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Pierre Schaeffer's Attempt to Create a Method of Electro-acoustic Music Analysis

Abstract

Since the middle of the 20th century, electro-acoustic music has become very important in the contemporary music landscape. Electronic elements have forced researchers focused on electro-acoustic music to develop analytical methods. Pierre Schaeffer was a pioneer in systematization of new sounds. His achievements in this area are fundamental, serving nowadays as a reference point for dynamically developing new concepts of electro-acoustic music analysis. The popularization of Pierre Schaeffer's method in Poland began with Włodzimierz Kotoński who partially translated *Traité des objets musicaux* into Polish. In his *Traité*, Pierre Schaeffer coined one of the most important terms, i.e. a sound object, which is a unit of electro-acoustic music. A sound object is related to reduced listening and is purely perception-oriented. By using a sound object in the context of music, the composer creates a music object. Schaeffer's goal in creating an analytical method was to design a new language which could be used in a discussion of "non-classical" sounds. In 1966 Schaeffer introduced his PROGREMU *Programme de la Recherche Musicale*, which covers the following five stages of musical research: typology, morphology, characterology, analysis, synthesis. In typology and morphology sound

objects are isolated from the context, then classified and described—it is a detailed stage of unit systematization. In the next step, sounds are grouped in genres according to their character. Sound objects are analyzed and specified in their musical context. With this information, the composer can make a new musical object. Each stage has its specific function; however, musical composition maintains its primary role. Schaeffer's method is dynamic in character and it is constantly developed because of new sounds.

Keywords

Pierre Schaeffer, typology, sound object, electro-acoustic music

Since it emerged in the middle of the 20th century, electro-acoustic music[1] has played a gradually increasing role in the area of contemporary music. Introducing new performance techniques, e.g. electronics, enforced the researchers not only to try to transfer the methods used hitherto in relation to the traditional instrumental music into the area of new technology, but also to create innovatory methods of analysis. The pioneer of the works leading to the systematization of a new sound (by definition non-musical, non-instrumental) was a composer and music theoretist, Pierre Schaeffer, whose achievements have fundamental character and are a crucial point of reference for many contemporary, still dynamically developing concepts of the electro-acoustic music analysis. In Polish musicological literature, however, they are not mentioned very often and even the

[1] In order to standardize the terminology, I will use the most common term nowadays, "electro-acoustic music" (in Polish: "muzyka elektroakustyczna"), that has a very inclusive character and can hold inside numerous phenomena from the field of availing electronic technology to generate and explore the sound material. See: S. Emmerson, D. Smalley, *Electro-acoustic Music*, [in:] *The New Grove Dictionary of Music and Musicians*, ed. S. Sadie, vol. 8, London 2001, pp. 59–67. It should be noticed that in Polish music publishing this term begins to displace the term "electronic music" that was popular thanks to Włodzimierz Kotoński. Compare: W. Kotoński, *Muzyka elektroniczna*, Kraków 1985; ed. 2, Kraków 2002.

original analytical concept of Schaeffer has not been the subject of a systematic and overall report yet.[2] The following article is an attempt to bridge the gap in this field.

Reception of the Schaeffer's concept in Polish literature concerning theory of music was initiated by Włodzimierz Kotoński, who also translated a fragment of Schaeffer's *Traité des objects musicaux*[3] into Polish, which was found in the archive of the Polish Radio Experimental Studio in Warsaw.[4] The synthetic reconstruction of Schaeffer's analytical method that will be displayed in this article is basically based on the existing literature and refers to this, hitherto unknown, source.

Perception of Electro-acoustic Music: Sound Objects

The characteristic feature of electro-acoustic music is its acousmatic character. The term "acousmatic" (from Greek: *akuō*: "I hear") refers to the term *musique concrète*,[5] created by Schaeffer, that means, on the one hand, the results of the composer's immediate work with the sound material, without the medium of symbolic system of notation; on the other, the underlining of the fact that particular material is based on the previously existing recordings (musical or environmental sounds). Acousmatics relates to music that has been recorded before and is performed without instrumental or vocal accompaniment; also, it is not processed during the concert; in other words, it exists only on

[2] Most articles about Pierre Schaeffer concentrate on the definition of the sound object. Kotoński wrote about Schaeffer's new compositional concept in his book *Muzyka elektroniczna* (compare: ref. 1). Ewa Schreiber analyzed the Schaeffer's theory in the context of metaphor in the book titled *Muzyka i metafora, Koncepcje kompozytorskie Pierre'a Schaeffera, Raymonda Murraya Schafera i Gérarda Griseya,* Warszawa 2012. Alicja Jarzębska created the base for the analytical concept in the book *Z dziejów myśli o muzyce. Wybrane zagadnienia teorii i analizy muzyki tonalnej i posttonalnej*, Kraków 2002.

[3] P. Schaeffer, *Traité des objets musicaux. Essai interdisciplines*, Paris 1966.

[4] P. Schaeffer, *Traktat o przedmiotach muzycznych,* transl. into Polish: W. Kotoński, [date unknown], the property of Prof. Krzysztof Szlifarski.

