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Electronic Music and Sonorism

Annotation

The essence of music based on sonoristic technique is the use of "the purely sonoric properties of the tonal material for artistic purposes". Hence the communicational competence between a composer and a listener often boils down to the ability to recognise communicational situations and the composer's selection of appropriate means for the creation of an auditively perceptible sound shape. This auditively perceptible sound shape results from the composer's auditory representations, which in turn reflect his thoughts and influences the shape of the perceptual representations arising in the mind of the listener while consciously listening to music.

In this context, it is not surprising that sonoristic music is rarely made the object of reflection from the perspective of semiotic research and various theories of communication. It would seem more legitimate to employ examples of sonoristic music in reflection from the field of psychoacoustics or the psychology of hearing. And yet sonoristic music is unquestionably a cultural phenomenon, and as such it must subject itself to semiotic-musical reflection. Sonoristics could constitute "a whole new area of musical thinking, straddling music theory, compositional practice and the psychology of hearing".

To my mind, this "new musical thinking" is linked to the fact that in a sonoristic composition, a semantic unit refers to the musical sign that is created by autonomous qualities produced by the musical structure and most often not having an object of reference to extra-musical reality. Sonoristic music is characterised by an exceptional wealth – in comparison with all other music – of musical structures, arising from the huge possibilities for the sonological transformation of pitch material. As Józef Chomiński writes: "Formal structuring assumes the simultaneity of the joint action of all the elements of a work, namely the tonal material, tonal systems, frequency bands, time regulation, states of compression and rarefaction of the sound and its modulation. And different types of structure depend on selection, hierarchy and proportion and the way these elements are treated."

The subject of the research recounted here is the creative attitude that is manifested by composers who are interested in the possibilities for creating a new sounds and ways of organizing sound material that is conceived electronically. The inspirations derived from the theoretical discourse and the practical experiences in the numerous centers of electronic music have resulted in varying, with regard to material, form and the creative strategy application of so-called electronic music. The musical works of composers such as Iannis Xenakis, Karlheinz Stockhausen, György Ligeti, Luigi Nono or Luciano Berio indicate that the experience with electronic music was for them to be either a turning point and had an impact on their later achievements, or accounted for a relatively brief "episode" in the creative attitude, which, however, did not remain without influence on the stylistic idiom of the later compositions. Because electronic music is the music that is created by autonomous qualities of the musical texture produced by the sonological transformation of musical material, the consideration of electronic music as an example of sonorism seems to be fully justified.

Keywords: György Ligeti, Luigi Nono, Luciano Berio, Józef Chomiński.

1. Introduction

I would like to offer some reflections on sonorism and texture music in the light of the thought of Polish musicologist, Józef M. Chomiński (1906–1994). The most important theoretical Chomiński's works (1956: 23–48, 1961: 3–10) in which he coined the term "sonoristics" and its derivatives (for example: sonoristic values, the theory of sonoristics, sonoristic regulation or sonoristic technique), show that "sonoristics" he understood as a new branch of musicological and analytical studies, which is centered on the sound technique of a composition. In the article from 1956 – the first in which he introduced the term – Chomiński undertook an evaluation of the changes that had taken place in the early 20th-century compositional technique up to that time and demonstrated a new methodological approach to the music in question based on developments in contemporary music.

My modest aim is the indication of three main issues that have been undertaken by Chomiński, that is to say: the origin of sonorism, the distinctions between the terms "coloristics", "tone color" and "sonoristic values" as well as the proposal for subdivision of the theory into five categories. I will try to exemplify and explain these separated categories on the chosen works of electronic music.

2. The origin of sonorism according to Chomiński

As to the origin of sonorism Chomiński has indicated mainly three phenomena of the early 20th-century music. The first, he related to the impressionist period, in which the composers have discovered "pure sound" independent from chordal relationships and as the result of this they have developed of new structural principles that are based on the transformations of the fundamental substance of music – the sonus itself. According to Chomiński in the impressionist period, in the context of this, one can note the transformation of melodic and harmonic functions into timbral ones.

