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Prohibition *versus* Apotheosis of the Tritone: A Historical Perspective

Abstract. This paper explores the change of the concept of the tritone – from its prohibition to tritonic apotheosis as well as draws attention to the acoustic peculiarities of the "devil's interval" (*diabolus in musica*[1]). The tritone is a very small object but features a portentous and unique sound as well as problematic intensity. The peculiarity of the discussed interval has evoked multifarious creative expressions and has also provoked controversial theoretical speculations throughout music history. This paper aims to draw a historical perspective providing a comprehensive representation of both theoretical and practical approach to the tritone in relation to its acoustic intensity. Critical consideration of the most remarkable theoretical declarations and analytical inquiry into particular musical examples reveal the significance and functionality of a tritone in different historical contexts. The paper shows the constant change of conceptions, canons of usage, composition techniques and harmonic systems although referring to the same object on discourse.

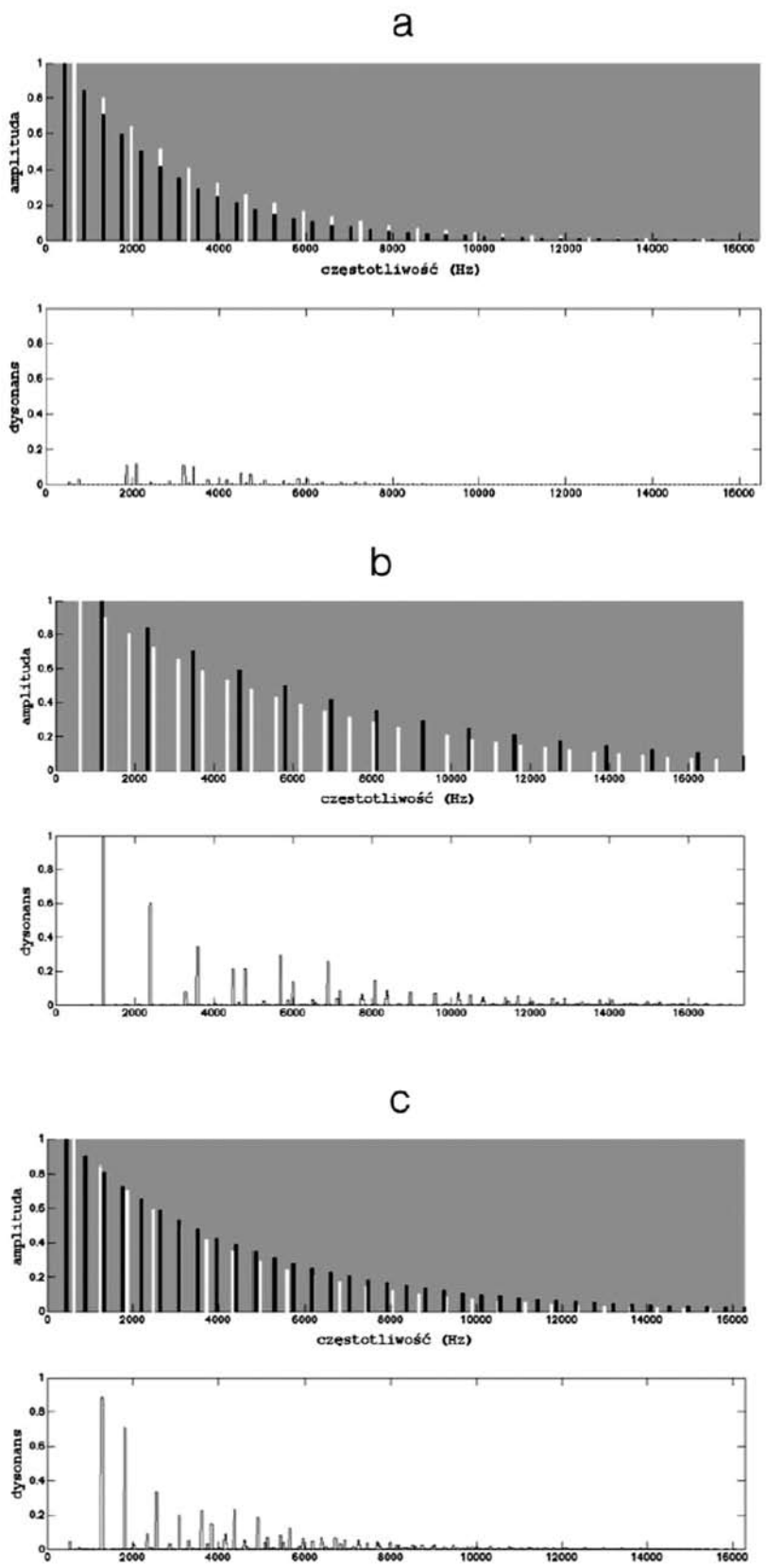
Keywords: tritone, dissonance, diabolus in musica, compositional process, musical symmetry, contemporary music.

Introduction: psychoacoustic peculiarities of the tritone and its musical perception

The uniqueness of the tritone, in terms of both theory and practice of composition, can be explained by its physical acoustic features. Such descriptions as rough, harsh etc. can be easily explained by the results of the cognitive music psychology of the 20th century. Tritone's physical parameters vary in different harmonies: in the Pythagorean theory, increased fourth is 729:512, reduced fifth is 1024:729, and in the tempered combination is $\sqrt{2} = 1.414$. Roger Shepard (b. 1929) discovered that the tritone has unique acoustic parameters that determine its duality (Shepard, 1963). What does this mean? Research by Diane Deutsch (1986) showed that the perception of a tritone may vary: "One listener will perceive the sequence of sounds *C–F#* as an augmented interval, and *G–C#* – as a diminished interval, while the other listener will perceive a similar sequence of sounds *C–F#* as a diminished intonation, and *G–C#* – as an augmented one" (Deutsch 1986: 2). This psychologist argues that the perception of the tritone is dependent on the listener's speech and dialect. David Butler assumes that a tritone is a necessary component for identifying a modal center, and after conducting a study (Butler 1989) he found that it was much easier for listeners who heard the tritone and tonic to set the tonality than for those to whom one triad was played after another. This allows us to conclude that the tritone, due to its acoustic characteristics such as volatility, stridency, uncertainty, has a traction to stable intervals, which allows us to set the modal center. In other words, it can be generalized by the principle from chaos to order. Speaking of the music of the 20th century, composer and theorist Ton de Leeuw characterized the tritone as enigmatic (mysterious, puzzling) interval (Leeuw 2005: 92).

