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Structural Cycles in My Microtonal Compositions

1   On the question of structural cycles

While composing I usually search for some structure, a rule according to which the musical material may be arranged in a structural order to create a structural cycle. I should say that the process of composition for me is rather a creation of a "rule" instead of just writing notes and successions of notes or chords. Creating an "order of creation," a principle that ensures the arrangement of different musical parameters, is a problem that I generally manage in my task of composing. After a structural rule is discovered, the formal decision of composition may suddenly come in one moment. Nevertheless, it sometimes takes an enormously long time to discover.

Some features are constantly used by me as "structural rules." Cycles of repetition of musical segments (*Twittering Machine*, 1984–1986), perpetual or spiral canon models (*Sybilla*, 1996), and permutation cycles may be mentioned (the latter will be discussed below). During the last decade, I have been especially interested in microstructural composition, taking into account only two musical parameters, that is, pitches and rhythm. In the field of pitch my approach to intervals smaller than a semitone is based on equidistant division (see the analysis of *Form is Emptiness* below). Analogically, the extraordinary short durations, as well as the microrhythmical and polytemporal constructions that sometimes result, attracted me.

In general, typical technical means of my composition are cycles of proportional or mensural canons. I may develop ideas of symmetry and infinity in musical form, searching for palindromic structures or structures based on fractal symmetry and self-similarity (*Cum essem parvulus*, 2001, and *Ex una voce*, 2004).

2   The idea of subdivision of the octave into 360 particles

Series of my works produced in the period 1999–2006 exploited the subdivision of a tempered semitone or octave into numbers of equal parts. In *Talita Cumi*, a sound installation for voice and electronics (1999), the tempered semitone is divided into especially small parts, spacing 30 notes inside it (consequentially the size of each microinterval is around 3.33 cents).

The musical process in *Talita Cumi* is limited within an extremely narrow space: rows of microtones are built inside of 3 semitones (F–F#, G#–A, and B–C).

Reviewing my vocal music, Polish musicologist Jan Topolski offers the idea of extending the microtonal scale into a range of an octave.[1] Thus, there may be 360 different sounds within the octave (30 sounds within each of 12 semitones). I was likely pushed by Topolski to create a musical system with 360 sounds in an octave in my recent composition *Form is Emptiness* (2006) for 12 voices, cello, and electronics. All pitches written down in succession give an impression of an extremely long microtonal scale, ascending from C to C#, D, D#, E, etc. (see Example 1). A notable feature of the scale is that every sound is *different* from another, and therefore we have a succession of 360 *different* unrepeated pitches.

3   The idea of permutations

In such works as *Talita Cumi* for voice and electronics (1999), *Canon mensurabilis* for 6 instruments (2000) and *Musica falsa* for 4 bassoons and electronics (2006) I have used the technique of permutations as an arrangement of elements in a row (a set) of microtones. This serial procedure is conducted according to Messiaen's interversion technique: the order of the succession of sounds in the row is changed, and new constellations of the same row appear. In *Form is Emptiness*, with the use of Messiaen-like interversions, the row is presented in "en éventail ouvert, du centre aux extremes" (from center, sideways).

There is a difference between the permutation technique used in my previous works and those in *Form is Emptiness*. The question is if a single note or either *group* of neighboring sounds from the row will be considered as a structural element (unit) to be affected by permutations. In *Form is Emptiness* the system of pitches comprises 360 notes, and the row is very long. That´s why I decided to consider the elements of the row as *groups* composed of different numbers of notes. I adopted a simple rule for the multiplication of notes, and the elements are:

1st note; 2nd and 3rd notes (2); 4th, 5th, and 6th notes (3), etc.

We may add one more note to each new group, and finally there is the longest group, which consists of 19 notes. After that, the groups are gradually shortened:

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1   More see: TOPOLSKI, Jan. 2005. "Talita cumi. Cum essem parvulus." *Kultūros barai* 10: 40.

Example 1: Mažulis's Form is Emptiness *(2006), numbers above the notes indicate that series of notes are higher in 10.0; 13.3; 16.6 cents, etc.*

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As a result, there are, in total, 36 elements in the row.

The permutation in *Form is Emptiness* was executed without mathematical severity. I simply made a sketch on a page with the microtonal 360-sounds row (see Example 2). Rather, there is a pass from the center of the page to the margins, jumping from one stave to another, groups of notes chosen in succession or sometimes in broken order (the arrows show the way to pass from the preceding group to the next one, etc.). Everything seems to be done in a spontaneous and intuitive way, and that´s why the moment of composing this stuff was so curious for me. Finally, the result is a presentiment of the same aggregate of 360 sounds, without repetition of any pitch (every sound appears only once during the whole piece; see Scheme 1).

