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Decoding the Musical Message via the Structural Analogy between Verbal and Musical Language

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"Music is the universal language of mankind."
Henry Wadsworth Longfellow (1807-1882)

Abstract: The topic approached in this paper aims to identify the structural similarities between the verbal and the musical language and to highlight the process of decoding the musical message through the structural analogy between them. The process of musical perception and musical decoding involves physiological, psychological and aesthetic phenomena. Besides receiving the sound waves, it implies complex cognitive processes being activated, whose aim is to decode the musical material at cerebral level. Starting from the research methods in cognitive psychology, music researchers redefine the process of musical perception in a series of papers in musical cognitive psychology. In the case of the analogy between language and music, deciphering the musical structure and its perception are due, according to researchers, to several common structural configurations. A significant model for the description of the musical structure is Noam Chomsky's generative-transformational model. This claimed that, at a deep level, all languages have the same syntactic structure, on account of innate anatomical and physiological structures which became specialized as a consequence of the universal nature of certain mechanisms of the human intellect. Chomsky's studies supported by sophisticated experimental devices, computerised analyses and algorithmic models have identified the syntax of the musical message, as well as the rules and principles that underlie the processing of sound-related information by the listener; this syntax, principles and rules show surprising similarities with the verbal language. The musicologist Heinrich Schenker, 20 years ahead of Chomsky, considers that there is a parallel between the analysis of natural language and that of the musical structure, and has developed his own theory on the structure of music. Schenker's structural analysis is based on the idea that tonal music is organized hierarchically, in a layering of structural levels. Thus, spoken language and music are governed by common rules: phonology, syntax and semantics. Fred Lerdahl and Ray Jackendoff develop a musical grammar where a set of generating rules are defined to explain the hierarchical structure of tonal music. The authors of the generative theory propose the hypothesis of a musical grammar based on two types of rules, which take into account the conscious and unconscious principles that govern the organization of the musical perception. The structural analogy between verbal and musical language consists of several common elements. Among those is the

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hierarchical organization of both fields, a governance by the same rules – phonology, syntax, semantics – and as a consequence of the universal nature of certain mechanisms of the human intellect, decoding the transmitted message is accomplished thanks to some universal innate structures, biologically inherited. Also, according to Chomsky's linguistics model a musical grammar is configured, one governed by *well-formed rules* and *preference rules.* Thus, a musical piece is not perceived as a stream of disordered sounds, but it is deconstructed, developed and assimilated at cerebral level by means of cognitive pre-existing schemes.

Keywords: musical perception, decoding the musical message, verbal and musical language, cognitive psychology.

1. Introduction

The topic approached in this paper aims to identify the structural similarities between the verbal and the musical language and to highlight the process of decoding the musical message through the structural analogy between them.

The process of musical perception and musical decoding involves physiological, psychological and aesthetic phenomena. Besides receiving the sound waves, it implies the fact that complex cognitive processes are activated, whose aim is to decode the musical material at cerebral level. During the process of musical perception, the aural analyser does not passively receive sounds, and is not limited to merely carrying to the brain the sound waves captured by the ear. The vibrations of the eardrum are carried to the brain as neural impulses and undergo a number of transformations on account of perceptual processes in which the structure of the sound is segmented and reorganized in rhythmic, melodic and formal schemes; as a result, the musical message is decoded. (Schroder & Driver & Streufert, 1967, pp. 3-7)

The process of musical reception and perception initially drew the researchers' attention on the aspect of emotional experiences triggered by listening to music, according to Behaviourism – a trend in psychology which interprets the mind's phenomena by excluding mental processes. However, Cognitivism – a trend in psychology that emerged in the '60s as a result of renewed efforts to study the mind, reconsidered how human reactions are triggered at cortical level by analysing the information that occurs between stimulus and response. Starting from the research methods in cognitive psychology, music researchers redefine the process of musical perception in a series of papers in musical cognitive psychology. Thus, musical perception and implicitly musical decoding is regarded as a cognitive phenomenon which involves the activation of complex mental mechanisms and operations of preparing, transforming, storing and recovering music information contained in the sensory input. Some of these papers are *Musical Structure and Cognition* de Peter Howell and Ian Cross (1985), *Music Cognition* by Water Jay Dowling

and Dane L. Harwood (1985), *Music, Cognition, and Computerized Sound* de Perry R. Cook (2001) as well as John Sloboda's[1] papers *The Musical Mind. The Cognitive Psychology of Music* (1985), *Musical Perceptions* (1994), *Perception and Cognition of Music* (1997), *Generative Processes in Music* (2000), *Music and Emotion* (2001), *Exploring the Musical Mind* (2004), *Psychology for Musicians: Understanding and Acquiring the Skills* (2007).

