

Symmetry in creative work of Mikalojus Konstantinas Čiurlionis

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Symmetry and musical symmetry are discussed. The creative work of Čiurlionis (especially piano music) is analysed from the symmetry point of view. Čiurlionis' efforts to find a structure common to music, painting and writing led him to the only solution found in all his creative work. The main idea of the article is that mirror symmetry became the structural backbone of all modes of self-expression of Čiurlionis.

Key words: symmetry, musical symmetry, reflection, rotation, glide reflection, translation, automorphism

The main idea of this study is that Mikalojus Konstantinas Čiurlionis (1875–1911), the Lithuanian composer and painter, like many other composers, used various forms of symmetry, however, his efforts to find a structure common to music, painting and writing led him to the only solution found in all his creative work. The symmetry of mirror reflection is the structural backbone of all modes of self-expression of the multitalented Lithuanian artist.

Symmetry, of course, is one of the global phenomena found in all areas of our activity and in the surrounding world. Symmetry occurs in geometry, mathematics, physics, biology, art, literature and so on. Symmetry in music is only a small part of the versatile world of symmetry.

The analysis of musical symmetry has a growing literature, including Riemann's (1896) theory of harmonic dualism, Lendvai's axis system (1993), and neo-Riemannian theory. There is a very important research done in last years by several scholars. The articles by Dalia and Judith Cohen (1999), Arthur L. Loeb (1999), Siglind Bruhn (1996) and Larry J. Solomon (2002) are the best examples. Besides, there are three international organizations whose activities in the last years furthered our understanding of symmetry and formed the large community of symmetry-involved researchers around the world. These organizations are:

1. International Society for the Interdisciplinary Study of Symmetry (<http://www.mi.sanu.ac.yu/vismath/jablan/isis2.htm>), which publishes the quarterly "Sym-

metry: Art and Science" (since 1997, earlier – "Symmetry: Culture and Science");

2. International Symmetry Foundation

(<http://www.mi.sanu.ac.yu/vismath/jablan/isis4.htm>)

3. Institute for Advanced Symmetry Studies SYMMETRION (<http://www.mi.sanu.ac.yu/vismath/jablan/isis5.htm>).

Descriptions of symmetry in different encyclopaedias are similar to this one taken from Online Encyclopaedia: "Symmetry is a characteristic of geometrical shapes, equations and other objects. The three main symmetrical operations are reflection, rotation and translation" (Online Encyclopedia, Symmetry).

However, as noted by Dalia and Judith Cohen, "the concept of musical symmetry (in the last decades) has been expanded, under the influence of three main factors:

1. the perception of symmetry as a comprehensive phenomenon manifested both in nature and in human activities;

2. the new research directions that regard musical activities as cognitive activities;

3. the increasing awareness of twentieth-century music (which rejects the learned schemata on which tonal music was based) of symmetrical operations functioning as basic procedures in the formation of a musical work (Cohen, 1999: 91).

Prof. Larry Solomon summarises: "Symmetry is a predominant principle of organization found in musical composition, crossing international boundaries of style, history, and ethnicity; i.e., in fact, most

of the relationships found in music are based on symmetry. The laws of symmetry are general laws that determine a relationship” (Solomon, 2002).

Three main symmetrical operations – reflection, rotation and translation – may be applied to any parameter of a musical composition. According to Larry Solomon, there is symmetry as a common denominator in all these examples:

timbre identity, isorhythmic motets, imitation, sonata rondo, mirror chords, cancrizans, parallel organum, antiphony, vibrato, fauxbourdon, scale formation, trills, compound rondo, compound ternary, invertible counterpoint, ostinati, chaconne, cantus firmus composition, melodic inversion, meter and pulse, augmentation, arch forms, Alberti bass, serial operations, canon, rounds, pitch identity, circle of fifths and sequence.

In all of these elements and characteristics, writes Solomon, symmetry will appear as the common generator of structure, perhaps the most significant determinant of musical composition (Solomon, 2002).

Theories of musical isometry (cf. Riemann, 1896 and Lendvai, 1993) parallel with Washburn and Crowe’s (1988) cross-cultural and cross-historical survey of isometries in decorative arts across cultures and historical epochs. The four plane isometries described in their book “Symmetries of Culture: Theory and Practice of Plane Pattern Analysis” are:

- a) mirror reflection;
- b) rotational symmetry;
- c) translation; and
- d) glide reflection.