One of the most important shifts relevant in tritone's research can be found in works on acoustics of Herman von Helmholtz (1877) and Carl Stumpf (1898). Due to their research we have a new notion of acoustics as well as rise of music psychology based upon empirical data research. Their methods led to fundamental research of tone interactions. Tones ceased to be one dimensional, they were started to be treated from the perspectives of physics and psychology which revealed a new range of problems. Due to research in acoustics we are able to analyze and ground tritone's sensory dissonance (it is important to make a distinction between sensory and cultural dissonance). According to Marcin Strzelecki (2014), tritone and major seventh have the least coincidence of partial tone pairs while the perfect fifth's consonance is due to the merge of partial tones into one entity. Tritone's and major seventh's partial tones don't coincide but are close to each other which raise local dissonances producing harsh and dissonant sound. According to the Example 1, we can conclude that tritone's dissonance is described not only by abstract epithets such as sharp, harsh, unpleasant, and distant to nature but also by facts established by research in physics.

[1] Tritone as *Diabolus in Musica* was first mentioned by Johann Joseph Fux in his treatise *Gradus ad Parnassum* (Fux 1725: 51). Also, an epithet *Mi contra Fa est Diabolus in Musica* is dedicated to August W. Ambros and mentioned in his work *Geschichte der Musik* (Ambros 1880: 180, Band II).



Example 1. Sensory dissonance: (a) perfect fifth, (b) tritone, (c) major seventh (Strzelecki 2014: 9)

1. Theoretical and practical approach to the tritone before the 20th century

The culturally dependent notion of dissonance can evolve and frequent use of it can make tritone's dissonance perception less harsh. On the other hand, the sensory dissonance of the tritone will always remain the same. Much research was carried out into human hearing and music perception in the 20th century. However, the results still are not final as together with changes in music (across the vertical, horizontal and diagonal dimensions) there are also changes in cultural hearing. This article will continue to discuss the change of the concept of the tritone in different historical times, from the Middle Ages (prohibition of the tritone) to the 20th century (apotheosis of the tritone).

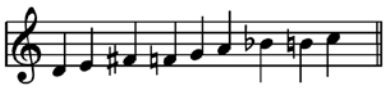
1.1. *Diabolus in musica*: the tritone in the theory of the Middle Ages and the Renaissance

Etymologically, "*tritonus* – three tones, derived from the Greek *τρίτονον* from *τρίς* – three times and *τόνος* – tension, tone raising. Italian – *tritono*; English *tritone*" (Troschke 1989: 1). *Τρίτονον* or *τριτης* can already be found in the writings of Euclid, Aristotle as well as the Aristoxenus of Tarentum (375–335 BC) treatise *Principles of Harmony* (*Elementa harmonica*), written c. 300 years BC. In the article *Tritonus* (1989) by Michael von Troschke, it is noted that the Greek form was replaced by Latin *tritonus* in medieval writings, and the first written sources mentioning this form of the word are found in the treatise *Micrologus* (1025/26) by Guido Aretinus (991–1033), and in the treatise *Opuscula Musica* (c. 1030) by Hermanus Contractus (1013–1054).

In the Middle Ages, the tritone is often referred to as a problematic interval: in pitch organizing systems it is called *confusio* ("confusion, confounding"), in compositional practice – *non multum in usu* ("use a small amount"), in the systems of pitch relationship it is described as *asper* ("rough"). In the Middle Ages and the Renaissance, the tritone – *diabolus in musica* – was treated as an unwanted interval both vertically and horizontally. The use of the tritone (as an augmented fourth or a diminished fifth) in ecclesiastical music was strictly forbidden, and in strict style it was forbidden to follow the sequence of two major thirds one by one (*f–a, g–h*), because of the tritone which turns up between the encompassing pitches of the sequence.

The name *Diabolus in musica* (the devil in music) was applied to the interval of the tritone, which theorists and composers considered most dangerous. The rule *mi contra fa* in the medieval hexachord theory was the main warning of possible sequences including the dangerous interval. The rule *mi contra fa* forbade the use of the whole tone between the third and fourth degree of hexachord in the system of pitch organization, as the tritone was formed by the intersection of two hexachords, namely between *Hexachordum durum* and *Hexachordum naturale*. This interval also occurred between *e* of the natural hexachord (*Hexachordum naturale*) (syllable *mi*) and *b*♭ of the minor hexachord (*Hexachordum molle*), which equals the syllable *fa* in the Guido system. Guido Aretinus refers to the tritone (*tritonus*) in his treatise *Micrologus* (1025/26), where he describes the relation between *b*♭ and *b*♮ and the possibility of the formation of a tritone in the harmony of concords. He suggests systematizing the use of *b quadratum* (*b*♯) and *b rotundum* (*b*♭) vertically and horizontally to avoid confusion. The system of alternative variants of *si* was founded to eliminate the tritone.

In order to avoid the tritone in music, medieval theorists created rules that had to be followed by music makers. By the end of the 13th century, a strict rule of pitch organization prevailed: "After the first (*d*), fourth (*g*) and seventh (*c*) tone of the scale, the whole tone had to follow; the second (*e*) and the fifth (*a*) tones were supposed to be surrounded by the whole tone from the bottom and the semitone from the top; the third (*f*) and the sixth (*b*) tones had to be surrounded by a semitone from the bottom and a whole tone from the top" (Troschke 1989: 6). It was this rule that eliminated the possibility of the tritone formation in music and allowed to avoid "rough" dissonances. It's important to mention that the music of the 13th century was mainly vocal and all the rules (how to avoid the tritone) were created naturally because of the problems of the tritone intonation.