[5] Concrete music is based on the sounds that have been recorded before, and then electronically converted.

the tape.[6] The essence is the fact that a listener cannot see the source of the sound and the speaker is treated only as a transmitter. This kind of music can consist of both recognizable sounds (instruments, voices, sounds of surrounding world), and these ones that were generated in the computer studio. Reception of this kind of music is different because a listener does not use sight and, not seeing the performer, cannot receive emotions; at the other end of the spectrum, a human can concentrate more of what he or she hears. Therefore, acousmatics indicates the subjectivism of impressions that are caused by sounds: it relates to perception. It is Pierre Schaeffer who, in his *Traité des objects musicaux*, described the acousmatic character of music. In order to categorise the sounds not strictly connected with their source, he created a new musical entity: sound objects (*objects sonores*).[7]

The sound object refers only to a situation of acousmatic character and is not connected with what evokes it, i.e. source of sound. According to Schaeffer, it is an abstract sound formation, which "[…] completely exists in our perceiving subconscious mind".[8] The musical object is the effect of physical changes (in case of the tape) and manipulations of the recorded sounds. Manipulation of the tape does not create a new variant of an item, but a new item. "If the listener is not able to distinguish the connection between different sound effect, even when memories and will of comparison help it, we can say that manipulations, beginning with the same signal (independently from our intentions) let it create different sound objects",[9] as Schaeffer says. Thanks to technology, it is possible to show the listener a particular sound event can have a different interpretation depending on the context in which it will exist.

In his *Traité*…, Schaeffer indicates that *objets sonores* are not a state of soul in their subjectivity. The sound objects are elusive: they can

[6] Compare: W.L. Windsor, *A Perceptual Approach to the Description and Analysis of Acousmatic Music*, PhD thesis, Sheffield 1995, p. 11, [online] http://www.personal.leeds.ac.uk/~muswlw/pubs/lwthesis.html [accessed: 18.08.2015].
[7] P. Schaeffer, *Akuzmatyka*, [in:] *Kultura dźwięku. Teksty o muzyce nowoczesnej*, ed. Ch. Cox, D. Warner, transl. into Polish by J. Kutyła, Gdańsk 2010, pp. 106–122.
[8] *Ibid.*, p. 110.
[9] *Ibid.*, p. 111.

be easily described and analyzed. Electro-acoustic music holds new qualities, not only sound qualities but also those related to space or time. The high level of abstractness, lack of the 'performer-listener-performer' relation during concerts causes that the perception of the compositions devoid of a visible source of sound can be more challenging, but, as Schaeffer underlines, acousmatics proposes to "deny the instrument and cultural conditioning, to put in front of us the sound and its musical «possibility»".[10]

It is worth specifying that the medium (tape, CD, generally: sound signal) cannot be a sound object because the object is what the human ear records. In order to create a piece for tape,[11] the composer uses more than one sound object.

Sound Objects from the Phenomenological Perspective

Schaeffer divides listening into objective, oriented on the subject of reception, and subjective, oriented strictly on the perception itself. The second division that he makes is into abstractive listening, in which the subject is reduced to the features describing the perception of creating the language, expressing the meaning, and concrete, which consists of discovering the reason for a non-modified sound.[12] In Schaeffer's opinion, as Ewa Schreiber notices, the subjective function of listening indicates the function of reduced listening, that lets us obtain the sound object. It means that reduced listening exists only when the listener is not interested in the reason for which the sound was created nor its sense.[13]

The researcher also noticed that Schaeffer in his view on the definition of the sound object is inclined to the direction of the phenomenology

[10] *Ibid*., p. 120.
[11] This term includes all electric, magnetic and digital media of music.
[12] See: M. Chion, *Guide to Sound Objects: Pierre Schaeffer and Musical Research*, transl. into English by J. Dack, Ch. North, 2009, p. 21, [online] https://www.academia.edu/2574473/Guide_to_Sound_Objects._Pierre_Schaeffer_and_Musical_Research_trans._John_Dack_and_Christine_North [accessed: 21.06.2017].
[13] See: E. Schreiber, *op. cit.*, p. 178.

and thoughts of such representatives of this philosophical movement as Edmund Husserl or Maurice Merleau-Ponty.

> This discipline, according to the composer, corresponds the best with the immediate character of experiencing of the object, at the same time allowing to avoid the multiplicity of philosophical questions that usually arise when it comes to considering terms from the field of epistemology and dismiss from the contemporary purposes of analysis.[14]

Beginning from the Husserl's thesis that "any psychological event has an equivalent in the process of phenomenological reduction that is a clear phenomenon, showing its immanent essence […] as the absolute",[15] Schaeffer describes the sound object in a different way than the source of sound (its medium) or individual state of a listener. The composer therefore leaves acoustics and psychology of hearing to go further. "The sound object, understood as the content of hearing experience, remains the correlate of reduced hearing. Both the action and its object designate and shape each other", as Ewa Schrieber explains.[16] Following the cited author, words of Carlos Palombini can be recalled:

> The sound object is not an aesthetic product but the significant practice, not structure, but, structuralizing, not an object, but work and playing, […] not an old musical piece, but the Text of Life.[17]

The aim of reduced listening is to observe the sound object. It is a process which requires experience. Moreover, the sound object, when it is put in the context of wider structure, becomes the musical object, and in this case relation between sound objects should be analyzed.

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[14] *Ibid*., p. 179.
[15] E. Husserl, *Idea fenomenologii,* transl. into Polish by J. Sidorek, Warszawa 1990, p. 55. Translation of a citation from: E. Schreiber, *op. cit*., p. 180.
[16] E. Schreiber, *op. cit.*, p. 181.
[17] C. Palombini, *Musique Concrete Revisited*, [online] http://www.rem.ufpr.br/_REM/REMV4/vol4/arti-palombini.htm [accessed: 17.08.2015]. Traslation of the citation from: E. Schreiber, *op. cit*., p. 199.

