Signs of Innovation in European Cinema.

Electronic Music in Antonioni and Tarkovsky

Roberto Calabretto, University of Udine

In the process of the emancipation of film music that took place in the first decades after World War II, the filmography of Michelangelo Antonioni and Andrei Tarkovsky offers multiple points of interest. Tarkovsky's well-established relationship with Eduard Artemyev, matured within the Moscow studio, allowed Tarkovsky to use electronic sounds in some of his films, such as *Solaris*, in a manner far removed from the worn-out standards of science-fiction cinema. Likewise, Antonioni found in the music of Vittorio Gelmetti a suitable aural commentary on the mental disorders of the protagonist in *Deserto rosso*, inserting electronic music into the palette to describe the horizons of the inner human psyche.
In both cases, the presence of noise is effectively combined with music to create a very complex sound texture.

Keywords
Michelangelo Antonioni
Andrei Tarkovsky
Vittorio Gelmetti
Eduard Artemyev
Electronic music and film
DOI
https://doi.org/10.54103/2036-461X/23857

In the years after The Second World War, cinema began accommodating the novelties of the musical experiments carried out by the avant-garde. Despite remaining the preferred point of reference for directors and composers, traditional soundtracks based on the American-derived thematic and symphonic framework occasionally began giving way to electronic music. New universes of sound are capable of entertaining more complex, and in our opinion more interesting relationships with moving images. And more. Rather than the chamber or symphonic music then in vogue, many composers and directors became convinced that electronic music was the true film music.

Luciano Berio, one of the fathers of the Italian avant-garde, had perfectly foreseen that thanks to its freedom and permeability to different psychological situations, electro-acoustic music could be adapted to the soundtracking of radio and television scripts and movie scores.

In one of his famous texts, he writes:

> *The musical successes of various experiments conducted on film soundtracks are well known; one need only mention the names of Honegger and Guy Bernard. [...] Walt Disney's cartoons, for example, are veritable anthologies of the occasional use of the tape recorder to achieve certain effects. [...] We know, in fact, that*

> *in practice, even having to write or just choose the background music for a film, radio or television script, most often results in a compromise between the psychological duration of the spoken text and the musical duration of rhythm, harmony, melody and timbre, i.e. the terms in which sound material is implemented. What we call rhythm, harmony, melody, and timbre that allow us to coordinate a musical fact, such as the music we hear from a tape recorder, can be made available in their free state, almost entirely free of any material identification and abuse by the same and comparable to sonic plasma, capable of conforming to any psychological duration. Understanding that this type of music is particularly suited to soundtrack radio, television and film scripts hardly requires a great leap of the imagination (Berio 1953, 11–13).*

These appeals, as yet subdued and largely unheeded, were joined by requests from enlightened filmmakers to rethink the functions of film music and make it play an active role and not just commentary or support for moving images. Emblematic, from this point of view, are the words of Michelangelo Antonioni who, during a debate, said:

> *The music was asked to create a special atmosphere that helped the images reach the viewer more easily. This was, after all, the function of the old player piano in the days of silent film. The player piano in silent films served first to cover the noise of the projection machine, then to emphasise and give greater strength to the images passing over the screen in total silence. The relationship has changed a lot since then, but the music still serves that function in certain films today, one of external commentary, commentary intended to create a relationship between music and viewer, not between the music and the film (Antonioni 1994, 42).*

Elsewhere, he had insisted:

> *It is rare for music to merge with images, it usually serves to numb the viewers, to prevent them from clearly appreciating what they see. All in all, I am rather against "musical commentary", at least in its present form. I find something old, something rancid in it. The ideal would be to create a wonderful soundtrack with noises and have it conducted by a conductor… Even if, in the end, perhaps the only one capable of doing so would be the director (Antonioni and Labarthe 1994, 127).*

These words echo those of other enlightened filmmakers, such as Alain Resnais, who in those years called for the need to avoid predictable synchronisation and emphatic and rhetorical emphasis,[1] and even more so, Robert Bresson, whose

1 "I think music is rarely used to reinforce the emotion of a scene; no, music replaces the emotion of a scene. At a given moment, the image will be almost neutral and the music will give the emotion; you can replace ten minutes of dialogue with three minutes of music and silent images" (Resnais 2002, 105). Accustomed to the demands of Hollywood cinema, when asked to collaborate on *Providence* (Alain Resnais, 1977),

admonition: "No accompanying, supporting or reinforcing music". "No music" would become famous (1992, 31).

