Music, the Unheard Music, the Unheard in Music, and Science

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The existing interior link between the universe as a whole and music was considered long before our age. In ancient India the universe was said to be full of some primordial sound and the modern researcher notices that when speaking about the sound the ancient Indians mentioned the vibrations that filled the Universe.[1] Primordial sound did not mean music, itself, but sounds and dynamic features of the universe were clearly connected in this representation. A contemporary philosopher remarked that music had a special philosophical meaning, for in the old concepts it was subdivided into human, instrumental, and cosmic: "The real musician was the one who could be in concord with the cosmic tune through music and thus to understand the laws of the universe."[2] In the European tradition, the harmony of the universe was revealed in one of its manifestations in the celestial music of the heavenly spheres—this music was unheard.

From the sixth centuries B.C. and the works of the Pythagorean school, numerical relations were connected with harmonic sounds that oscillating strings produced. Inside the same school of thought the idea of *order* was considered in relation to the description of the heavens; cosmos, signifying "order," was the word introduced, as one supposes, by Pythagoras himself (it does not seem a coincidence that music might in turn be perceived as an order reflected in its numerical relations).[3] It is since this time that the idea of the order of the universe, as well as the harmony of celestial music, established itself in European thought. The interpretations of this music were quite different. For example, the music of the heavens being made possible by the commensurable movements of the heavenly spheres was described in the fourteenth century in the work "On the Commensurable and the

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Incommensurable in the Heavenly Movements," by Nicholas Cusa, while the aim to make audible this silent music may be perceived in I. Kepler's writings as far back as the seventeenth century. In this sense silent music, or unheard music, might be called the goal of the sciences for many centuries.

There are still some reservations as to the exactness of this statement. For example, A. Koestler has remarked that the metaphor of the heavenly music was more of a poetic and mystic inspiration than that of a scientific nature, for Aristotle had already "chased the harmony, the heavenly harmony" from the scope of interest of serious science.[4] But works like those mentioned above, where the heavenly music was considered, can hardly be labeled as purely mystical or poetic and in these cases the notion of the music of heavenly spheres is a representation or a substitute for the notion of the mystery or riddle of the order in cosmos, and the regularities one tries to single out in it. The question arises: Why was it that music linked the heavens and the earth? What meaning did this metaphor have, and in what way may it be considered a metaphor?

One point is to be singled out in this connection. Although the notion of harmony in the (so to speak) *technical* meaning of the term is usually connected with music, the sense of the word is much wider; while speaking of the harmony of the world it is an order and a definite, perfect structure that is presupposed. This means that the idea of perfect harmony is also used for spacial figures and is connected with the idea of spacial symmetry. It is known that the geometrical perception of sound was familiar in the ancient East and the Pythagorean geometrical images of harmonic sounds may also be mentioned in connection with this.[5] There have been published special works with studies of different cases of such notions of harmony,[6] treating both musical harmonies and spacial / structural symmetries, for if musical harmony pertains to a diachronic temporal notion, the symmetrical harmonic structure refers to a spacial, synchronic description. When Kepler was constructing the "perfect world of the heavenly spheres" he used the notion of perfect, symmetrical, three-dimensional figures, considering that the perfect world would be constructed out of perfect figures (thus reinterpreting the Pythagorean images, or returning to the Plato's primordial perfect elements—i.e., symmetrical, regular, three-dimensional "atoms"). The answer to the question of why such a scientifically mistaken idea had led to such a scientifically correct result as the three Kepler laws of planet movement may be sought in the examination of the possible extensions of the meaning of symmetry and regularities, and the idea of holistic relation between different types of symmetry. And it may be explained considering the discoveries of the nature of sounds as wave movements in the medium,

but in all cases the idea of a basic symmetry (be it just the idea of the symmetric unseen basic units of structure) in connection with the idea of a harmony of the music of the heavenly spheres expressing this order cannot be labeled simply poetic or mystical. The idea of a *working hypothesis* may be more appropriate in this case. And it is in this sense that the notions of harmony and the laws of nature may be considered as coinciding even at the beginning of the seventeenth century.

