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UDC78

TRITONAL SYMMETRY AND SYSTEMIC CONSTRUCTIVISM

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Abstract
The tritone enjoyed particular attention on both the theoretical and creative planes in the 20th century: one could say that, in the 20th century, the dominance of the tritone in music reached its apogee. Tritone-based symmetrical sequences became an important object of analysis. The expression of this interval is unique in coordinating the linear and the vertical parameters and the structure of a composition. For this reason, the current paper unfolds the constructiveness of the phenomenon of the tritone symmetry in series, in harmony, and on the vertical and the diagonal using more prominent postwar avant-garde examples. It explores the significance of the tritone in 12-tone music, in which it manifests itself through symmetry, specific dissonance, and tension. Tritonal symmetry and strict constructivism are especially characteristic of the postwar avant-garde leaders Nono, Boulez, or Stockhausen, who were active participants of the Darmstadt Summer Course, the centre of post-Webernian serialism. In the analysis of the change in the tritone concept in the context of the postwar avant-garde, we shall explore 12-tone series from a structural, harmonic, and melodic viewpoint as well as their spread in compositions.

Keywords: *tritone, dissonance, contemporary music, twelve-tone matrix, cyclic set, Allintervallreihe [all-interval row]*

Introduction

The tritone was a particularly significant factor in composing music during the 20th century. It was consistently and systematically incorporated into compositional models, cf. Josef Matthias Hauer (1883–1959), Arnold Schönberg (1874–1951), Anton Webern (1883–1945), Bernd Alois Zimmermann (1918–1970) Luigi Nono (1924–1990)), Pierre Boulez (1925–2016), and Karlheinz Stockhausen (1928–2007). The establishment of the tritone in the 20th century compositions predetermined the change in the harmonic structure of musical works, their sound, and the psychology of perception. Quite often, the fifths and their tertian content predominating in the composition of chords were replaced by the combinations of the tritone, a second, a fourth, a seventh, and other intervals. In his dissertation *Untersuchungen zum tonalen Musikdenken des 20. Jahrhunderts* [Investigations into Tonal Thinking in the 20th Century] (1988), Klaus Lagaly noted the changed concept of interval use, highlighted the specificity of harmonic systems, and substantiated his research by the analysis of compositions by Alexander Scriabin (1872–1915), Béla Bartók (1881–1945), and Olivier Messiaen (1908–1992) [1] We can assume that the instability, acoustic properties, and the established autonomy of the tritone became a cause for emergence of a number of unique compositional and theoretical systems. It is important to emphasise that, in the 20th century, not only did the elements of the chord structure change radically, but also the concept of the vertical itself: from a specific chord (function) to

ISSN 1512-2018

the chord of an individual, conceptualised structure. Despite long-standing prohibitions and strict medieval rules that unequivocally rejected the use of the tritone, gradually, and seemingly unnoticeably, the tritone, considered as an intolerable and undesirable element in music, became an integral part of compositions.

I. SYMMETRICAL CHORDS OF FRITZ HEINRICH KLEIN

Since the current paper focuses on symmetrical constructivism, it is necessary to remember the two symmetrical chords developed by Fritz Heinrich Klein (1892–1977) on the basis of the tritone: *Pyramidakkord* [Pyramid chord] and *Mutterakkord* [Mother chord]; 17 years later, Nicolas Slonimsky (1938) added the third chord, *Grossmutterakkord* [Grandmother chord]. In Klein's paper *Die Grenze der Halbtonwelt* [The Boundary of the Semitone World], only the first two chords (the Pyramid chord and the Mother chord) were published, while the authorship of the third symmetrical chord (the Grandmother chord) belongs to Nicolas Slonimsky. In his analysis of the 20th-century music from the viewpoint of structuralism, Arved Ashby highlighted Klein's explorations which also led to the formation of his own style; Ashby argued that music went through numerous stages from elementary triads to the above mentioned complex chords, yet "in the kingdom of tones, all citizens were equal" [2]. The 20th century vertical (chord) acquired quite a few recognisable and characteristic features, and the distinctiveness and autonomy of the vertical came to light: in chord relations, no centre of tonal attraction remained. Verticals were increasingly frequently described in terms such as intensity and sonority. Rimantas Janeliauskas (2002), who conceptualised those innovations, clearly distinguished between the changed conception of intervals and the traditional functional-modal perception and introduced the concept of *stuctural-intervallic tonality* [3].

