

## Music and Architecture: Engaging in a Dialogue? (Some Problems and Promises within the “Frozen” Parallel)

“The business of architecture is to establish emotional relationships by means of raw materials”, Le Corbusier, *Vers une architecture* (1923)

“Music is a science which is concerned with numbers and proportions”,  
Zarlino, *Le institutioni harmoniche* (1558)

The mysterious kinship between music and architecture has chased our imagination for a long time and continues to do so. What gives this idea such power over our minds is the immediacy and complexity of the associations it evokes. The endless debate about the topic “music and architecture” could result from the fact that both parties involved in the dialogue see the problem quite differently. To musicians and all other “laymen” in architecture, the idea presents an intellectually stimulating topic for discussion and not much else. Music inspired by architecture – e.g., the motet *Nuper Rosarum Flores* by Guillaume Dufay, presumably based on the proportions of the Florence cathedral Santa Maria del Fiore (1436),<sup>1</sup> Musorgsky’s “translation” of an architectural drawing into “The Golden Gates of Kiev” from *Pictures at an Exhibition* (1874) (Example 1),<sup>2</sup>



**Example 1.** The Golden Gates of Kiev

“La cathédrale engloutie” from the first book of *Preludes* by Debussy (1909–13), and Stravinsky’s *Canticum Sacrum* (1955), a tribute to the San Marco Basilica in Venice<sup>3</sup> – has been sometimes considered by music historians and critics as an act of extravagance, a whim, or a joke<sup>4</sup>. Yet the other party, the architects, has never been too fastidious to turn to music for serious advice on a variety of important artistic and practical matters. The 20<sup>th</sup> century almost balanced the scales: composers started to address architecture for inspiration more regularly and some interdisciplinary terminology started to acquire a permanent place in scholarship (e.g., the notions of “musical space”, “volume”, and “gravity”), while musical scores began to resemble architectural drawings. However, the implicit notion that music is, according to Gioseffo Zarlino (1517–90), “without any doubt, superior to architecture”, still prevails in discussions of the subject from a “musical” point of view and should be overcome if a true dialogue between the two disciplines is to be established. By “dialogue” I refer to numerous works of various scope and quality,

produced over the last few decades in different European languages, occasionally by musicologists, but mainly by architects, art and architecture historians, psychologists, philosophers, literary critics, composers, sound engineers, and others. My purposes in the present paper are: (1) to offer a more systematised view of the topic in an attempt to avoid the superficiality and approximation, which have invaded it in the recent years; (2) to outline several problems, pointing at differences of approach between musicians and non-musicians and citing relevant examples, including some from my own native city of Kharkov, Ukraine, and my “adopted” city of le Havre, France; and (3) to propose several possibilities for research that could deepen our understanding of the enigmatic relationship between these two art forms.

### The Analogies between Music and Architecture

The tradition of drawing analogies between music and architecture is as ancient as the arts themselves. According to the disciplines concerned, these analogies can be grouped roughly into the following five domains: (1) philosophical: how the properties of space and time reveal themselves in music and architecture; (2) physical-

<sup>1</sup> As it has been demonstrated recently by Tiago Simas Freire, none of the relationships previously established between the motet and an architectural object may be valid. See: <[http://en.wikipedia.org/wiki/nuper\\_rosarum\\_flores](http://en.wikipedia.org/wiki/nuper_rosarum_flores)>.

<sup>2</sup> Viktor Gartman’s drawing features an unrealised neo-folkloristic architectural project for the entrance gate to Kiev (“Proekt gorodskikh vorot v Kieve”).

<sup>3</sup> Yet another musical composition, which was inspired by architectural practice of a composer, led to the creation of a building (a temporary structure, more precisely). The Philips Pavilion, a joint venture of Le Corbusier, Varèse and Xenakis, designed entirely by the engineer Iannis Xenakis as an advertisement for the Dutch company at the Universal Exposition of Brussel (1958), was inspired by the structural procedures of glissandi in Xenakis’ 1955 musical work *Metastasis*.

<sup>4</sup> Cf. the article entitled «Murder in the Cathedral» in the *Time* magazine of 24 September, 1956, a reaction to the premiere of *Canticum Sacrum* which Stravinsky himself conducted.

mathematical: how the properties of the materials used in music and in architecture determine their structure; (3) aesthetical: the significance of the classical laws of proportion, balance, and symmetry for these two arts; (4) sociological: the exceptional capability of both arts to affirm, praise, glorify, and exert their influence on the emotions and mentality of large groups of people; (5) psychological: the study of the way by which the involuntary mutual transposition of images of the two arts, based on the phenomenon of *synesthesia*, influences perception, execution, and composition in both art forms. This list is by no means exhaustive; moreover, the boundaries between these analogies are often blurred to the extent that they have been grouped together into what Yolanda Cole termed the *mathematical/scientific* and the *poetic/synesthetic* categories of thought about music and architecture (Cole 1987: 171). According to Cole, both categories of thought originated in the ancient Greek philosophy and mythology respectively, and had their significance by turns at different moments of the Western cultural history. However, as other critics noted, this idea is based on the questionable premise that the two categories of thought have existed independently since antiquity:

It is more likely that the polarization between mathematical and poetic principles originated in the mid- to late 18<sup>th</sup> century as Europe readied itself to accept Romanticism. Over time, the Romantics glorified the synesthetic analogy between music and architecture to the gradual and inevitable exclusion of the mathematical/scientific analogy: an ‘abnormal’ division that, fuelled by a widespread and anachronistic romanticism... lingers to this day (Dai 2001: 1).

