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***Discontinuum-continuum*: the Theory of Composition by Julio Estrada**

Abstract

The Julio Estrada's output is still an unexplored area, what creates the opportunity to study the phenomenon called *discontinuum-continuum*. During the last thirty-six years of his creative activity, Estrada has developed several aspects of the *macro-timbre* that integrate particular compounds of a composition. In his research, Estrada confronts two different situations in the compositional process: continuous transformation of the sound and chronographical method, using strictly defined recording process in order to receive three-dimensional movements of the sound in the topological order. As a result of existence these two situations, a musical work is impossible to be defined by one technique or musical style. Examination of the theory of composition called *discontinuum-continuum* allows one to understand a new methodology of musical creation that involves scientific research of the physical phenomenon of sound and introspection of the imagination of the sound.

Keywords

Julio Estrada, *discontinuum-continuum*, macro-timbre, contemporary Mexican music

A Mexican composer, Julio Estrada (born in 1943), although almost unknown in Poland, is one of the most prominent composers of the last decades. He is also famous as a theorist, a creator of new, original theory of composition, that he named *discontinuum-continuum*. He was educated in Mexico City under guidance of Julian Orbon; then, he continued education with such famous teachers as Olivier Messiaen, Nadia Boulanger and Iannis Xenakis in France and György Ligeti and Karlheinz Stockhausen in Germany. His original concept of musical masterpiece was created when he worked in Centre d'Études de Mathématique et Automatique Musicales in Paris (1980–1986); then, this theory was used when he formed the structure of his compositions. Among his most outstanding works there are: the electro-acoustic music *eua'òn* for system UPIC (1980), the string quartet *ishini'ioni* (1984–1990), *eolòòolin* for sextet of percussionists (1984–1998), *yu-unohui'sen* for violin solo (1990), the opera *Murmullos del páramo* (1992–2006), *eua'òn'ome* for orchestra (1995), and *yuunohui'èhecatl* for solo flute, oboe, clarinet, bassoon, horn, trumpet, trombone and tuba (2010–2012).

The compositional output of Estrada is complemented and shaped by the research from the field of theory and philosophy of music, done during his scientific studies in Instituto de Investigaciones Estéticas at Universidad Nacional Autónoma de México (IIE UNAM). The composer published results of his research e.g. in the works: *Música y teoría de grupos finitos* (1984), *El sonido en Rulfo* (1989), *El continuo de las escalas. Teoría d1* (2004), *Realidad e imaginación continuas. Filosofía, teoría y métodos de creación musical en el continuo* (2012) and *Canto Roto. Silvestre Revueltas* (2012). The sense of focusing on both specialisations, theory and practice of music, at the same time is best described by the words of Estrada himself: “to compose means—to make real what is imagined”.¹

Numerous awards are the evidence of positive opinions about Estrada's compositions and publications in Western Europe and his native Mexico. Among them, we can list: the French award *Ordre des*

¹ Translation of a citation from: N. Velia, *El arte de frontera en la música de Julio Estrada*, “Anales del Instituto de Investigaciones Estéticas” 81 (2002), p. 124.

Arts et des Lettres (1981, 1986), Monegasque Award Prix Prince-Pierre-de-Monaco (1999), and Mexican awards, such as Premio Universidad Nacional en Creación Artística (2000) and Medalla Bellas Artes (2016).

Theory of *discontinuum-continuum*

The theory of *discontinuum-continuum* created by Estrada influenced the musical environment and compositional technique. The fundamental for its shape was both his musical imagination and research that he has done, integrating ethnomusicological knowledge from the area of Mexican culture, mathematics and physics. The aesthetic premise of the theory was the thought of the composer, contained in the sentence: “Beauty is, just, an imperfection, and also a part of the universe”.²

Searching for the form which would match the best his imagination and fantasy, the composer came through several stages of forming the musical language. This process was initiated by learning contemporary European compositional systems thanks to studies in Mexico, France and Germany. These artistic experiences let him formulate in the 1980s above-mentioned theory of composition that he named *discontinuum-continuum*. Its elements were created step by step, and every stage was shaped as a cycle that Estrada described as following: creativity—search / research—achievement—production—continuation—creativity.³ This rhythm of work is characteristic also for the present activity of the composer. What is important, the process of creating the sound in written compositions is independent from the traditional components of a piece, such as melody, rhythm, metre and form. Crucial for the Estrada’s theory of composition are, however, three terms: *discontinuum*, *continuum* and *macro-timbre*.