The Use of Sound Objects in a Composition

From the technical point of view, Schaeffer's approach to create *musique concrète* can be recognized, according to the systematics introduced by Włodzimierz Kotoński, as experimental, in contrast to the conceptual way. The first attempt consists of using sounds recorded before, giving them a new meaning in a new context, like in *musique concrète*, what can be compared with collage.[18] The second way is a realization of the preliminary concept of a piece that can be found in almost every detail of the piece. What is superior then is creating sounds from the base using electronic apparatus.[19]

People are surrounded by, generally speaking, noise: there is no situation in which people would be excluded from sounds. Thanks to possibilities that the brain has, we are able to ignore the sound environment that surrounds us. If a sound is louder or we expect a sound, in this case passive listening evolves into so-called intentional listening. Kotoński noticed that, on the basis of the collected sound experiences correlated with visual and tactile experiences, people are able to extract acoustic signals that they are familiar with from the environment through the following mechanisms:

1. Perceiving particular parts of the area as significant signals;
2. Identification of sources for these signals;
3. Understanding of their meaning, that is interpretation.[20]

Composers, when creating *musique concrète*, use fragments of the sound environment. The fundamental task for the artist is to distinct sound objects. On the base of Schaeffer's work—following Kotoński—it must be noticed that the primary element of *musique concrète* are balanced objects (*objet équilibré*) that are characterized by the following features:

[18] See: W. Kotoński, *Muzyka elektroniczna*, Kraków 2002, pp. 126–129.
[19] It is related to the term *elektronische Musik*, created in the 1950s among composers associated with the electronic studio in Cologne.
[20] W. Kotoński, *op. cit.*, p. 132.

> It is an object neither too short nor too long; neither too simple nor to complicated, similar to a short word or syllable in speaking, to a chord on the piano, tremolo on the drum or rubbing a piece of steel with a bow. Objects at this level of complexity allow to distinguish themselves easily from other sound phenomena; they can be divided into smaller but still recognizable episodes, they are proper material for building more complicated structures from them. Balanced objects are therefore extremely convenient from the music for tape's composer's point of view […].[21]

Kotoński pays attention to balanced objects, because they are crucial for the process of composition:

> The sound object is therefore what can be separated without problem from the sound continuum and be identified as a certain sound unity. Balanced objects are the vast majority of objects that composers of *musique concrète* have to deal with.[22]

Typology

The purpose of Schaeffer's studies on sound objects was to introduce a new language that would allow to talk about "non-classical" sounds. In the electro-acoustic sound material Schaeffer sought a universal approach to music studies in general. As a result, he developed a catalogue of terms and concepts that were formed by music culture.

Music theory created by Schaeffer aimed at adjusting the language of music description to its contemporary shape. The composer displayed it as a PROGREMU, called *Programme de la Recherche Musicale*, that covers five strategies-musical stages of the research: typology, morphology, characterology, analysis and synthesis. Thanks to typology and morphology, sound objects become isolated from the context, next, they are classified and described—it is a special stage of the programme of systematization of objects. In the next stage, sounds, according to their character, can be grouped into genres. Through

[21] *Ibid.*, p. 133.
[22] *Ibid.*

analysis the musical potential of the structures is evaluated. Thanks to this information, a composer can eventually create a synthesis of a new sound object. Several stages play special functions, but still the primary purpose is the composition itself. It must be underlined that the systematization of the sounds, that is the aim of Schaeffer's programme, has not a closed character, his system is dynamic and is subject to continuous rebuilding because composers of electro-acoustic music create new sound qualities all the time.[23]

According to Schaeffer, every yet created system of classification of sounds has failed. From the late 1940s, he analyzed and rejected different methods, before he created the eventual shape of his typology. What was achieved was a typology, the first stage of PROGREMU, so it is the long-shaped attempt to fix inefficiency of traditional systems in relation to electro-acoustic sounds.

Schaeffer's typology has two basic purposes: to isolate a sound object from the context through a phenomenological reduction, and to classify it. This is how Ewa Schreiber explains it:

> A person surrounded by sounds is inclined to reduced listening, which enables us to gradually receive the consciousness of an object. To become familiar with it and to notice its features (typology) is the next stage of research. At the end, it is description, called morphology.[24]

What is extremely difficult is to isolate an object from electro-acoustic music. In traditional sources of sound, such as musical instruments, there are "natural" physical parameters resulting from the physical features of instruments, their form and relation between energy cumulated and distracted, what does not happen in the case of new timbres. It seems that the most objective method of identification of changes of the sound object's energy are criteria of articulation/foundation, because "the moment of impulse, articulation allows to sketch the border of an object, whereas intonation (foundation) makes it stable".[25]

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[23] See: J. Dack, *Systematising the Unsystematic*, [online] http://eamusic.dartmouth.edu/~music3/docs/Dack/SystematizingTheUnsystematic.pdf [accessed: 4.07.2015].
[24] E. Schreiber, *op. cit.*, pp. 196–197.
[25] See: *ibid.*, p. 202.

The criteria of division of sound objects are based on predispositions of human perception. An isolated object can be classified in accordance with three accepted pairs of criteria: mass/facture, duration/variation, balance/originality:

- Morphological criterion. Mass describes the area of space of frequency occupied by the sound object. It covers the scope from a single sinusoidal wave through a constant mass, to a dense spectrum of sound, which is the noise. As Schaeffer explains: "This is the criterion of constancy and variation—simple or complex, and in the case of constancy—exact or only approximate possibility of defining."[26] The facture attached to it refers to possible causes of producing the sound. It is also treated as a way of receiving different types of duration, consisting of imagining the possible causes of producing the sound.[27] In his text, Schaeffer describes facture as "[…] the way in which the energy is conveyed and how it manifests itself in sound duration depending on the sound initiation and sustainment".[28] Schaeffer selected both criteria to be mutually independent.