The *mathematical/scientific* analogy stresses the vertical or simultaneous aspect of music and architecture. Based on the theories of harmonic ratios discovered by Pythagoras, this concept developed continuously throughout history in the writings of such architectural authorities as Vitruvius, Alberti, Palladio, Serlio, Barbaro, and others. In the 20<sup>th</sup> century it was re-introduced by Le Corbusier in his *Modulor*, the system of universal proportions based on the proportions of the human body, on the irrational number *phi* (~0.681...) of the golden section,<sup>5</sup> and on the Fibonacci series.<sup>6</sup> Leon Battista Alberti (1404–72), the first and most influential architectural theorist of the Renaissance, distinguished beauty from ornament, stressing that beauty comes from “the harmony and concord of all the parts achieved in such a manner that nothing could be added or taken away or altered except for the worse”, while ornament is “something added and fastened on, rather than proper and innate” (Wittkower 1952: 29). For Alberti, the evidence of objectivity of nature’s harmony was in the fact that numerical proportions which are required in musical theory to produce consonances – the Pythagorean numbers 1, 2, 3, 4 (the so-called Tetractys or the “Mystic Tetrad”<sup>7</sup>), and their ratios 1: 2, 2: 3, 3: 4<sup>8</sup> – also produce pleasing ratios in architecture. Alberti’s façade of the Santa Maria Novella Church in Florence (Example 2) is the best embodiment of the principle: it features, e.g., 1: 2 – the ratio of the width of the upper storey to that of the lower storey, 2: 3 – the ratio of the width to the height of the entrance bay, and 1: 3 – the ratio of the width of the dark square incrustations of the attic to the height of the attic (Wittkower 1952: 40–41).



Example 2. Santa Maria Novella Church in Florence

The *poetic/synesthetic* category emphasises the durational or narrative aspects of music and architecture. This concept, whose origin could be traced back to the Greek myths about Amphion, Orpheus, and Apollo, emerged in the Enlightenment with the development of the science of psychology, when the first reports of a psychological phenomenon known as *synesthesia* appeared in the writings of John Locke (1690) and Isaac Newton (1704) (Cole 1987: 172).<sup>9</sup> In 19<sup>th</sup>-century Germany, out of a revival of interest in Greek mythology,

<sup>5</sup> Two quantities are in golden ratio if the ratio of the sum of the quantities to the larger quantity is equal to the ratio of the larger quantity to the smaller one. The golden rectangle (the rectangle whose sides are in golden ratio, 1 : 1.618 : 1) can be seen, e.g., in the façade of the Parthenon in Athens.

<sup>6</sup> In the Fibonacci series, each subsequent number is the sum of the previous two, while the ratio of the two adjacent numbers tends towards the golden ratio: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, etc.

<sup>7</sup> Pythagoras (6th c. B.C.) is credited with devising the Tetractys, an equilateral triangle which consisted of ten points arranged in four rows. The Tetractys was worshipped both as a mathematical idea and a metaphysical symbol by the Pythagoreans.

<sup>8</sup> As a reminder, 1: 2 stands for the perfect octave, 2: 3 for the perfect fifth, and 3: 4 for the perfect fourth.

<sup>9</sup> “Syn(a)esthesia” is a relatively common perceptual anomaly, where a stimulus of one of the senses (e.g., hearing) results in experience or sensation in another sensory modality (e.g., vision or taste). In the beginning of the 20th century, research on synesthesia

there emerged a romantic concept “architecture is frozen music” (*estarrte Musik*), which was first coined and explained by Schelling in his “Lectures on the Philosophy of Art” (1802–3). It was later re-formulated and developed by Goethe in his conversations with J.P. Eckermann (1829) to such an extent that the former is often erroneously credited today with the invention of the metaphor itself. The Romantic metaphor of “frozen music”, devoid of the acknowledgement of the mathematical link between architecture and music, persisted throughout 19th-century German poetry, literature, philosophy and aesthetics (Hegel, Schlegel, Brentano, Fischer, Goerres, Negeli, Schopenhauer, Solger, and others)<sup>10</sup>, and was disseminated in the rest of Europe by poets and writers such as Byron and Madame de Staël (Cole 1987: 173–4).