In such a context, in which instances of renewal entailed a rethinking of the typology of sound commentary and its functions within the audiovisual plot, electronic music began taking its first steps.

It had already been used in the early years after The Second World War, albeit in a banal and predictable manner, in science-fiction films. One need only think of the famous *Forbidden Planet* by Fred M. Wilcox (1956), which had already made an association between sci-fi imagery and electronic sounds. The theremin emphasised an "other" state, a context different from everyday life and normality, and lent itself to becoming the sound of contact with something dark, threatening, the subconscious, or with the world "outside the world".[2] It would then take the mastery of Stanley Kubrick, who in *2001: A Space Odyssey* (1968) wisely used György S. Ligeti's material, in this way freeing this cinematic genre from the humdrum sound clichés that Soviet films had long since been abandoned.

Here, electronic experiments coincided singularly with the love certain composers had for oriental music and the timbral qualities of its instruments. In a speech at an international conference dedicated to electroacoustic music held at the Teatro alla Scala on 20–21 November 1999, Eduard Artemyev, Andrei Tarkovsky's musical alter ego, began by quoting a Chinese religious philosopher from the IV century BC, Cguan Zsi.

> *I started playing again, connecting the melody to natural life. The sounds followed one another haphazardly, without taking shape, as in the parts of the forest's melody. Spreading widely, but without exceeding in extension, the dusky, vague, almost mute melody came out of nowhere, and stopped in the deep darkness. Some called it dying, others call it flowering. In the movement, in the flowing, it vanished, moving, not clinging to the constant. In the world, they doubted it, leaving it to wise men to study… Listen carefully: the sounds of this music you cannot hear, its form you cannot see; looking carefully, it can fill the sky, the earth as well, embracing six poles with it (Artemyev 2002, 53–54).*

Artemyev, Tarkovsky's favourite musician as we shall see, had later commented that in these words "could be taken as a sort of manifesto of contemporary music, a proclamation that the material of electronic music extends to the entire

---

Miklós Rozsa was always reproached for using anachronistic ways of emphatically underlining images. "No synchronisation, please. I don't want any synchronisation" — this was the director's admonition during these discussions.

2 The use of the theremin has had a long history in cinema, and unique homage has even been paid to its memory. In 1994, in the film *Ed Wood* dedicated to him, Tim Burton entrusted the musical arrangement to Howard Shore in the intention of bringing back the theremin, an instrument that was mainly used in Hollywood as an effect for flying saucers. Regarding Wilcox's film, see Wierzbicki (2005). On the use of the theremin in cinema, see Magni (2002, 17–18), and Doerschuk (1994, 48–51).

audible sound spectrum" (Artemyev 2002, 54).[3] The composer consequently avoided the contrasts then in vogue between electronic and acoustic music by inviting us to find points in common, likewise in Tarkovsky's *Solaris* where its music is uniquely blended with the pages of Johann Sebastian Bach becoming the undefined voice of Nature.

On the other hand, in 1945 even Alfred Hitchcock, in *Spellbound*, had shown how effective the theremin could be in interpreting the states of estrangement and deviance that crowd the narrative of this masterpiece. Twenty years later, in 1964, Michelangelo Antonioni used Vittorio Gelmetti's music in *Red Desert* (*Il deserto rosso*) to describe the mental distress of Giuliana, the film's protagonist in constant prey to phobias and fears. Electronic music was therefore destined to become the voice of a very specific state of the human condition, the furthest thing possible from being the paladin of an unreal science-fiction universe. As we shall see, a number of enlightened filmmakers who were able to grasp the scope of the new technologies appearing on the cinematic scene at the time would bear these functions in mind.

FROM THE THEREMIN TO THE SYNKET AND THE ANS

The theremin, of course, is a forerunner instrument of those that would soon be used in setting up film soundtracks. In Paris, the *Groupe de Recherches Musicales* had begun devoting a small area of their research to a system for film applications in those years.[4] In these Parisian studios, a smooth-band magnetophone that could work synchronously with 16 mm film was used, thus significantly facilitating the composer's task. In contrast to what was happening in Italy at the time, applied music—for film, stage, ballet, radio and television—was a relevant and significant part of the group's activities, although this activity had not yet led to an adequate theoretical reflection on the relationship of music to images.