- Criterion of time. Duration and variation refer to the duration of the sound object. Duration concerns the subjective reception of the sound and categorizing it as (too) short or (too) long. Schaeffer, with help of the measure of duration, makes a distinction between micro-sounds and macro-sounds. On the other hand, variation is related to changes in the dynamics and shape of the sound spectrum in time.[29] It is defined as "[…] the ratio of the deviation (so what changes) to the duration of the change. […] The duration and variation of objects in relation to the criterion of mass or facture would be taken into account".[30]

[26] P. Schaeffer, *Typologia przedmiotów dźwiękowych, kryteria klasyfikacji*, [in:] *idem*, *Traktat o przedmiotach muzycznych*, *op. cit.*, p. 46.
[27] E. Schreiber, *op. cit.*, pp. 203–204.
[28] P. Schaeffer, *Typologia…*, *op. cit.*, p. 46.
[29] See: M. Chion, *op. cit.*, p. 136.
[30] P. Schaeffer, *Typologia…*, *op. cit.*, p. 47.

- Criterion of structural nature of sound. Balance and originality are related to the structural, quality dimension. Balance refers to a certain compromise in the facture of a sound object:

> [Objects are considered] at the appropriate level of perception, so neither too elementary nor too complex. Objects that are too elementary would tend to merge into more memorable structures, conversely—too complicated ones would have the tendency to break down into simpler elements. We can also see that the duration affects the determination of the central group: the term to remember, if it denotes the medium form, it also suggests the appropriate duration, not too short and not too long, of the optimal time required to listen to the object.[31]

The structure of an object can be additionally complicated regardless of its duration. In order to simplify it, Schaeffer classifies objects as balanced and unbalanced. It is crucial to determine

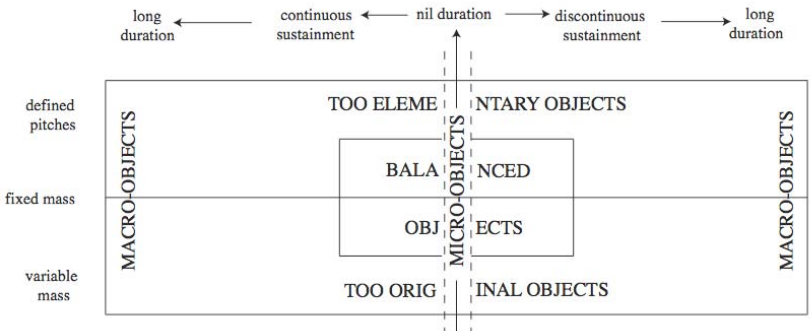
> […] whether they will be a good compromise between too complex and too simple, or they will come closer to structures that, from the point of view of perception, will either be deficient (too elementary) or redundant (too complex).[32]

Originality, however, is equal with the bigger or smaller object's ability to meet expectations as it develops. Lack of originality connects with redundant sounds, redundant originality with eccentric and too unpredictable ones.[33] There is a correlation between originality and balance: "a complicated structure will be, by definition, more original than a simple structure. Originality, however, stands apart where two balanced objects are taken into consideration."[34]

The simplified form of Schaeffer's typology is presented on the diagram based on the criteria of morphology and time (Ex. 1). On the horizontal axis, there are sound objects classified because of the

[31] *Ibid.*, p. 49.
[32] *Ibid.*, pp. 49–50.
[33] See: M. Chion, *op. cit.*, pp. 136–137.
[34] P. Schaeffer, *Traktat o przedmiotach muzycznych…*, *op. cit.*, p. 50.

criterion of time. In the middle of the axis, there is zero that describes micro-objects, e.g. impulses. The farthest from the middle of the axis are macro-objects of a longer duration (on the left there are sustained continuous objects, on the right sustained discontinuous objects, iterated). The intermediate stadium between micro-objects and macro-objects are balanced objects. Horizontal axis refers to mass. Centre of the axis marks fixed mass, and above the middle of the axis there are objects of defined pitch; on the opposite side, there are objects of variable mass. "The more variable will be the mass of the sound, the more it will raise its originality, but also the more it will be exposed to disturbance of structural balance because of complexity of its structure as well as because of rising fortuity."[35]



Ex. 1: Dependence of mass and duration of sound.[36]

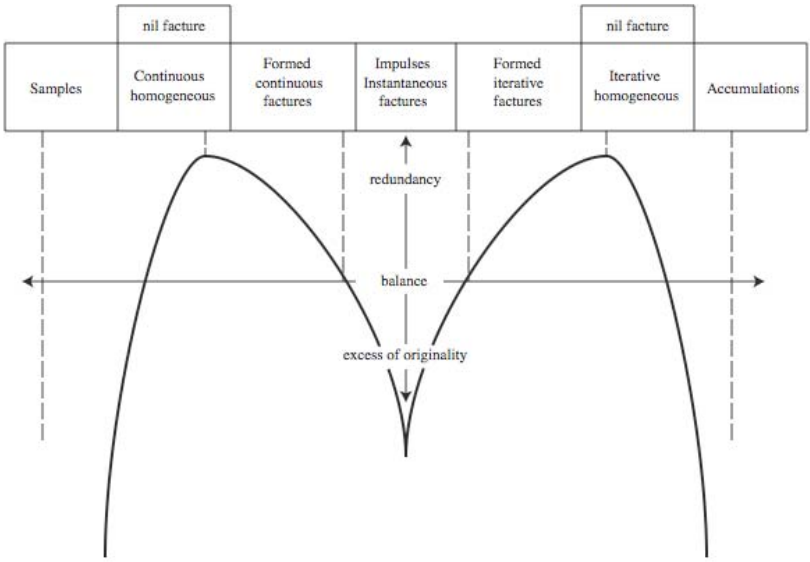
Types of facture can be discussed in the context of duration (Ex. 2), we can differentiate longer sounds (readily perceived) and impulses (faintly perceived). As it goes further from the centre of the axis, leading to right or left, facture starts to have the particular shape—it can be pointed, formed, "zero" or random (irregular samples or accumulations), regardless or the fact if initiation is continuous or discontinuous.