Discontinuum refers to structure of height and time of a composition, which rules of organization are inspired by mathematical theories: indefinite orthogonal group theory, theory of nets and theory of

² “La belleza es, simplemente, la imperfección misma, parte también del universo”. *Ibid*, p. 136.

³ N. Velia, *op. cit.*, p. 124.

potential combination of intervals. Category of *continuum*, however, means maximal resolution of rhythm and sound, what results in impossibility to distinguish and organize the musical material and its combinations.

The third category, extremely significant and the most complex, is worth discussing in detail.

***Macro-timbre* and Process of Musical Transcription**

The category of *macro-timbre* was inspired by Einstein's theory of general relativity. It contains sounds, which height and duration were integrated. Inspiration for this concept were works by American composers and musicologists: Julián Carilla, Henry Cowell and Conlon Nancarrow. Analysis of their art was an impulse for introducing the division of octave into almost 800 micro-intervals. Achieved pitch and the structures of vibration characteristic for them were next used by the composer to create polyagogical musical passages, what let him obtain different levels of rhythmical counterpoints.

The structure of composition shaped in this way is characterized by the synthesis of musical material. Fusion of height and rhythm of a sound that appears there is similar to fusion of time and space in contemporary physics. As Estrada notices, in the case of musical material, the reason for this unification is the equality of parameters that constitute *macro-timbre*. Firstly, the frequency of acoustic wave states in terms of rhythmical structure its duration, and in terms of melodic structure—its height; secondly, the amplitude of the wave determines the attack, accentuation for rhythm and intensity for timbre; thirdly, wavelength shapes the microstructures of duration at the level of rhythm (compared by the composer with *vibrato* and *tremolo*), and at the level of sound—the timbre of sound.⁴ The composer underlines that in the process of creating the sound all the mentioned parameters are equally important.

⁴ J. Estrada, *Focusing on Freedom and Movement in Music. Methods of Transcription Inside a Continuum of Rhythm and Sound*, "Perspectives of New Music" 2002, No. 1, pp. 72–73.

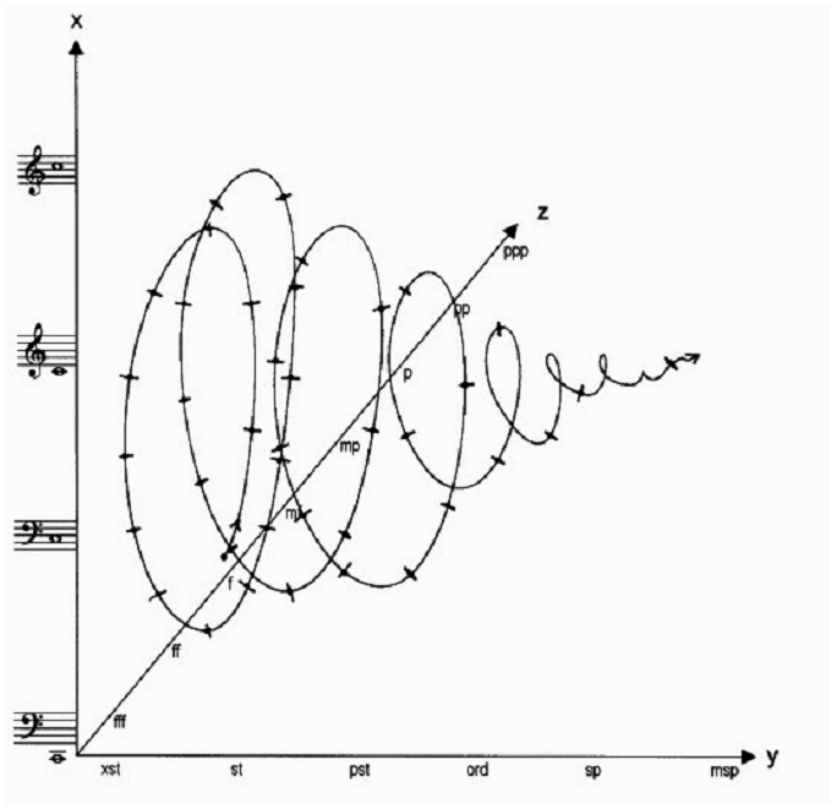
The process of creating the musical composition based on this theory is a multistage process, different than the traditional one. The starting point is the same: until the imagined landscape will receive the real shape, the idea of a composition arises. Its source is imagination of a composer, his intuition, free associations, fantasy and perception of sounds. The difference takes place at the stage of ordering this musical landscape:

The imaginary can be translated into music through a chronographical recording method that utilizes a precise drawing process similar to a sound recording procedure, in which the musical matter is broken up into numerous chrono-acoustical categories. By doing so, traditional notions of rhythm and sound are enlarged to create a broader reference for graphic recording methods. This discussion will concentrate mainly on a different understanding of transcribing what is considered a continuum of rhythm and sound. With no specific reference to a pre-existing musical language, this compositional methodology is based upon a chrono-acoustical description of either an imaginary individual universe or of other methodologies that tend towards abstract transformations of musical material.⁵

The process of writing the score using chronological method was modified over the years. At the beginning, when Estrada studied with Greek composer and architect, Iannis Xenakis, he was focused on controlling of the pitch changes. Then, he enhanced this approach, using the computer program created by Xenakis, UPIC, which let him obtain different shapes of sound envelope.

Estrada decided that the procedure is incomplete and insufficient to use three-dimensional, chronographical register of sounds in it. He searched for other methods that would give him the possibility to mirror simultaneous trajectories of particular components of *macro-timbre* in a multidimensional way, so that in three-dimensional space every dimension of a sound could be connected with particular parameters, e.g.: axis x—a frequency of a wave, y—amplitude, z—harmonic content (Ex. 1).

⁵ *Ibid.*, p. 71.



Ex. 1: Three-dimensional register of sounds. Parameters: x—frequency, y—harmonic content, z—amplitude. Short lines on the spiral mark the units of time.⁶

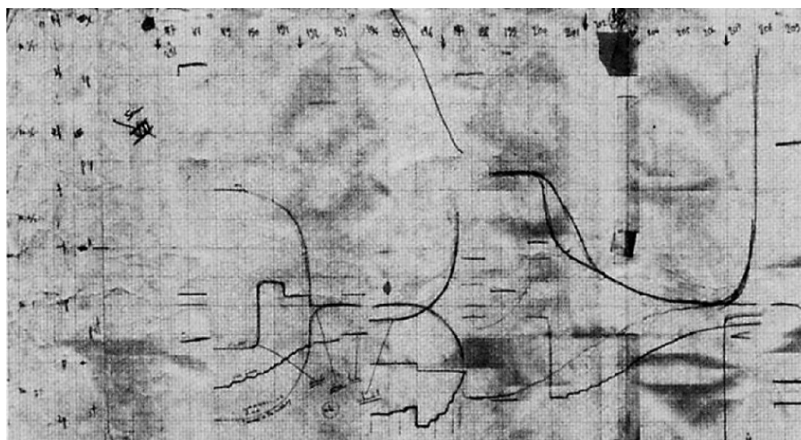
The Estrada's compositional work began from preparing sketches of particular musical layers. Since the 1990s, this process was helped by the computer program called *eua'olin* (in Nahuatl language: *eua*—fly away, *oolin*—movement, namely movement of flying), which Estrada prepared at Universidad Nacional Autónoma de México in years 1990–1995. Chronographically registered sounds became the base for the musical score. The parameters of sounds written there, which create a composition, were a point of reference for performers in searching for their own interpretations. Despite the multitude of information comprised in the score, it does not show the composer's idea with premeditation, it is only a reference for possibilities of realization of his artistic idea.

⁶ Source: J. Estrada, *Focusing on Freedom and Movement in Music*, op. cit., p. 78.

Estrada himself described this process of musical transcription, “conversion of chronographical notation to musical notation”:

1. A chronographical recording—an accurate copy of any musical material.
2. The assigning of a series of reference scales to chosen parameters in order to obtain the conversion of chronographical data.
3. A series of alternatives for transcribing data into a multidimensional musical score.
4. A musical performance that is a new version of the original material (I) based on the resulting score.⁷

As an example illustrating this process can serve the series of compositions *yuunohui* for different instruments, written in years 1983–2012. The original chronographical notation of the earliest composition, *yuunohui'hei*, was used later by the composer to create many different transcriptions, and as a result—new compositions with different parameters (Ex. 2 and 3).