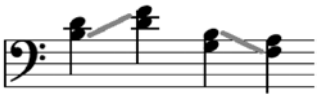


Example 2. The rule of organizing pitches (*Regula*)

In the 14th century, the concept of the tritone began to change gradually. Hugo Spechtshart from Reutlingen, Baden-Württemberg, noticed that the rare use of the tritone in music could enrich it, bringing in a "sweet resonance" (*dulcis resonatia*) (Troschke 1989: 6). Tritone was started to be used in weak parts of the measure, syncope or cadence. On the contrary, in *Liber de arte contrapuncti* (1477), Johannes Tinctoris

(1435–1511) named a tritone to be an enemy of nature/naturalness, which is not only unpleasant to the ear, but which is impossible to be sung in tune for the human voice in both ascending or descending direction: "The nature of a tritone as a dissonance is hostile to nature, it is annoying and irritating to human hearing" (Troschke 1989: 6).

In the 16th century, the theoretician Gioseffo Zarlino (1517–1590) in his treatise *Le istitutioni harmoniche* (1558) argues that the sequence of two major thirds or minor sixth is an unacceptable conduct of voices because there are no harmoniously related intervals as their sequences create distant intervals in the tritone ratio.



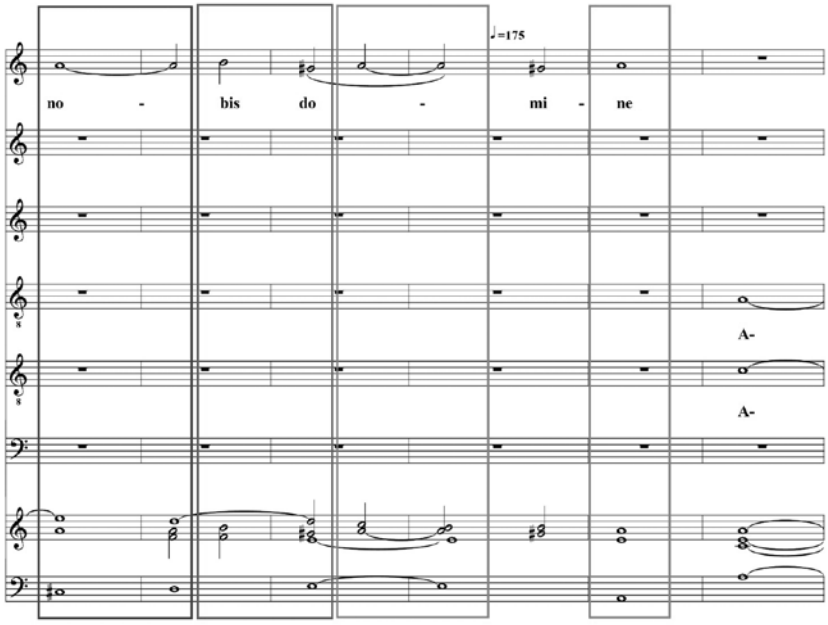
Example 3. Sequences of the thirds

In the Renaissance, the concept of composing music changed dramatically. Zarlino (1558/1976) emphasizes the increasing importance of the tritone in the vertical, and especially in the cadences. The theorist points out that music begins to break, with special changes in the composite vertical and horizontal.

Nicola Vicentino (1555), before Artusi's criticism of Monteverdi, suggested using a tritone not only when it accidentally appears as hexachords are overlapping on the diagonal or as a random phenomenon in the vertical, but also to enter the tritone jumps in the melodic line. He also discusses the problems associated with tritone intonation, but states that these properties of the interval are irreplaceable to produce a "magic" effect. It is emphasized that the tritone interval used in the ascending direction (e.g. *c-fis*) causes the effect of joy, while its appearance in the descending direction (e.g. *fis-c*) evokes the effect of a great sadness. Vicentino argues that there are more and more singers who practice tritone intonation and are not "ashamed" of this interval at all. He points out that if we can accurately intonate a tritone, when it is filled with other intervals (e.g. *f-g-a-h*), then why cannot we get used to the intonation of the tritone jump? In his opinion, everything depended on practice: "Many times repeating the same, though the heaviest task, over time, it becomes easy to overcome in all professions" (Vicentino 1996: 77). Nowadays, however, it is easy to check on a computer that even those singers who intonate other intervals with great precision will always raise or lower the tritone. In other words, there is a natural traction towards constant intervals, or a tritone deactivation.

In the work *Mannerism in Italian Music and Culture, 1530–1630* by Maria Rika Maniates (1979), Vincenzo Galilei (1520–1591) and Claudio Monteverdi (1567–1643) are distinguished as the main innovators of music. In his compositional practice, Galilei has distinguished such dissonances as semitone, whole tone and the seventh. Galilei named the tritone as "intermediate" dissonance. Maniates (1979) points out that these intervals are distinguished by Galilei as being less harsh and indicates that they can be used in music under less stringent rules as attributable to semitone, whole tone and the seventh. Monteverdi called this method *seconda prattica* in order to emphasize the difference between the new and the old traditions (the latter greatly supported by Zarlino and Giovani M. Artusi). Meanwhile, Vicentino named the tritone as the most undervalued interval in compositional practice, and the effect it produced was named as amazing or heavenly. Artusi condemns Monteverdi for the inappropriate use of the tritone in music in his treatise *Delle imperfezioni della moderna musica* (1600–1603) and emphasizes that the rules of strict counterpoint provided by authoritative theorists should be followed. The limits of diatonic become ineffective as even greater stylistic innovations appear in music, and they begin to deform to increasingly complex, complicated structures in case of mannerism.