In these same years in Italy, Paolo Ketoff had created a particular synthesiser,

3 Eduard Artemyev has accompanied Tarkovsky's cinema since *Solaris* (1972). In many interviews, the composer has stated that he never knew why the director broke off his partnership with Ovchinnikov, hypothesising problems of personal, rather than professional nature. He went on to say that he admired Ovchinnikov's music, extolling the two scores written for Tarkovsky. As regards his biography, see the interviews by Annelise Varaldiev (n.d.), Tatyana Egorova (n.d.), Galina Drubachevskaya (n.d.), Lilia Suslova (n.d.), Archie Patterson (n.d.) and Margarita Katunjan (n.d.) on the composer's website. Some interviews with the composer and his filmography also appear there. On the collaboration with Tarkovsky, see the interview in Turovskaja (1991, 83–89). On the involution of Artemyev's poetics, see instead the timely and shrewd observations of Pestalozza (1987, 175–79).

4 The complex problems and relationships Pierre Schaeffer and the GRM had with the audiovisual universe cannot be dealt with here. For more detail see Bizzaro (2011).

the Synket (SYNthesizer-KEToff) that was widely used later in Antonioni's films. Ketoff saw himself as a luthier serving musicians always ready to experiment with new solutions and devise new instruments. These qualities made him highly sought after in the world of cinema which, as Luigi Pizzaleo recalls, "required quick and effective solutions to any technical problem [and those in which] Ketoff had been able to exercise his virtues as a 'genial inventor', ready to modify existing devices or create new ones to meet the needs of the moment" (2014a, 22).[5] Ketoff presented himself as the "link between otherwise distant musical experiences and passageway between two macro-areas of musical practice: film and the neo-avant-gardes".[6] From this point of view, he had succeeded in collaborating with the sound engineer Federico Savina, who remembered him as "one of those artists who knew how to cope with any need" in demonstration of how science could be comparable to sound craftsmanship in his mastery. "If he needed a loudspeaker," Savina continued, "he would build it immediately, without going out to buy one"[7] in proof of his eagerness and readiness that suited him perfectly to the universe of film music production.

After devising with Gino Marinuzzi, the soul of Rome's Studio R7, the *Fonosynth* instrument that tried to combine research with "commercial" activities, including those involving music in the universe of moving images, Ketoff created his unique synthesiser Synket on commission from the American Academy in Rome in 1964.[8]

---

5 For a closer look at the Synket, see Bernardo (1967), Eaton (1967), Pizzaleo (2014b), Zaccone (2005).

6 "The peculiar status of the figure of Paolo Ketoff, a sound engineer esteemed internationally both in the world of cinema (there are many anecdotes: Roman Vlad recalls that 'if there was a problem, we turned to Ketoff', and on one occasion, Dimitri Tiomkin explicitly wanted him at his side for a month in London), and in avant-garde experimentation (he lent his support to practically every composer with electro-acoustic interests in the area around Rome: Gino Marinuzzi Jr, Domenico Guaccero, Egisto Macchi, Walter Branchi, and Franco Evangelisti with whom, together with the other genial technical presence of Guido Guiducci, he would set up Studio R7 in 1968; Ennio Morricone, who is credited with the initial suggestion for the composition of *Suoni per Dino* in 1969, for viola and two live magnetophones, for which Ketoff also handled the technical aspects of the first performance; Vittorio Gelmetti, the composers resident at the American Academy in Rome, and again, Mario Peragallo and Gianfranco Maselli), makes him an emblematic figure of the interweaving of levels in the music scene in Rome in the late 1950s and the following decade" (Corbella 2009, 65).

7 Savina emphasises how Ketoff was his fundamental guide in learning the secrets of cinematic sound universes and how standing next to him, he could appreciate the "wide sound" (Calabretto and Savina 2022, 29).