4   Rotation of the prime form of the row

The resulting constellation of 360 sounds is presented in the work as a basic (prime) form of the structural row (see Example 3). In order to get 6 forms (according to the required arrangement for a chamber vocal group, with 6 female and 6 male voices) I accomplished a *rotation* of elements within the row: the first prime-form consists of 36 elements in succession, but the 1st rotation (R^1) results starting with the 2nd element, while the first one goes to the very end of the row. The 2nd rotation (R^2) has a 3rd element for the beginning, and the 1st and 2nd elements go to the end; consequentially the 3rd rotation (R^3) and 4th to 5th (R^4 and R^5) are derived with the same order (see Scheme 2).

151 (1) – 122-123 (2) – 184-186 (3) – 97-100 (4) – 221-225 (5) – 76-81 (6) – 262-268 (7) – 59-60; 31-36 (8) – 277-285 (9) – 16-25 (10) – 326-330; 301-306 (11) – 337-348 (12) – 169-180; 152 (13) – 121-136 (14) – 197-210; 181 (15) – 92-96; 101-111 (16) – 232-240; 211-218 (17) – 69-75; 82-90; 61-62 (18) – 243-261 (19) – 52-60; 37-47 (18) – 288-300; 271-274 (17) – 5-15; 26-30 (16) – 331-336; 349-357 (15) – 153-166 (14) – 137-149 (13) – 182-183; 187-196 (12) – 112-120; 91; 219 (11) – 220; 226-231; 241-242; 269 (10) – 63-68; 48-50 (9) – 270; 275-276; 286-287; 307-309 (8) – 51; 1-4; 310-311 (7) – 358-360; 150; 167; 219 (6) – 312-316 (5) – 318-320 (4) – 321-323 (3) – 324-325 (2)

Scheme 1: Mažulis's Form is Emptiness *(2006), scheme of permutation*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 Prime

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 1 R^1

3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 1 2 R^2

4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 1 2 3 R^3

5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 1 2 3 4 R^4

6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 1 2 3 4 5 R^5

Scheme 2: Mažulis's Form is Emptiness *(2006), scheme of permutation*

Example 2: Mažulis's Form is Emptiness *(2006), microtonal 360-sounds row*

Example 3: Mažulis's Form is Emptiness *(2006), constellation of 360 sounds*

Example 4: Mažulis's Form is Emptiness *(2006), constructing canon*

5   Constructing canon

Polyphonic presentation of 6 structural "lines" in 6 vocal parts results in a six-part canon. The "prime" form appears in the upper part, while the rotation forms in the rest of parts (2–6). Starting at the same time, 6 voices are expressed in constantly changing textural relationships. The scheme above demonstrates a gradual shifting of segments from the vertical to diagonal position. Simultaneous overlapping of different segments in 6 parts create a very special harmony, and the quality of "chords" is difficult to explain in structural terms. On one hand, the harmonic shape of the music may be considered as a logical consequence of the linear presentation of the microtonal rows (actually, the same notes and groups of notes appear in different parts, and we may follow the vertical situation in the score, see Example 4). On the other hand, the vertical aspect of music is not under control of the composer: the process is totally based on canonic structure, and harmony is rather a random result of linear development. The physical phenomena resulting from a mixture of different pitches, as a fusion of harmonics, the heterodyning of microtonal pitch spectra, etc. were unexpected for me while listening to the sound first. Though I could not succeed in being in control of the acoustical parameters of sound, only these aspects should be considered as essential features of the harmonic language of the work.

6   Rhythm and literary text

The piece is rather a study of the micro-intonation of pitches but not of precise rhythm or tempos. There is no strict synchronization in time between the 12 vocal parts and cello part. Every performer has an individual "pilot track" (made as a MIDI-sequence) with the exact intonation of notes that should be performed. Thus 13 CD players (or a multichannel sound system) should be used for the performance to ensure the possibility of the live performance of the piece.

A well-known quotation from The Sutra Prajnaparamita was used as the literary text in the composition: "Form is emptiness and the very emptiness is form; emptiness does not differ from form, form does not differ from emptiness, whatever is emptiness, that is form, the same is true of feelings, perceptions, impulses, and consciousness." The words are separated into syllables, and each syllable is fixed to every individual note. To get 360 syllables (as well as notes), very simple calculations allowed me to identify some phrases of the text to be repeated several times.

7   Conclusion: spontaneity in the creation process

Using structural methods for composition does not eliminate intuition and spontaneity. I always need emotional tension during certain moments of my creative work. Finding the right solution to a structural arrangement in a composition may be compared with the status of "enlightenment" that usually comes after long period of searches and endeavor.