Despite the fact that the tonal-functional system was finally formed in the 18th–19th century, and, at the end of the epoch, it was already affected by various deformation processes, until the18th century the tritone was called cunning, unnecessary, imperfect – *quarta falsa* and *quarta superflua, quinta deficiens* (Troschke 1989: 1). Artusi became a great critic of Monteverdi, and responded about the tritone in his music as follows: "The singer, who has performed the work, has not understood whether he has sung correctly or incorrectly" (Artusi 1600: 43). Regardless of the rules, Monteverdi uses two tritones sequentially without any solution. In the examples from the *Litany of Loretto* (17th century), you will see that the tritone in the seventh chord of the dominant is introduced from the fourth degree (*d-f-a*) and solved into tonic A minor.



Example 4. Claudio Monteverdi. *Litany of Loretto* (1620), mm. 261–265

The philosopher, scientist, musician of the 17th century Marin Mersenne emphasizes the importance of intervals to carry out expression in his treatise *Harmonie Universelle contenant la theorie et la pratique de la musique* (1636/37). He suggests using the tritone[2] in music to trigger a tension, energy effect, or convey a mood of war.

1.2. The tritone in the musical rhetoric of the Baroque

René Descartes (1649) distinguishes six affections: admiration, love, hatred, craving, joy, and sadness (*Admiration, Amour, Haine, Désir, Joie, Tristesse*). A deeper look into the theory of affects has revealed that it was precisely with regard to the affect of love that the tritone was forbidden. Here the nature of the word harmony should be addressed and its link with Greek mythology. Harmony, the daughter of Aries and Aphrodite, is directly related to the nature of love and unity. Here the link between the affect of love and harmony is drawn, which is directly related to the tritone. In Rolf Dammann's theoretical work *Der Musikbegriff im deutschen Barock* (1984), the affect of love (in which the tritone was forbidden to use) is compared to the affect of sadness (according to the text), but here, on the contrary, dissonances were desirable.

In the music of Renaissance or Baroque, it is common to use musical rhetoric or otherwise called *musica poetica*[3], which defined the connection between music and poetic text. Tritone in this theory is associated with tragic, sad death, and is used to enhance the psychophysical effect by invoking emotions, conveying meaning to the listener.

The second part of Johann S. Bach's cantata *Sehet, wir gehn hinauf gen Jerusalem* (1729) BWV 159 begins with the words *O harter Gang! hinauf? O ungeheurer Berg, den meine Sünden zeigen!*, and in order to strengthen the meaning of the text, the composer uses the tools of the theory of affects: *O harter Gang* is enhanced by MRF (musical rhetorical figure) *multiplicatio* and *saltus duriusculus* as well as *O ungeheurer Berg* is enhanced by *parrhesia*[4], *saltus duriusculus*[5]; in both cases, the tritone becomes the main intonational element.

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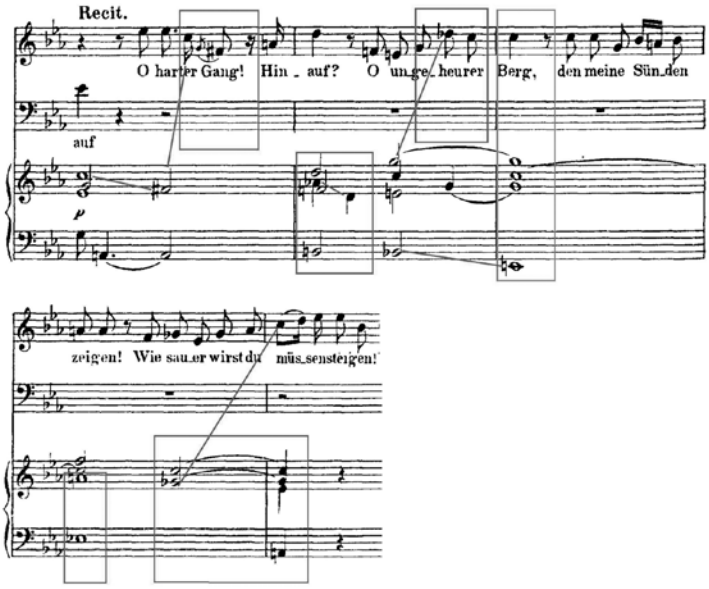
2 "The upper voice lines (*chant*) moves in a halftone causing emotion of sadness, while the major thirds in the melody cause the emotion of joy... The emotion of sadness and love can best be expressed in major halftone and minor halftone (*demi-ton majeurs, moyens at mineurs*). In order to convey an energetic or war mood, the composer must use full tone sequences (*presentees par les ton*), major thirds and sixths (*et par les Tercies et les Sextes majeures*) as well as tritones (*ou par la Quarte juste juste ou superflue*)". Mersenne, 1636, "La Voix" 1636: 41; "Les Consonances" 1636: 360 (rev. Ranum 2001: 385).

3 More about *musica poetica* in Eggebrecht, Hans Heinrich [Hrsg.]: Handwörterbuch der musikalischen Terminologie, internet access: http://daten.digitale-sammlungen.de/~db/0007/bsb00070512/images/

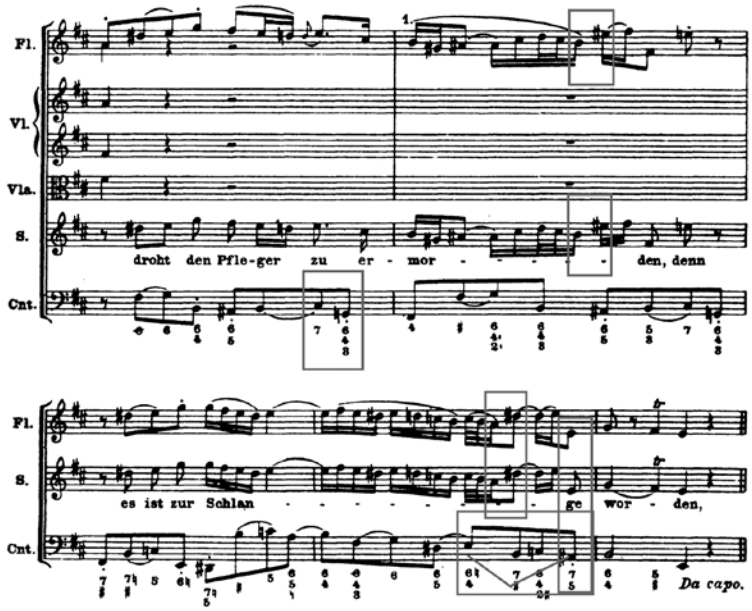
4 More about *parrhesia* in Bartel, Dietrich *Musica Poetica: Musical-Rhetorical Figures in German Baroque Music*: "The insertion of a dissonance such as cross relation or tritone on a weak beat" (Bartel 1997: 352).