The second phenomenon of early 20th-century music is the change of composers' interest from the "content" of musical work to its actual, sounding form. Chomiński has linked the change with the tendency to the penetration of the sonic properties of the musical material. Per analogous to the discoveries of musical aspects of the words and to the shifting the focus from the meaning of the words to its sounding, made by symbolist poets, Chomiński has recognized the composers' tendencies to the shifting the focus from motives, themes of the musical work and their development to its sound qualities.

And finally Chomiński distinguished the new approach to musical composition of the Viennese composers, already seen in about 1913, especially in the works of Anton Webern, recognized by Chomiński as a turning point in the history of the musical technique. These specific features of the new approach were the emancipation of individual notes of melody and the elimination of the bass foundation from the sound structure of musical work. According to Chomiński a complete transformation of melody and harmony from their traditional sense occurred together with the breaking of the melodic line into isolated sounds that were placed in contrasting registers and the use of the bass register for purely timbral effects. Since these changes, melody and harmony have become a sonic universe regulated by rhythm, timbre and registral contrasts, and in the result of it "the structural and expressive roles were taken over by purely sonic values of the work, enriched by registral differences and the wealth of dynamic, agogic, and articulatory means" (Chomiński 1969a: 5).

On the margins of the phenomena observed in early 20th century music, Chomiński discussed also the differences between the terms: coloristics – tone color – sonoristic values. Originally, Chomiński linked the sonoristic element in music with "tone color", the emancipation of which occurred also in the impressionist period. But then, clearly, he differentiated these concepts, emphasizing that coloristics, as it had developed since the Mannheim school and throughout the ninetieth century, is the element of the musical work that has a merely "coloring" role and appears on the basis of other elements, such as harmony, in turn color in music "does not have a visual character, but is simply a substitute term denoting a conscious formation of sonic, sonoristic values" (Chomiński 1969b: 181). Chomiński identified the sonoristic values as a result of utilization sonoristic means, such as: timbre, texture, registers, articulation, dynamics, rhythm agogic and also melody and harmony, although the latter he linked with other elements that interact with each other. According to him sonoristic values are the new autonomous elements of musical work, which encompass all aspects of the work's sonority and they are generated by sonoristic means and their interaction.

3. The theory of sonoristics and its categories

By introducing the new term, Chomiński also attempted to rationalize analytical terminology, to capture the novel sound qualities of 20th-century music that could not be explained satisfactorily by older music theory.

Sonoristic music is rarely made the object of reflection from the perspective of semiotic research and various theories of communication. It would seem more legitimate to employ examples of sonoristic music in reflection from the field of psychoacoustics or the psychology of hearing. And yet sonoristic music is unquestionably a cultural phenomenon, and as such it must subject itself to semiotic-musical reflection.

Sonoristics could constitute "a whole new area of musical thinking, straddling music theory, compositional practice and the psychology of hearing" (Bristiger 1973: 109). To my mind, this "new musical thinking" is linked to the fact that in a sonoristic composition the semantic unit refers to the musical sign that is created by autonomous qualities produced by the musical structure and most often not having an object of reference to extra-musical reality. Sonoristic music is characterized by an exceptional wealth – in comparison with all other musics – of musical structures, arising from the huge possibilities for the sonological transformation of pitch material. As Chomiński wrote: "Formal structuring assumes the simultaneity of the joint action of all the elements of a work, namely the tonal material, tonal systems, frequency bands, time regulation, states of compression and rarefaction of the sound and its modulation. And different types of structure depend on selection, hierarchy and proportion and the way these elements are treated" (1976: 25). He believed that the problems of sonoristic phenomena in 20th-century music required the analysis focus on "the factors shaping the sound of the work, i.e., the selection of performing means, instrumental and vocal texture, dynamics, agogic, articulation" (1969b: 183).