Ex. 2: A Fragment of original chronographical notation of first nine units of the composition *yuunohui'hei* (1983).⁸

⁷ *Ibid.*, p. 80.

⁸ Source: J. Estrada, *yuunohui'hecatl. Collective score for solo woodwinds and/or brass instruments*, facsimile, Mexico 2012, p. 3.

A handwritten musical score for a string quartet, page 34. The score is arranged in four systems, each corresponding to a different instrument: Violin I (top), Violin II, Viola, and Cello/Double Bass (bottom). Each system includes a staff with a melodic line, a staff with rhythmic markings (crosses and dots), and a staff with dynamic markings and performance instructions. The page number '34' is centered at the top. The score is written in black ink on white paper.

Ex. 3: J. Estrada, *ishini'ioni*—a fragment of score of a string quartet.⁹

Micropolyphony of Estrada

Mehmet Okonşar in his work *Micropolyphony. Motivations and Justifications Behind a Concept Introduced by György Ligeti* compared micropolyphonic texture to the form of microbacterie and its complex integration system. According to this musicologist, micropolyphony is “a mass of a musical texture made of a high number of individual parts which cannot be distinguished as such.”¹⁰

Micropolyphonic texture in the music of Estrada introduces new perspective of looking at the technique of creating the sound. In *Theory*

⁹ Source: J. Estrada, *ishini'ioni*, facsimile, Mexico City 2012, p. 34.

¹⁰ O. Mehmet, *Micropolyphony. „Microscopic” Polyphony*, [in:] *idem, Micropolyphony. Motivations and Justifications Behind a Concept Introduced by György Ligeti*, Ankara [n.d.], [online] <http://www.okonsar.com/Documents/Analysis-Ligeti.pdf> [accessed: 4.04.2013].

d1, which he created in Laboratorio de Creación Musical Escuela de Música in years 1997–2000, the composer together with mathematicians listed all possibilities of microtones.¹¹ In effect, four bases were distinguished, in which segregated microtones were put in the system of *permutahedron*. Since the 1980s, the compositions made by the Mexican composer have been based on microintervals and are an example of creating new aesthetics in terms of height of sound and rhythm.

Interesting use of polyphony by the composer is shown in the string quartet *ishini'ioni* (1984–1990).

The image displays a page of handwritten musical notation for a string quartet. It features five staves, each representing a different string instrument. The notation is highly complex, with numerous microtonal markings, including circles and lines indicating specific intervals and pitch bends. There are also various performance instructions and annotations in Spanish, such as 'pizzicato', 'arco', and 'ritardando'. The score is numbered '26' at the top and includes measure numbers 360, 375, and 385. The handwriting is dense and detailed, reflecting the intricate nature of the composition.

Ex. 4: Topological variations used in micropolyphony in the string quartet *ishini'ioni*, bb. 360–375.¹²

¹¹ J. Estrada, *MúSIIIC-Win. Teoría d1* [comp. program], Mexico 2006.

¹² Source: J. Estrada, *Focusing on Freedom and Movement in Music. Methods of Transcription Inside a Continuum of Rhythm and Sound*, “Perspectives of New Music” 2002, No. 1, p. 86.

Two scales are used there: the first of them is divided into 24 microtones, and the second one—into 36 microtones. In the example shown above, we can observe topological variation—the effect of transcription of different space changes (e.g. rotations) of the original three-dimensional shape present in the chronographical notation of a composition.

Rhythm

The rhythmical aspect of music Julio Estrada's music is one of the most important issues for the researcher, because probably in this field the first syndromes of imagined sound obtain their concrete shape. The concept of rhythmical organization in music of this composer consists of maintaining the rhythm wave, its fluctuation independent from any metre. This solution the composer called "non-periodicity". The concept can be found even in early works by Estrada: *Memorias* for piano, accordion or percussion (1971), *Arrullo* for female voice solo or with accompaniment of instruments (1978) and *Cantos* (1973–1978). Flexible non-periodicity of the rhythm, fluctuating all the time, results from continuous acceleration and relaxation of pulse. In the piece *eolooolin* for sextet of percussionists (1983), the composer enriched the technique, adding not synchronized vertically rhythm. The further stages of developing it in 1955 led to use in the piece *euàonòme* almost fifty different macro-sounds, creating *continuum* based on micropolyphony.