2. Decoding the musical message via the analogy between language and music

In the case of the analogy between language and music, deciphering the musical structure and its perception are due, according to the researchers, to several common structural configurations.

2.1. Noam Chomsky and Generative Grammar

A significant model for the description of the musical structure is Noam Chomsky's generative-transformational model. Leonard Bernstein considered that the linguistic system proposed by Chomsky can be applied to music and that both Chomsky's analytical methods and his terminology are valid (Bernstein, 1984, p. 122).

Fig. 1 Noam Chomsky

The founder of transformational generative grammar, the American linguist Noam Chomsky[2] (Fig. 1) has contributed an original theory which has revolutionized linguistics through its generative models. Chomsky claimed that, at a deep level, all languages have the same syntactic structure, on account of innate anatomical and physiological structures, that became specialized as a consequence of the universal nature of certain mechanisms of the human intellect (Nierhaus, 2009, p. 4). Discussing the importance of the role played by heredity in the development of the intellect, Chomsky takes part in the debate known as the controversy

[1] John Anthony Sloboda (b. 1950) studied psychology at Oxford and London, music at Royal Academy of Music, London; Professor in Psychology and Director of Unit for the Study of Musical Skill and Development, University of Keele, Staffordshire, Director of the journal Psychology of Music, associate editor at Quarterly Journal of Experimental Psychology.

[2] A famed professor in linguistics, Avram Noam Chomsky (b. 1928, Philadelphia) with the Massachusetts Institute of Technology (MIT), best known for his *Theory of generative grammar* and for his contributions to the field of theoretical linguistics; he has revolutionized modern linguistics through his generative models. Among his linguistics works are *Topics in the Theory of Generative Grammar* (1966), *Language and Mind* (1968), *Studies on Semantics in Generative Grammar* (1972), *Modular Approaches to the Study of the Mind* (1984), *The Architecture of Language* (2000).

between Inneism and Constructivism (1975), against the Swiss psychologist Jean Piaget (1896-1980), who was the supporter of the view that linguistic structures are acquired in the process of language acquisition (Piattelli-Palmarini, 1980). Piaget claimed that environment and the experience acquired had a crucial role in human development, but did not completely deny the role of heredity in the functioning of the brain according to innate principles; however, he challenged the idea of excessive cerebral specialization and stated that "linguistic constructions appear not earlier than the age of one and a half, after the development of sensory-motor thinking has made some progress. In the process of acquiring experience, schemes are created, which are organised and thus enable the gradual creation of the complex structures of language and thought. [...] Perception, thinking, language imply the synthesis and the construction of sense related data, which are closely linked to our reactions and actual actions on reality" (Cosmovici, 1996, p. 92).

Chomsky's theory has revolutionized linguistics and has influenced research in many other fields: psychology, logic, mathematics and music. Chomsky's studies supported by sophisticated experimental devices, computerised analyses, algorithmic models, have identified the syntax of the musical message, as well as rules and principles that underlie the processing of sound-related information by the listener; this syntax, principles and rules show surprising similarities with the verbal language.

2.2. Heinrich Schenker and his analysis of musical structure

Fig. 2 Heinrich Schenker

The musicologist Heinrich Schenker[3] (Fig. 2), 20 years ahead of Chomsky, considers that there is a parallel between the analysis of natural language and that of the musical structure, and has developed his own theory on the structure of music, "a system both doctrinal and analytical to understand the music" (Preda Ceamurian, 1996, p. 28). Schenker's structural analysis is based on the idea that tonal music is organized hierarchically, in a layering of structural levels. His analytical method identifies "the existence of a particular type of structure, underlying all tonal musical creations of unquestionable value, regardless of the genre or the form (Bach to Brahms, with the exception of Wagner)" (Cucu, 2004, p. 39). His analysis starts from the original structure, common to the entire tonal music, called *the Ursatz*, consisting of a melodic and a harmonic line that represents the skeleton of the work. The deep fundamental structure –

[3] Heinrich Schenker (1868-1935), musicologist, music critic, composer, pianist, teacher

