

Rytis Mazulis

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:

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

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
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6
 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

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.

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 R¹

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 R²

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 R³

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 R⁴

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 R⁵

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

The image displays a musical score for 'Form is Emptiness' (2006) by Rytis Mažulis, illustrating a 360-sound microtonal row. The score is organized into several systems, each containing a staff with a sequence of notes and their corresponding pitch classes. The notes are represented by circles on a staff with a treble clef. The pitch classes are indicated by numbers and accidentals (sharps and flats) below the notes. The systems are as follows:

- System 1:** Measures 16-36. Notes: 50.0, 53.3, 56.6, 60.0, 63.3, 66.6, 70.0, 73.3, 76.6, 80.0.
- System 2:** Measures 37-60. Notes: 83.3, 86.6, 90.0, 93.2, 96.6.
- System 3:** Measures 61-84. Notes: 100.0, 103.3, 106.6, 110.0, 113.3, 116.6.
- System 4:** Measures 85-108. Notes: 120.0, 123.3, 126.6, 130.0, 133.3, 136.6.
- System 5:** Measures 109-132. Notes: 140.0, 143.3, 146.6, 150.0, 153.3, 156.6.
- System 6:** Measures 133-156. Notes: 160.0, 163.3, 166.6, 170.0, 173.3, 176.6.
- System 7:** Measures 157-180. Notes: 180.0, 183.3, 186.6, 190.0, 193.3, 196.6.
- System 8:** Measures 181-204. Notes: 200.0, 203.3, 206.6, 210.0, 213.3, 216.6.
- System 9:** Measures 205-228. Notes: 220.0, 223.3, 226.6, 230.0, 233.3, 236.6.
- System 10:** Measures 229-252. Notes: 240.0, 243.3, 246.6, 250.0, 253.3, 256.6.
- System 11:** Measures 253-276. Notes: 260.0, 263.3, 266.6, 270.0, 273.3, 276.6.
- System 12:** Measures 277-300. Notes: 280.0, 283.3, 286.6, 290.0, 293.3, 296.6.
- System 13:** Measures 301-324. Notes: 300.0, 303.3, 306.6, 310.0, 313.3, 316.6.
- System 14:** Measures 325-348. Notes: 320.0, 323.3, 326.6, 330.0, 333.3, 336.6.
- System 15:** Measures 349-372. Notes: 340.0, 343.3, 346.6, 350.0, 353.3, 356.6.
- System 16:** Measures 373-396. Notes: 360.0, 363.3, 366.6, 370.0, 373.3, 376.6.
- System 17:** Measures 397-420. Notes: 380.0, 383.3, 386.6, 390.0, 393.3, 396.6.
- System 18:** Measures 421-444. Notes: 400.0, 403.3, 406.6, 410.0, 413.3, 416.6.
- System 19:** Measures 445-468. Notes: 420.0, 423.3, 426.6, 430.0, 433.3, 436.6.
- System 20:** Measures 469-492. Notes: 440.0, 443.3, 446.6, 450.0, 453.3, 456.6.
- System 21:** Measures 493-516. Notes: 460.0, 463.3, 466.6, 470.0, 473.3, 476.6.
- System 22:** Measures 517-540. Notes: 480.0, 483.3, 486.6, 490.0, 493.3, 496.6.
- System 23:** Measures 541-564. Notes: 500.0, 503.3, 506.6, 510.0, 513.3, 516.6.
- System 24:** Measures 565-588. Notes: 520.0, 523.3, 526.6, 530.0, 533.3, 536.6.