Chomiński introduced the new classification of formal issues which formed the essence of an analytical method that became known in Polish musicology as the theory of sonoristics – "new branch of study, with the sound technique of our century as its subject" (1961: 4). Chomiński subdivided the following categories: sound technology, rationalization of time, formation of horizontal and vertical structures, transformation of elements and formal continuum.

4. Electronic music and its characteristics

Electronic music blossomed in the second half of the 20th century. Not only did it expand instrumental music to a wider range of sound material, but it also opened a new sonic art form – another branch of music, as different from instrumental music as cinema is from theater. Since the inception of the electronic age, the music world has witnessed a veritable flood of extraordinarily diverse creative efforts, at times resulting in music of uncommon richness and diversity.

The subject of the paper is also the creative attitudes that are manifested by composers who are interested in the possibilities for creating a new sounds and ways of organizing sound material that is conceived electronically. Inspirations derived from the theoretical discourse and arising from numerous centres of electronic music resulted in varying with regard to material, form and the applied creative strategy of so-called electronic music. The musical works of composers such as Iannis Xenakis, Karlheinz Stockhausen, György Sándor Ligeti, Luigi Nono or Luciano Berio indicate that the experience with electronic music was for them to be either a turning point and had an impact on their later achievements, or accounted for a relatively brief "episode" in the creative attitude, which, however, did not remain without influence on the stylistic idiom of the later compositions. Because an electronic music is the music that is created by autonomous qualities of the musical texture produced by the sonological transformation of musical material, the consideration of electronic music as an example of sonorism seems to be fully justified.

One of the characteristics of electronic music is its sound materials containing both a pure sine tone as well as a virtual kaleidoscope of noise. Another feature of this music is diversity of the sound transformations. Among them one can mention: a loop, an echo-reverberation, a filtering, a modulation of one or more parameters, a change of reading velocity of the tape (time stretching, transposition), a tape reversing or a spatialization. In this context electronic music has introduced the change of instruments of musical writing – the microphone, the reverberation (with loudspeakers and microphone), the tape and an instrument with keyboard which permitted to vary the reading velocity of the tape (the ancestor of modern samplers), the generator of sound materials, finally the computer and digital software. Thanks to such diversity of musical material and sound transformations, an entirely new vocabulary of sounds could come into being, and an organization of electronic music has been extended beyond the well-known structures of a traditional musical language.

In turn, the music theory has not got yet fully developed the means to confront such a wealth of sound materials. Up to now in research are used such tools as: typomorphology, spectromorphology, spatialmorphology, UST (*unités sémiotiques temporelles*), language grid, something to hold on to factor, new computational approaches (ones to do with structure beyond the level of gesture, and ones to do with live performance, installations or audio-visual works). The main problem of research is the lack of analogous representations to the conventional scores and the presence of different formats of the same electronic music. Compositional techniques are depended on the creative composer's attitude, and an analysis of electronic music is related to the particular musical work. The knowledge of the historical period and instruments typical for musical repertory is fundamental here, because electronic music equipment with their potentials and limits, influence the typology of sound, the compositional process, the performance and the listening. Even if the analyst is not interested in the real process of the technical realization of sound, he should consider these aspects in order to understand at least the compositional and perceptive problems.

5. Electronic music and five categories of the theory of sonoristics

Composers of electronic music, rather than concentrating on conventional units of musical meaning, focus on concrete "sound objects" and their transformations. Since these objects are approached as real, i.e., aurally perceivable phenomena, analysis, according to Chomiński, should begin with the description of the specific performing forces that are used to generate them, the specific kinds of manipulation employed in their execution, and their dynamic features. All these elements form the first category of the theory of sonoristics, which Chomiński called "sound technology". According to him, sound technology "comprises the entire set of procedures associated with the selection and treatment of generators of sound, both traditional and new" (1968a: 129).