5 More about *saltus duriusculus* in Bartel, Dietrich *Musica Poetica: Musical-Rhetorical Figures in German Baroque Music*: "The harshness of the leaps is conveyed through the word *durus*, meaning not only "hard, harsh" but also "rough, brazen". This negative connotation is particularly well suited to express a text…" (Bartel 1997: 381).



Example 5. Johann S. Bach. *Sehet, wir gehn hinauf gen Jerusalem* (1729) BWV 159, mm. 10–14

In Bach's works there are many rhetorical figures that help to give a sense to music or emphasize the meaning of the text. Aleksandra Pister (2005) defines *saltus duriusculus* as a "disposable jump that is used in the melody" (Pister 2005: 31). In Bach's cantata *The Passion according to Saint Matthew* BWV 244, the tritone is used when it comes to lies, death and murder to emphasize the tragedy of the situation: "*... droht den Pfleger zu ermorden; denn es ist zur Schlange worden*" (Bach 1736: 53). Three tritones are played in the word *Schlange* (snake) vertically (*e–a♯*) horizontally and diagonally (*e–a♯*). Due to the acoustic properties of the tritone, tension is created.



Example 6. Johann S. Bach. *The Saint Matthew Passion* BWV 244, Aria Coro II, mm. 40–44

The analysis of the compositions revealed that the tritone acted not only as a composite element coordinating horizontal, vertical and diagonal, but was also part of the rhetoric. In many cases, it is associated with the symbolism of numbers or is intended to enhance the meaning of the text.

2. Evolution of the concept of a tritone in theory and practice of the 20th century

It can be said that there was a real breakthrough in the approach to the tritone: from the hard-to-explain, unused and banned interval, the tritone became the inevitable interval in music of the 20th century, based on many composing systems. As we examine the evolution of the concept of the tritone in the context of theoretical systems of the 20th century, we note that the most intense debate arises from the approach to the interval.

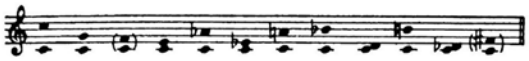
2.1. Theoretical insights into the intensity of the harmonic tritone

In theoretical and practical systems, the tritone is increasingly associated with harmonic/melodic intensity or tension. Arnold Schönberg (1874–1951) introduces the term *vertical tension* (Ger. *Intensität*), Józef Kon (Ю́зеф Ге́йманович Кон, 1920–1996) – *vertical density* (Кон 1973: 299), and Paul Hindemith (1895–1963) – *harmonical intensity* (Hindemith 1945: 219), or more specifically "beating" (Ger. *Gefälle*). Thus the relatively new conception of sound intensity and tension, which has been generalized and "scanned" from the most important tritone acoustic features, comes into the view of composers and theorists.

Such theorists as Herbert Eimert (1897–1972), Vincent Persichetti (1915–1987), Ernst Křenek (1900–1991), Rimantas Janeliauskas (b. 1947) do not only relate the tritone to tension in their research, but also take the next step trying to mathematically calculate and theoretically justify the intensity of chords. Howard Hanson (1896–1981) joined in the discussion and talking about the tension in consonances in his book *Harmonic materials in modern music: resources of the tempered scale* (1960), faces the problem of determining the degree of consonance and dissonance. Hanson argues that the concentration of several dissonances and consonances in one compound makes it difficult to judge the level of tension in the consonance (Hanson 1960: 2–4).

The tension and intensity of the consonances also became the basis of the theory of Ernst Terhardt (b. 1934). The scientist explains in detail the concepts of chords, intervals, consonance/dissonance and harmony. This theory speaks about human hearing and its different levels when trying to identify the main tone of the consonance. Here is an allusion to Paul Hindemith's *Die Reihe 2*. Hindemith also supports Terhardt, who points out that the better the key tone is determined, the brighter consonant or dissonant sensation is. It should be emphasized that tritonic dissonance and instability are very pronounced, because the tritone does not have a basic tone, in other words, neither the upper nor the lower tones have any preconditions for the combination tone. The volatility of the tritone causes a psychophysiological effect of agitation and tension.

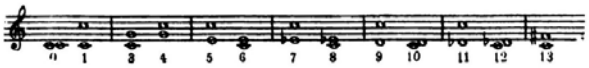
In the book *Twentieth-Century Harmony: Creative Aspects and Practice* (1961), Persichetti distinguishes open consonances, soft consonances, soft dissonances, sharp dissonances. In this system, like in Hindemith's theory, the tritone is called a neutral interval. The system presented by Persichetti clearly correlates with the Hindemith's system. By consistently compiling Persichetti's (1961) sequence from open consonances to sharp dissonances and tritone, we obtain Hindemith's *Reihe 2*. In the Persichetti's sequence (Ex. 7), the tritone is the last interval, and the position of the other intervals is also identical to the Hindemith's *Reihe 2*.