Each of these basic geometric motions – or plane isometries – has its musical analogue. For example, rotational symmetry (round a point in the plane) is not only characteristic of an equilateral triangle, which is invariant under rotation by 60° (Washburn and Crowe, 1988: 45), but also of the augmented triad, which enharmonically maps onto itself at T_4 . Like the equilateral triangle, the augmented triad permits two rotational mappings (or inversions) before mapping onto itself. Mirror reflection (on a line in the plane) corresponds to real inversion. Glide reflection (a symmetry that combines mirror reflection with translation, such as may be found in human footprints), while somewhat rarer in music, does so occasionally. Finally, translation (repeated shapes, with no fixed axis of symmetry) corresponds to transposition (sequence) or to ostinato.

There is also spatial dilation or contraction, which is a special type of symmetry transformation usually called automorphism. Augmentation and diminution are traditional examples of this operation. Musical symmetries may be confirmed by mapping melodic and harmonic intervals onto a “chromatic circle” representing an equal-tempered pitch space. This means that a 360° rotation of a vector returning to its initial position may be considered to be the vi-

sual analogue for octave equivalence in music. The 360° rotation space may then be divided into 12 intervals of 30° , corresponding to the equal-tempered chromatic scale. The circle as a representation of pitch space is found in the writings of Johann David Heinichen (1728), Johann Mattheson (1735) and other Baroque theorists (Lerdahl, 2001: 42). Such schemata were used to depict closeness of key-area relationships, especially as the adoption of equal temperament became more widespread and survives today as the well-known circle of fifths. However, the “chromatic” circle, in which points along the circle are arranged not by successive perfect fifths but by closeness of frequency (successive half steps in equal-tempered pitch space), is a useful schema for melodic structure (Brower, 2000: 339).

Symmetry manifestations in Čiurlionis' works

The universality and versatility of symmetry in musical and visual contexts is particularly vivid in the creative work of the Lithuanian artist and composer Mikalojus Konstantinas Čiurlionis (1875–1911). Čiurlionis is not alone among composers of the late nineteenth and early twentieth centuries in his explorations of various forms of symmetry. One could just as easily point to Rimsky-Korsakov’s experiments with the octatonic scale, Berg’s use of intervallically symmetrical chord sets, and Debussy’s non-functional “planing” of identical harmonic structures such as dominant seventh chords. However, Čiurlionis’s efforts to find a structure common to music, painting and writing led him to uniquely apply symmetry simultaneously – and with equal emphasis – in all of his creative work, which embraced music, painting, photography, and poetry. The symmetry of mirror reflection thus provides the structural backbone of all modes of self-expression of this multitalented Lithuanian artist.

It is obvious that Čiurlionis’s painting studies which started in 1904 made a decisive influence on his musical composition. The elements of plastic forms appear in the musical sketches from 1904–1906. On the other hand, musical form became the pattern of his paintings from 1907. It is also obvious that Čiurlionis tried to create or discover some meta-linguistic system common to all forms of artistic expression. He used separate “musical” letters and even an artificial alphabet to find a possibility to “translate” words from one area of art to another, from verbal language to musical, from musical to visual. Symmetry as a universal tool became the cornerstone for all his discoveries.

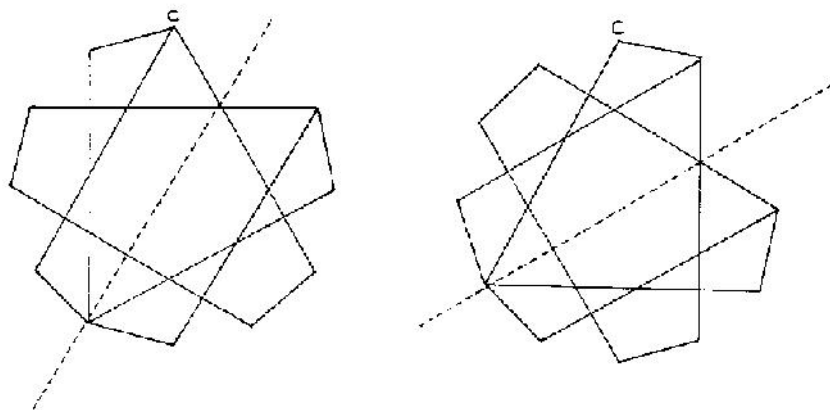
Washburn and Crowe’s definition of symmetry allows for resulting shapes that may not appear to be visually symmetrical but may be generated through symmetrical processes. “Symmetry classification is not concerned with the shape of the unit, but with the motions which move the pattern along