Concret PH, 2-track (1958) by Iannis Xenakis in the Philips Pavilion was projected over 425 loudspeakers through an 11-channel sound system. This is an example of *musique concrète*, in which the crackling and hissing of burning charcoal is the only sound source. The main creative attitude was the study of density and the calculation of articulation points for each layer of sound. In the result, the crackling texture evolves in a continuous manner and additionally the music moved along the trajectories through the loudspeakers,

specially using primarily mid-to-high-register grains of sound. According to Xenakis, the effect of the sound technology is "lines of sound moving in complex paths from point to point in space, like needles darting from everywhere" (Rowell 1983: 241). The recorded sound source was cutting into one-second fragments, with numerous transpositions and overdubs. And a granular texture creates a continuum. Using slight manipulation, the main techniques were splicing, tape speed change, and mixing. The piece was composed intuitively, but with using technology. One can note its continuously varying processes and accumulated power with the fluctuating timbre of a rough dust of sound with rare periodic patterns. Frequency and its perceptual feature, the pitch, are hardly controllable here, as it is impossible for listener to integrate differences of pitch and amplitude in such brief moments.

The consideration of time organization in 20th-century musical works led Chomiński to the discovery of two operating procedures which transcended the older categories of meter and rhythm: monochrony and polychrony. Monochronic organization is the regulation of time by the use of a single primary temporal unit to which the most diverse rhythmic and metric patterns can be related; all temporal relationships are relative and independent of the agogic factor. While polychronic organization as rationalization of time (the second category of the Chomiński's theory) is "synthesis of various factors, namely agogic, metric and rhythmic values" (Chomiński 1968b: 107) and this organization has an aleatoric character of an auditory effect. The polychronic organization involves constant variability of dynamic temporal units. In the music that is based on this principle, the temporal flow of sound impulses is measured in seconds, but within these precisely measured spaces the duration of individual impulses remains variable.

Karlheinz Stockhausen's *Gesang der Jünglinge* (1955/56) typically proceeds from a single governing idea. Here, the idea was to seamlessly fuse the sound of the human voice with electronically generated sounds. At West German Radio's Studio for Electronic Music, Stockhausen analyzed sung verses divided into their elementary phonetic components, then incorporated these sounds into a timbre continuum that ranged from pure tones (electronically generated sine waves) to white noise (electronically generated aperiodic sound). In order to construct a smooth continuum that embraced all vocal elements, Stockhausen had to create additional elements to fill in the gaps between them. Using contemporary studio resources, Stockhausen generated sine wave complexes to imitate vowel-like sounds and filtered electronically generated noise to arrive at consonant-like sounds. Once the continuum had been constructed, the composer extracted from it the basic elements and groups of elements he would use in composing. As to organization of time Pascal Decroupet, Elena Ungeheuer and Jerome Kohl indicate four temporal parameters in *Gesang*: "1. the *value*: the fundamental duration, which regulates the intervals of entry between successive complexes; 2. the *duration*: the actual duration of each complex obtained by a positive or negative transformation of the value; depending on the duration/value ratio, the complexes will be partially superimposed or will be separated by a silence; 3. the *group of formants*: the number of 'octaves of durations' within which the durations will be taken for carrying out the various harmonic subdivisions of the duration, the octave grouping being limited to 5 octaves; 4. the *evolutionary form in time*: where the concepts of attack and decay of the sound, developed earlier, take place. The temporal reference grid has seven octaves with seven equidistant subdivisions and extends from four to 512 centimetres, which for a tape playing speed of 76,2 cm/sec corresponds to a scale extending from the twentieth of a second to nearly seven seconds" (1998: 101).

The nature of the specific sound objects of electronic music is clearly far removed from typical melodic and harmonic constructs of tonal music. Therefore – in Chomiński's opinion – the horizontal and vertical structures (the terms used as the third category of his theory of sonoristics) could be discussed systematically only in very general terms. The sound objects of electronic music, as a result of constant balancing between the horizontal and vertical structures, generate purely sonoristic qualities of music.