It is up to the researcher to decide which micro-object will be perceived as central (balanced and enough original). Therefore, there are

[35] *Ibid.*, p. 53.

[36] M. Chion, *Guide to Sound Objects. Pierre Schaeffer and Musical Research*, transl. by J. Dick and Ch. North, 2009, p. 125.

two approaches possible: either the point of reference will be objects used in the analyzed composition, or the analysis will be done with respect to all existing sound objects.



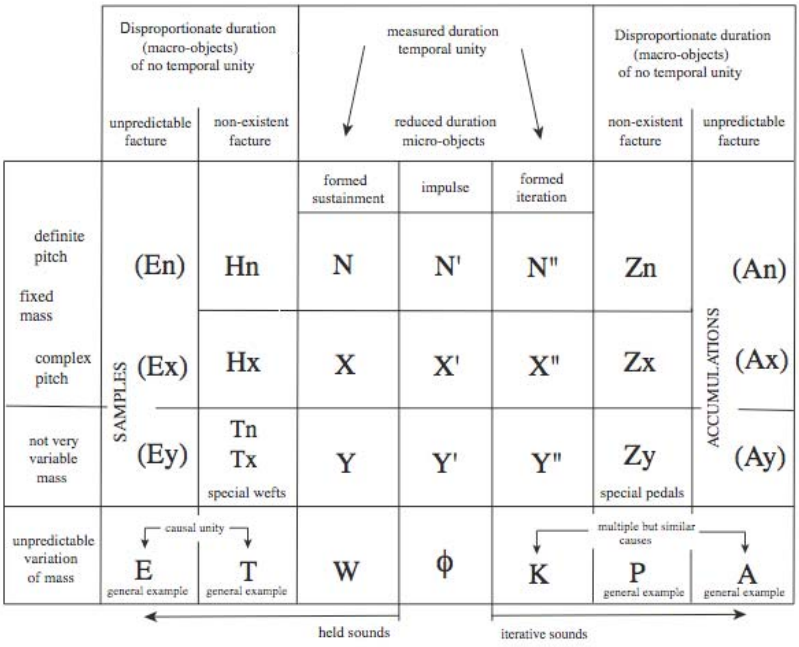
Ex. 2: The excess or lack of balance of sound objects.[37]

The final purpose of typology is to define usefulness of the sound object to create music. According to Schaeffer, every sound object can be classified, but not every sound object will be a musical object. Preferred sounds are characterized as following:

> Since our intention is to create music, our typology should prioritize the object that, for the musical ear, will be presented a compromise between what is easy to learn, easy to define and easy to remember (so, at the same time worth remembering).[38]

For the compositional purpose, the most adequate are balanced and sufficiently original objects that fit in the central part of the table TARTYP (*Tableau récapitulatif de la typologie*; Ex. 3).[39]

[37] *Ibid.*, p. 126.
[38] P. Schaeffer, *Traktat o przedmiotach muzycznych…*, *op. cit.*, p. 54.
[39] A kind of "translation" of the original Schaeffer's table TARTYP, which M. Chion put in his own paper. See: *Idem*, *op. cit.*, pp. 138–139, table TARTYP [125] and [126].



Ex. 3: TARTYP.[40]

Morphology

Morphology is used to describe sound objects subjected to typology in the detailed way. Morphological criteria can be defined as observable features of sound objects, characteristic or timbre features, and perceptual features of the sound object.[41] The purpose of morphology is to extract sound objects from continuum and to classify them.

Schaeffer's description was based on seven chosen classifying criteria and was used to contextualize sound objects. The criteria are as follows:[42]

[40] M. Chion, *op. cit.*, p. 172.
[41] See: *Ibid.*, p. 158.
[42] The following description of criteria was based on the work by Michel Chion. See: *idem*, *op. cit*, pp. 163–187.

- **Mass:** described before; in the morphological criteria, Schaeffer however distinguishes more detailed types, classes, types and genres;

- **Dynamic:** a profile of intensity of timbre that changes in time. It is based on the objects of constant mass. It is, next to attack, one of the criteria of the form;

- **Harmonic timbre:** is associated with spectral representation of sound;

- **Melodic profile:** refers to the sound objects, their trajectory of change can be traced in the frequency space;

- **Mass profile:** relates to evolution of mass in time;

