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A BRIEF HISTORY OF THE NOTIONS ”CONSONANCE” AND “DISSONANCE”

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SUMMARY. From a historical point of view, the phenomenon called consonance/dissonance has been perceived under three main trends: the first one – mathematical; the second one – acoustical and psychological and the third one – contextual. My research is based on Plato’s thought that consonants are produced by planets as well, in their movement on the orbits, a thought that is to be found in the sxteenth century as well in Zarlino’s *Instituzioni harmoniche.*

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From a **historical** point of view, the phenomenon called consonance/ dissonance has been perceived under three main trends: the first one – the mathematical one; the second one – the acoustical and the psychological trends and the third one – the contextual trend.

From a mathematical point of view, the notions consonance and dissonance can be described by means of numerical rapports due to the relations between sounds.

The Pythagoras system – although it bears the name of the sixth century B.C. scholar, this system was not invented by Pythagoras; he just theorized it, as the above system had been identified in the music of many other countries since very old times.

The generating element of the system is *the perfect quint* in the natural resonance (which is reported as 3/2 from an acoustical-mathematical point of view).

The functionality of the constituent sounds is double folded – fundamental sounds and general quints.

The intervals of constant pitch are the tone (9/8), the diatonic semi-tone (256/243), the chromatic semitone (2187/2048) and the Pythagoras comma (74/73).

The functionality of the system is maxim in the monody by the expressive potentiality it involves. From the point of view of the whole, it can be used only in the unison; otherwise it cannot be performed in the homophony and the polyphony.

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Pythagoras called a symphonic, a consonant (meaning "to sound together" = "con suonare") only the intervals produced by the chords whose pitches could be symbolized by numbers from one to four. These were as follows: the octave (2/1), the quint (3/2), the quint over the octave (3/1), the fourth (4/3) and the double octave (4/1).

In practice, this means that all the intervals are generated by the quint.

Plato thought that the consonants are produced by the planets as well, in their movement on the orbits, a thought that is to be found in the sixteenth century as well in Zarlino's *Instituzioni harmoniche.*

The mathematical division of the sonorous space could not meet the requirements of the musical practice from the beginning, so other thinkers like Euclid, Ptolemy made changes in the system, especially as this concerns the low and very low intervals.

After Pythagoras, ***Aristoxenos of Tarrant*** (sixth century B.C.) developed another theory, starting from the observation that the octave needs other types of measurements. Aristoxenos does not agree that a consonant chord is related to a certain numerical rapport, but he thinks that every interval which is formed by adding one or more octaves to a Pythagoras consonant chord is called a consonant – besides the ones accepted by Pythagoras as well.

Later on, according to the new classification made in *Armonia*, **Ptolemy** agrees with Aristoxenos's theory and he states that the consonant chords also include the compounds of the Pythagoras consonants, by adding an octave.

Thus, he defines **four** distinctive **categories** of **consonant chords**, by dividing the intervals into the *homophones* (the prime and the octave), the *symphonic* (the quint and the fourth, as well as the combinations between them and the homophonic intervals), the *emmelic* intervals (the intervals which are lower than the fourth, which are used in the melody) and the *ekmelic* intervals (which are not to be used in the melody).

Aristoxenos from Tarrant does not consider the octave as being expressed only by means of mathematical rapports, but he measures it by means of tones and semitones.

In the thirteenth century, ***Johannes de Garland*** suggests a threefold classification of the consonant chords and the dissonant chords, based on the musical practice of his age. According to him, the **consonant chords** are <u>perfect</u> (the unison and the octave), <u>imperfect</u> (the big and small third) and <u>medium</u> (the fourth and the quint). **The dissonant chords** are classified as <u>imperfect</u> – the big sixth and the small sixth, <u>medium</u> (the big second and the small second) and <u>perfect</u>: the small second, the triton (the increased fourth or the decreased fourth) and the big seventh.

During the Renaissance, the musical practice consequently imposes the concept of an enlarged consonant chord and it initiates the process of consolidating the harmonic concept. The thirds, perceived as a connection between the quints and the octaves, get an increased importance. Setting up the tonal diatonic system is a direct consequence of these new aspects in the musical practice.