In its revolt against Romanticism, Modernism reintroduced the *mathematical/scientific* analogy between music and architecture on a new level. In *Vers une architecture* (1923), Le Corbusier described the Parthenon as follows: “Here, the purest witness to the physiology of sensation, and to the mathematical speculation attached to it, is fixed and determined: we are riveted in our senses, we are ravished in our minds; we touch the axis of harmony” (Le Corbusier 1986: 220). Le Corbusier’s later collaboration with Iannis Xenakis represented a modern interpretation of Platonic rationalism and of the Renaissance ideas about the internal structural correspondences between the two arts.<sup>11</sup> In the second half of the 20th century, a glance at the theoretical writings and scores of many composers confirms that schematic and graphic impulses start to dominate the representation of music on paper and figure prominently in the process of composition. However, in post-modern architecture, as Aaron Dai puts it, “despite the efforts of architects as Steven Holl, a unified concept of music-architecture is not in currency today due to powerful and ubiquitous Romanticism” (Dai 2001: 5). The relationships between music and architecture now suffer in both analogies, states the author, because their evocation by musicologists, composers, architects, and art historians often reflect a “disturbing ignorance” of the other domain (Ibid.).

#### Five Analogies between Music and Architecture

Below, I will discuss in more detail the five analogies between music and architecture listed above: philosophical, physical-mathematical, aesthetical, sociological and psychological. Of these five, the first three generally belong to the *mathematical/scientific* category and the remaining two to the *poetic/synesthetic* category; however, several overlappings are possible, and a detailed examination of these overlappings would be a fascinating topic for further study. For example, the physical-mathematical analogy deals with numbers, while the aesthetic analogy involves the notions of harmony, symmetry, and proportions – and these also can be expressed by number in both music and architecture. Likewise, the aesthetic ideal of the synthesis of the arts (*Gesamtkunstwerk*), as proposed by Richard Wagner in 1849 and later developed by Aleksander Scriabin his colour-music performances of *Prometheus* (1910), by the followers of Rudolf Steiner (1861–1925), by the Russian constructivists of the Vkhutemas institute (1920–30), and by the architects and designers of the Bauhaus in Germany (1919–33) cannot be made possible without taking into account its social (objective) and psychological (subjective) components.

#### (1) Philosophical analogy

The temporal or *diachronic* nature of music is typically opposed to the spatial or *synchronic* nature of architecture (Vergani 1987: 164). In the perception of music, memory plays a major role, whereas the perception of painting, sculpture, and architecture relies less on memory and more on a viewer’s quick eye movement. Nevertheless, the synchronic approach can be applied to music – the method that “reduces it to its architectural dimensions outside of time” (Ibid.) – and vice versa, diachronic to architecture. Architecture is observed diachronically: “the reading of architecture unfolds through time” (Vergani 1987: 165). Music moves in front of the listener in one irreversible direction, whereas the observer is required to move in order to appreciate a three-dimensional building fully. Music can also be perceived synchronically: musical notation provides such a synchronic representation of music, although it belies the psychological fact that what we hear is not a multitude of different notes all at once, but only one tone moving up and down according to the profile of the melody.

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was conducted simultaneously in several countries, but due to the difficulties in measuring subjective experiences, synesthesia fell into an oblivion and has only recently been rediscovered by researchers.

<sup>10</sup> For more information, see Galeev 2000.

<sup>11</sup> Xenakis worked as an engineer for Le Corbusier in 1947–59. For more information, see Mäche 2001.

### (2) Physical-mathematical analogy

As taught by the traditional music theory, several basic elements of music can be expressed through rational numbers (on the other hand, the Pythagorean tuning, based on the ratio 3:2 found in the overtone series, uses irrational numbers). The basic elements of the musical rhythm can be conveyed by rational numbers divisible by four, although duplets, triplets, quadruplets, quintuplets etc. can be expressed only through irrational numbers. In equal temperament, all tones of the 12-tone scale, repeated over the span of several octaves, comprise a discrete row of rational numbers in a geometric progression, if the frequencies, such as A = 440 Hz, are taken into account (Lomanov 1972: 145). In equal temperament, the Circle of Fifths is a perfect circle (C major = D double-flat major), and all the diatonic scales (major, minor, pentatonic, octatonic, whole-tone, etc.) are symmetrical, i.e. repeated exactly over an interval of an octave.