- System 25:** Measures 589-612. Notes: 540.0, 543.3, 546.6, 550.0, 553.3, 556.6.
- System 26:** Measures 613-636. Notes: 560.0, 563.3, 566.6, 570.0, 573.3, 576.6.
- System 27:** Measures 637-660. Notes: 580.0, 583.3, 586.6, 590.0, 593.3, 596.6.
- System 28:** Measures 661-684. Notes: 600.0, 603.3, 606.6, 610.0, 613.3, 616.6.
- System 29:** Measures 685-708. Notes: 620.0, 623.3, 626.6, 630.0, 633.3, 636.6.
- System 30:** Measures 709-732. Notes: 640.0, 643.3, 646.6, 650.0, 653.3, 656.6.
- System 31:** Measures 733-756. Notes: 660.0, 663.3, 666.6, 670.0, 673.3, 676.6.
- System 32:** Measures 757-780. Notes: 680.0, 683.3, 686.6, 690.0, 693.3, 696.6.
- System 33:** Measures 781-804. Notes: 700.0, 703.3, 706.6, 710.0, 713.3, 716.6.
- System 34:** Measures 805-828. Notes: 720.0, 723.3, 726.6, 730.0, 733.3, 736.6.
- System 35:** Measures 829-852. Notes: 740.0, 743.3, 746.6, 750.0, 753.3, 756.6.
- System 36:** Measures 853-876. Notes: 760.0, 763.3, 766.6, 770.0, 773.3, 776.6.
- System 37:** Measures 877-900. Notes: 780.0, 783.3, 786.6, 790.0, 793.3, 796.6.
- System 38:** Measures 901-924. Notes: 800.0, 803.3, 806.6, 810.0, 813.3, 816.6.
- System 39:** Measures 925-948. Notes: 820.0, 823.3, 826.6, 830.0, 833.3, 836.6.
- System 40:** Measures 949-972. Notes: 840.0, 843.3, 846.6, 850.0, 853.3, 856.6.
- System 41:** Measures 973-996. Notes: 860.0, 863.3, 866.6, 870.0, 873.3, 876.6.
- System 42:** Measures 997-1020. Notes: 880.0, 883.3, 886.6, 890.0, 893.3, 896.6.
- System 43:** Measures 1021-1044. Notes: 900.0, 903.3, 906.6, 910.0, 913.3, 916.6.
- System 44:** Measures 1045-1068. Notes: 920.0, 923.3, 926.6, 930.0, 933.3, 936.6.
- System 45:** Measures 1069-1092. Notes: 940.0, 943.3, 946.6, 950.0, 953.3, 956.6.
- System 46:** Measures 1093-1116. Notes: 960.0, 963.3, 966.6, 970.0, 973.3, 976.6.
- System 47:** Measures 1117-1140. Notes: 980.0, 983.3, 986.6, 990.0, 993.3, 996.6.
- System 48:** Measures 1141-1164. Notes: 1000.0, 1003.3, 1006.6, 1010.0, 1013.3, 1016.6.
- System 49:** Measures 1165-1188. Notes: 1020.0, 1023.3, 1026.6, 1030.0, 1033.3, 1036.6.
- System 50:** Measures 1189-1212. Notes: 1040.0, 1043.3, 1046.6, 1050.0, 1053.3, 1056.6.
- System 51:** Measures 1213-1236. Notes: 1060.0, 1063.3, 1066.6, 1070.0, 1073.3, 1076.6.
- System 52:** Measures 1237-1260. Notes: 1080.0, 1083.3, 1086.6, 1090.0, 1093.3, 1096.6.
- System 53:** Measures 1261-1284. Notes: 1100.0, 1103.3, 1106.6, 1110.0, 1113.3, 1116.6.
- System 54:** Measures 1285-1308. Notes: 1120.0, 1123.3, 1126.6, 1130.0, 1133.3, 1136.6.
- System 55:** Measures 1309-1332. Notes: 1140.0, 1143.3, 1146.6, 1150.0, 1153.3, 1156.6.
- System 56:** Measures 1333-1356. Notes: 1160.0, 1163.3, 1166.6, 1170.0, 1173.3, 1176.6.
- System 57:** Measures 1357-1380. Notes: 1180.0, 1183.3, 1186.6, 1190.0, 1193.3, 1196.6.
- System 58:** Measures 1381-1404. Notes: 1200.0, 1203.3, 1206.6, 1210.0, 1213.3, 1216.6.
- System 59:** Measures 1405-1428. Notes: 1220.0, 1223.3, 1226.6, 1230.0, 1233.3, 1236.6.
- System 60:** Measures 1429-1452. Notes: 1240.0, 1243.3, 1246.6, 1250.0, 1253.3, 1256.6.
- System 61:** Measures 1453-1476. Notes: 1260.0, 1263.3, 1266.6, 1270.0, 1273.3, 1276.6.