Polyverse Form and Three-Dimensional Space of Performance

Estrada's concept of musical form is based on the idea of polyverse. Scores of his compositions contain numerous elements that are not precise and give the performers the opportunity to discover many possibilities of totally different ways to perform the piece. Such fragments appear both in solo part and in ensemble parts. Estrada in his several compositions gives performers also the free choice of instrumentation or the order of parts (e.g. *Canto alterno* for cello, 1978). Interesting example

of the Estrada's approach to form is *ensamble'yuunohui* for string and wind instruments (1983–2012). The possibilities to link the individual fragments is given also in the Estrada's opera, *Murmullos del páramo* (1992–2006), consisting of several modules with different instrumentation (e.g. *Mictlan, hum, mictlà'ome, Fosiles resonantes, Retrato*), that can be performed individually or conjoined in free order and configuration.

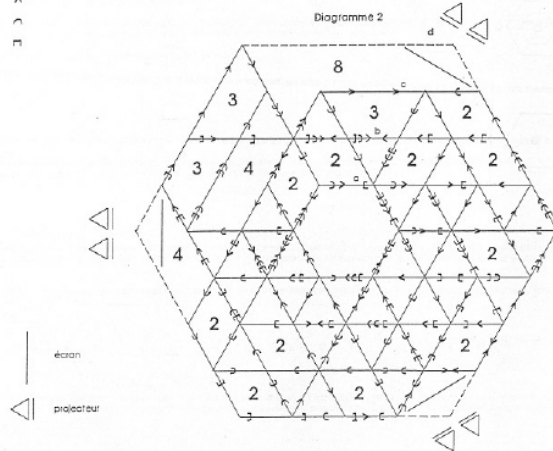
The open character of a musical form also results from the movable character of its special arrangement, i.e. a situation in which instrumentalists change their position on the stage during the performance of a piece. Three dimensions of performing space are crucial in the Estrada's concept, it is the last element of the process of "making possible what is imagined".¹³ It is clearly seen in already mentioned string quartet *ishini'ioni* (1984–1990). In the instruction to the score, that is a diagram, the composer strictly describes the shape of space and the stage movement of musicians during performing of this piece (Ex. 5). Including the three-dimensional character of music is typical not only for forming the particular compositions, but also for the whole theory of composition by Estrada.

XVI

Le Diagramme 2 indique tous les couloirs utilisés dans la partition. Il suggère les endroits les plus spacieux, où pourraient être placés les trois couples d'écrans et les rétroprojecteurs (petits triangles) dans l'espace du concert. Les nombres indiquent la quantité de triangles correspondant aux espaces non employés comme couloirs dans la partition.

Dans le Diagramme 2, trois lignes différentes représentent l'espace couvert par les différents itinéraires des trois instrumentistes tout au long de la partition :

- violon 1 A
- violon 2 B
- alto C



Un enregistrement de la version dans la forme traditionnelle effectué lors de la création mondiale par le Quatuor Astiti au Koninkgebouw d'Amsterdam le 9 juin 1991, est disponible aux Éditions Solbert et constitue une excellente version de référence.

Ex. 5: String quartet *ishini'ioni*—instruction.¹⁴

¹³ See: ref. 1.

¹⁴ Source: J. Estrada, *ishini'ioni*, Mexico 2010, p. XVI.

Murmullos del páramo*, the First Opera Based on the Theory *discontinuum-continuum

One of the first and at the same time extraordinarily important compositions by Estrada is the opera *Murmullos del páramo*. The crucial inspiration for the composer was, in this case, the 20th-century Mexican literature, especially magical realism¹⁵ that links elements of mythology and pre-Columbus art with contemporary Mexican culture. The particular role was played here by the art of Juan Rulfo (1918–1986), who is regarded as the icon of Mexican literature.

For the first time Estrada discovered his compositions in 1960—he heard the short story *!Diles que no me maten!* in the radio audition. He decided to know better the Rulfo's literature, especially its sound layer. The research became inspiration for Estrada to write the book *El sonido en Rulfo: "el ruido ese"* (1989), in which he analyzes the sound aspects of this art. He distinguished four stages of sonorism in Rulfo's literature:

- sonorism of narration,
- sonorism of environment (place),
- sonorism of music (described in a book),
- sonorism of time (i.e. evolution of time and strategy of manipulation of it in a text).