Fritz Heinrich Klein's chords are distinguished by their constructiveness, and the tritone "operates" in a special way there: the Pyramid chord is made up of all intervals, in a narrowing order from perfect octave to minor second. The tritone is in the centre of that chord: the intervals get wider downwards from it and narrower upwards. The Mother chord consists of an all-interval series *Die Allintervallreihe* and *Symmetrischen Reihen* [4], upon converting it to a vertical. Although the Grandmother chord is often also attributed to Klein, Nicolas Slonimsky was the first to present it on 13 February 1938: "The chord consists of twelve different tones and symmetrically inverse intervals in relation to the central interval, the tritone, which is a reversal of itself " [5].

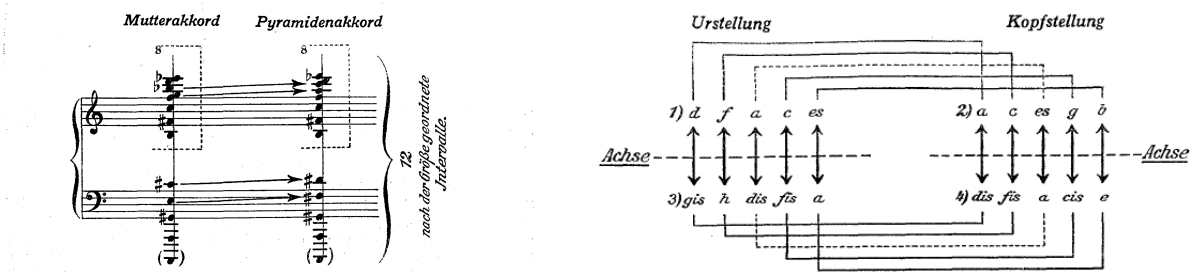


Fig. 1. Fritz Heinrich Klein's symmetrical chords [6]

All three chords testify to the manifestations of systemic constructivism in music, while in terms of the tritone, the Mother chord is of particular importance to us. Upon converting it to the compositional horizontal, we notice that the expansion from the tritone *d–as* in the centre in both directions results in a new tritone. At first glance, the diatonic-sounding series actually consists of six pairs of dissonant intervals – tritones. In the process of consistent moving from the central tritone towards the edges in opposite directions, we observe that the series consists of six symmetrical pairs of

ISSN 1512-2018

tritones. We see that Klein uses four spatially arranged non-chords to explain the structure of these verticals, yet it is very important that, on the vertical, they are related by the interval of a tritone (the first non-chord to the third and the second to the fourth) and on the horizontal, by the interval of a fifth (the first to the second and the third to the fourth). On Klein's symmetrical verticals, the tritone is contrasted with the element that suppresses it, i.e. a fifth. It is in that schema of Klein (Fig. 1) that the spatiality of symmetrical chords is revealed.

It is important to pay attention to the Pyramid chord, as that vertical consists of all intervals, starting with a major seventh and ending with a minor second, keeping the tritone in the centre; however, Klein uses only 11 chromatic tones. The Pyramid chord lacks C sharp, because only after eliminating C sharp do we get a symmetrical vertical consisting of six pairs of tritones. A similar situation can be observed also in Slonimsky's Grandmother chord. We can conclude that all three chords are formed on a similar principle, when, moving away from the central tritone in both directions towards the edges, a tritone interval is obtained in each step, although at first glance we notice only one tritone in the structure of the series. Those verticals can be called the basis of modernist creation which had a huge impact on the 20th century compositional systems.

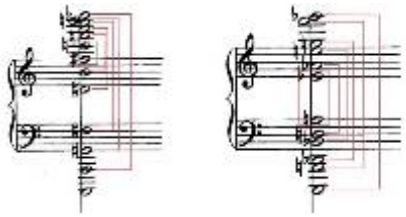


Fig. 2. Comparison of the Pyramid chord [6] and Grandmother chord [5]

The tritone is in the centre of each of the above mentioned (Klein, Slonimsky) vertical or horizontal. George Perle's (1915–2009) series are based on an identical principle: the tritone is in the centre, and it is surrounded by tritones up to the marginal tones. In Klein, Slonimsky, and Perle's theories and corresponding series, the tritone occupies the central position. "The series used in Osvaldas Balakauskas' dodecatonics is constructed on the same principle. Balakauskas himself explained the emergence of his series as a result of Paul Hindemith's analysis of the first row (Reihe) and of controversy. [...] However, it is not difficult to notice that a basically analogous series from tone C was formed by George Perle, a researcher into Schönberg's school, and especially the work of Alban Berg" [7].