With the recent discoveries of modern science, the idea of discovering the secrets of unheard music has in some sense conserved its validity, while having been transformed. It may be reformulated as the transfer from the search for the audible though silent to the search for the visual though unseen that the modern science has made. For it has passed from the search for silent sounds to the search for hidden symmetries, a symmetry being considered as a notion pertaining in general to visual perception. Still, as in the case of heavenly music that is not heard, the symmetry should not be considered only as something which can be really seen, something which has a visual representation, for the symmetries in question are mostly not of a geometrical character and are not supposed to be visualized. Once more it is just the regularities of the world that are looked for in these symmetries, or reflected in this music.

And in this sense both science and music might be considered in this context as the representations of some deep realities transcending the world of phenomena, for it is the unheard music (in the past) and the hidden (unseen) symmetries (in the present) that define and reflect the world as it is in its very essence (accepting the presupposition that this essence exists). While no more attempts are made to make audible the supposed heavenly music, and no secret messages are supposed to be held by it, it is definitely to science that the task to discover and transmit all knowledge about the world has passed.

There is a principal difference still between the unseen symmetries being sought and the unheard music that might be made audible. There are strict definite meanings those symmetries represent in the order and structure of nature. They are connected with the laws of conservation, interpreted in the language of physics. The exact mathematical relations are the descriptions of these symmetries. Nothing similar exists for music. What's more, in the elaboration of Kepler's laws it was the visual models and images that played an extremely important role. It is well known that it was a kind of visual imagery that played an important role in elaborating scientific theories and working out scientific worldviews. The history of science preceding our century demonstrates the important role a visual image played in

the working out of a new theory. Although it is usually considered that in very abstract contemporary science visual images no longer play a role this point of view can now be put into doubt. In a recent work, A. I. Miller has once more demonstrated the persistent value of a visual image in an elaboration of a scientific theory.[7]

But even those who put into doubt the heuristic value visual images might have in modern science are absolutely positive about the way they help to create a more comprehensive model or interpretation. Nobody has ever supposed that any audible image may be used in such aims, that is in helping to operate within the analytical formal world of the scientific concepts. European civilization demonstrates a kind of disparity between visual and audible (and the same is true for science as one of the main achievements of this civilization), that differs from ancient Indian civilization, for example, where the audible was of a primordial importance. To some extent, the difference between visual and audible may be perceived as the difference between static (synchronic) and dynamic (diachronic). The comparison between the dynamic universe of the ancient Indians and, in an evident sense, the static universe of the ancient Greeks is an example, though a rough one. As R. Lannoy has noticed, "...before the introduction of a Western education every Indian child was born into the resonant world of sound. He learned by looking and listening and developed a hyper receptivity to the dynamism of the auditory world."[8] It was the traditional Indian knowledge that corresponded to this perception of the world, but it contradicted the emerging scientific search for fixed formal rules and notions. The unheard music of the heavens was not part of these regularities and formal concepts. This meant a kind of a principal rupture with the holistic perception of music in the Eastern tradition and throughout antiquity.

It is in the perspective of a logical, rationalized tradition of modern science that the question can be asked about the informative value of this heavenly music. If one succeeded in making it audible and in listening to it, what would it change in one's knowledge of the universe? Or, in different words, is music able to communicate any fixed information?