Example 7. The sequence from open consonances to sharp dissonances (Persichetti 1961: 15)

Arnold Schönberg (1874–1951), contrary to Hindemith's theory, characterizes dissonances as remote consonances. In the chapter *Konsonanz und Dissonanz* of *Harmonielehre* (1911/1922), he distinguishes only prima and octave as perfect intervals. Using the harmonic overtone spectrum, he scales all intervals, starting with octave according to the degree of consonance. The further the interval from the octave, the lower its consonance index. The tritone follows seconds and sevenths on his scale, as the theorist names dissonant intervals (the most distant consonances): "Semitone and major seventh, full tone and minor seventh, as well as all reduced and increased intervals" (Schönberg 1922: 18). For Schönberg, the consonance-dissonance ratio is not particularly significant as its composition system emphasizes the equivalence of intervals.

Kon (1971) accurately named the degree of tritonic dissonance, which he measured according to his own scale of interval dissonance. Consonances include the lowest while a tritone the highest degree of dissonance (i. e., 13) in this system. The theorist bases the chord dissonance and consonance on the property of vertical *density* (Кон 1971: 299). His method of analysis consists of mathematical actions: mathematically calculated chord density using interval indices. Kon claims that "chord density depends on interval composition, layout, and register" (Кон 1973: 303–304). The line made by Kon closely correlates with Hindemith and Persichetti, but this sequence is complemented by degrees of dissonance.



Example 8. The number index system provided by Kon (Кон 1971: 306)

Vincent Persichetti (1915–1987) attributes the concept of *neutral* to the tritone, while Kon, on the contrary, assigns the index of the maximum dissonant interval. So how can we measure the vertical density under Kon's system? This theorist introduces a rule to measure the composite intervals: if the interval exceeds one octave, the index must be subtracted from 1, if two octaves – 0.5, if three – 0.25, if four – 0.125. In this way, Kon introduces different coefficients for all octaves: 3 – for sub-contra octave and contra octave, 4 to C–c, 5 to c–c', 6 – c'–c'', 7 – c''–c''', 8 – c'''–c'''', 9 – c''''–c''''', 10 to c'''''.

The tritone index in the system is 13 if we expand it to an increased eleventh (*undecima*), we will have to subtract 1 (13 – 1), and thus we will get an increased eleventh (*undecimal*) density of 12, which is identical to the density of the semitone. Here we find an inaccuracy, because the chord intervals are formed not only from the lowest tone, but also from the other tones, however, it remains not calculated. Indeed, in Kon's theoretical works, we see the beginning of the calculations of vertical density and rhythm intensity, but this idea is not systematized. Rimantas Janeliauskas (1983) argues that the determination of acoustic intensity is very complicated, and it is not enough to use only the structural characteristics of the chord, but attention should also be paid to chord function, context: dynamics, register, layout, texture, rhythm. The theorist assigns mathematical indices to intervals, but unlike Kon, in the system of Janeliauskas, indices end with a tritone. Milton Babbit assigns a central position to the tritone in the sequence of twelve tones in his article *Twelve-Tone Invariants As Compositional Determinants* (1960). By operating that the tritone symmetrically divides the octave into two parts (12/2), the theorist assigned it Index 6 (Babbit 1960: 254). All broader than tritone intervals, analogously to Janeliauskas, are considered by the theorist as inversions of the former. Janeliauskas proposes to sum up the structural degrees of all intervals and divide the result by the number of tones. The tritone in this system is between the third and the second, which happens because the theorist uses the spectrum of overtones (C-c-g-c^1-e^1-g^1-b^1-c^2-d^2-e^2-fis^2-g^2), where there is no exact place of the tritone between adjacent overtones and it is formed between the edge tones of reduced triads. However, tritones are also formed between b^1-e^2 or c^2-fis^2, then it remains unclear why the tritone is not at the end but in the middle of the sequence.

As we examine the evolution of the concept of the tritone in the context of the theoretical systems of the 20th century, we note that the most heated debate arises from the position of the interval in theoretical systems.

Persichetti and Křenek call the tritone a neutral, restless interval, Hindemith – extreme dissonance, Kon attributes the highest dissonance index to the tritone, Javorski calls it the most volatile interval, and Cope attributes the description of the "extremely unpredictable" interval to the tritone (Cope 1977: 15).

The absolute majority of the discussed theories are created using the spectrum of overtones. The tritone interval does not form in the natural sequence of sounds; therefore we assume that this leads to a complicated classification of the tritone and the formation of different approaches to this interval in the theories of the 20th century. Comparing the change of the concept of the tritone with the assumptions of earlier theorists, analogies can be distinguished: Schönberg – Vicentino; Cope – Aretinus and Contractus; Hindemith, Javorski, Kon, Hanson – Tinctoris, Mersenne, Zarlino; Persichetti; Křenek – Aaron, Coclino.

	Neutral	Unstable	Dissonance	Very unpredictable	Consonance
In the 20th century	Persichetti (1961); Křenek (1940)	Javorski (1972)	Hindemith (1945); Hanson (1960)	Cope (1977)	Schönberg (1922)
Before the 20th century	Must be resolved or avoided.	Creates a tension, energy effect, suitable for conveying the mood of the war; it is hateful to nature; it is annoying and irritating to human hearing.		Sly, needless, imperfect.	Wonderful, heavenly.
	Aaron (1976); Coclico (1552)	Tinctoris (1447); Mersenne (1636–1637/2001); Zarlino (1558)		Aretinus (1876); Contractus (2015)	Vicentino (1996)

Table 1. Parallels between theories of the 20th century and earlier historical periods (Middle Ages and the Renaissance)

In the 20th century, the tritone began to be called a neutral interval, possibly related to the autonomy of all intervals in composite systems as well as the ever-decreasing boundary between consonances and dissonances.