8 "An instrument capable of arousing the enthusiasm and inventiveness of a generation of Roman composers, having survived the soundtracks of films and television dramas, the Synket lives again today in a specimen restored to full efficiency by the efforts of the Centro Ricerche Musicali di Roma at the Paolo Ketoff laboratory recently inaugurated at the Accademia di Santa Cecilia. [...] The Synket is a compact synthesiser consisting of three subtractive synthesis modules with an equaliser and the possibility of routing external sources into the signal circuit. The conformation of its sound depends largely on the settings of a series of switches located on each module and, to a lesser extent, on 'patching' (i.e. that complex system of connecting inputs and outputs typical of the 'heroic' family of machines like the Moog or Buchla). Like the

The functioning of Synket can be summarised in these terms:

> *The instrument can be divided into five main sections.*
>
> *1) Sound Combiner. The "Sound Combiner", as Ketoff called it, is the Synket's main sound-generating section. There are three such modules in the instrument, each one contains a square-wave oscillator, three flip-flop type frequency dividers, a high-shelf filter, a bell filter and three modulators (i.e. three low-frequency oscillators). The square-wave oscillator can be controlled by keyboard or by potentiometer, choosing one of the two control sources. The oscillator signal will then be split into two parallel branches, one going to the switch which will insert it into the remaining circuit of the module, the other sent to three frequency dividers (normally they divide the signal by two, so the output signal will have a halved frequency) placed one in series with the other, whose respective output can be sent to the remaining by the respective switches. The use of these four switches produces the sum of four-square waves placed at an octave interval from each other. It is possible to take the frequency divided signals from the appropriate side outputs. Likewise, it is possible to change the division ratio of the frequency dividers via switches, thus creating very rich spectra both harmonically and inharmonically. Returning to the description of the circuit, a white noise can be sent into the remainder, along with the four-square wave signals, which can be activated via switches. The sum of the signals will then pass through a bell filter and a high-frequency filter: for the bell filter, you have Frequency and Resonance controls, while for the high-frequency filter you have a control for their attenuation.*
>
> *2) Modulator section. There are three modulators and they can work simultaneously or independently. They are equipped with oscillators with frequencies ranging from 1 to 20 Hz, which allow various parameters within the circuit to be varied, such as volume, bell filter cut-off frequency, and square-wave oscillator frequency, and they can be activated individually or simultaneously. Finally, it is possible to reverse the modulation. The modulators are controlled two potentiometers for speed and volume. The modulators can be synchronised with external signals by sending them to the appropriate input or taken from the output to be inserted into other sections of the instrument circuit. The last potentiometer controls the Sound Combiner's overall volume. Unlike those mentioned above, these modulators have a separate module. These are low-frequency oscillators that influence the amplitude of the signal, each with a characteristic waveform: the speed and intensity of each modulator can be adjusted, and the modulation destination can be selected, i.e. the Sound Combiner they will influence. The side outputs permit the output of modulator 2 and 3 signals.*
>
> *3) Multiband Filter. The multiband filter consists of a series*

Fonosynth, also the Synket meets the need for speed and effectiveness typical of so-called 'applied music' in producing both sound effects and music in the more traditional sense and is aimed at a public interested in obtaining results even without specific scientific training" (Pizzaleo 2021).

of bandpass filters. These have their respective centre-band frequencies one octave apart, it is, in fact, often called an Octave Filter. The cut-off frequency of the individual filters was indicated on the faders of some, so it may be assumed that it is around the same for all of them: 40 | 80 | 160 | 32 | 640 | 1.28 | 2.560 | 5.120 | 10.240. The selected band can be amplified by moving the potentiometers upwards or the amplitude can be diminished even to zero by moving them downwards.

4) Matrix. This is a jack matrix with different inputs and outputs positioned at different stages of the Synket circuit.

5) Keyboard. The Synket keyboard is divided into three smaller keyboards of two octaves each, each of these controls the frequency of the square wave oscillator of its respective Sound Combiner. The keyboards cover a total of four octaves in which the first octave of the lower keyboard corresponds to the lowest and the second octave of the higher keyboard corresponds to the highest: the first octave of each keyboard corresponds to the second octave of the previous one. The lateral potentiometers let the pitch of the respective keyboard be varied in order for vibrato or glissati to be performed. The 'moving keyboard' system lets vibratos be performed (by pressing any key and moving the keyboard sideways). To tune the keyboard, the individual pegs on the back must be moved, each of which corresponds to a key: this is a variable resistance system, in which the resistance value decided by the peg chosen, and therefore by the key played. The priority of the notes, in the case of several notes played, is given to the lowest one (Paradisi 2022).