an axis or around a point. These motions can be regarded as *generating* the design” (55). For example, the “serial” repetition of melodic patterns in Čiurlionis’s piano work *The Sea* (VL 317, 1908) undergoes a constant rhythmic transformation but, in the pitch parameter, is symmetrical by the process of translation. A similar instance of translation in Čiurlionis’s visual work can be found in the swallow motif in the lower left of the *Sonata of Summer: Scherzo* (1907) (Holm-Hudson and Kučinskas, 2004).

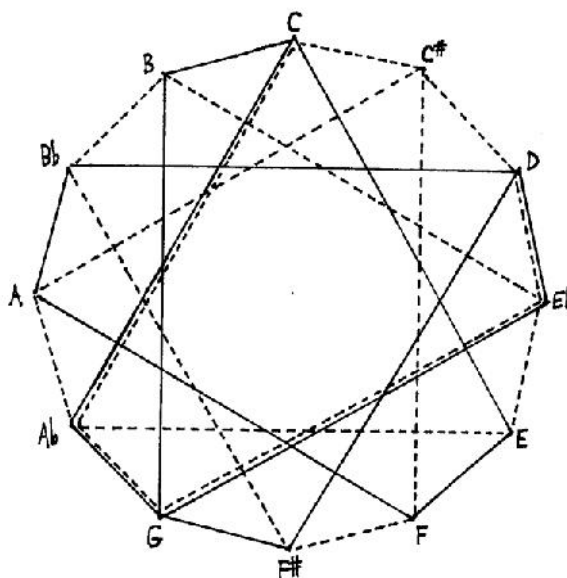
Both types of the **musical translation** motion class – transposition and ostinato – are strikingly used in the fourth of the *Besacas* variations (VL 265, 1905). The $\langle Bb, E, Eb, A, C, A, Eb \rangle$ “theme”, which is constructed of “musical” letters and treated as a cantus firmus or ostinato in the other variations, here is repeated in the transpositions that reflect the ordered interval series on the larger level. The result is that the first note of each phrase also spells out the whole series, like a musical version of a “magic square” or matrix (or perhaps, in literary terms, an acrostic). This passage is often cited as an evidence of Čiurlionis’s standing as a “proto-serialist”.

Washburn and Crowe point out that isometries may also be found in combination (Washburn and Crowe, 1988: 32). For example, the [0268] set (e.g., $\langle C, D, F\#, G\# \rangle$) not only maps onto itself at T_6 (thus possessing rotational symmetry), but is also intervallically symmetrical (thus possessing mirror symmetry). Prelude VL 256 (1904) makes extensive use of the [0268] set. Measures 16 and 17 show the greatest concentration of this chord and the greatest number of possible relationships: T_5 or T_7I from the first to second and second to third chord, T_{11} or $T_{11}I$ from the third to fourth, T_{10} or T_2I from the first chord to the third, and T_4 or T_0I from the second to fourth.

In Čiurlionis’s visual art, too, rotational symmetry is sometimes found combined with mirror symmetry. One example can be found in the spider web in the painting *Sonata of the Sun: Finale* (1907). The web may be divided into four quadrants that admit rotation by 90° , starting with the upper vertical axial strand. Each quadrant is divided into three parts, the secondary axial strands forming angles of 35° , 20° , and 35° . Within each quadrant, then, there is mirror reflection symmetry (the unseen axis of



1. M. K. Čiurlionis. Prelude VL 324. The ascending and descending series can be interpreted as the “inversion” or as T_1 retrograde of the ascending pattern



2. M. K. Čiurlionis. Prelude VL 324. A union of the ascending and descending patterns

symmetry bisecting the 20° angle), and each quadrant admits rotational symmetry to form the web.