It is difficult to imagine two more antithetical matters – the ephemeral, short-lived, delicate musical sound and the lasting, rough and heavy stone. But the methods of organisation of these two materials reveal a certain similarity (Martin 1994: 16). In classical architecture, the gravitation force is opposed so as to create organised hollow spaces on, above, or below the ground level. The vertical piles and the horizontal beams are arranged in a precise parallel-perpendicular construction whose ultimate purpose is to remain in this balance for a long time. In a piece of tonal music, the tonic governs the entire form by being present at certain predictable moments, usually in the beginning and at the end.<sup>12</sup> Such at least double – at both ends of a musical composition – appearance of tonic “supports” the entire musical edifice and prevents the tonal centre (“the support system”) from being undermined or destroyed by the rest of the tonal material (“the covering”).<sup>13</sup>

### (3) Aesthetical analogy

Historically, the concepts of perfection, symmetry, and balance are interconnected to the extent that they often mean the same thing. In visual arts, however, spatial symmetry manifests itself much more clearly than in music. The re-interpretation (usually *post factum*) of long fragments of a musical form as symmetrical relies on memory and therefore is rather difficult to achieve; on the other hand, smaller fragments – such as motives, phrases, and periods – are more easily perceived as such. It is tempting to place the axis of symmetry exactly in the middle of a piece of music as did Georgiy Conyus (1862–1933), who continuously tried to transpose the visual notion of symmetry to musical form in his “theory of metrotectionism”. Symmetry in musical form is represented in at least three ways – the one that is achieved by displacement or turn (imitation, exact repetition, or canons), the mirror symmetry (inversion, retrograde, and retrograde-inversion), and isomorphism or the similarity of smaller motives (Lomanov 1972: 143).<sup>14</sup> However, perfect symmetry in both music and architecture can be perceived as empty or boring.<sup>15</sup> More than ever, Francis Bacon’s famous citation “there is no excellent beauty that hath not some strangeness in the proportion” still holds true today.

### (4) Sociological analogy

Both music and architecture have traditionally served specific social and practical needs for different authoritative and democratic layers of society. In that, they respectively accompanied and provided a venue for important state and religious ceremonies, private and social gatherings, competitions, and shows. The hypnotising qualities of architecture and music, and the capability to praise, exalt and glorify are inherent in the objective constructive laws that govern both arts. While books and paintings could be more or less easily

<sup>12</sup> In Soviet musicology the phenomenon of tonal gravity (*tyagotenie*) was explored in the theory of tonal rhythm (*teoriya ladovogo ritma*) of Boleslav Yavorsky (1877–1942). The American psychologist and art historian Rudolf Arnheim (1904–2007) tried to introduce the notions of «magnetism», «gravity», and «inertia» into music theory.

<sup>13</sup> The notion of musical “gravity” can be both melodic (e.g., the aspiration of the seventh degree into the tonic) and harmonic, which stems from the acoustic properties of the overtone series (a natural tendency of any tone to be resolved a perfect fifth lower). This latter observation became the basis of Schoenberg’s concept of the “main tonal antagonism” which views dominant and subdominant as the two opposite forces in the establishment of a key. The subdominant, a much more distant relative of the tonic on the overtone scale, has a potential to act as a challenger to the tonic and to lead to distant tonal areas; thus the union of the tonic and the dominant is needed to counterbalance this force. Such a view of musical form is opposed in Schoenberg’s thinking to his view of the 12-tone system as “tonality in the state of weightlessness”. For more information, see Lupishko 1998.

<sup>14</sup> Schoenberg maintained that music evolved historically from presentation of one and the same idea vertically in several voices (polyphonic music), to presentation of one and the same idea horizontally in the upper part (homophonic music). The result of this new “distribution of space” was the appearance of musical forms that feature repetitions in different sections: AB, ABA, AA’BA’ (Lied-form), rondo, sonata form, etc. See more in Lupishko 1998.

<sup>15</sup> “R.C. I have often heard you say ‘an artist must avoid symmetry but he may construct in parallelisms.’ What do you mean? I.S. The mosaics at [Santa Maria Assunta in] Torcello of the Last Judgment are a good example. Their subject is division – division, moreover, into two halves suggesting equal halves. But, in fact, each is the other’s complement, not its equal nor its mirror, and the dividing line itself is not a perfect perpendicular” (Stravinsky, Craft 1959: 19).

destroyed during a political crisis, the objects of architecture and the pieces of music are sometimes (but, alas, not always) preserved, either in a “renovated” or a “castrated” form (e.g. the new hymn of Russia that uses the music of the old hymn of the USSR), and are used in new conditions under a new ideology. The social analogy between music and architecture also concerns the notion of style, that is, a similarity between certain concrete manifestations of both arts within certain periods of their parallel historic development, e.g. the objectivity and clarity of both Renaissance and Classical style, and dramatic tension and/or the subjectivity of Gothic, Baroque, and Romantic style of music and architecture.

#### (5) Psychological analogy

In 1883, Francis Galton made the first scientific reports, describing the experience of synesthetes: “The only information that reaches us concerning outward events appear to pass through the avenue of our senses; and the more perceptive the senses are of difference, the larger is the field upon which our judgment and intelligence can act” (Galton 1883: 27, cit. in Heyrman 2005: 21). Of the 733 cases of nearly 40 distinctly different types of synesthesia examined by Sean A. Day in 2005 (cit. in Heyrman 2005: 3), 51% had multiple multi-sensory synesthesia, which means that these people are naturally predisposed for artistic creation.