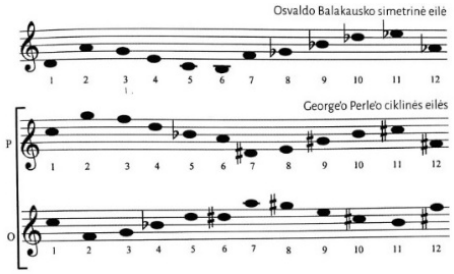
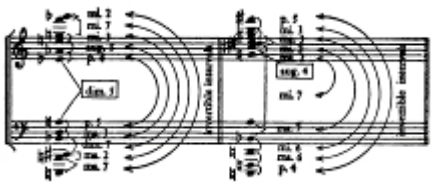


Fig.3. Balakauskas' symmetrical sequence of the affinity of tones and G. Perle's cyclic sequence

We see that the tritone actually occupies the central position in the 20th century theoretical and



ISSN 1512-2018

compositional practice, as evidenced by its position in series as well as by regular theorists' debates on its significance. In Chapter 8 of his book *Twentieth-Century Harmony: Creative Aspects and Practice*, Persichetti introduced a compound chord, however, it is important to specify that the chord of such a structure had already been introduced by Nicolas Slonimsky (1938) [8].

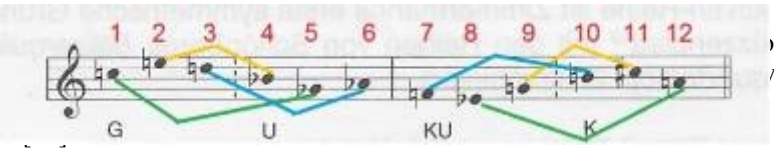
Fig. 4. Persichetti's compound chords [8]

The only difference between the two authors is that Slonimsky used D flat, while Persichetti replaced it enharmonically by C sharp; however, the tritone remained at the centre of the vertical. The structure of both chords is identical, and it is clear that Persichetti's ideas[1] closely correlate with the works of other authors. The tritone is granted a very meaningful position in the 20th century music, and its significance in symmetrical verticals (Klein, Slonimsky, Perle, Persichetti, Balakauskas) is characterised by the special tension of not only the tritone sound, but also of the tritone-related issues.

II. BERND ALOIS ZIMMERMANN: SYMMETRICAL SERIES

In the compositional system of Bernd Alois Zimmermann[2], German composer and pedagogue, the tritone, symmetrical sequences, and their configurations represent a key element. Theorist Oliver Korte (2000) identified [9] two sets of Zimmermann's compositions. The series of the compositions in the first set are divided into four segments[3] (groups of three tones): *Grundgestalt* - G, *Krebs* - K, *Umkehrung* - U, *Krebsumkehrung* - KU. [Original-G, Retrograde invetion-K, Inversion-U, and Retrograde inversion-KU]. Each segment of the series consists of three tones separated by an interval of a second or a third. Zimmerman used the principle in his compositions *Perspektiven* (1955/1956), *Sonate für Viola solo* (1955), *Omnia tempus habent* (1957), and *Impromptu* (1958). The second set of Zimmenrman's works includes the compositions *Sonate für Cello solo* (1960), Dialoge (1960/1965), *Presence* (1961), *Antiphonen* (1961–1962), *Die Befristelen* (1967), and *Ekklesiastische Aktion* (1970), which use symmetrical all-interval series. In those series, the tritone operates as intensely as in Klein's symmetrical verticals.

The groups identified in Zimmermann's series can be compared to the modes of limited transposition of Olivier Messiaen as well as to the series of Anton Webern. The analogy with Messiaen's modes of limited transposition (sound sequences, modes) arises due to symmetrical tritone-based structures, which also represent the axis of Messiaen's system of the modes of limited transposition. Although there is no tritone at the centre of Zimmerman's *Perspectiven* series just as in Messiaen's modes of limited transposition, the sound sequence is divided into intervallically symmetrical groups. Compared to Messiaen's system, the tritone operates more intensely there, because, e.g., in the first part of Zimmermann's *Perspectiven* series as many as three tritones are formed, which is the maximum possible number. In Messiaen's system, the tritones are formed between the edge tones, and the number of tritones in Messiaen's system can be increased by reversing the order of the mode



[1] The opposite case is that ...mposition using all twelve tones in his theoretical ...veral years before Arnold Schönberg (who introduce... a forerunner of the idea of that method of compositio...