The problem of the content one may ascribe to music, as well as the question of what may be considered as the *meaning* of music, were and still are at the center of a great discussion. Different disciplinary approaches have been used in trying to answer this question. In a recently published article, W. P. Dougherty remarks that "...music would benefit enormously being placed under a semiotic microscope: after all, music as a cognitively interpretable communication system exhibits hierarchic organization, both on structural and expressive levels, and music's special correlation of concrete

forms with abstract relations seems particularly amenable to insights from semiotic theory."[9] A bit later he acknowledges that "...a semiotic of music does not yet exist," quoting though not supporting H. Orlov's point of view that although music "may be described in semiotic terms [it] does not necessarily mean that terminology and theory of semiotics will help us to understand music better. As such attempts have shown, music stubbornly and defiantly conceals even what is already known, and turns out to be a very difficult object to deal with."[10]

The elusive character of music comprised, for example, in its continuous sounding nature makes its semiotic interpretation rather difficult. In the attempts to decipher the musical semantics two opposite points of view are expressed. The first affirms that "music lacks a semantic." One of the recent discussions of this issue gave birth to the special emphasis made on the literary, textual part of music. Music without "text, title, program or plot"—"music alone"—was considered to be only decorative in contrast to music that has a text.[11] This music, music with the text, makes up part of fine art, which means in this context "the art of representing human expression in musical tones." Thus in this sense it is the unheard in music—for example, a program or a title that is not necessarily even transformed into sounds—is considered to be the very element that gives meaning to music. As P. Kivy puts it, "music alone" is just a quasi-syntactic structure that has no meaning, no representational context. In a recent article, N. McFee argues with this point of view, partly demonstrating in what way one may ascribe a distinct, particular meaning to "music alone" and why it is logically possible.[12]

Attempts have been made to show that music in no way can be considered a language: "Because music does lack semantics and because it is...a dense symbol system, it requires a comprehensive concentration...."[13] The problem of the comprehension of music still arises, and this understanding is definitely different from purely emotional involvement; thus music is supposed still to contain and transmit something that is to be comprehended. Departing from this premise, many concrete tries were still made to construct a musical semantics. One of the most recent concerned the creation of a musical semantics based on R. Montague's approach.[14] I. A. Gerasimova constructs semantics for musical notation having introduced the notion of a musical event and considering three different levels of the "sound organization of musical data": physical, intellectual, and emotional. And all three of them give the different facets of the world having been reflected in the musical language, thus creating a many-leveled semantic representation.

The semantics constructed in the work mentioned above was the case of a semantics for "music alone," but it was constructed only for the physical level of music, as had been the author's intention. Other levels of music organization will lead to different semantics, thus once more stressing the many-colored character of the possible semantics of music alone.

"Music alone" was mentioned by many contemporary philosophers where references were made to its cognitive aspects. But it seems quite revealing that in an essay about Ludwig Wittgenstein's understanding of music its author, S. E. Worth, insisted on understanding involving not only music as such.[15] The idea of understanding music in the interpretation given in Worth's essay included not only getting understanding out of the musical work. Understanding was supposed to be achieved with the combination of the study of the written rules of musical compositions, theories of musical forms, and so on, and this knowledge was to be applied to the piece of music. In this interpretation, the understanding of the music as such, "music alone" was not considered. It is once more the texts—rules, the technology of mastering them—that create the "state of understanding." Although the article in question is not directly aimed at the discussion of the problem examined here, still its author's implicit position confirms that only *with* the texts (rules, and the vast amount of knowledge about the theory of music) can one understand music. The unheard in music defines its understanding. Although this position arises no direct objections—for the more we know about music the better we might understand it—still it does not answer the question of *how* and *if* one might understand "music alone" and if it can transmit some kind of a meaningful message to us.

During ancient times, music was supposed to reflect directly the order of the universe and to express the essence of the world. In order to understand it one needed what is now is labeled by Worth as "comprehensive concentration,"[16] and what might be called a "concentrated contemplation," but no contemplation is possible with formal modern knowledge, and as "music alone" is devoid of any formal content so the problem of its information value is now put into doubt. But if the content of music cannot be formalized, its structure has quite a formal character and the problems musicians and mathematicians solve may often be represented as similarly formal ones. D. R. Hofstadter mentions J. S. Bach's canons and fugues and compares them to complicated mathematical and logical constructions, and while speaking of Bach's "Musical Offering" he remarks that it is not only the beauty and the emotional involvement that are at stake in the perception of the work but the intellectual ingenuity of the approach.[17]