Synesthesia is seven times more common among artists, novelists and poets, and creative people in general. Artists often have the ability to link unconnected domains, have the power of metaphor and the capability of blending realities (Ramachandran, Hubbard 2003, cit. in Hayrman 2005: 3).

Be that as it may, one of the fundamental questions remains unanswered. Why does it happen that both a major triad and a Byzantine semicircular arch evoke a general sense of joy and stability, while a minor triad and a Gothic pointed arch suggest a certain sadness and restraint?

#### Problems with “Music and Architecture”

The problems within the “frozen” parallel became apparent already in the 19<sup>th</sup> century, when Schopenhauer in the second edition of *The World as Will and Representation* (1844) made a mock of Goethe’s vision: “A simple sense of analogy brought to life this bold joke, popular at the end of the 1830s, that architecture is frozen music...” (cit. in Galeev 2000: 3). According to Schopenhauer, the analogy between music and architecture, based primarily on the similarity between visual symmetry and musical rhythm, “can be extended only to the outside appearance and not to the *inner essence* of both arts: in relation to this inner essence they differ as greatly as the earth does from the sky” (Ibid., italics mine – M. L.).<sup>16</sup> Here is the list of the most common problems:

1. Superficiality, simplification, “blasphemous and fruitless word play with paradoxical meanings” (Galeev 2000: 4). The peak of this banality, Galeev notes in his paper (2000: 5), came with the comparison of Bach’s organ music to Gothic architecture as introduced by E.T.A. Hoffman (1813) and repeated by Carl Maria von Weber, A.B. Marks, and many others.

2. A «disturbing ignorance» of the other domain (Dai 2001: 5). As an example of such ignorance, Aaron Dai quotes Christian Norberg-Scholz, one of the contributors to *Quantril*, Webb 1991: «I like that big key-stone on the top of the Portland building; I find that fascinating, that blowing it once to a fantastic size. Bach in his fugues, for instance, used themes in augmentation, so that suddenly the theme became much bigger» (cit. in Dai 2001: 5). Here is Dai’s comment:

While Norberg-Scholz’s architectural ‘augmentation’ is about gathering immediate visual attention, musical augmentation is in itself not a device for emphasis (as is dynamics, or loudness); it is simply a contrapuntal tool (Ibid.).

3. Term precision: time, space, dimension, symmetry, harmony, contrast, repetition, balance, proportion, rhythm, gravity, material, volume, intensity, mass, texture and so on. Such phrases as “musical harmony” and “musical rhythm” are often used by architects and art historians without any understanding of what the technical terms “harmony” (the vertical aspect of musical sonority, compared to melody, which is the horizontal aspect) and “rhythm” (temporal organisation of the musical material, which is governed by metre) mean for musicians. Another often-misused term is “dimension”: what are dimensions in music and how many dimensions are there?

<sup>16</sup> It should be mentioned that music for Schopenhauer represented a much higher reality than architecture and was considered to be an immediate embodiment of the world will power.

4. Legends, obfuscation, errors, wishful thinking. My first example concerns the Gosprom or (in Ukrainian) the Derzhprom, the State Industry Building – one of the finest examples of the Soviet Constructivism, built in 1925–29 in my native city of Kharkov, Ukraine. Designed by the architects S. Serafimov, S. Kravets, and M. Felger and built in only three years with practically no large-scale machine equipment, it was to become the tallest structure in Europe for its time. The building's unique feature lies in a "hidden" symmetry which can be perceived only at one point in the centre of the square, because the building is tripartite and semi-circular in plan; its three sections are interconnected by covered walkways at the 3<sup>rd</sup>, 5<sup>th</sup> and 6<sup>th</sup> floors. Popular legend has it that from a bird's eye view the building resembles the opening melody (!) of "l'Internationale", the most popular left-wing anthem (Examples 3–4).<sup>17</sup> A bird's eye view of the Gosprom in Google Earth does not resemble any melody whatsoever. It is much more plausible that the remarkable rhythmic quality of the building and the overall sense of harmonic equilibrium gave birth to this legend.



Example 3. Gosprom in the 1930s



Example 4. Gosprom today

My second examples concerns St. Joseph Church built in 1951–7 as part of the reconstruction project of my «adopted» town of Le Havre, France, which was almost entirely destroyed during the World War II.