Hintergrund or *Background*, is developed using the technique of reduction, by means of intermediary structures – *Mittelgrund* or *Middleground*, up to the superficial form – *Vordergrund* or *Foreground*, which is the written score (Nierhaus, 2009, p. 93). A speaker produces grammatical clauses and sentences by developing each expression as a unified structure that relates the parts of the discourse, between which it creates relations that can be represented as a branching structure. By analogy, the composer is able to create a work because he can infer the structures of the *Ursatz* that guide him in the process of generating the sequences of notes. Schenker's analysis offers a complete view of tonal musical structures through a synthesis of the contrapuntal and harmonic components of the musical piece. The analysis of the form proposed by Schenker uses a rich original symbolism; only the graphical analysis of the score is presented, which does not require additional explanations. The analysis begins by identifying the main pillars of the structure; they are distinguished by harmonic, melodic and rhythmic criteria (Preda Ceamurian, 1996, p. 32). The original nature of Schenker's analysis will be followed by Schönberg's; both musicians were considered progressive theorists at the beginning of the 20th century. Schönberg starts his analysis of musical structures presented in his theoretical writings from an entity he named *Grundgestalt.* It designates a basic musical motif whose role is that of generating the musical form (Dudeque, 2005, p. 137).

2.3. Musical and linguistic structure. Phonology, syntax, semantics

Schenker's and Chomsky's research points present surprising similarities between spoken language and music, between linguistic and musical structure. Thus, spoken language and music are governed by common rules: those of phonology, which studies the selection of a finite number of phonemes out of an infinite number of sounds, those of syntax, which studies the combinations of sounds and of words, those of semantics that studies the meaning of these structures and their combinations.

Phonology (or functional phonetics) studies the sounds in a particular language, from a functional point of view, the manner in which stress is placed on the word and in the sentence, the various intonational patterns of the languages and of sentences. The smallest unit of sound in language, the phoneme, which can change the meaning of a word significantly, represents a class of sounds occurring at a certain frequency and duration; it constitutes a class through which the language is perceived at the syntactic and semantic level. Phonology studies the mechanisms that allow the speaker, at the earliest age, to make the distinction between sound duration and the various manners of pronunciation, as for example that between two different consonants. In musical phonology the phoneme is the musical note, the sound. Each note is perceived as a member of a scale where all the other sounds are in an interval

relationship to each other. The difference between the various manners of producing a sound is achieved in a similar manner, in the case of the violin, for example, the difference between a pizzicato note and a sound created by the draw of the bow, or the classification of rhythmic schemes according to their duration and frequency in musical works (Sloboda, 1988, p. 54).

Syntax is that part of linguistics that studies the way words are organized and structured in larger units, and the relations between them; the units are the phrase and sentence. In the syntax of a language the elements of a sentence are related to each other grammatically, but also psychologically; the functions of language favour unity and stability. These structural relationships occur similarly in music; the musical syntax represents the organization of elements in the musical language and is an important component of the musical style (Snyder, 2000, p. 201). Thus, the syntax of music studies the rules by which musical signs are combined in a piece. Each musical culture, each period, each composer has its own musical syntax. Starting from the analysis of works belonging to Brahms, Debussy and Berio, Michel Imberty[4] demonstrated that music is based on a symbolic representation of the existential experience of time. There are basic rules in language which have to be complied with in order for the spoken language to be understood. The same happens with the musical language: for the musical message to be understood by the listeners, who possess the genetic and cultural code to decode music, a minimal set of rules must be observed. Equally, understanding the musical language depends on the listener's ability to grasp the various structural strategies created by the composer. For music to have a certain style a minimal set of "grammar" rules must be observed: those are rules regarding melody, harmony and rhythm. The way musical language is structured in modules and the way in which the modules are linked reflect creative processes that underlie the mechanisms of musical composition; the listener mainly perceives structural coherence, even if the piece contains decorative details, too.

Semantics is the area of semiotics that studies the relations the signs have with the objects and events to which they refer. One of the prerequisites of a communication system is that its signs should signify and refer to a reality that transcends them. There are various opinions on the semantics of music that lead to two points of view: on the one hand, the musical language is devoid of meaning and exists only as a convention, within specific social groups, within specific historical and cultural contexts; the concept of musical semantics emerges contextually, closed upon itself; on the other, semantics is studied in terms of both the relationship between sound and extra-musical reality, which is mainly emotional-attitudinal, and also as an intertexture of sounds that have suggestive powers. The musical language appeals to meanings outside music

[4] Michel Imberty, Professor of Psychology at the Paris Nanterre University, Director of *Centre de Recherche en Psychologie et Musicologie Systématique* (Psychomuse).

and sometimes imitates the sounds of reality; it symbolically refers to events using various musical motifs which trigger or illustrate certain ideas or emotional states.