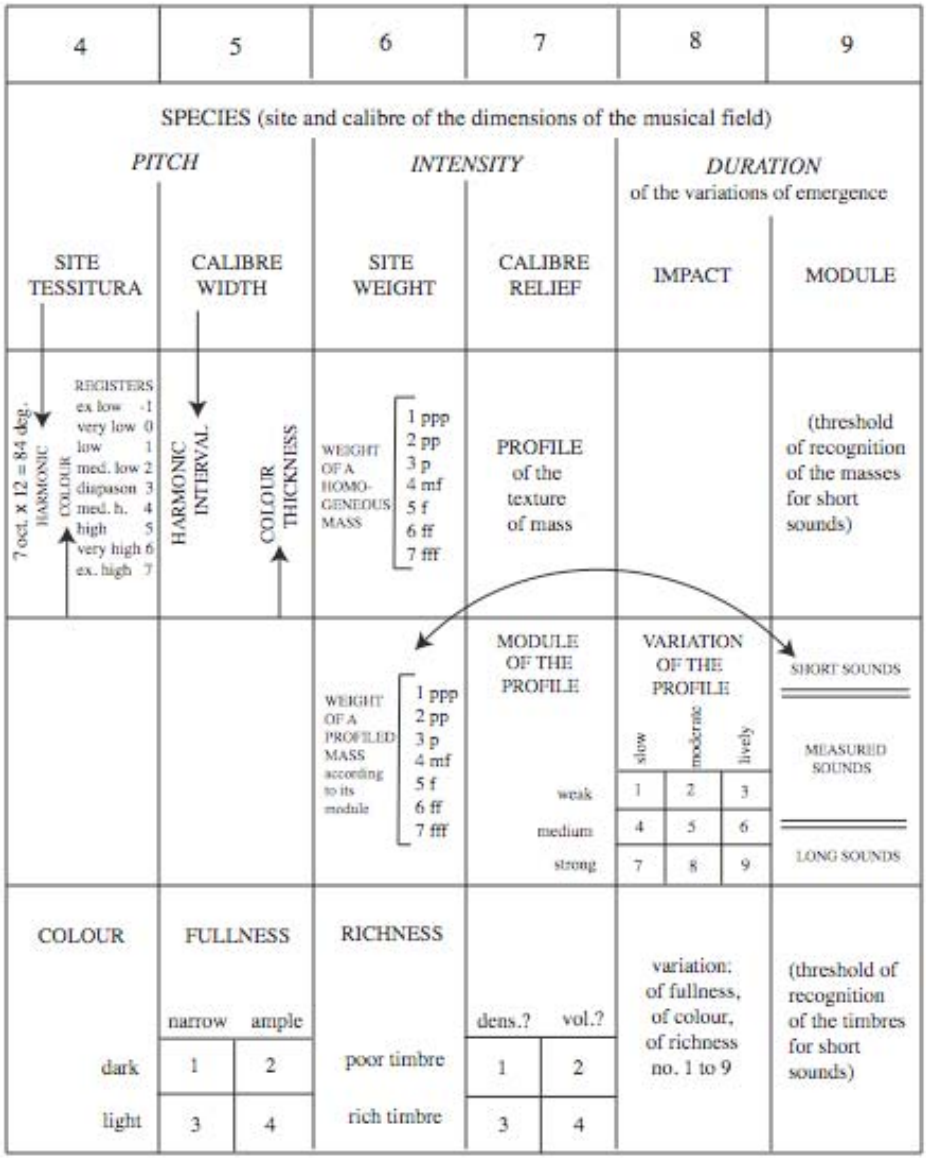
- **Grain:** granulation is the general perception of small irregularities;[43] using subjective descriptions (thick, thin, rough, matte). As Ewa Schreiber explains: "One-time impulse corresponds to harmonic (resonance) granulation, continuous sound to compact granulation, while compund sound to discontinuous granulation";[44]

- **Allure:** a change of the frequency level, volume, timbre. Thanks to the movement it is possible to distinguish if the sound is natural or artificial.

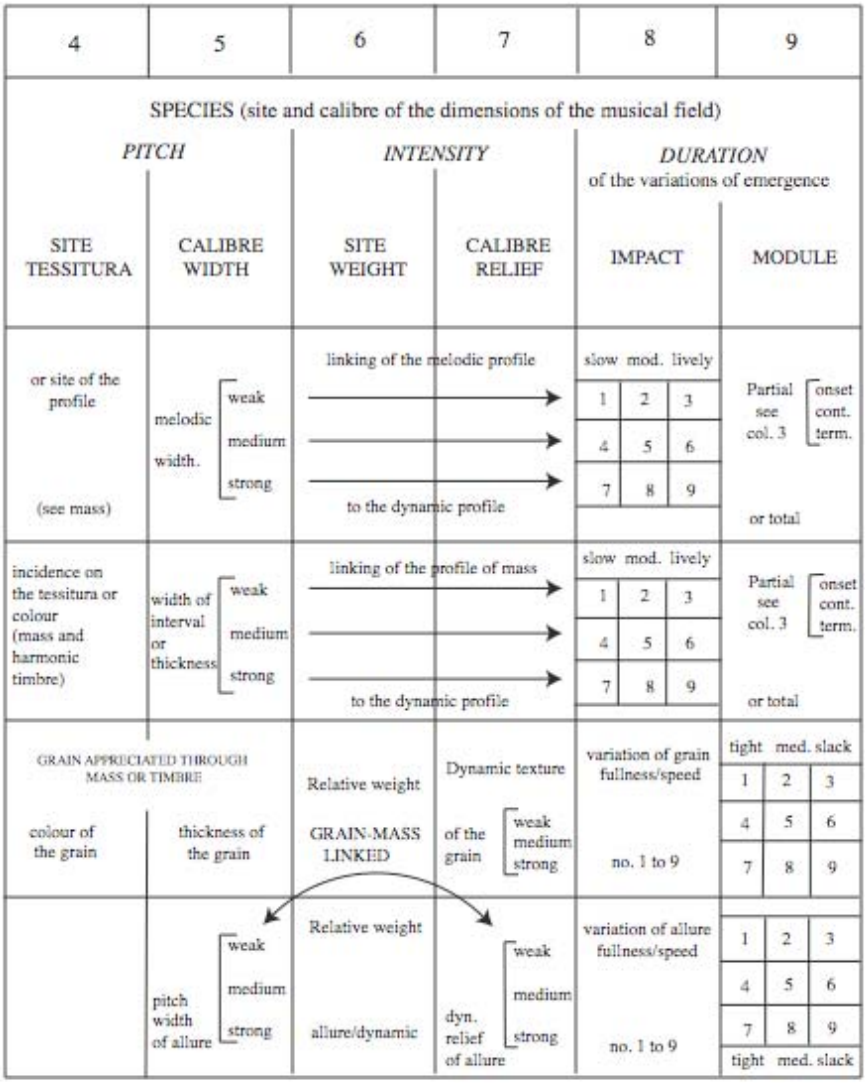
Schaeffer's criteria of division of sound objects, including division into types (typo-morphological recapitulation), classes (musical morphology), types (musical characterology) and genres (pitch, intensity, duration) are summarized in the table TARSOM (*Tableau récapitulatif du solfège des objets musicaux*; Ex. 4).