2.2. Symmetrical sequences of tritones as a manifestation of systemic constructivism

In the composition of the 20th century, the changes in the harmonic structure of the work were especially highlighted. Not only the elements of chord structure have changed cardinally, but also the concept of the vertical itself – from the particular chord (function) to the consonance. The vertical (consonance) has acquired many recognizable and characteristic qualities. It was in the composition of the 20th century that the characteristic and independence of the vertical became apparent, i.e. the chord relations no longer have a center of tonal attraction. Verticals are increasingly characterized by concepts such as intensity. Conceptualizing these innovations, Janeliauskas (2002) clearly differentiates the concept of intervals between traditional functional/modal perception and the concept of *structural interval tonality*.[6]

In the series of Anton Webern's (1883–1945) Symphony Op. 21 (1927–1928), we observe the tritones emanating from the central tritone, but also the tritones in the vertical in the form of a series (P, I, R, IR). It is important that the initial twelve-tone series form (P) and its retrograde (R) interval structure are identical. Investigating the principles of the tritone operation further, we found that it forms symmetrical structures in the vertical, horizontal and diagonal. The tritone divides the series (P0) in half, and the fact that the tritone reversal is equal to itself, creates the conditions for an identical series cut at the tritone interval in all its forms.

	I_0	I_9	I_{10}	I_{11}	I_7	I_8	I_2	I_1	I_5	I_4	I_3	I_6	
P_0	A	G♭	G	A♭	E	F	B	B♭	D	D♭	C	E♭	R_0
P_3	C	A	B♭	B	G	A♭	D	D♭	F	E	E♭	G♭	R_3
P_2	B	A♭	A	B♭	G♭	G	D♭	C	E	E♭	D	F	R_2
P_1	B♭	G	A♭	A	F	G♭	C	B	E♭	D	D♭	E	R_1
P_5	D	B	C	D♭	A	B♭	E	E♭	G	G♭	F	A♭	R_5
P_4	D♭	B♭	B	C	A♭	A	E♭	D	G♭	F	E	G	R_4
P_{10}	G	E	F	G♭	D	E♭	A	A♭	C	B	B♭	D♭	R_{10}
P_{11}	A♭	F	G♭	G	E♭	E	B♭	A	D♭	C	B	D	R_{11}
P_7	E	D♭	D	E♭	B	C	G♭	F	A	A♭	G	B♭	R_7
P_8	F	D	E♭	E	C	D♭	G	G♭	B♭	A	A♭	B	R_8
P_9	G♭	E♭	E	F	D♭	D	A♭	G	B	B♭	A	C	R_9
P_6	E♭	C	D♭	D	B♭	B	F	E	A♭	G	G♭	A	R_6
	RI_0	RI_9	RI_{10}	RI_{11}	RI_7	RI_8	RI_2	RI_1	RI_5	RI_4	RI_3	RI_6	

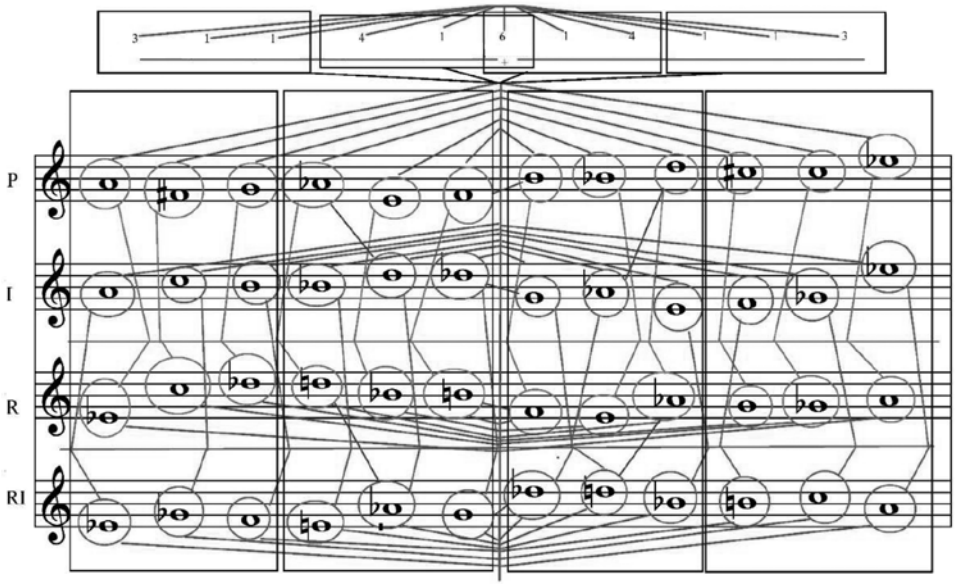
Example 9. Anton Webern. Symphony Op. 21 (1927–1928) series[7]

We have noticed that the tritone on the diagonal (*As-D*) forms a symmetrical structure, but this principle occurs not only in the diagonal but also in the forms of a series: e.g. between (P) part 1 and (R) part 2, (I) part 1 and (RI) part 2. Each segment of a series has its own equivalent in other modifications of a series. The diatonic-sounding series is actually made up of tritones. We have noticed that every single form in the center saves one tritone, which allows us to consistently analyze the entire composition.

[6] More about it: Janeliauskas, Rimantas (2002). Monaric as a companion of composing. *Lithuanian Musicology*, Vol. 3. Vilnius: Lithuanian Academy of Music, Institute of Culture, Philosophy and Art, p. 73–105.

[7] In the matrix of works by Webern and Schönberg, tone *B = H, tone B♭ = B*.

Anton Webern begins *Symphony* Op. 21 (1927–1928) with different variants of the prime form of the row. In this part, Webern uses P0, P4, P5, R1, R3, RI1, RI2, and RI6. These forms of the row are exposed sequentially, i.e. the tones are arranged in a sequence from 1 to 12. The tritone in this part usually occurs vertically (m. 7, 9, 19, 21) and several times in the horizontal (m. 8, 14, 15, 16). It is important to emphasize that the series is used conceptually as the main series is exposed in twelve bars (mm. 1–12). The series is orchestrally divided into segments: the first four tones (*A-Fis-G-As*) are exposed in the first four bars followed by a pause, then two more segments are exposed (*E-F, H-B*). The last segment of the series consists of four tones (*D-Cis-C-Es*), which means that it is symmetrical to the first. It is possible to split the series into three tones, thus obtaining a musical palindrome.