It is the complicated formal structure of a musical work, and a fugue in particular, that makes Hofstadter recall the logical paradoxes of the self-referential expressions used by K. Goedel in demonstrating the theorem that considerably put into doubt any possibilities of complete axiomatic foundations of mathematics and the paradoxical images of M. C. Escher's graphics. To consider the fugue to be connected with something close to a scientific creation was rather a common view, as Hofstadter shows with Frédéric Chopin, for example, the fugue was like pure logic in music, and much attention in the creative activity of this composer was devoted to the solving of formal problems. The complicated harmonies, and their mathematical interpretations, in Chopin's music were invoked in another Hofstadter work.[18] The author rewrites the notation of one of the composer's études in the form it had been presented by the composer himself and so as to reflect its rhythmical nature: "This figure reproduces quite accurately the large scale visual patterns of Chopin's own manuscript, in which Chopin took great care to align all the crests of the massive waves."[19] The notation forms a periodic figure resembling a wave and, as the author noticed, it was Chopin himself who sacrificed the clarity of notation in order to conserve the periodicity of its image.

But this visual image of the curve represents the features of what may be referred to as the syntactic pattern, which corresponds to the formal patterns used in poetry such as rhyme and meter, while the semantic pattern the author compares with logic. In both cases there is no way to single out in a unilateral way, the meanings of these patterns; the fixed image of the music—image which is not directly transformed into music (as to its special form)—although helping to represent the work does not help to fix its interpretation. It is quite revealing that Hofstadter himself, while speaking about the meanings of Chopin's works, argues with the acknowledged interpretations of some of them.

The evident conclusion should be that no definite unilateral meaning may be ascribed to a musical work and it seems that quite a different solution might be envisioned in this context, indicated by S. Clavell, who M. Worth mentions in her essay. Clavell makes a comparison between the problem of finding meaning to metaphor and finding meaning to music. The problem of understanding and finding the meaning of metaphor has been the center of vast and continuing research where both the cognitive value of a metaphor and its complicated interactive meaning generating character, have been studied.[20] It is through this comparison with understanding metaphor that the links and differences between scientific and musical understanding may emerge. The meaning, and thus the

understanding, of a metaphor can not be reduced to the literal substitution of it by the properties metaphor is transferring. Metaphor differs from analogy and it can be presented as an analogy containing an inconsistency, but this is an inconsistency that does not depreciate or exclude the meaning of the metaphor. This inconsistency (which would be more correct to label a "paraconsistency") might accept a variety of different explanations but this does not exclude the possibility of understanding metaphor and considering a kind of semantics that includes it. If one accepts this approach it means that one, unilateral meaning is not something that is necessary for understanding music, there exists instead a *set* of meanings that can serve as the basis of understanding. The evident solution for the understanding and meaning of music consists in acknowledging that if each of the precise meanings might be expressed, in a natural language, in precise terms, the understanding as such of the music as a whole escapes this understanding and cannot be reduced to a rationalized unilateral discourse. Thus one can state that there is something unheard, unpronounced, in the understanding of music and thus in the messages that music transmits.

The gap between scientific and musical messages mentioned above may also be perceived through the utilization of metaphors. The science has always been considered as the activity where metaphors play only negative roles, obscuring the distinct and clear language of a scientific discourse. It is this difference, in relation to metaphor, between the language of art and that of science that has been stressed by T. Kuhn when he noticed that while writing a work in science, the aim of the scientist is to get rid of any metaphors that are usually a preliminary stage of the final formulation he tries to achieve.[21] As for art, metaphor is the aim in itself. The understanding of music is metaphorical in its essence, if not to consider special, programmed music, where the unheard shapes the rationalized understanding of the music. But even in this case music overcomes the fixed meaning of its program.