[43] See: *ibid.*, pp. 171–173.
[44] E. Schreiber, *op. cit.*, p. 205.

		1	2	3
	Description (2-3) Evaluation (4-9) of CRITERIA of musical perception	TYPES typo-morphological recapitulation	CLASSES musical morphology	GENRES musical characterology
1	MASS	TONIC type N COMPLEX X VARIABLE Y OTHERS W, K, T	1. PURE SOUND 2. TONIC 3. TOMIC GROUP 4. CHANNELLED 5. NODAL GROUP 6. NODE 7. WHITE NOISE	characteristic TEXTURES of mass
2	DYNAMIC	homogeneous H nil: iteratif Z weak: web N, X, T formed: note N, X, N°, X° impulse N', X' cyclic Zk reiterated E accumulated A	SHOCKS Anamorph: RESONANCE profiles cresc. decresc. delta hollow mordant Lifeless: flat	ATTACKS (dynam. timbre) 1. abrupt 2. solid 3.soft 4.flat pseudo mordant 5.gentle 6.stressed 7.nil
3	HARMONIC TIMBRE	either: GLOBAL TIMBRE or: secondary masses M1 M2 M3 ... timbre of masses th1 th2 th3 ...	(conneced to masses) NIL 1-7 TONIC 2 COMPLEX 6 CONTINUOUS 3-4 CHANNELLED 4-5	CHARACTERISTIC OF THE SOUND BODY hollow-full round-pointed bright-matt etc.


4
5
6
7
8
9
SPECIES (site and calibre of the dimensions of the musical field)
PITCH
INTENSITY
DURATION
of the variations of emergence
SITE TESSITURA
CALIBRE WIDTH
SITE WEIGHT
CALIBRE RELIEF
IMPACT
MODULE
7 oct. x 12 = 84 deg.
HARMONIC COLOUR
REGISTERS
ex low -1
very low 0
low 1
med. low 2
diapason 3
med. h. 4
high 5
very high 6
ex. high 7
HARMONIC INTERVAL
COLOUR THICKNESS
WEIGHT OF A HOMO-GENEOUS MASS
1 ppp
2 pp
3 p
4 mf
5 f
6 ff
7 fff
PROFILE of the texture of mass
(threshold of recognition of the masses for short sounds)
WEIGHT OF A PROFILED MASS according to its module
1 ppp
2 pp
3 p
4 mf
5 f
6 ff
7 fff
MODULE OF THE PROFILE
weak
medium
strong
VARIATION OF THE PROFILE
slow
moderate
lively
1 2 3
4 5 6
7 8 9
SHORT SOUNDS
MEASURED SOUNDS
LONG SOUNDS
COLOUR
FULLNESS
narrow
ample
dark
light
1 2
3 4
RICHNESS
poor timbre
rich timbre
dens.?
vol.?
1 2
3 4
variation: of fullness, of colour, of richness no. 1 to 9
(threshold of recognition of the timbres for short sounds)

		1	2	3
	Description (2-3) Evaluation (4-9) of / CRITERIA of musical perception	TYPES typo-morphological recapitulation	CLASSES musical morphology	GENRES musical characterology
4	VARIATIONS MELODIC PROFILE	Progress / Profile / Anam. Fluc. N, X / N, X / N', X' Dev. Y, T / Y, W / Y' Mod. G, P / G, M / K	(Only Y notes) podatus torculus clivis porrectus	characrteristic of the profile: pizz, melodic, dragging, etc.
5	VARIATIONS MASS PROFILE	Typological development Fluc. N/X or X/N Dev. Y/W or W/Y Mod. G/W or W/G	(Only thickness) swelled delta thinned hollow	Characteristic development of mass, of harm. timbre
6	SUSTAINMENT GRAIN	Pure or mixed of resonance friction iteration	Quiv. / Shim. / Limpid rough / matt / smooth coarse / net / fine	harmonic compact-harmonic compact compact-discontinuous discontinuous discontinuous-harmonic
7	SUSTAINMENT ALLURE	Pure or mixed mechanical living natural	order / fluct. / disord. 1 / 2 / 3 4 / 5 / 6 7 / 8 / 9	regular cyclic vibrato progressive irregular abrupt decay, muffled incident



Ex. 4: TARSOM.[45]

[45] M. Chion, *op. cit.*, pp. 174–177.

Characterology

In comparison to typology and morphology, in which sounds are isolated using adequate criteria, characterology means a return to the original sounds. What is analyzed here are mainly examples of their formed combinations, both in the sound and musical space. For this purpose, characteristic criteria are used, largely in accordance with the rules of acoustics.[46]

The use of characterology includes combining sounds of similar characteristics into groups or families of sound objects on the basis of similarity.[47] This is a kind of return not only to the timbre, but also to the composition.