- System 62:** Measures 1477-1500. Notes: 1280.0, 1283.3, 1286.6, 1290.0, 1293.3, 1296.6.
- System 63:** Measures 1501-1524. Notes: 1300.0, 1303.3, 1306.6, 1310.0, 1313.3, 1316.6.
- System 64:** Measures 1525-1548. Notes: 1320.0, 1323.3, 1326.6, 1330.0, 1333.3, 1336.6.
- System 65:** Measures 1549-1572. Notes: 1340.0, 1343.3, 1346.6, 1350.0, 1353.3, 1356.6.
- System 66:** Measures 1573-1596. Notes: 1360.0, 1363.3, 1366.6, 1370.0, 1373.3, 1376.6.
- System 67:** Measures 1597-1620. Notes: 1380.0, 1383.3, 1386.6, 1390.0, 1393.3, 1396.6.
- System 68:** Measures 1621-1644. Notes: 1400.0, 1403.3, 1406.6, 1410.0, 1413.3, 1416.6.
- System 69:** Measures 1645-1668. Notes: 1420.0, 1423.3, 1426.6, 1430.0, 1433.3, 1436.6.
- System 70:** Measures 1669-1692. Notes: 1440.0, 1443.3, 1446.6, 1450.0, 1453.3, 1456.6.
- System 71:** Measures 1693-1716. Notes: 1460.0, 1463.3, 1466.6, 1470.0, 1473.3, 1476.6.
- System 72:** Measures 1717-1740. Notes: 1480.0, 1483.3, 1486.6, 1490.0, 1493.3, 1496.6.
- System 73:** Measures 1741-1764. Notes: 1500.0, 1503.3, 1506.6, 1510.0, 1513.3, 1516.6.
- System 74:** Measures 1765-1788. Notes: 1520.0, 1523.3, 1526.6, 1530.0, 1533.3, 1536.6.
- System 75:** Measures 1789-1812. Notes: 1540.0, 1543.3, 1546.6, 1550.0, 1553.3, 1556.6.
- System 76:** Measures 1813-1836. Notes: 1560.0, 1563.3, 1566.6, 1570.0, 1573.3, 1576.6.
- System 77:** Measures 1837-1860. Notes: 1580.0, 1583.3, 1586.6, 1590.0, 1593.3, 1596.6.
- System 78:** Measures 1861-1884. Notes: 1600.0, 1603.3, 1606.6, 1610.0, 1613.3, 1616.6.
- System 79:** Measures 1885-1908. Notes: 1620.0, 1623.3, 1626.6, 1630.0, 1633.3, 1636.6.
- System 80:** Measures 1909-1932. Notes: 1640.0, 1643.3, 1646.6, 1650.0, 1653.3, 1656.6.
- System 81:** Measures 1933-1956. Notes: 1660.0, 1663.3, 1666.6, 1670.0, 1673.3, 1676.6.
- System 82:** Measures 1957-1980. Notes: 1680.0, 1683.3, 1686.6, 1690.0, 1693.3, 1696.6.
- System 83:** Measures 1981-2004. Notes: 1700.0, 1703.3, 1706.6, 1710.0, 1713.3, 1716.6.
- System 84:** Measures 2005-2028. Notes: 1720.0, 1723.3, 1726.6, 1730.0, 1733.3, 1736.6.
- System 85:** Measures 2029-2052. Notes: 1740.0, 1743.3, 1746.6, 1750.0, 1753.3, 1756.6.
- System 86:** Measures 2053-2076. Notes: 1760.0, 1763.3, 1766.6, 1770.0, 1773.3, 1776.6.
- System 87:** Measures 2077-2100. Notes: 1780.0, 1783.3, 1786.6, 1790.0, 1793.3, 1796.6.
- System 88:** Measures 2101-2124. Notes: 1800.0, 1803.3, 1806.6, 1810.0, 1813.3, 1816.6.
- System 89:** Measures 2125-2148. Notes: 1820.0, 1823.3, 1826.6, 1830.0, 1833.3, 1836.6.
- System 90:** Measures 2149-2172. Notes: 1840.0, 1843.3, 1846.6, 1850.0, 1853.3, 1856.6.
- System 91:** Measures 2173-2196. Notes: 1860.0, 1863.3, 1866.6, 1870.0, 1873.3, 1876.6.
- System 92:** Measures 2197-2220. Notes: 1880.0, 1883.3, 1886.6, 1890.0, 1893.3, 1896.6.
- System 93:** Measures 2221-2244. Notes: 1900.0, 1903.3, 1906.6, 1910.0, 1913.3, 1916.6.
- System 94:** Measures 2245-2268. Notes: 1920.0, 1923.3, 1926.6, 1930.0, 1933.3, 1936.6.
- System 95:** Measures 2269-2292. Notes: 1940.0, 1943.3, 1946.6, 1950.0, 1953.3, 1956.6.