On one hand the polyphonic style featured the linear outline, the organization on imitative movement, the asymmetry in construction and the latent harmony; on the other hand the harmonic style is defined on the accord outline, the motive-like organization, the symmetry in construction.

In his work called *Le institutioni harmoniche* – 1558, ***Giossefo Zarlino*** theorizes the classical mathematical concept of the consonant, as it was perceived from the fourteenth century until the nineteenth century.

Zarlino considers the consonant chords all the intervals that can be expressed as an acoustical-mathematical value by means of the rapports based on numbers from one to six. Thus, the rapports 5/4, 6/5 and 5/3 will be accepted as consonants as well. But the small sixth (expressed under the rapport 8/5) was regarded reticently, as it was considered a compound interval, made of a perfect fourth and a small third.

Zarlino realized that the numerical criteria he theorized regarding the sound and the consonant chords could not be applied to instrumental music, only to vocal music, which, according to him could achieve the perfect harmony. The art of the counterpoint, the consequence of his theory regarding consonant chords was mainly dedicated to the vocal music. Thus, the counterpoint became an art which could produce *the union of the mastery characterizing the various sounds brought back to concordance* by means of excellent harmony.

Zarlino used certain rules so that the various elements (sounds) could be concordant to each other. The dissonant chords were subordinated to the consonances, being accepted on the strong tempos only as the syncope of the consonant chords.

But the dissonant chords on the short tempos were allowed on any subdivision of tempos. The counterpoint rules set up by Zarlino used to be a consequence of Willaert’s rules.

The system proposed by Zarlinian is similar to the Pythagoras system, a succession of natural quints to which the overlapping of the great third in the resonance (5/4) is added; this brings about the big tone (9/8) between the steps I-II, IV-V and VI-VII, the small tone (10/9) between the steps II-III and V-VI, the diatonic semitone (16/15) between the steps III-IV and VII-VIII, the sintonic comma (81/80) – as a distinctive element between the big tone (9/8) and the small tone (10/9) and the big comma (128/125) – which makes the enharmonic sounds different from the others.

A comparison between the system proposed by Pythagoras and the one proposed by Zarlino shows that in C major the sounds E and B are lower in the Pythagoras system than in the Zarlinian system. The contribution of the system to the musical practice of the sixteenth-eighteenth century was huge, which made the development of the polyphonic and homophonic styles possible.

Nevertheless, the difficulties which occurred during the process of modulation and transposition of the intonation system on other steps led to its impracticability nowadays; it is known as “the scale of specialists in acoustics” and it is mainly used in laboratory calculations and in theorization. **Francesco *Salinas*** (1513-1590) and ***Francesco Vallotti*** (1697-1780) developed the trend that was brought on by Zarlino.

Marin Mersenne (1588-1648), an erudite researcher, dealt with a theory of the musical composition, the history of music, instruments and the explanation of the Tabulaturs in the paper *L’harmonie universelle* and he tackled the acoustic principles of music in the book *La verite de science* (1625).

Mersenne, but especially ***Joseph Saveur***, developed a scientific theory regarding to the relation between the consonance-dissonance and the sounds which are the result of the natural resonance.

Nicolaus Mercator (1620-1687) and ***William Holder*** (1614-1697) proved that a moderation of the octave in 53 equal parts allowed a clearer representation of all the relations between the sounds.

The system is called *the singers’ scale* and it is perceived as a characteristic of singing.

Joseph Sauveur (1653-1716) discovered the way of calculating the absolute number of vibrations of a sound by means of beats and the musical acoustic. It was for the first time that he explained scientifically the phenomenon of the superior harmonics.

Jean-Philippe Rameau (1683-1764), a famous composer and researcher of the science of music, renown by his contemporaries, was strongly influenced by Enlightenment as well as by Mersenne’s and Saveur’s research, which were the source of the affirmation of this harmonic doctrine.

In his famous *Traite de l’Harmonie reduite a ses principes naturels* (1722) he took into consideration old principles like the natural numbers, the harmonic and the arithmetical proportions, the phenomenon of the natural resonance. At the same time, he reduced the multitude of the accords to a number of fundamental types by means of the theory of inverting the component sounds; he stated for the first time that E-G-C was identical harmonically to C-E-G. Rameau’s fundamental bass which is different from *continuo* bass, although often taken for the former one, there is an imaginary structure, made of the series of the fundamental accords which could occur under various inversions during harmonic realization.