[2] Bernd Alois Zimmermann studied at the University for Music in Cologne from 1963. He started his career as a composer in 1950 by writing *Concert for Violin, Symphony in one movement,* and the ballet *Contrasts*. In 1965, he wrote his only opera *Die Soldaten* [The Soldiers], which belonged to the second *Werkkomplex* .[set of works] (cf. *The Musical Times* Vol. 111: 1034, No. 1532 (Oct., 1970).

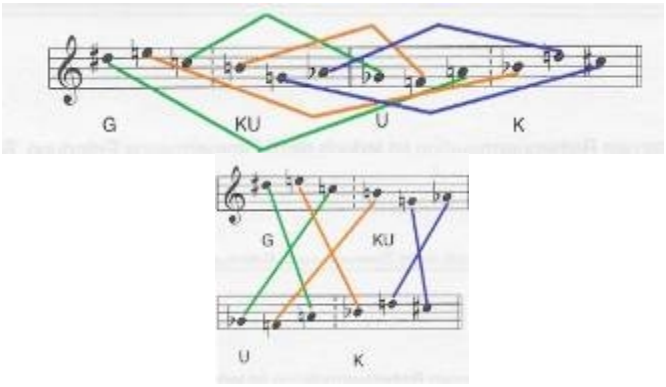
[3] In the analysis of the *Perspectiven* series, we noticed that the tritone divides a series into three symmetrical parts: 1–5 (*C–Ges*) and 8–12 (*Es–A*), 2–4 (*E–B*) and 9–11 (*G–Cis*) as well as 3–6 (*D–As*) and 7–10 (*F–H*). The symmetry was confirmed by the sum of the running numbers of the tones in the sequence forming the pairs: 1 (*E*) +5 (*Ges*) +8 (*Es*) +12 (*A*) =26; 2 (*E*)+4 (*B*)+11 (*Cis*) +9 (*G*) =26; 3 (*D*) +6 (*As*) +10 (*H*) +7 (*F*) =26.

ISSN 1512-2018

segments.

Fig. 5. Analysis of the first (Zimmermann's) perspective series [9]

In the second *Perspectiven* series, we identify pairs of tritones that form the following equations: 1 (Dis) + 9 (A) = 3 (C) + 7 (Fis), 2 (E) + 10 (B) = 8 (F) +4 (H), 5 (G) + 12 (Cis) = 6 (As) + 11 (D). It is important to note that the equations of the tritones are reflected in the structure of the series. Adding the segments G, KU and U, K, we notice that we get three pairs on the diagonal (Dis – A and Ges – C, E –



B and H – F, G – Cis and As – D).

Fig. 6. Analysis of the second Zimmermann's perspective series

Zimmermann also uses a sequence of symmetrical axes that correlates with Klein, Slonimsky, and Persichetti's verticals. Polarly related tritones can also be expressed in numbers, because by adding the tone numbers of each tritone, we get that each tritone is equal to thirteen: 1 (B) + 12 (E) = 13; 2 (Cis) + 11(*G*) = 13; 3 (*C*) + 10 (*Fis*) = 13; 4 (*D*) + 9 (*Gis*) = 13; 5 (*Es*) + 8 (*A*) = 13; 6 (*H*) + 7 (*F*) = 13.

Fig. 7. Zimmermann's series of symmetrical axes

The symmetry of Zimmerman's series is revealed not only through the prism of the tritones; it is also observed in the segment structure of the series. The segments of the first *Perspectiven* series consist of major thirds and major seconds: segment G consists of a major second and a major third; segment U consists of a major second and a major third. Upon placing them together on the vertical, we see that those groups of sounds form intervallic equality. We also note that three parallel tritones are formed between the tones of those two groups. The remaining two segments (KU and K) are inversions of G and U. The tones of those groups are also related to each other by parallel tritones.