Estrada's research, after which the book was written, led him to the following phase of his musical discoveries. At the end of this stage, the above-mentioned opera *Murmullos del páramo* was written. It is based on the novel *Pedro Páramo* by Rulfo, published in 1955. The book describes the return of a character to Comala, which appears to be a stranded city as if from the underworld, hidden bloody story, where human souls whisper, scream and cry. What is important, the opera is based not on the plot of the story, but on the sonic layer: screams, cries, whispers, lamentations of the dead that appear in different con-

¹⁵ The term "magical realism" was used for the first time by German art critic, Franz Roh, in 1925, referring to Post-Expressionism. Nowadays, it refers mainly to important trends in contemporary literature that arose and developed in South America in the second half of the 20th century. Referring to folk beliefs and magic, magical realism introduces irrational, and magical elements to the everyday reality.

figurations. These elements corresponded with flexible time structure, characteristic for Estrada's art. As a result, the perfect fusion of "magical realism" of Rulfo and theory *discontinuum-continuum* was created.

In the structure of the opera, four layers of the organisation of the composition can be indicated:

- the text spoken by actors,
- sounds recorded before,
- music played during the performance,
- moves of a dancer *buto*, creating dramatic visualization of the dead bodies.

The opera divides into two acts, titled *Doloritas* and *Susana San Juan*, and also, independently from them, into modules: *Mictlan* (female voice, *noisemaker*, double bass), *hum* (vocal quintet), *Matlapoa* (shō), *Retrato* (trombone), *iztacihuatl* (two female voices, one male voice, double bass, trombone, *noisemaker*), *Caja con trenzas* (guitar), *Fósiles resonantes* (vocal quintet and instrumental quintet).

The image shows a handwritten musical score for the module 'Mictlan' from the opera 'Murmulllos del páramo'. It consists of four staves: Vocal (V.), Double Bass (Bo Sv.), Trombone (B.), and another Double Bass (Cb.). The vocal line includes lyrics in Spanish and Nahuatl. The instrumental lines feature complex rhythmic patterns and dynamics. The score is marked with various dynamics (ppp, mp, p, pp) and includes performance instructions like 'Ritmo 1 (humido)' and 'simile'. The score is divided into measures numbered 0 to 10.

Ex. 6: *Murmulllos del páramo*, module *Mictlan*, solo part, fragments A1–A5.¹⁶

¹⁶ Source: J. Estrada, *Murmulllos del páramo*, facsimile, Mexico City 2012.

Murmullos del páramo was finished in 2006, after fourteen years of work. In May of the same year, the premiere of this composition took place in Madrid, and the next performances were in July of the same year in Stuttgart, in September in Mexico, in October in Venice and in 2010 in Tokyo. The last performance took place in 2014 in Beijing. The opera had positive reviews in France, Spain and Germany, and at Universidad Nacional Autónoma de México the documental movie about this piece directed by Aurelie Semichon was produced.¹⁷

Conclusion

Inspired both by traditional and the 20th-century Mexican culture, the theory of composition *discontinuum-continuum*, created by Julio Estrada, introduces the element of freedom to the process of composition. The aesthetic aim of Estrada is to manifest freedom and constant movement, using strictly described compositional procedures. The whole scientific-artistic activity of the composer and researcher is the result of these pre-requisites, as well as exploration of the world of sounds and inspiration by Mexican culture, especially by literary texts by Julian Rulfo. Phenomenological studies on macro-sound and deep analysis of the whole concept of *macro-timbre* can be found in many publications, articles and compositions of the artist himself. They prove that the category of *macro-timbre* can refer to such distant fields as music, aesthetics, philosophy, pedagogy, physics and mathematics. Therefore, it has a chance to influence the shape of contemporary generation of music listeners.

Theory of *discontinuum-continuum* and composing it according to the presumptions of a composition, especially the opera *Murmullos del páramo*, were analyzed by the musical societies of Mexico, France and Germany. We can suppose that in the future this art will be noticed also in different European countries. In Poland, Estrada's music has

¹⁷ *Murmullos de Julio Estrada* [film], dir. A. Semichon, Mexico City 2012, [online] <https://www.youtube.com/watch?v=5sWYBTUh5eE> [accessed: 30.03.2017].

been performed only once so far, almost forty years ago. It took place during the International Festival of Contemporary Music "Warsaw Autumn" in 1981, when the composition *Canto Naciente* (1978) was performed, conducted by the composer himself. I hope that this paper will contribute to the return of this extremely interesting art at Polish stages.

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