In 1956 György Ligeti composed *Artikulation* after moving to Cologne into the same building as sound pioneers Stockhausen and Gottfried Michael Koenig. While its reported that he was highly influenced by the crazy electronic sounds he heard coming out of this building; this is one of only two electronic pieces he composed before returning back to the instrumental medium. Ligeti assembled small sound fragments and artificial speech components, using sine-wave, white-noise and impulse generators, plus filtering equipment. He grouped these source ingredients associatively into ten categories, for example: grainy, friable, fibrous, slimy etc. Then from these elements were extracted bits of tape, which were spliced together to make "syllables", "words" and "sentences". Finally, the resultant "language" was subjected to the transpositions, reversals and overdubbing of standard tape manipulation (Steinitz 2003: 80). Therefore *Artikulation* shows constant balancing between the horizontal and vertical dimensions of the composition. In the 1970's, a graphic designer, Rainer Wehinger,

created a "score" for Ligeti's *Artikulation.* The liner notes for the score provide an explanation for what's going on in the music: "The piece is called 'Artikulation' because in this sense an artificial language is articulated: question and answer, high and low voices, polyglot speaking and interruptions, impulsive outbreaks and humor, charring and whispering" (Ligeti 1970).

The fourth category of the discussed theory – distinguished by Chomiński – concerns the transformation of elements. Moreover, the most noticeable kind of transformation one can be found just in electronic music. Chomiński noted that in electronic music "a specific sound object is indeed subjected to transformational manipulations" (1968a: 164). *La Fabbrica Illuminata* (1964) by Luigi Nono is composed for female voices and four-channel magnetic tape that uses noises and speech sounds recorded in a factory. These were combined with choral and electronic sounds and taken through multiple transformations. Chomiński stressed that the transformation is, on the one hand, "only when certain instruments are used in a manner different from that applied formerly, against their natural properties and original purposes; in other words, when generators of melody and harmony are transformed into tools that serve to produce rustling effects and tone colours" (1968a: 164) but also on the other hand he noted that "the evolutionary processes of music in general can be reduced to constant transformations of sonic phenomena" (1968a: 163). In *La Fabbrica* massive vocal tone clusters followed by declarative, fragmented political chants begin the work. The evolutionary processes of this musical work are reduced to constant transformations of such sonic phenomenon as deep rolling sounds, wind-like roars of empty landscapes, voices of muscle-exhausted workers and the sounds of their expended effort, cars rushing past, and the actual and electronically described sounds of turning gears. As the result of this creative attitude Nono has created the work that encompass a variety of sonic phenomena, and the range of the musical material has been extended to include a variety of non-musical sounds, because the sound sources are used against their natural properties and original purposes.

The last category is formal issues. Chomiński's discussion of form in the context of sonoristic regulation was reduced and defined in very general terms such as "the resultant of the interaction among various regulatory elements" (Józef M. Chomiński; Krystyna Wilkowska-Chomińska 1983: 15). Nevertheless, a form of electronic music is not exclusively related with the internal structure of the work, but may point to its surface, that is to say to the level on which the sonic phenomena are heard.

Perspectives for electronic sounds on tape (1957) by Luciano Berio is a nearly seven- minute-long work for two-track magnetic tape. The piece has a pointillist style of writing, has used long tones in juxtaposition to these points later in the respective pieces, it contains spatialization techniques, and it uses dramatic and abrupt changes in dynamic level. The work is organized into eight sections, each set apart by lengthy (usually about 3.5 seconds in length) silences. Within each section one can observe diverse sound of surface of musical form.

6. Conclusions

Analysis of selected parameters of musical works mentioned above confirms the observation that electronic music has got the specific features with regard to a sound material and its utilization to construction of musical form, entirely distinct from musical tradition. Moreover, from the one hand, it includes all categories of the theory of sonoristics that are indicated by Józef Chomiński, and from the other hand, these categories determine the main aspects of musicological analysis of electronic music with its sonoristic point of view.

Acknowledgments. This work has been funded by the National Science Centre in Poland appropriations for science in the years 2012–2015 as research project Grant number 2011/03/B/HS2/03935, Program Opus 2.

