2$ is engaged in an
ostinato based on the **quadruple symmetrical translation** of a **harmonic scordatura-module** of **panchromatic** extension.

**Fig. 11, bars 85-94, pp. 9-10/PG**

In the context, each harmonic module consists of three distinct minor chords whose fundamentals are located at an interval of 3M/6m. The juxtaposition of the chords reflects the application of the **scordatura** based on a combination of semitone 'glide' (↑/↓) and common sounds (see Fig. 12+13). The intermodular connection of the minor triads generates oppositions of 8- (sometimes expressed by 7M), and chronology conforms to the constant grid: root position, 2nd inversion, 1st inversion.

**Fig. 12**

Consequently, each scordatura module exhausts the sonorous availabilities of the octaval symmetrical system 1:3, the union (intersection) of the four harmonic sequences clarifying the reference set **modulo12**. Besides, a similar spread of the panchromatic environment also results from the virtual union of the four sections of chordal fundamentals (4 x 3 = 12).

**Fig. 13**

The issue approached above enters the realm of the applied research of modal systems organised according to principles of symmetry, complementarity and transposition. The examples analysed highlight the palindrome structures as a double-articulated generative matrix: syntagmatic and paradigmatic.

**References:**