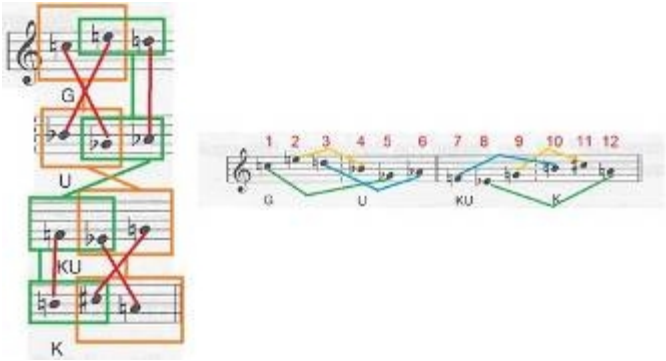


Fig. 8. Analysis of the first Zimmermann's *Perspectiven* series

ISSN 1512-2018

Symmetrical tritone-based structures operate at all levels. In the second set of Zimmermann's compositions, he uses a symmetrical all-interval series; however, other composers-theorists (Klein; Slonimsky; Persichetti; Perle) also created series of a similar structure. Tritonal symmetry dominates in Persichetti's compound chord structure as well as in the sequences of the affinity of symmetrical tones (Balakauskas) and cyclic sequences (Perle) compared by Gražina Daunoravičienė. As we see the similarity of the systems, which testifies to the relevance of the issues under consideration, we wonder whether a compositional-theoretical system can be absolutely original. After all, both compositional and theoretical systems emerge in a certain cultural and historical context. It is difficult to avoid the interaction between the theoretical-compositional systems that predominate the epoch and are relevant to most of the creators of the time. On the other hand, despite the similarity of the systems, we see that each composer emphasises different elements of the symmetrical verticals and horizontals: Perle and Balakauskas focused on modality and searched for harmonic logic and relations, Klein focused on the symmetry of series and their spatial structures, while Zimmerman or Messiaen split up series into smaller groups that unfolded on the compositional vertical, horizontal, and diagonal.

II. THE TRITONE IN THE POSTWAR AVANT-GARDE THEORIES AND COMPOSITIONAL PRACTICES: NONO, BOULEZ

As observed by Alexander Goehr (1960), the integral (total) serialism completely neutralises the character of music [12]. The creative idea is "simplified" and replaced by a simple technological procedure. In the traditional sense, there is no compositional material left, but only pre-compositional abstraction and a probabilistic matrix for the expected course of events. Luigi Nono's composition *Il Canto Sospeso* (1955–1956) for soloist, choir, and orchestra, Boulez's *Structures I* (1952) for two pianos, and many other serialist compositions are based on that principle. Although they were written by composers from different countries, they were, like by a magnet, brought together by the Darmstadt Summer Course (Germ. *Internationale Ferienkurse für Neue Musik*), the centre of post-Webernian serialism), which was especially popular between 1950 and 1960. In 1952, not only Nono but also Boulez, Stockhausen, and other postwar avant-garde leaders took part in that Summer Course.

Kathryn Bailey in her paper *Work in Progress: Analysing Nono's Il Canto Sospeso* (1992) identified a series (A – B – As – H – G – C – Fis – Cis – F – D – E – Es) used by Nono in writing *Il Canto Sospeso*. [11] For our study, the interval of the tritone in the series is relevant. At first glance, the series is formed of expanding intervals: starting with a minor second and ending with a major seventh. After calculating all the shapes of the series by means of the Matrix Calculator, we noticed that the symmetry of the Nono series is not due to the inversion of the intervals (perfect fourth – perfect fifth, major third – minor sixth, etc.) but due to the tritonal axes that operate both on the vertical and on the horizontal.

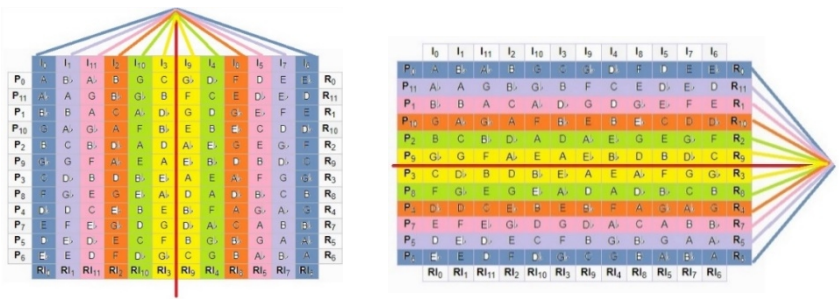
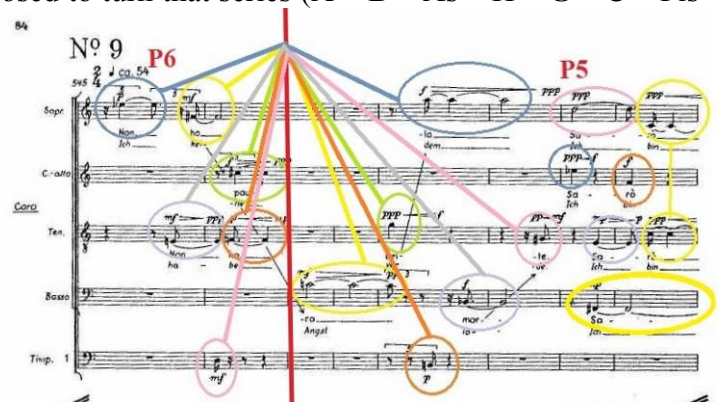