The Synket was widely used on the Roman music scene in the 1960s and 1970s, both in film and concert. During these years, Ketoff participated in making the soundtracks of films such as *Kapo* by Gillo Pontecorvo (1960), *General Della Rovere* (*Il Generale della Rovere*, Roberto Rossellini, 1959), *L'Avventura* by Michelangelo Antonioni (*L'avventura*, 1960), *Bandits of Orgosolo* (*Banditi a Orgosolo*, Vittorio De Seta, 1961) and others.[9] John Eaton requested his services in 1968 for the *Concert Piece for Synket & Orchestra*.

The most interesting news, however, came from the Moscow Experimental Studio of Electronic Music, where Eduard Artemyev worked with Andrei Tarkovsky, and bother were assisted by sound engineer Semën Litvinov.[10] The

9 Recently, the Santa Cecilia National Academy in Rome organized a music workshop dedicated to Ketoff. See Accademia Nazionale di Santa Cecilia (n.d.). The Academy also preserves a short video in which Michele dall'Ongaro remembers Ketoff and his synthesiser and short biographical notes recalling his main film collaborations: "At the same time, he took part in the construction of the equipment of the Titanus dubbing plant in Via Margutta; the company also assigned him the soundtrack of two important productions in 1953: *Pane, amore e fantasia* by Luigi Comencini and *Café* Chantant by Camillo Mastrocinque. From 1953 to 1957, he was entrusted with the RCA recording studio. In 1957, he went to work in the studios of Fonolux S.p.A., where he remained until April 1965 as technical director, then—after three years at NIS Film in the same role—he became a freelance recording studio designer and manufacturer of electronic music instruments, an activity he had already pursued since the early 1960s".

10 In addition to Artemyev, members of the Studio working from 1960 to around

studio's research was based on the ANS synthesiser devised by Evgeny Murzin.[11] Almost as if to establish an ideal continuity from the sound-colour synergic principles of the organ of lights to the photoelectronic transformation of the graphic sign, the ANS (the initials of Aleksander Nikolayevich Skriabin) had been conceived by a group of researchers that formed around Murzin and provided common ground in the research of the musicians at the Moscow Experimental Studio of Electronic Music. Skriabin was a real model for these composers and, even more so, for Murzin, who was fascinated by his music and the combinations of sound and the harmonic aggregations within it, which provided an inspiration for his own sound research (Murzin 2008).

Contrary to what was happening on the Italian music scene, where the avant-garde movements at the Studio of Phonology in Milan kept fairly apart from the cinema and the musical experiments conducted in it, in Russia, the seventh art was a field of experimentation open to the contributions of new technologies. By no coincidence, in an essay addressing the problems in the use of this synthesiser in film music, David Beer emphasises the importance of technological components in designing sound for moving images (Beer 2006, 101).

The main feature of the ANS was to create sounds using the photo-optical method already widely adopted in cinema that allowed sound to be synthesised from an artificially-drawn wave.[12] In this case, the photo-optical generator was designed in the form of several rotating glass discs with 144 sound tracks corresponding to pure tones. The disc was formed of concentric tracks: the one closest to the centre had the lowest frequency, the highest was at the edge. Five similar discs with different rotation speeds produced 720 pure tones that Murzin had derived from a segmentation of the frequency continuum based on psychoacoustics studies.[13] This system was based on the desire to overcome the limits of the equal temperament in order to ideally approach, as we have seen above, oriental cultures, through research that in some ways similar to effort being made by the spectralists. [Fig. 1, next page]

1980 include Alfred Schnittke, Sofia Gubaidulina, Edison Denisov, Oleg Buloshkin, Stanislav Kreitchi, Schandor Kallosh, and Alexander Nemtin, who dedicated his life to the completion of Aleksander Skriabin's *Mysterium*. Schnittke, also known in the world of film music, made use of the ANS in the early 1960s as support for traditional instrumentation. A collection of compositions for ANS can be found in *Electroshock Presents: Electroacoustic Music Volume IV: Archive Tapes Synthesizer ANS 1964–1971* (Electroshock Records, ELCD 011, 1999); electronic works by Oleg Buloshkin; Sofia Gubaidulina; Eduard Artemyev; Edison Denisov; Alfred Schnittke; Alexander Nemtin; Schandor Kallosh; Stanislav Kreitchi.

11 As regards the ANS, see: Beer (2006, 103–08) and Kreichi (1997).

12 It must be remembered that cinema makers had been thinking about hand-drawn sound technique since the early decades of the XX century and that in this context Murzin was part of a tradition that also had roots in Russia.