Example 10. Anton Webern. *Symphony* Op. 21 serial palindromes

It is possible to express this structure numerically, which further reveals the symmetricity of this tritone-based series: 3 + 1 + 1 – 4 + 1 ± 6 – 1 + 4 – 1 – 1 + 3. In the second part (mm. 27–58), the composer uses P7, P8, P10, R3, R5, R4, RI3, but in this part the tones are not always consistently exposed in sequence. The tones of the rows are divided into different registers: the R3 series, which begins at the 26th bar and ends at 33rd, and its tones are split into one for each instrument. In this subdivision, the tritones are broken not only vertically, horizontally, but also diagonally. In the last division (mm. 59–66), it comes back to the serial forms P1, P4, P5, P8, which were exposed at the beginning of the work. It is important to emphasize that identical serial forms are exposed (P4 and P5) at the beginning and the end of the composition. There is an allusion to the arch form, because we see material at the end that is initially exposed in a similar way. When we listen to a piece of work, we hardly associate these two divisions; we can only identify it by looking at the score. Paradoxically in tonal music we always pay attention to a tritone while in music based on tritones we do not distinguish them and therefore it is hard to analyze them by hearing.

Conclusions

It can be said that in the approach to the tritone there was a real breakthrough: from the hard-to-explain, unused and banned interval in music to the inevitable role in the music of the 20th century, based on many composing systems. As we examine the evolution of the concept of the tritone in the context of the theoretical systems of the 20th century, we note that the greatest debate arises because of the different theoretical position regarding the interval.

The 20th century brought new challenges and problems at the same time associated with the tritone. It is assumed that the change in the concept of a tritone, which is directly related to the change of the conception of a tritone, determines the emergence of new composing systems. This becomes obvious in the 20th century where the tritone strongly determines the compositional process as well as generates horizontal, vertical, and diagonal structures. In this paper, we regarded the concept of the tritone from its prohibition to tritonic apotheosis as closely related to compositional processes.

Sources of examples and tables

Example 1. Sensory dissonance: (a) Perfect Fifth, (b) Tritone, (c) Major Seventh. Example came from: Marcin Strzelecki doctoral thesis (2014: 9).

Example 2. Created by the author of this article, but ideas and information came from: Troschke, von, Michael (1989). Tritonus. HmT – 17. Hamburg: Auslieferung.

Example 3. Created by the author of this article, but ideas and information came from: Zarlino, Gioseffo (1558). *Le istitutioni harmoniche*. Venice: Francesco dei Franceschi.

Example 4. Analysis of Johann Sebastian Bach *Sehet, wir gehn hinauf gen Jerusalem* (1729) BWV 159, mm. 10–14. Created by the author of this article.

Example 5. Analysis of Johann Sebastian Bach Matthäus-Passion BWV 244. Created by the author of this article.

Example 6. Analysis of Claudio Monteverdi. *Litany of Loretto* (XVII a.), p. 32. Created by the author of this article.

Example 7. Persichetti, Vincent (1961). *Twentieth-Century Harmony: Creative Aspects and Practice*. W. W. Norton & Company.

Example 8. Юзеф Гейманович (1971). Об одном свойстве вертикали в атональной музыке. *Музыка и современность,* вып. 7 [сб. статей]. М.: Музыка, p. 294–318.

Example 9. Created by the author of this article.

Example 10. Created by the author of this article.

Table 1. Created by the author of this article.

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Nuo tritonio draudimo iki apoteozės: istorinė perspektyva

Santrauka

Nedidelis tyrimo objektas – tritonis – turi labai plačią savo sampratos kismo istoriją. Neatsitiktinai tai lemia ir itin įvairiapusį taikomų teorinių modelių bei analizės technikų spektrą. Nors muzikos sintaksėje tritonis yra vienas mažiausių elementų, jis pasižymi ypatinga ne vien savo skambesio, bet ir tyrimo problematikos įtampa. Jo funkcionalumą ir reikšmingumą liudija kintanti samprata bei naudojimo kanonai skirtinguose muzikos istorijos tarpsniuose: nuo jo draudimo (viduramžiais), toleravimo (Renesanso, baroko laikotarpiais), įsigalėjimo (klasicizmo, romantizmo laikais) iki apoteozės XX a. kompozicinėje technikoje bei harmoninėse sistemose.

XX a. tritonio intervalas tampa neatsiejama kompozicinės vertikalės ir horizontalės dalimi. Teorinėse ir praktinėse sistemose tritonis vis dažniau siejamas su harmoniniu / melodiniu intensyvumu, įtampa. Į kompozitorių bei teoretikų akiratį patenka sąlyginai naujas fenomenas – skambesio intensyvumo, įtampos reiškinys, kuris buvo apibendrintas ir „nuskaitytas" nuo svarbiausios tritonio akustinės ypatybės. Pastebėta, jog šis tritonis pasižymi skirtingais fizikiniais ir psichofiziologinio suvokimo ypatumais: gebėjimu sukelti sonorinį efektą, stimuliuoti chromatiką specifiniu disonansiškumu, įtampa, taip pat derminiu nepastovumu ir trauka į kitus intervalus, jis neturi pastovaus tono, tik vedamuosius.

Tiriant XX a. komponavimo sistemas, išryškėjo kompozicinės vertikalės, horizontalės bei įstrižainės tritoninis konstruktyvizmas. Tritonio įsigalėjimas XX a. kompozicijoje nulėmė kūrinių harmoninės sandaros, skambesio bei suvokimo pokyčius. Svarbu pabrėžti, kad XX a. iš esmės pasikeitė ne tik akordų sandaros elementai, bet ir pačios vertikalės samprata – nuo konkretaus akordo (funkcijos) iki individualios, konceptualizuotos struktūros sąskambio.