An interest in semiotics appeared as early as the ancient world: Plato and Aristotle studied signs and the language. Currently this area has become a major interest of modern philosophy. The science of signs, semiotics, branches into three subfields – semantics, syntax, pragmatics – and was founded almost simultaneously by two European linguists, Ferdinand de Saussure (1857-1913) and Charles Sanders Peirce (1839-1914); the latter viewed it as an essentially philosophical discipline, included in the field of logic and phenomenology; semiotics is defined as the science that studies the processes of semiosis. Peirce, a mathematician, physicist and philosopher, known for his research and contributions in the field of logic and epistemology, the founder of Pragmatics and modern Semiotics, identifies a three-sided relation in semiosis, between sign-object-interpreting instances; in this relationship, the sign plays the role of mediator between the world of objects and the inner world of ideas (Jachia, 1994, p. 69). In the semiotics of music, the name was created by Jean-Jacques Nattiez (Nemescu, 1983, p. 13), the relationship between the parts of the musical project imitate the existing relationship between the objects and the events to which they refer – this is the case of music that imitates the dancers' rhythm and movements; this is also the case of the way the musical sign is used to highlight the changes, in the case of the ascending musical scales used to represent the ascent, and the descending scales used to illustrate fall and descent. In this case the process used to create this is similar to metaphor.

2.4. Universal innate structures

A hypothesized musical syntax, based on the analogy between musical and verbal language, has made researchers to pursue – Paul Fraisse (1958), Michel Imberty (1981), Célestin Deliège (1984) – some universal innate structures, biologically inherited. The existence of a variety of musical cultures has made possible the discovery of certain features which are universal, as there are fundamental intercultural differences determined by specific contextual elements. However, certain universal elements have been identified. This is the case of the rhythmic structures individualized by Paul Fraisse: the rhythmic elementary relation between two durations, one of which is the double of the first, in a ratio of 2 to 1 (2:1). Fraisse remarks on the fact that both ternary and binary rhythmic structures derive from this type of relation (Fraisse, 1956, p. 74). A few years after Fraisse's remarks, Constantin Brăiloiu writes the following about the universal nature of children's rhythmical structures: "the documents show that it (the rhythm) is strictly identical in the whole of Europe [...] and outside it, at least in the case of the kabili, the tuaregs, the population of Senegal, from Dahomy and the Sudan, to the indigenous

people of Taiwan. The fact seems all the more striking as, within the children's rhythmic creations, the position of stress is immutable, while the idioms use multiple stress" (Brăiloiu, 1967, p. 125).

The hypothesis of universal rhythmic structures has triggered a search for intervals and universal melodic structures. A study conducted by Michel Imberty must be mentioned here, the one that highlights the presence of a pivotal interval around which the whole structure is built, in all musical scales in children's songs. Similar mobile intervals account for the musical systems that do not pertain to western music (Imberty, 1981, pp. 107-130). Musicologist Célestin Deliége's research of universal musical structures reveals the existence of a three-sided structure, present both in spoken and musical language. This corresponds with the structure of the prosodic organization called anacrusis-accent-ending and labelled ATK – an acronym of the Greek words Arsis (momentum), Thesis (climax), Katalexis (falling action) (Deliège, 2005, p. 211). However, such a structure does not have a universal character, as it is absent from many musical cultures that are based on bipartite structures. The research carried out by Deliége on the structure of phrases in human language emphasizes the fact that the bipartite structure is followed by the tripartite structure in the evolution of language. These experiments indicate the hypothesis of a possible parallel evolution of the ATK structure in the musical language. These findings may lead to the conclusion that there are no rigid structures. Also the role of the differences between listeners, contextual factors and considerations of style of the musical discourse, the sequence of the musical events in time and space during the audition music must be taken into account.

2.5. The Generative Theory of Tonal Music

Fred Lerdahl[5] and Ray Jackendoff[6] published, in 1983, *A Generative Theory of Tonal Music* (1983), a work "in which the influence of the psychology of form is combined with the model proposed by Chomsky's linguistics" (Nattiez, 2005, p. 26). Lerdahl and Jackendoff develop a musical grammar where a set of generating rules are defined to explain the hierarchical structure of tonal music. The authors of the generative theory propose the hypothesis of a musical grammar based on two types of rules, which take into account the conscious and unconscious principles that govern the organization of the musical perception: *well-formed rules* – that describe the perceptual mechanisms that allow an intuitive understanding of musical structure and

[5] Alfred Whitford (Fred) Lerdahl (b. 1943), composer, musicologist, Professor of Musical Composition at Columbia University, New York

[6] Ray Jackendoff (b. 1945) studied with Noam Chomsky at the Massachusetts Institute of Technology (MIT); linguist, Professor of Philosophy, musician (clarinetist); Co-director at Center for Cognitive Studies, Tufts University, Medford, Massachusetts

preference rules – related to the preferences that the listener have at a particular point in the structuring of the sounds; the choice is made from among a series of possible logical solutions (Lerdahl, Jackendoff, 1983, p. 9).