13 The precise of this subdivision allowed a very high number of sounds to be synthesised in the octave. The premises for the creation of this synthesiser were presented by Murzin himself at the International Conference on Electronic Music Studies in Florence in June 1968.

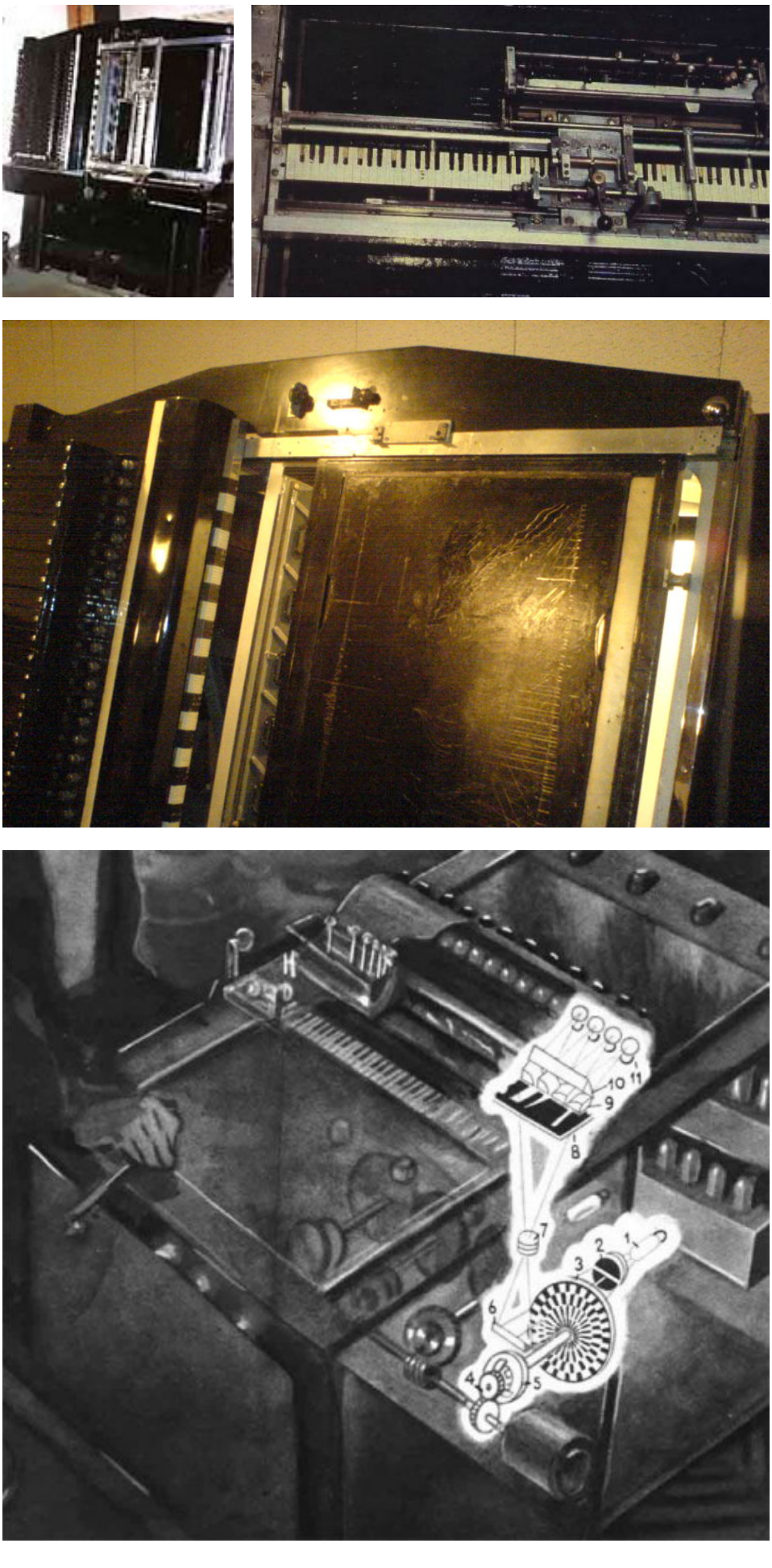


Fig. 1.
The ANS synthesiser.