Fig. 9. Matrix of the series of *Il Canto Sospeso* (1955–1956) by Luigi Nono

ISSN 1512-2018

Bailey (1992) proposed to turn that series (A – B – As – H – G – C – Fis – Cis – F – D – E – Es)



into a set, however, in our case, the sequence of sets would not reveal the tritonal axes, but would only show the general trends in the development of pitch classes in the composition. The constructiveness revealed in the composition perfectly echoes Goehr's insight about those rigid structures being a technological procedure [12]. No balance or interaction is left between intuition and rationality. The compositional process settles at only one level of rationality and constructiveness, which consists of planning, calculating, and constructing.

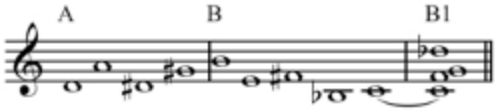
Fig. 10. **Luigi Nono *Il Canto Sospeso* (1955–1956), analysis of an excerpt from Movement 9**

In the composition *Il Canto Sospeso*, the place of each tone is pre-determined by using a 12-tone series. The composition is also rich in tritones, as evidenced by a deliberately chosen all-interval series. The retrograde of that series is identical to the original form transposed by the tritone. The strict "selection" (construction) of the primary material determines the logical structure of the composition which does not contain any random tones. The paradox, however, is that we will not feel much difference when swapping the segments of the composition in a combinatorial way, which is due to the constant change of tones and mechanical constructiveness. The constant change of elements prevents the listener from memorising the structure. The strict order of tones basically reflects only one element of composition – the rational one, leaving no room for mystification or intuition in the process of creation. Of course, one can say that the choice of the series itself is intuitive; however, basically the composer chooses a 12-tone series which is one of the 479,001,600 chromatic sound sequence combinations. The system is closed, but has a specific finite number of combinations.

Serial technique is constructively and systematically used in the composition. In the analysis, the tones are coloured in the same way as in the matrix (Fig. 12) – the colours correspond, therefore we can see that often the central tritones sound on the vertical. Such marking allows one to see how the tones unfold from the central tritone. Due to pointilism characteristic of Nono, the tones are scattered in all voices, seemingly laid out inconsistently, yet most constructively. Nono leaves no random tone in that composition, everything is systematically structured. As composer Karlheinz Essl wrote in his paper *Aspekte des Seriellen bei Stockhausen* (1989), "such structures operate on a simple from-tone-to-tone principle" [13]. It could be specifically noted that postwar avant-garde composers, who disseminated their ideas in the Darmstadt Summer Course of New Music, rejected the inherited rhetoric of music and used the powers of individual sounds (tones), segments in composing. In his *Philosophy of New Music* (1949; 2006), Theodor Adorno criticised [14] the muteness of Anton Webern's music, the modernist "abstraction", and the *post*-Webernian tradition itself, however, he also noted that it was that new direction (ideology) that mobilised the Darmstadt avant-garde like a magnet. For that reason, in the present paper, we analyse the compositions of Nono and Boulez [15].

ISSN 1512-2018

Conductor and composer, representative of integral serialism Pierre Boulez (1925–2016) also attended[4] the already mentioned Darmstadt Summer Course of New Music in 1952. Boulez soon became the leader of the postwar avant-garde movement. Alex Ross in his *The Rest Is Noise: Listening to the Twentieth Century* (2007) talked about Boulez and emphasised that "at all times he seemed absolutely sure of what he was doing. Amid the confusion of postwar life, with so many truths discredited, his certitude was reassuring [16]. Boulez's *Second Piano Sonata* (1947-1948) was very strictly structured; it had been composed before he visited Darmstadt, but it was clear that the system of Boulez dated back to an era when integral serialism, as well as the tritone function, reached their apotheosis. The sonata consists of four movements: I. *Extrêmement rapide*; II. *Lent*; III. Moderé presque; and IV. *Vif,* in which Boulez uses a strict system of structure organisation. As pointed out by



theorist and composer Ton de Leeuw (1926–1996), the series used in the composition "consists of three cells (segments): A) a perfect fifth, followed by the tritone and a perfect fourth; B) a descending perfect fifth, a major second upward, an augmented fifth (m. 6) downward, an ascending major second; B1) an inversion of segment B" [16].