Although the information one gets out of music cannot be defined in a unilateral way it is largely due to this property of flexibility that music can contain and transmit knowledge that is not available by scientific means, and through scientific discourse. For it is not out of a scientific approach that one can get all the information about the world, and the ways of modeling the world cannot be reduced to scientific models. The point of view of composer and ethnomusicologist G. Mikhailov is of special interest in this context. Mikhailov elaborates a very interesting theory of the musical interpretation of the world, having based it both on its own creative activity and on the deep knowledge of music of Eastern civilizations. He considers

music as a method of modeling the most complicated and often unarticulated pictures of the world, or as the worldview that is appropriate for the given civilization.[22] Insisting that music created in different musical cultural traditions needs as much interpretation as literature written in different languages, and attracting attention to the formal meaning musical tradition might have in some Eastern cultures, Mikhailov proposes his own way of defining music. Music is considered, in his approach, as something different from sound, for it is something much more complicated and developed. As he puts it, ". . . every music is a system" and one can distinguish different types of music departing from the types of organization of music.[23] The two main types of music are singled out in this approach: "The first are the texts based on using rather developed grammar principles, the texts temporal development of which is marked by qualitative internal transformations. The second are generated communicational regularities, some adopted momentum associated with scanning the text and adequate reception of expressive characteristics." Here the main property of music is singled out—that of being a means of communication and thus a means of the transfer of information. The music differs in the level of "sophistication" as to the structure and level of development of the "language" which it uses. In any case it is supposed to be communication (and Mikhailov even stresses in one of his works the only when communication has emerged can one speak about music). It is in this sense as well that in all cases, to be music there must be a system, and by definition only a system may be called music. If one accepts this point of view, one should distinguish pre-music, post-music, and the like, the notion of music being reserved for a perfect system. Then, to put sound in this context, one should consider it as a music generating surroundings.

This approach presupposes the unique and organized structure of music —one that considers it as a whole, structured entity, as a perfect system. But it is exactly the perception of nature as a system that is typical of scientific methods, for they presuppose the establishment of definite and fixed links between all natural phenomena based on the knowledge of the laws of nature. The question now emerges as to whether there is a contradiction between the rigid system of organization and the multiple meanings that can be ascribed to music.

The answer consists in examining the evolving, interacting character heard music has. And it is the temporal character of heard music that makes European philosophers wonder at the secrets of the possibility of musical perception as a whole system, each new sound having been merged with a previous one, and destroyed by the new or forthcoming. This particularity

of music (which has been discussed by E. Husserl) makes more evident the role of the unheard in music, and the role texts play in singling out its meaning. For words, texts have a nontemporal character and thus may be fixed and perceived in a unique way. Here Mikhailov brings attention to the fact that *visual* does not always indicate *notation* (what ever type of notation that may be), and that the particularity of Eastern music consists in its different principles of organization, which vary from the European units of musical work. Mikhailov insists that what might seem a simple improvisation to a person accustomed to the European musical tradition reveals instead different laws of music organization. It is with these different patterns that *both* visual and audible representations are linked in European and in various Eastern traditions, the latter also differing among themselves.

From another angle, the idea of music being considered as a system emphasizes music perceived as a whole, as an interacting, closed entirety, but this property of wholeness does not exclude the variety of the meanings that may be represented and transformed. It is exactly the multitude of these meanings (although—and this is extremely important—a limited set of meanings) that has made it possible for music to express what definite, straight scientific discourse fails to do.

Beneath the multitude of musical meanings there lies a fixed syntax of music, which is realized by its form, a form that may be expressed, as to the harmonies it contains, by mathematics itself. But if the harmony of music is described by numerical relations, it is one of the main achievements of the science of modern times that mathematics can be used in the description of nature. The conviction that "nature speaks mathematical language" has been one of the pillars of modern science. As such, the regularities in nature are conditioned by strict mathematical laws, the same as the laws of harmony in music are depicted by strict mathematical relations. And it is in this sense that the methods of making audible the silent music of the spheres, in the Middle Ages—or later, in the time of Kepler—may be considered to be of a scientific character.