The church was designed by the chief architect for the reconstruction of Le Havre, Auguste Perret (1874–1954). The coloured stain glass windows were made by Marguerite Huré (1895–1967), a master glass-maker and Perret's collaborator. Inspired by Kandinsky's programme in *On the Spiritual in Art*, Huré conceived that the four levels of the church bearing stain glass windows at regular intervals with progressively less spacing between them (the basement, the upper gallery, the pyramid, and the lantern) should receive musical tempo markings according to the four movements of a «poème symphonique» (Largo, Allegro, Andante, and Allegretto). Unfortunately she had her tempo marking wrong in naming the lantern part Allegretto, which she erroneously took for the brightest and fastest movement of a symphony («le mouvement le plus vif and le plus animé de la symphonie»), instead of, e.g., Presto or Prestissimo (Examples 5–8).<sup>18</sup> Prestissimo would indeed better suit the



Examples 5–8. St. Joseph Church

impression of a strong aspirational force towards the sky, which is felt by anyone who has experienced the remarkable interior of St. Joseph Church and has stood just below the lantern.

<sup>17</sup> I am grateful to Dr. Margarita Katunyan, who, during my presentation in Vilnius, suggested that this legend may in fact be a repercussion of the visual link of the Gosprom with Tatlin's Tower of the Third International, one of the most influential Russian constructivist projects.

<sup>18</sup> For this information, as well as for the citations, I am grateful to Dr. Françoise Gasté, an art historian and a guide-lecturer of Le Havre's tourist office, who is currently preparing a publication about St. Joseph Church.

**Table 1.** The 10 Points of View at the Parallel between Music and Architecture

	<b>Primary Matter</b>	<b>Inspiration</b>	<b>Conception</b>	<b>Execution</b>	<b>Perception</b>
<b>Music</b>	<ul style="list-style-type: none"> <li>- A = 440 Hz</li> <li>- The Pythagorean ratios – 2:1 (perfect octave), 3:2 (perfect fifth), 4:3 (perfect fourth) – distinguish consonances from dissonances</li> <li>- Basic rhythmic values are divisible by 2</li> <li>- In equal temperament, the Circle of Fifths is a perfect circle (C major = D double flat major)</li> <li>- Scales (major, minor, pentatonic, octatonic, etc.) are symmetrical (repeated exactly over an interval of an octave)</li> <li>- Attraction, gravitation, gravity (Yavorsky's <i>tyagotenie</i>), centrifugal vs. centripetal forces/ functions of a musical form (Schoenberg's "main tonal antagonism")</li> </ul>	<p><b><u>Music inspired by Architecture:</u></b></p> <ul style="list-style-type: none"> <li>- G. Dufay, Motet "Nuper Rosarum Flores" (1436) + the Santa Maria del Fiore Cathedral in Florence</li> <li>- Musorgsky, "The Golden Gates of Kiev" from <i>Pictures at an Exhibition</i> (1874) + Gartman's drawing</li> <li>- Debussy, "La cathédrale engloutie" (1909-13), <i>Preludes</i></li> <li>- Stravinsky, <i>Canticum Sacrum</i> (1955) + San Marco Basilica, Venice</li> <li>- Stockhausen, <i>Hinab-Hinauf</i> for the German pavilion at the 1970 Osaka World Fair (unrealised)</li> <li>- B. Ferneyhough, "Carceri d'Invenzione I" (1982)</li> <li>- L. Andriessen, "De Materie" (1984-88)</li> </ul>	<p><b>1. Number:</b> (Golden section <i>phi</i> ~0.681, Fibonacci series: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144...) – Bach, Schubert, Debussy, Satie, Bartók, Xenakis and more</p> <p><b>2. Symmetry/ asymmetry, proportions, balance</b></p> <ul style="list-style-type: none"> <li>- ABA, <i>Lied</i> form</li> <li>- AABA, rondo form</li> <li>- ABACADA, sonata form... (Conyus' metrotectonic theory)</li> <li>- Repetition, canonic imitation, 12-tone music, serial music: inversion, retrograde, inversion-retrograde... (Schoenberg's "law of the unity of musical space")</li> </ul> <p><b>3. Rhythm</b></p> <p>Stravinsky: "rhythm in my understanding is the music itself"</p>	<p><b><u>Music for specific places/ events/ dispositions:</u></b></p> <ul style="list-style-type: none"> <li>- Andrea and Giovanni Gabrieli, double antiphonal choirs for San Marco Basilica in Venice (16<sup>th</sup> c.)</li> <li>- Wagner, <i>Parsifal</i> (1882) for the opera theatre in Bayreuth</li> <li>- Messiaen, several organ works for the organ of St. Trinity Church in Paris (1950-60s)</li> <li>- Stockhausen, <i>Carré</i> (1959-60), <i>Gruppen</i> (1955-6)</li> <li>- La Monte Young, <i>Dream House</i> (1969), Munich and other locations</li> <li>- Xenakis, <i>Terrektorh</i> (1965), <i>Nomos Gamma</i> (1967-8), <i>Windungen</i> (1976)</li> <li>- Ph. Glass, "Dancissimo" (2001) for the Santiago Calatrava wing of the Milwaukee Art Museum</li> </ul>	<ul style="list-style-type: none"> <li>- Greek myths of Amphion, Orpheus, Apollo</li> <li>- the Romantic concept of "frozen music" and the hierarchy of the arts: Schelling, Goethe, Hegel, Schlegel, Schopenhauer...</li> <li>- "unification" of the arts, <i>Gesamtkunstwerk</i>: Wagner, Scriabin, R. Steiner, Futurism, Constructivism, Bauhaus...</li> <li>- space in music (diachronic vs. synchronic approach), the problem of dimensions, of synesthesia and of the <b>deeper essence</b> I. Xenakis: "our perception of music and architecture depend on our mental structures"; Ph. Glass: "[in both arts] structure and function... are very close"</li> </ul>
<b>Architecture</b>		<p><b><u>Architecture inspired by Music:</u></b></p> <ul style="list-style-type: none"> <li>- Xenakis, The Philips Pavilion (1958) for the World Fair in Brussels + <i>Metastasis</i> (1954)</li> <li>- Toyo Ito, The Tower of Winds (1986), Yokohama, Japan</li> <li>- Steven Holl, The Stretto House, Dallas (1992) + Bartok, <i>Music for Strings, Percussion and Celesta</i> (1936)</li> <li>- Frank Gehry, Experience Music Project, Seattle (2000)</li> <li>- Daniel Libeskind, the Jewish Museum, Berlin (2001) + Schoenberg, <i>Moses und Aron</i>, the final unfinished act (1954)</li> </ul>	<p><b>1. Number, proportions:</b></p> <ul style="list-style-type: none"> <li>- Parthenon, Athens (5<sup>th</sup> c. B.C.)</li> <li>- Alberti, Santa Maria Novella Church in Florence (15<sup>th</sup> c.)</li> <li>- Le Corbusier's Modulor I and II</li> </ul> <p><b>2. Symmetry/ asymmetry:</b></p> <ul style="list-style-type: none"> <li>- Serafimov, Kravets, Felger, the Gosprom Building, Kharkov, USSR (1925-9)</li> </ul> <p><b>3. Rhythm:</b></p> <ul style="list-style-type: none"> <li>- Auguste Perret, Margherite Huré, St. Joseph Church in le Havre, France (1951-7)</li> </ul>	<p><b><u>Acoustics in Architecture:</u></b></p> <ul style="list-style-type: none"> <li>- Hans Scharoun, the Berlin Philharmonie (1963)</li> <li>- Renzo Piano, projection hall for IRCAM in Paris (1974) and the Auditorium of the Parco della Musica in Rome (2002)</li> <li>- Christian de Portzamparc, Cité de la Musique, La Villette (1995) and the Philharmonie of Luxemburg (2005)</li> </ul> <p>Toyo Ito: "I feel betrayed once the building is there"; D. Libeskind: "[buildings]... are also <i>de facto</i> instruments, giving shape to the sound of the world"</p>	<ul style="list-style-type: none"> <li>- Greek myths of Amphion, Orpheus, Apollo</li> <li>- the Romantic concept of "frozen music" and the hierarchy of the arts</li> <li>- time in architecture (diachronic vs. synchronic approach), the problem of dimensions, of synesthesia and of the <b>deeper essence</b></li> <li>D. Libeskind: "a sense of wonder... forms the difference between building and architecture"</li> </ul>