Prelude VL 339 (1909) serves as a particularly rich musical example of symmetries in combination. The left hand presents a sequence of arpeggiated augmented triads or (048) sets; the rotational symmetry properties of this chord have already been noted, and how the chord relationships are to be interpreted – at least in tonal music – depends to some extent on how the chord is (enharmonically) spelled. For example, Measure 1 presents a series of arpeggios that perceptually appear to be rising by a semitone with each quarter note pulse. Examining the chords’ spelling, however, shows that the pattern – at least initially – is moving by successive T_5 s, or moving through the circle of fifths ($C+$, $F+$, $Bb+$, $Eb+$). These successive transpositions thus re-

veal a translation process. When chord spelling is considered, measure 2 repeats the harmonic pattern of measure 1 but rotating the chords' inversions (root becomes first inversion, first inversion becomes second, and second inversion becomes root position). Translation on another level is revealed by comparing the second two beats of measure 1 with the first two beats; when enharmonic equivalents are considered, the second pair of chords is a sequence of the first pair, up to a whole tone.

Regardless of how they are spelled, the arpeggiations in Prelude VL 339 have two rhythmic patterns, each with its own contour segment set. The pattern of four sixteenth notes has the contour segment CSEG<0121>, where 0 represents the lowest pitch in the pattern; the pattern of two sixteenth notes plus an eighth note has the contour segment CSEG<120>. The contours, then, are also congruent by translation. Finally, mirror symmetry is also seen in this prelude, from the last chord of measure 2 through the second chord of measure 5 inclusive (just before the change of texture). The eleven-chord sequence is a palindrome: <Eb+, Bb+, F+, C+, Eb+, Bb+, Eb+, C+, F+, Bb+, Eb+>.

Other examples of rotational symmetry can be found in Čiurlionis's music. Like some of his contemporaries in Russia, Čiurlionis also experimented with the octatonic scale. This, too, is a rotationally symmetrical construct, mapping onto itself at T_3 , T_6 , and T_9 . The Prelude VL 300 (1906) exclusively uses the octatonic scale $OCT_{0,1}$ for its first six measures.

Examples of **rotational symmetry** can be found in Čiurlionis's music as well. Here I'd like to mention interesting discoveries by Kevin Holm-Hudson last spring. He analyses Prelude VL 324 which starts with an up-going row of minor sixths and a down-going row of major sixths. K. Holm-Hudson writes: "The pattern, can be interpreted as, initially, a series of ascending minor sixths subjected to sequential transpositions of a perfect fifth. After six such transpositions, the pattern is inverted, with descending minor sixths sequentially transposed down a perfect fifth with each iteration. Inscribing the melodic motion within a chromatic circle representing an equal-tempered pitch space yields the shapes shown in Example 1. The first shape, representing the ascending pattern, admits mirror symmetry around the axis of C#/G. The second shape represents the descending series; here we find that the axis of symmetry has rotated by 30° to D/G#. In other words, the "inversion" found in the descending pattern can also be interpreted as the T_1 retrograde of the ascending pattern. The union of the ascending and descending patterns is diagrammed in Example 2; solid lines represent the ascending pattern and dashes represent the descending pattern. The total pattern admits both mirror and rotational symmetry" (Holm-Hudson and Kučinskis, 2004).

There are also other interesting examples of **rotational symmetry combined with an automorphism**. The best examples are Prelude VL 272 and Prelude VL 303. Both of them are built on chromatic motion of the left hand. The first prelude forms a circle from D to E, whereas in Prelude VL 303 a whole circle is drawn. There are, of course, some examples where Čiurlionis creates a texture of rows constructed from augmented or diminished intervals. All the left hand of Prelude VL 294 is based on a two-bar ostinato figure, in which the first bar consists of octave/diminished octave/minor seventh, while the second bar is an inversion constructed of minor second/fourth/fifth. Another intriguing example is Prelude VL 327. Here the composer uses a sequence of intervals (fourth, fifth, sixth, seventh, second, triton, third) to construct an ostinato figure in the bass. Musicologist Audronė Jurkėnaitė pointed out a similarity between this intervallic pattern and the series developed by Alban Berg in his "Lyric suite" for string quartet in 1925 (Jurkėnaitė, 2001: 55).