- System 96:** Measures 2293-2316. Notes: 1960.0, 1963.3, 1966.6, 1970.0, 1973.3, 1976.6.
- System 97:** Measures 2317-2340. Notes: 1980.0, 1983.3, 1986.6, 1990.0, 1993.3, 1996.6.
- System 98:** Measures 2341-2364. Notes: 2000.0, 2003.3, 2006.6, 2010.0, 2013.3, 2016.6.
- System 99:** Measures 2365-2388. Notes: 2020.0, 2023.3, 2026.6, 2030.0, 2033.3, 2036.6.
- System 100:** Measures 2389-2412. Notes: 2040.0, 2043.3, 2046.6, 2050.0, 2053.3, 2056.6.
- System 101:** Measures 2413-2436. Notes: 2060.0, 2063.3, 2066.6, 2070.0, 2073.3, 2076.6.
- System 102:** Measures 2437-2460. Notes: 2080.0, 2083.3, 2086.6, 2090.0, 2093.3, 2096.6.
- System 103:** Measures 2461-2484. Notes: 2100.0, 2103.3, 2106.6, 2110.0, 2113.3, 2116.6.
- System 104:** Measures 2485-2508. Notes: 2120.0, 2123.3, 2126.6, 2130.0, 2133.3, 2136.6.
- System 105:** Measures 2509-2532. Notes: 2140.0, 2143.3, 2146.6, 2150.0, 2153.3, 2156.6.
- System 106:** Measures 2533-2556. Notes: 2160.0, 2163.3, 2166.6, 2170.0, 2173.3, 2176.6.
- System 107:** Measures 2557-2580. Notes: 2180.0, 2183.3, 2186.6, 2190.0, 2193.3, 2196.6.
- System 108:** Measures 2581-2604. Notes: 2200.0, 2203.3, 2206.6, 2210.0, 2213.3, 2216.6.
- System 109:** Measures 2605-2628. Notes: 2220.0, 2223.3, 2226.6, 2230.0, 2233.3, 2236.6.
- System 110:** Measures 2629-2652. Notes: 2240.0, 2243.3, 2246.6, 2250.0, 2253.3, 2256.6.
- System 111:** Measures 2653-2676. Notes: 2260.0, 2263.3, 2266.6, 2270.0, 2273.3, 2276.6.
- System 112:** Measures 2677-2700. Notes: 2280.0, 2283.3, 2286.6, 2290.0, 2293.3, 2296.6.
- System 113:** Measures 2701-2724. Notes: 2300.0, 2303.3, 2306.6, 2310.0, 2313.3, 2316.6.
- System 114:** Measures 2725-2748. Notes: 2320.0, 2323.3, 2326.6, 2330.0, 2333.3, 2336.6.
- System 115:** Measures 2749-2772. Notes: 2340.0, 2343.3, 2346.6, 2350.0, 2353.3, 2356.6.
- System 116:** Measures 2773-2796. Notes: 2360.0, 2363.3, 2366.6, 2370.0, 2373.3, 2376.6.
- System 117:** Measures 2797-2820. Notes: 2380.0, 2383.3, 2386.6, 2390.0, 2393.3, 2396.6.
- System 118:** Measures 2821-2844. Notes: 2400.0, 2403.3, 2406.6, 2410.0, 2413.3, 2416.6.
- System 119:** Measures 2845-2868. Notes: 2420.0, 2423.3, 2426.6, 2430.0, 2433.3, 2436.6.
- System 120:** Measures 2869-2892. Notes: 2440.0, 2443.3, 2446.6, 2450.0, 2453.3, 2456.6.
- System 121:** Measures 2893-2916. Notes: 2460.0, 2463.3, 2466.6, 2470.0, 2473.3, 2476.6.
- System 122:** Measures 2917-2940. Notes: 2480.0, 2483.3, 2486.6, 2490.0, 2493.3, 2496.6.
- System 123:** Measures 2941-2964. Notes: 2500.0, 2503.3, 2506.6, 2510.0, 2513.3, 2516.6.
- System 124:** Measures 2965-2988. Notes: 2520.0, 2523.3, 2526.6, 2530.0, 2533.3, 2536.6.
- System 125:** Measures 2989-3012. Notes: 2540.0, 2543.3, 2546.6, 2550.0, 2553.3, 2556.6.
- System 126:** Measures 3013-3036. Notes: 2560.0, 2563.3, 2566.6, 2570.0, 2573.3, 2576.6.
- System 127:** Measures 3037-3060. Notes: 2580.0, 2583.3, 2586.6, 2590.0, 2593.3, 2596.6.
- System 128:** Measures 3061-3084. Notes: 2600.0, 2603.3, 2606.6, 2610.0, 2613.3, 2616.6.
- System 129:** Measures 3085-3108. Notes: 2620.0, 2623.3, 2626.6, 2630.0, 2633.3, 2636.6.
- System 130:** Measures 3109-3132. Notes: 2640.0, 2643.3, 2646.6, 2650.0, 2653.3, 2656.6.