3. Conclusions

The structural analogy between verbal and musical language consists of several common elements. Among those is the hierarchical organization of both fields, governance by the same rules – phonology, syntax, semantics –, and as a consequence of the universal nature of certain mechanisms of the human intellect, decoding the transmitted message is accomplished thanks to some universal innate structures, biologically inherited. Also, according to Chomsky's linguistics model a musical grammar governed by *well-formed rules* and *preference rules* is configured. Thus, a musical piece is not perceived as a stream of disorderly sounds, but is deconstructed, developed and assimilated at cerebral level by means of cognitive pre-existing schemes. The predefined processes are governed by an inherent grammar of the musical language; within the musical message received, there is a morphological structure, which is the carrier of meanings that are different from the structural elements of the piece, which are created and reassembled by the listener to form complex conceptual structures.

References

Ayotte, B. McK. (2004). *Heinrich Schenker: A Guide to Research*. New York and London: Routledge.

Bernstein, L. (1976). *The Unanswered Question. Six talks at Harvard*. Cambridge, Massachusetts: Harvard University Press.

Brăiloiu, C. (1967). Ritmul copiilor [The rhythm of the children]. In Brăiloiu, C. (Ed.), *Opere* [Works], Vol. I (pp. 78-123). Bucureşti: Editura Muzicală.

Chomsky, N. (1978). *Topics in the Theory of Generative Grammar* (Janua Linguarum. Series Minor, Book 59). Berlin: Mouton De Gruyter.

Cosmovici, A. (1996). *Psihologia generală* [General psychology]. Iaşi: Polirom.

Cucu, O. (2004). Conceptele analizei schenkeriene [The concepts of Schenkeriene analysis]. *Muzica*, new series, XV, *1* (57), 39-53. Bucureşti: UCMR.

Deliège, C. (2005). *Sources et ressources d'analyses musicales: journal d'une démarche*. Wavre: Mardaga Editions.

Dudeque, N. (2005). *Music theory and analysis in the writings of Arnold Schoenberg (1874-1951)*. Hampshire: Ashgate Publishing.

Fraisse, P. (1956). *Les structures rythmiques*. Louvain: Publications Universitaires de Louvain.

Gorlée, D. L. (1994). *Semiotics and the problem of translation: with special reference to the Semiotics of Charles S. Peirce*. Amsterdam: Editions Rodopi.

Imberty, M. (1986). *Suoni, Emozioni, Significati. Per una semantica psicologica della musica*. Bologna: Clueb.

Imberty, M. (1981). Tonal articulation and percetual structuring of musical time in children. *Basic musical functions and musical ability* (107-130). Stockholm: The Royal Swedish Academy of Music.

Jachia, P. (2006). *Umberto Eco: arte, semiotica, letteratura*. San Cesario di Lecce: Manni Editore.

Leisi, E. & Watts R. J. (1984). *Modes of interpretation*. Tubinger: Gunter Narr Verlag.

Lerdahl, F. & Jackendoff, R. S. (1983). *A generative theory of tonal music*. Cambridge, Massachusetts: The MIT Press.

Monti, Martin M. (2017). The role of language in structure-dependent cognition. In Moody, M. (Ed.), *Neural mechanisms of language* (81-101). New York: Springer US.

Nattiez, J. (2005). *Istoria muzicologiei şi semiologia istoriografiei muzicale*. Iaşi: Artes.

Nemescu, O. (1983). *Capacităţile semantice ale muzicii* [The semantic capabilities of music]. Bucureşti: Editura Muzicală.

Nierhaus, G. (2009). *Algorithmic composition. Paradigms of automated music generation*. Wien: Springer-Verlag.

Piattelli-Palmarini, M. (1980). *Language and learning: the debate between Jean Piaget and Noam Chomsk*. London: Routledge & Kegan Paul.

Preda Ceamurian, H. (1996). H. Schenker – pro şi contra [H. Schenker - Pros and Cons]. În *Muzica*, new series, VII, *2* (26), 27-48. Bucureşti: UCMR.

Schroder, H. M. & Driver, M. J. & Streufert, S. (1967). *Human information processing. Individuals and groups functioning in complex social situations*. New York: Holt, Rinehart and Winston.

Sloboda, J. A. (1988). *La mente musicale. Psicologia cognitivista della musica*. Bologna: Il Mulino.

Snyder, B. (2000). *Music and memory: an introduction*. Cambridge, Massachusetts: The MIT Press.

Temperley, D. (2001). *The Cognition of Basic Musical Structures*. Cambridge, Massachusetts: The MIT Press.