Mirror symmetry is most often found in Čiurlionis' works. By using elements of inversion Čiurlionis achieves a multilevel symmetry of the whole texture of a musical composition. The cycle *The Sea*, Part 2 is the most striking example of total symmetry. Bar 4 is made up of a combination of vertical and horizontal reflections, inversions and translations. The right hand in bar 8 is written in two parts where the second voice repeats the first in augmentation. In bar 18 two lines rotate 180° around the note g¹.

Some of Čiurlionis's music contains literally "visual" passages. For example, in a passage from the symphonic poem *The Sea* (1903–1907), Čiurlionis staggered instrument entries to suggest the outline of a fir-tree on the score. The inverted form of a fir-tree is seen in Prelude VL 259 (1904) after the rhythmical pattern in right hand (1st part) is written under the vertical axis of symmetry. Occasionally, more "abstract" correspondences between musical gesture and visual pattern can be found. For example, the conclusion of the second movement to *The Sea* piano cycle (measures 30–34), as noted by K. Holm-Hudson, features a mostly chromatic descending line (measure 30) subjected to a progressive series of "erasures" in measures 31–33, until nothing is left of it.

There is a number of paintings in which mirror symmetry lays the background of the visual composition. The cycle of paintings "Day, Evening, Night (24 hours)", the Allegro part of the painted "Sonata of the Stars" show the most obvious realization of mirror symmetry.

There are also examples of correspondence between the musical compositions and paintings of Čiurlionis. For example, the musical cycle *The Sea* corresponds to the painted three-movement "Sona-

ta of the Sea" (Eberlein, 1995), and variations on the theme "Easacas" correspond with the painted cycle "The Sparks" (Kučinskas, 2003).

Čiurlionis's literary poem "Psalm" could serve as an example of symmetry in his literary compositions. The place of repetitively used words "Lord", "forest", "field", "river" within the text is not accidental. The sequence of these words construct a form based on an exact mirror reflection.

However, perhaps the most striking finding is that the poem "Psalm", the painted cycle "Sparks" and the musical variations "Easacas", all created in the same year 1906, are identical expressions of the same structural form – mirror symmetry.

CONCLUSIONS

As Dalia and Judith Cohen wrote, "all music has some sort of symmetry, which can be regarded as a specific case of symmetry in human life and natural phenomena" (Cohen, 1999:122). The symmetry found in Čiurlionis's works shows that Čiurlionis was consciously searching for realisation of all forms of symmetry in all his creative work

. While rotational symmetry, especially in combination with different forms of automorphism, is found more often in Čiurlionis's piano music, mirror symmetry is more often discovered in paintings and literary works.

The most important thing is that after he began his artistic training, he evidently came to see musical lines as lines, in an abstract, spatial sense; this led to his experiments with varying kinds of symmetries and the ordering of intervallic space into controlled patterns of expansion and contraction. Therefore, his abstract conceptualization of musical line and register as analogues for artistic principles was his distinctive musical language, and as such they can be regarded as important forerunners – even though they are conventionally notated – of the "graphic scores" of the 1950s and 1960s avant-garde.

His strive to find a universal structure common to all artistic expressions is unique to this day. Efforts to combine different artistic media within one type of symmetry are most obvious in the creative process of Čiurlionis and is one of the most valuable results in the art history of the early 20th century.

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SIMETRIJA M. K. ČIURLIONIO KŪRYBOJE

Santrauka

Straipsnyje nagrinėjamas simetrijos vaidmuo M. K. Čiurlionio kūryboje. Keliamas prielaida, kad simetrija yra vienas esminių kūrybos elementų. M. K. Čiurlionis, kaip ir daugelis kitų menininkų, naudojo įvairias simetrijos rūšis ir formas, tačiau siekė skirtingų meno rūšių kūrinius sujungti tapačia forma. Veidrodinė simetrija kaip tik ir tapo ta vienijančia struktūra, per kurią reiškėsi visa brandžioji M. K. Čiurlionio kūryba – muzika, dailė, literatūra, fotografija. Straipsnyje aptariama muzikinės simetrijos samprata ir jos kaita pastaruoju dešimtmečiu, išryškinamos pagrindinės jos formos, akcentuojamos universaliosios rūšys: veidrodinė, rotacinė, poslinkio ir veidrodinė poslinkio simetrija; analizuojami konkretūs simetrijos atvejai, aptinkami M. K. Čiurlionio muzikinėje kūryboje.