- System 131:** Measures 3133-3156. Notes: 2660.0, 2663.3, 2666.6, 2670.0, 2673.3, 2676.6.
- System 132:** Measures 3157-3180. Notes: 2680.0, 2683.3, 2686.6, 2690.0, 2693.3, 2696.6.
- System 133:** Measures 3181-3204. Notes: 2700.0, 2703.3, 2706.6, 2710.0, 2713.3, 2716.6.
- System 134:** Measures 3205-3228. Notes: 2720.0, 2723.3, 2726.6, 2730.0, 2733.3, 2736.6.
- System 135:** Measures 3229-3252. Notes: 2740.0, 2743.3, 2746.6, 2750.0, 2753.3, 2756.6.
- System 136:** Measures 3253-3276. Notes: 2760.0, 2763.3, 2766.6, 2770.0, 2773.3, 2776.6.
- System 137:** Measures 3277-3300. Notes: 2780.0, 2783.3, 2786.6, 2790.0, 2793.3, 2796.6.
- System 138:** Measures 3301-3324. Notes: 2800.0, 2803.3, 2806.6, 2810.0, 2813.3, 2816.6.
- System 139:** Measures 3325-3348. Notes: 2820.0, 2823.3, 2826.6, 2830.0, 2833.3, 2836.6.
- System 140:** Measures 3349-3372. Notes: 2840.0, 2843.3, 2846.6, 2850.0, 2853.3, 2856.6.
- System 141:** Measures 3373-3396. Notes: 2860.0, 2863.3, 2866.6, 2870.0, 2873.3, 2876.6.
- System 142:** Measures 3397-3420. Notes: 2880.0, 2883.3, 2886.6, 2890.0, 2893.3, 2896.6.
- System 143:** Measures 3421-3444. Notes: 2900.0, 2903.3, 2906.6, 2910.0, 2913.3, 2916.6.
- System 144:** Measures 3445-3468. Notes: 2920.0, 2923.3, 2926.6, 2930.0, 2933.3, 2936.6.
- System 145:** Measures 3469-3492. Notes: 2940.0, 2943.3, 2946.6, 2950.0, 2953.3, 2956.6.
- System 146:** Measures 3493-3516. Notes: 2960.0, 2963.3, 2966.6, 2970.0, 2973.3, 2976.6.
- System 147:** Measures 3517-3540. Notes: 2980.0, 2983.3, 2986.6, 2990.0, 2993.3, 2996.6.
- System 148:** Measures 3541-3564. Notes: 3000.0, 3003.3, 3006.6, 3010.0, 3013.3, 3016.6.
- System 149:** Measures 3565-3588. Notes: 3020.0, 3023.3, 3026.6, 3030.0, 3033.3, 3036.6.
- System 150:** Measures 3589-3612. Notes: 3040.0, 3043.3, 3046.6, 3050.0, 3053.3, 3056.6.
- System 151:** Measures 3613-3636. Notes: 3060.0, 3063.3, 3066.6, 3070.0, 3073.3, 3076.6.
- System 152:** Measures 3637-3660. Notes: 3080.0, 3083.3, 3086.6, 3090.0, 3093.3, 3096.6.
- System 153:** Measures 3661-3684. Notes: 3100.0, 3103.3, 3106.6, 3110.0, 3113.3, 3116.6.
- System 154:** Measures 3685-3708. Notes: 3120.0, 3123.3, 3126.6, 3130.0, 3133.3, 3136.6.
- System 155:** Measures 3709-3732. Notes: 3140.0, 3143.3, 3146.6, 3150.0, 3153.3, 3156.6.
- System 156:** Measures 3733-3756. Notes: 3160.0, 3163.3, 3166.6, 3170.0, 3173.3, 3176.6.
- System 157:** Measures 3757-3780. Notes: 3180.0, 3183.3, 3186.6, 3190.0, 3193.3, 3196.6.
- System 158:** Measures 3781-3804. Notes: 3200.0, 3203.3, 3206.6, 3210.0, 3213.3, 3216.6.
- System 159:** Measures 3805-3828. Notes: 3220.0, 3223.3, 3226.6, 3230.0, 3233.3, 3236.6.
- System 160:** Measures 3829-3852. Notes: 3240.0, 3243.3, 3246.6, 3250.0, 3253.3, 3256.6.
- System 161:** Measures 3853-3876. Notes: 3260.0, 3263.3, 3266.6, 3270.0, 3273.3, 3276.6.
- System 162:** Measures 3877-3900. Notes: 3280.0, 3283.3, 3286.6, 3290.0, 3293.3, 3296.6.
- System 163:** Measures 3901-3924. Notes: 3300.0, 3303.3, 3306.6, 3310.0, 3313.3, 3316.6.
- System 164:** Measures 3925-3948. Notes: 3320.0, 3323.3, 3326.6, 3330.0, 3333.3, 3336.6.