Fig. 11. Series of the *Second Piano Sonata* presented by Ton de Leeuw [17]

In Leeuw's proposed case (2006), we repeated tone C twice (tie B to B1), therefore, after a consistent analysis of the beginning of the *Second Piano Sonata*, we discovered that it would be more logical to arrange the tones of the series as they sounded in the composition. We got a series that split into three segments: *D – A – Dis – Gis; Cis – F – G – H; B – C – Fis – E*. Each segment consisted of two tritones. We identified six pairs of tritones: *D–Gis*, *A–Dis*; *Cis–G*, *F–H*; *B–E*, *Fis–C*. We also paid attention to the arched structure of the series: between tones 1–4 and 9–12, tritones formed at the edges and at the centre. The symmetry of the series became apparent through the tritone; we could not reveal the symmetry of the series through other intervals.

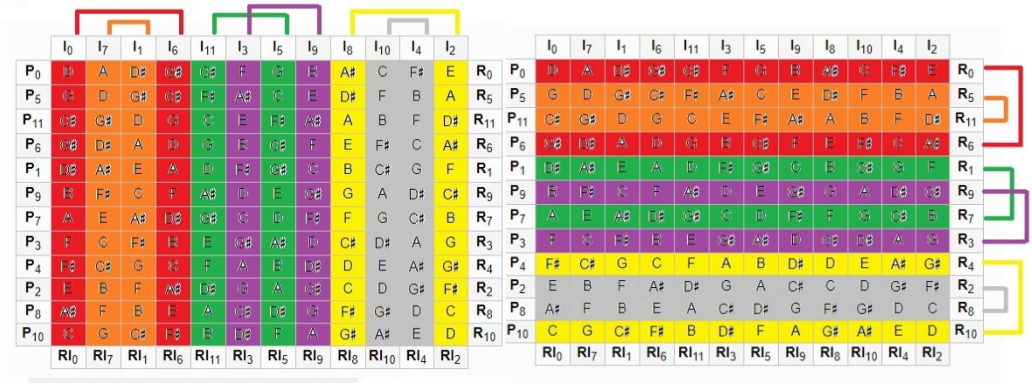
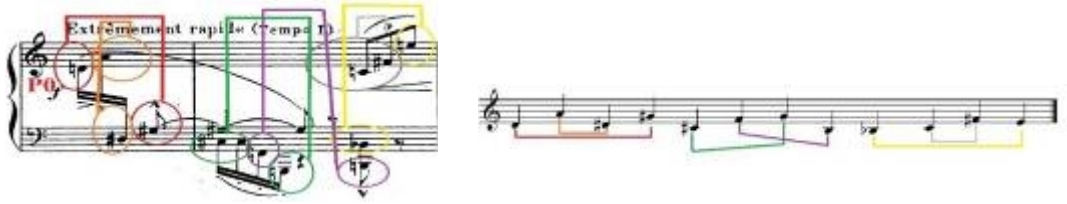


Fig. 12. Matrix of the series in Pierre Boulez's *Second Piano Sonata*



[4] Boulez also taught in the Darmstadt Summer Course (in 1956, 1959, 1960, 1961, and 1965), at Harvard University (1963), and at *Collège de France* (1978). His teaching material was published in two books: *Penser la musique aujourd'hui* (1963), using the Darmstadt material, and *Jalons (pour une decennie*) (1989), using his teaching notes from *Collège de France* [18]).

ISSN 1512-2018

Fig. 13. Pierre Boulez's series and its application in Movement 1 of the *Second Piano Sonata* (bars 1–2)

Boulez's 12-tone structures are formed not merely on the basis of tone organisation; they are also inseparable from the length of the divisions, resulting in a tightly organised time and space of the composition. Walters David, in his dissertation *The Aesthetics of Pierre Boulez* (2003), points out that in all spheres of music: conducting, performing, or teaching the basis for Boulez was rational thinking.

The *Second Piano Sonata* was composed using a rational beginning which enabled the creation of a strict system-based structure of the *Sonata*, in which polyphonic structures were developed in accordance with the dogma of dodecaphony – strictly avoiding the repetition of tones. Schönberg (1976) in his book *Stil und Gedanke* argued that such compositions were constructed "using twelve interconnected tones[5]" [17]. Thanks to the constant change, *a melody of chords* was formed, defined by Schönberg (1922) as *Klangfarbenmelodie*. It is important to note that the composition of most of the chords (the vertical) in the *Sonata* contained one or more tritones, while tritonal symmetry was already encoded in the series itself. We made sure that the said interval was the axis of the systems of Schönberg, Webern, Zimmermann, Nono, and Boulez, and they all partially correlated with each other. We can identify such commonalities that dominated in the systems of those composers, such as the splitting up of the series into smaller segments or the structure of symmetrical axes with the tritone in the centre.