5. Subjectivity, lack of a common basis for comparison: “In rhetoric, comparison requires that the factors by which the comparison is to be made are definitely established at least in one case out of the two. The comparison procedure involves, first of all, establishing a common basis, and second, establishing a qualitative assessment of what is being compared” (Volkov 2009, chapter 5).<sup>19</sup> A typical example of such unfounded comparison is found in Vergani 1987:

By establishing relationships between musical and architectural elements, it then becomes possible to capture relevant events in music and reconstruct or ‘transpose’ them into architectonic space/structures. *Pitch* is transposed into *color, tones* and *timbres* into *textures* and *materials*, musical *dynamics* into contraction and dilation of scale (Vergani 1987: 165, italics in the text – M. L.).<sup>20</sup>

6. Lack of a clear definition of the speaker’s point of view (composer vs. performer, performer vs. listener, architect vs. client, client vs. casual observer...) – which relates to the ten points of view at the subject of music and architecture as presented in my Table 1. The table is somewhat related to the two categories described above: the third column deals with the *mathematical/scientific* category, and the last column with the *poetic/synesthetic* category. The table is presented not only to stimulate future discussions of the topic of music and architecture in 10 different directions,<sup>21</sup> but primarily to separate the viewpoints of the producers of music and architecture (composers, architects, performers) from the viewpoints of the interpreters (critics, theorists, psychologists, philosophers, etc.). It is my obvious conclusion that the point of view of the producers should be given preference, if superficiality and approximation are to be avoided in future research on this never-ending topic. The table is self-explanatory, because some of the items have been already addressed in this paper; for other items I invite the readers to consult the bibliography or to conduct their own research. In the guise of a *post scriptum*, below I present fuller versions of the abridged citations shown in grey in the table:

Goethe once said: ‘Architecture is frozen music’. If we try to dig this analogy somewhat deeper, in order to reformulate things more objectively, we will quickly come to mental structures, to the group theory. The four rotations of a rectangle or of a melody [+ inversion, retrograde, retrograde-inversion] are four groups of transformations.... There are thus several levels of correspondence. The most ambiguous one is that of Goethe. I have just given you another one, more objective. There is yet another one: of creating musical or architectural spaces with acoustic curves such as glissandi... (Iannis Xenakis interviewed in Xenakis 1986: 5–6).