Characterology is complemented by musical analysis, in the practical (timbre, instrumentation, registers) and theoretical (study of musical structure) area of the process, which aims at the synthesis of musicality. However, Schaeffer presents these two procedures as a hypothesis, as opposed to the typology and morphology that can be considered complete and certain.[48]

Analysis and synthesis

The purpose of analysis is to project the morphological criteria on the area of perception in the way that we come closer to musical values (pitch, intensity, duration). Thanks to values described as position (*site*) and bulk in the field (*calibre*)[49] it is possible to move the earlier stages of PROGREMU in the area of music.[50]

Groups of sound objects are analyzed from the perspective of usefulness for the basic element of music, an equivalent of scale in the

[46] *Ibid.*, p. 113.
[47] See: J. Dack, *op. cit.*
[48] See: M. Chion, *op. cit.*, p. 113.
[49] Schaeffer analyzes *site* and *calibre* separately for each of three indicated musical dimensions. For dimension of frequency *site* is a main tone and *calibre* is a white noise. For intensity and duration, defining the position and size becomes problematic, because perception of these dimensions is more intuitive and plastic.
[50] See: M. Chion, *op. cit.*, p. 115.

traditional understanding. As John Dack indicates, "Such generalised scales are necessary if abstract relationships are to be created between discrete sound objects".[51] The composer can (but it is not compulsory) use frequency structure (mass) of the object for this purpose, which in this case becomes its scale and simultaneously the main morphological criterion. Varieties of one feature—in this case pitch—depend on stability of other characteristics, the whole of the characteristic features, which all together make the sound, analogously to the musical instrument, where the pitch of the sound changes, but the timbre remains similar. Schaeffer called it "the permanence of characteristics / variation of values" and claimed that it is a concept domineering all musical phenomena. If the composer decides that he needs new degrees of scale, then he can create a new sound object.[52] This approach is a final stage of the PROGREMU synthesis, the goal of which is to create the musical object of the "bundles of criteria" that, placed together, can create easily recognizable structures of values. In order to achieve it, one should imagine a new kind of instrument or tablature, adapted to the new theory of musical structures. Synthesis depends on two pairs of criteria: values/characteristics (*valeur/caractère)* and variation/texture (*variation/texture*), depending on whether the evaluated realizations are discontinuous or continuous.[53] As John Dack sums it up: "The goal of this synthesis is to create a specific musical object, but only as the final effect of the ended previous stages of intelligent listening, that is required by analysis."[54]

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Typology, morphology and characterology aim at identification of the sound object, whereas analysis and synthesis place it in the musical context. Nevertheless, both analysis and synthesis require refinement. This problem is highlighted by Chion, who notices that the last two stages are only sketched by Schaeffer.

[51] J. Dack, *op. cit.*
[52] See: *ibid.*
[53] See: M. Chion, *op. cit.*, p. 115.
[54] J. Dack, *op. cit.*

However, the assumption of the researcher-composer was to present the method that would be adequate to new music, not concentrating on the results.[55] What is more, it can be read as explanation of his own compositional practice. Later, many composers also worked by recreating Schaeffer's technique, adhering to the principle of "primacy of ear", responding to the challenges of changing technology or creating libraries of categorized sounds.

Although Schaeffer's theory in its original form did not find the use in analysis of electro-acoustic music, it is a reference point for numerous discussions of researchers and for creating new analytical projects. The most frequently repeated or modified element of this theory is typology. It is not surprising—this categorization, which is first of its kind, probably depletes all the possibilities of sounds existing in the world, both created artificially by humans and acquired from Nature. Systematization of sound objects in Schaeffer's table TARTYP was a point of reference for such concepts as spectromorphology of Denis Smalley[56] or analytical concept of Lasse Thoresen,[57] as well as for analyses made by Robert Normandeau[58] and Carlos Palombini.[59] So, it can be said that in the context of subsequent analytical attempts based on the same assumptions as the theory created by Schaeffer, new systematics of sound events and the approach based on the reduced listening have the significant position in the contemporary theories. Attempts to create analytical notation for different categories of non-traditional sounds are important as well.

Today, the idea of graphical interpretation of sound objects is the most inspiring element of Schaeffer's theory. For example, the creator of eAnalysis software, Pierre Couprie, allowed users to benefit from the

[55] M. Chion, *op. cit.*, p. 115.
[56] D. Smalley, *Spectromorphology. Explaining Sound-shapes,* "Organised Sound" 2 (1997), pp. 107–126.
[57] L. Thoresen, *Spectromorphological Analysis of Sound Objects: An Adaptation of Pierre Schaeffer's Typomorphology*, "Organised Sound" 12 (2007), pp. 129–141.
[58] R. Normandeau, A *Revision of the TARTYP Published by Pierre Schaeffer*, [online] http://www.ems-network.org/IMG/pdf_EMS10_Normandeau.pdf [accessed: 11.11.2015].
[59] C. Palombini, *Technology and Pierre Schaeffer*, [online] http://pandora.nla.gov.au/nph-wb/20000831130000/http://farben.latrobe.edu.au/mikropol/volume4/palombini-c/palombini.html [accessed: 04.09.2015].

letters that are symbols of sound objects, which was proposed, among others, by Schaeffer. However, they are not very useful for analytical purposes, because the collection of these symbols concentrates around typology, whereas morphological or characteristic features of the sound are limited to description, number symbols and sometimes graphics. It happens that one graphic symbol reproduces different aspects of sound (for example, symbol < relates to mass, dynamic and attack of the sound). Therefore, researchers, starting with Schaeffer, propose much more consistent and consequent solutions, e.g. in the way Lasse Thoresen did it, designing the special font Sonova.[60]

The contemporary approaches to analysis of electro-acoustic music, usually very advanced in the area of technical possibilities because of the dynamic development of computer technology, do not therefore lose the connection with the Schaeffer's concept of sound objects, presented in this article.

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[60] See: [online] http://www.spectromusic.com/download/ [accessed: 04.09.2016].

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