Rameau anticipated ***Helmholtz*** in many respects, but especially in that consonance or dissonance was explained by means of the physical measurement of the harmonic acoustic spectrum, that were generated by the vibration of a fundamental sound.

Bach composed his musical works under the confluence of the polyphonic and homophonic style and he is awarded the merit of having adopted the division of the octave in twelve equal semitones, as it was presented for the first time by ***Andreas Werkmeister*** around 1700, but it had been theorized two centuries before. ***Bach*** imposed the use of the new system and he proved its utility and capacities in his work called *Das Wohltemperierte Klavier*.

In 1714, ***Giuseppe Tartini*** (1692-1770) noticed the existence of the resulting sound, or the third sound, which could be perceived by the ear in a low register only when a third or a sixth was correctly performed from an intonation point of view. Like Zarlino and Rameau, Tartini made a rapport between the minor consonance and a supposed series of inferior harmonics, which is symmetrical to the superior one, which he was convinced to have discovered. This supposition was taken over later by Helmholtz and Riemann. The theory of the inferior harmonics caused numerous speculations, like the one that the minor accord is formed between the harmonics 4-5-6 of the inferior resonance. But later on, it was proved that the inferior harmonics *could not be heard*.

Francesco Vallotti (1697-1780) considered that the sounds 7, 11 and 13 in the series of the superior harmonics had nothing in common with the tonal system; he found the major scale just by resorting to higher harmonics.

Felix Savart (1791-1841) also had a contribution by researching the issue of the sounds propagation in various environments.

By his work, ***Herman Helmholtz*** (1821-1894), a German researcher, also had a contribution to the clarifying the details of the process of audition and many other concepts in the modern theory of the music.

He dealt with the physical and physiological acoustical issues as well as the combination tones.

Helmholtz classifies the tones as follows: the combination tones, the difference tones, the summation tones and the beat phenomenon. The combination tones are heard when two sounds of the distinguished pitch is produced simultaneously and it is evenly continuous. The pitch of the combination tones is different from the fundamental sounds and their harmonics. They are classified into difference tones and summation tones.

The difference tones are stronger than the summation tones, as they are directly proportionally on the pitch of the basic sounds. In smaller intervals than the octave, their pitch is usually higher than the harmonics. Helmholtz set difference sounds up to those of the rank four.

The summation tones are of lower pitch than the difference tones and they can be heard only under certain favorable circumstances. They equal the sum of the amount of vibrations of the basic sounds and they are higher.

Helmholtz stated that combination tones are made up in the inner ear, so they are the result of the physiological acoustic, but the vibrations which would correspond to the combination tones are not to be found in the air.

The difference between the combination tones and the beats (the beats phenomenon) consists in the fact that the ear can decompose the former ones into simple sounds, while in the event of the beats phenomenon this operation is not possible any longer. When the sounds have the same pitch, the interference phenomenon takes place and the *beats* are obtained when they are almost equal.

Helmholtz came to the conclusion that there were beats for longer intervals and the presence of harmonics should be taken into consideration in this case. To determine the interval consonance the harmonics beats are of much greater importance than the weak beats of the combination tones.

Helmholtz classified the **consonances** into four categories: <u>the absolute consonances</u> – the octave, the twelfth and the double octave; <u>the perfect consonances</u> – the quint and the fourth; <u>the medium consonances</u> – the big sixth and the big third and imperfect – the small sixth and the small third.

Wilhelm Wundt (1832-1920) emphasized the psychological aspect rather than the physiological aspect of a sound. He thought that the quality of perceiving a sound could be developed through attention and practice. He made a connection between the consonance phenomenon and the sounds which did not give out beats he also made a connection between the harmony phenomenon and the coincidence of the harmonics.

Carl Stumpf (1849-1936) can be considered the founder of the musical psychology; he also published a research about the consonance and the dissonance.

Paul Hindemith, ***Wolfgang Kohler*** and ***Max Wertheiner*** are also worth mentioning among the musicians preoccupied with this issue in the twentieth century.

The research and the work made by the twentieth century composers justify our reason to speak about an emancipation of the concept called *dissonance*; consequently, the notions of *consonance* and *dissonance* became irrelevant in their traditional approach.

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