The structure and function: isn’t that the whole idea of modern architecture, that structure and function are very connected? That, of course, is the secret of music: the structure and function... – the emotional content and the structure of music are very close (Philip Glass interviewed in Lerner 2002).

The system in configuring sounds in music is determined by the composer. But how the player takes them each time, makes a lot of difference in the spatial sound of the music created. Moreover, sounds die away as time goes by. I would like to create such an architectural space. So I think virtual architecture existing in my consciousness can be well translated into something like music. But in reality, once a building is constructed on earth, it can no longer be translated into music. I myself fell betrayed, as soon as I see a completion of my work (Toyo Ito interviewed in Berwick 1997–8).

Buildings provide spaces for living, but are also *de facto* instruments, giving shape to the sound of the world. Music and architecture are related not by metaphor, but also through concrete space. Every building I have admired is, in effect, a musical instrument whose performance gives space a quality that often seems to be transcended and immaterial. The ineffable or the immeasurable gives a sense of wonder that forms the difference between building and architecture (Daniel Libeskind interviewed in Libeskind 2002).

*Rhythm* in my understanding is the music itself. For example, the works of Bach, which are standards of comparison for us all, consist of nothing else but *rhythm* and *architecture*. Rhythm is an essential and dominating quality of music. But the Romantic composers have destroyed it with their infinite vignettes and ornaments of all kinds. (Igor Stravinsky interviewed in *Le Matin*, Antwerp, January 10, 1924, cit. in Varunts 1988: 402, italics in the text – M. L.).

<sup>19</sup> Volkov, A., 2009. *Kurs russkoy ritoriki* (A course on Russian Rhetoric). Moscow: Indrik.

<sup>20</sup> One might ask, why would musical pitches be transposed into colours in architecture, and not, e.g., timbres into colours? And how about musical texture, harmony, or rhythm? Such “transpositions” are no more than subjective synesthetic experiences which are different in different people.

<sup>21</sup> Nine, to be more precise, because the primary matters of architecture (stone, glass, concrete, light...) have not been discussed in my table in relation to music.

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## Santrauka

### Muzika ir architektūra: įsitraukimas į dialogą?

Paslaptinga muzikos ir architektūros giminystė jau nuo seno jaudina žmogaus vaizduotę. Ir mūsų protus ši idėja užvalo todėl, kad sugeba sukelti paprastas ir sudėtingas asociacijas. Nesibaigiančius debatus muzikos ir architektūros ryšio tema galima paaikškinti ir tuo, kad kiekviena iš dialoge dalyvaujančių pusių problemą mato gana skirtingai. Muzikologams ši idėja yra ne daugiau nei stimulus intelektualiai diskusijai, o architektai niekada nebuvo tokie skrupulingi, kad klausytų muzikų patarimų svarbiais meniniais ar praktiniais klausimais. XX amžius beveik išlygino svarstyklės: muzikos teorijoje įsivirtino šiek tiek tarpdisciplininės terminologijos (pavyzdžiui, muzikinės erdvės sąvoka), o ir pačios muzikinės partitūros pradėjo panašėti į architektūrinius eskizus. Šiandien, regis, pribrendo laikas persvarstyti įprastą manymą, kad muzika (remiantis Zarlino teorija) yra „be abejonės aukščiau už architektūrą“, ir įsitraukti į dialogą. Dialogu aš vadinu visą didžiulį kiekį darbų, parašytų pastaraisiais dešimtmečiais anglų, prancūzų, rusų ir kitomis kalbomis. Tarp jų autorių tik nedaugelis yra muzikologai, daugiausia – architektai ir meno istorikai.

Šio straipsnio tikslai yra: (1) pasiūlyti labiau susistemintą požiūrį į šią temą siekiant atsikratyti pastaraisiais metais joje įsigalėjusio paviršutiniškumo ir nekonkretumo; (2) įvardyti keletą problemų nurodant muzikų ir ne muzikų požiūrių skirtumus, remiantis aktualiais pavyzdžiais, tarp jų ir esančiais mano gimtajame Ukrainos mieste Charkove, ir Prancūzijos mieste Havre, kuriame gyvenu; ir (3) pasiūlyti tyrinėjimams keletą krypčių, kurios padėtų mums giliau suvokti mįslingą šių dviejų meno šakų tarpusavio ryšį.