Music is in itself a special type of modeling the world where it can be considered a perfect system, this quality distinguishing it from other types of expressions. Music cannot be ascribed unilateral meaning unless it is a music with some written, and—as it often means—some unheard, components. In order to get an understanding of music one should consider that its meanings form a fuzzy set, and a multitude—although a limited multitude—of meanings can be ascribed to a concrete musical piece. One of the reasons why it is the unheard that is supposed to fix a unilateral type of understanding to music might be perceived in the atemporal character of a

written piece, in contrast to the ever-mixing, ever-interacting sequences of sounds in the music heard.

The special type of mathematical links connecting scientific expressions and musical harmonies is limited only to the *formal* type of musical relations—that is, to its syntax in contrast to the semantic value it plays in science. It is this special character, both of mathematical involvement and of the undefined, many-valued character of the *meaning* in music, that makes it an appropriate instrument with which to model the world, in a much more subtle way than science can.

Notes

1. V. E. Eremeev. *The Technical Design of the Antropocosmos*. Moscow, 1993, 184.
2. I. A. Gerasimova. *Music and Spiritual Creativity: Problems of Philosophy*. 1995, 87, note 6.
3. *Fragments of the Early Greek Philosophers*. Moscow, 1989, 147.
4. A. Koestler. Les somnambules. Paris, 1960, 29.
5. I. A. Gerasimova. *Music and Spiritual Creativity*, 89.
6. *Patterns of symmetry*. Eds. M. Senechal and G. Fleck. Amherst, MA, 1977.
7. A. I. Miller. "Imagery and Metaphor: The Cognitive Science Connection. *Multidisciplinary Approach to the Cognitive Content of Metaphor*. Ed. Z. Radman. Berlin, 1995, 199–224.
8. R. Lennoy. *The Speaking Tree*. London, 1975, 278.
9. W. P. Dougherty. "On Musical Semiotics: the Role of Directional References in Musical Signification." *Semiotics 1990*. Ed. K. Haworth et al. New York, 1993, 3.
10. Ibid., 4.
11. P. Kivy. *Music Alone: Philosophical Reflections on Purely Musical Experience*. Ithaca: Cornell U. P., 1990.
12. G. McFee. "Meaning, and the Art-Status of 'Music Alone'." British Journal of Aesthetics 37 (1997): 31–46.
13. A. Clark. "Is Music a Language?" 1982. Preprint.
14. I. A. Gerasimova. "Semantic Analysis of a Musical Notation." *Logical Studies* 3 (1995): 314–51.
15. S. E. Worth. "Wittgenstein's Musical Understanding." *The British Journal of Aesthetics* 37 (1997): 158–67.
16. Ibid., 164.
17. D. R. Hofstadter. Goedel, Escher, Bach: an Eternal Golden Braid. Sussex. 1979
18. D. R. Hofstadter. Pattern, Poetry, and Power in the Music of Frédéric Chopin/ D. R. Hofstadter. Metamagical Themas: Questing for the Essence of Mind and Pattern. NY. 1985, 173–189.
19. Ibid., 180.
20. *Metaphor and Thought*. Ed. A. Ortony Cambridge, 1970.
21. T. Kuhn. The Essential Tension. New York, 1985.
22. I would like to thank his widow, M. Mikhailova, and his pupil and collaborator M. Karatygina, who made it possible for me to read his papers and lectures.
23. G. Mikhailov. "Music Versus Phonos: How Hegemony of Discursivity Suppressed Natural Creativity in Sphere of Sound (a Trial of Systemological Approach)." VII European Seminar in Ethnomusicology. Prepublication of conference papers. Berlin, 1990, 345. In this interpretation, the chance music by J. Cage is not a system and thus not music.