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Elektroninė muzika ir sonorizmas

Santrauka

Sonoristine technika sukurtai muzikai esminga tai, kad joje „meniniams tikslams pajungiamos grynai garsinės prigimties medžiagos savybės". Tokiu būdu komunikacinė kompetencija tarp kompozitoriaus ir klausytojo susiaurinama iki gebėjimo atpažinti komunikatyvias situacijas, o kompozitoriaus atveju – dar ir pasirinkti tinkamas priemones klausa suvokiamų garsinių pavidalų kūrimui. Toks klausa suvokiamas garsinis pavidalas kyla iš kompozitoriaus audialinių vaizdinių, kurie atspindi jo mintis ir daro poveikį tam, kokie vaizdiniai suvokimo metu kyla klausytojo sąmonėje, šiam atidžiai klausantis muzikos kūrinio.

Esant tokiam kontekstui nenuostabu, kad į sonoristinę muziką retai žvelgiama iš semiotinių tyrimų ar komunikacijos teorijų perspektyvos. Atrodytų kur kas labiau įprasta pasitelkti sonoristinės muzikos pavyzdžius svarstant psichoakustikos ar girdėjimo psichologijos klausimus. Tačiau sonoristinė muzika, kaip kultūros reiškinys, turi būti atviras semiotinėms-muzikinėms refleksijoms. Sonoristika galėtų tapti „visiškai nauja muzikinio mąstymo sritimi, jungiančia muzikos teoriją, kompozicijos praktiką ir girdėjimo psichologiją".

Mano nuomone, „naujasis muzikinis mąstymas" remiasi duotybe, kad sonoristinėse kompozicijose semantinis vienetas nurodo į muzikinį ženklą, kurį sukuria autonomiškos muzikinių struktūrų ypatybės, neturinčios jokių reikšminių sąsajų su tikrove anapus muzikos. Iš visų kitų muzikos rūšių sonoristinės kompozicijos išsiskiria ypatinga muzikinių struktūrų įvairove, kurią lemia neribotos garso aukščių sonologinių transformacijų galimybės. Pasak Józefo Chomińskio, konstruojant formą vienu metu pajungiami visi kūrinio elementai – garsinė medžiaga, jos organizavimo sistemos, dažnių amplitudė, laiko organizavimo būdai, skambesio kompresijos ir išretėjimo būsenos, kaita. O skirtingus struktūros tipus lemia atrankos, hierarchijos ir proporcijų kriterijai, būdas, kuriuo šie elementai jungiami kūrinyje.

Minėto autoriaus darbe tyrinėjama kūrybinė nuostata būdinga kompozitoriams, kurie domisi naujų garsų kūrimo galimybėmis ir būdais organizuoti elektroniškai apdorojamą garsinę medžiagą. Inspiracijos, kurias teikė daugelyje elektroninės muzikos centrų plėtojamas teorinis diskursas ir kaupiama praktinė patirtis, vadinamojoje elektroninėje muzikoje įgijo pačius įvairiausius pavidalus pasirenkamos medžiagos, formos ir kūrybinių strategijų požiūriu. Tokių kompozitorių kaip Iannis Xenakis, Karlheinzas Stockhausenas, György'is Sándoras Ligeti, Luigi Nono ar Luciano Berio kūriniai aiškiai rodo, kad elektroninės muzikos kūrybos patirtis jiems tapo tam tikru posūkio tašku, lėmusiu jų vėlesnius laimėjimus, arba tebuvo trumpas kūrybinio darbo „epizodas", neišvengiamai šiek tiek paveikęs ir jų vėlesnių kūrinių stilistiką. Elektroninė muzika kuriama remiantis autonomiškomis muzikos faktūros ypatybėmis sonologiškai transformuojant garsinę medžiagą, todėl visiškai pateisinama į ją žvelgti ir ją nagrinėti kaip vieną iš sonorizmo atvejų.

Reikšminiai žodžiai: György Ligeti, Luigi Nono, Luciano Berio, Józef Chomiński.