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
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150
 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180
 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210
 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6

211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240
 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6

241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270
 83.3 86.6 90.0 93.2 96.6 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6

271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300
 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 3.3 6.6 10.0 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 70.0

301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330
 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6

331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360
 13.3 16.6 20.0 23.3 26.6 30.0 33.3 36.6 40.0 43.2 46.6 50.0 53.3 56.6 60.0 63.3 66.6 70.0 73.3 76.6 80.0 83.3 86.6 90.0 93.2 96.6

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

J=60

Soprano 1
f *P*
 Sa - ri - put - ra, em - pri - ness and

Soprano 2
f *P*
 Sa - ri - put - ra, em - pri - ness and

Soprano 3
f *P*
 Sa - ri - put - ra, em - pri - ness and

Alto 1
f *P*
 Sa - ri - put - ra, em - pri - ness and

Alto 2
f *P*
 Sa - ri - put - ra, em - pri - ness and

Alto 3
f *P*
 Sa - ri - put - ra, em - pri - ness and

Tenor 1
f *P*
 Sa - ri - put - ra, em - pri - ness and

Tenor 2
f *P*
 Sa - ri - put - ra, em - pri - ness and

Tenor 3
f *P*
 Sa - ri - put - ra, em - pri - ness and

Bass 1
f *P*
 Sa - ri - put - ra, em - pri - ness and

Bass 2
f *P*
 Sa - ri - put - ra, em - pri - ness and

Bass 3
f *P*
 Sa - ri - put - ra, em - pri - ness and

Violoncello
f *P*
 Sa - ri - put - ra, em - pri - ness and

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.