The compositional system of Boulez was developed during the apotheosis of not only the tritone but also of modernism, although at that time strict and rationally calculated compositional systems prevailed. As stated by Boulez himself in an interview with David Walters, "it is very difficult to explain musical processes, it is possible to analyse a composition, however, basically only from the aspect of the compositional technique, there is no any other way (...) Often people move from the starting point towards the centre, however, do not go further and try to explain most things through the prism of mathematics without asking the question: how? The question of how cannot be answered unambiguously, only intuitive arguments can be presented, but nothing can be really explained" [18]. Undoubtedly, Boulez had strong aesthetic attitudes, though obviously he was not the first one who tried to rationalise the compositional process. Quite a few theorists and composers deliberated over the composition of music: Rameau in his *Traite de l'harmonie* (1722), Berlioz in *Traite d'Orchestration* (1844), Hindemith in *Unterweisung im Tonsatz* (1937) and *The Craft of Musical Composition* (1941), and Schönberg in *Style and Idea* (1950). It is important to emphasise that composers and theorists wrote about the processes of music composing not so much in order to develop their authorial theories, but to disseminate their aesthetic attitudes and reflect on ongoing processes.

In the period of the apotheosis of modernism (1950), Boulez got acquainted with several composers outside Paris. Among the significant ones were the most important participants in the Darmstadt Summer Course: Karlheinz Stockhausen and John Cage. Boulez met John Cage in 1949, and they actively corresponded until 1952, when Boulez first traveled to New York. In the publication of their letters, *The Boulez-Cage Correspondence* (1991), we see that Boulez was attracted by several of Cage's reflections, in particular to the effect that "new methods with Schönberg's 12-tone system will be discovered" [19]. Here we see a parallel with Boulez's reflections on integral serialism. However, Cage's ideas are far removed from the 12-tone music, and simultaneously from the tritonal structures. In the practice of his own compositional system, he splits up rows into short motives to be used in his work.

Conclusions

[5] Germ. *mit zwölf nur aufeinander bezogenen Tönen.*

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In the current paper, we unfolded the symmetry of the tritone (Klein; Slonimsky; Persichetti; Zimmermann; Balakauskas; Perle) and systemic constructivism (Nono; Boulez) in the 20th century postwar avant-garde compositions. The tritone plays a special role in 12-tone music, where it manifests itself by specific dissonance, tension, and symmetrical structures. It is the leaders of the postwar avant-garde, who got together at the centre of post-Webernian serialism, the Darmstadt Summer Course, that are characterized by symmetry and strict constructivism. An analysis of Pierre Boulez's *Second Piano Sonata* (1947–1948) and Luigi Nono's *Il Canto Sospeso* (1955–1956) revealed the change in the tritone concept in the context of postwar avant-garde theoretical-compositional systems, especially through the series of tritonal axes made up of six pairs of symmetrical tritones. Those compositions are characterised by intelligence, constructiveness, and strict and conceptual principles of the tritone operation. The phenomenon of the tritone was a tool whose use inspired the 20th century composers (Schönberg; Webern; Berg; Nono; Boulez; Stockhausen) to develop new systems, new compositional techniques, and to expand the field of systemic constructivism; however, it also as if "turned off" creativity, as the composer was often forced to perform only technical work, recording totally predetermined musical material in his own pre-composition. In composers' systems, no room was left for romanticism or emotionality, finally eliminated by rational, systematically calculated composing, the tritonal symmetry, and the apogee of that interval in music. "Although the perfection of the serial technique turned into an illusionary value in the minds of thinkers, the disclosure of sound complexity and depth initiated by it is undoubtedly one of the most valuable discoveries in music in the 20th century" [7]. The serial technique also inspired composers to discover its unique use in their compositional practice and to develop new methods of tone organisation, however, in the second half of the 20th century, the system began to balance between strictness and randomness. The tritone's expression and its compositional generativity weakened, and composers turned back to medieval music and drew inspiration from the music of different nations, which was reflected in the expression of tritonal sound tension. The automation in composing was exhausted, and the composers (Stockhausen; Cage; Penderecki; Grisey; Pärt, Górecki; Gordon) tended to apply non-formal (compared to integral serialism) and new compositional techniques as well as, paradoxically as it may be, to free up creativity in the creative process. In the second half of the 20th century, composers paid attention to conceptuality, structure, and elaboration of musical works; they in no way rejected modernity, however, gradually abandoned total determinism in compositional practices.

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