In order to select the sounds necessary for the timbral mixtures of a work, an interface was created—Murzin even called it a "score"—consisting of a sheet of glass covered with black mastic on which scrapings were made to allow light to penetrate selectively. The light beam passed through the interface and the light was modulated by the discs and picked up by a photocell.

The use of mastic also allowed the immediate correction of the resulting sounds: the parts of the plate that generated superfluous sounds were recoated so that the missing ones could be added. The reading speed of the "score" could be adjusted to a complete stop, allowing the composer to work directly and materially with the sound production. Twenty bandpass amplifiers were located on the left side of the main front panel. There was a readout and pitch-control device at the centre of the synthesiser; the operating area was on the right-hand black board; the controls for the twenty bandpass amplifiers and a lever for controlling the tempo was on the lower front panel.[14]

Unlike other synthesisers used in the film world, the ANS offered itself as an instrument capable of creating a soundtrack based on the same constituent elements as the moving images. This is why it was easily perceived as an instrument for the creation of music designed exclusively and specifically for film production. From the very beginning, Murzin had, in fact, conceived the ANS as a music collection tool designed exclusively for such purpose, cinema, in particular, and not just another way to reproduce acoustic music. Last but not least, in "hand-drown sound" he saw the possibility of giving the composer of the music total control.

> *For the first time in the history of music, ANS made it possible to bring together three processes: composing, recording, and performing music. The transition from sound to noise and back again, the formation of complex combinations of harmonic and non-harmonic overtones, "echoing", noise sounds of different contours and lengths, as well as the possibility of combining various techniques while maintaining control over a graphically recorded score made the ANS a unique studio instrument for composers in its time (Novichkova 2016, 256).*

With Murzin's death in 1972, the Moscow laboratory was closed and the research it had begun came to an abrupt halt and was entrusted only to the goodwill of Stanislav Kreichi and Andrei Smirnov. The ANS continued its life at the University and then the Moscow Conservatory.

RED DESERT BY MICHELANGELO ANTONIONI

In a context with such portent and signs of innovative signals, these new instruments could be put to excellent use in the sound research of some

14 Time ratios depend on the performance of the reading encoding and can be varied without changing the pitch of the timbre and the sounds.

particularly enlightened directors. Antonioni and Tarkovsky, two directors we have chosen as reference points here, succeeded surprisingly well in perceiving the potential of these new languages and instruments by combining them with their own poetics of sound. From this point of view—and as we will see in the case studies presented in this paper—their filmography offers a precious asset in investigating the new sound universes that would be widely used in cinema in the coming decades.

Antonioni's *Red Desert* represents a truly outstanding moment in the history of music for films. As Carlo Di Carlo aptly remarks, Antonioni gave electronic music "an expressive function, as a stylistic and rhythmic cadence of the image [...] to be consumed in the artistic product" (Di Carlo 1988, 181). Antonioni's assistant director, his consultant for musical choices, clearly perceived how far the functions that electronic music is called to serve in Antonioni's cinema is from usual purposes pursued in those years. Di Carlo refers to its "expressive function"—as in *The Cry* (*Il grido*, Michelangelo Antonioni, 1957), in the scene where Rosina, after seeing mentally ill people on the loose, runs away in tears from her father who had previously scolded her. He also mentions an equally important stylistic function, such as in *L'Avventura*, in which the sound of the sea, translated and processed on reels of magnetic tape, punctuates long sequences in the central part of the film. Masterful, we might add, is the synthesis of electronic sounds and urban noises that accompanies the vertical tracking shot as the opening credits of *The Night* (*La notte*, Michelangelo Antonioni, 1961) scroll, that testify to the sound research Antonioni had been conducting for some time.

The music of *Red Desert*, beside the short vocal piece composed by Giovanni Fusco, is by Vittorio Gelmetti. For our purposes, it is worth remembering that in those years Gelmetti had developed a conception of film music in perfect harmony with that of Antonioni. In his many essays dedicated to cinematic sound commentary,[15] he had outlined certain objectives to which composers should address their research in the hopes of developing something for film soundtracks that resembled the experimental music that had led to the erasure of the distinction between sound and noise.

> *Only to the extent that all distinctions vanish between music and sound effects, between dialogue and international soundtrack, considering all sound events as music or in other words, all music as a non-privileged sound event, only under these conditions can a discourse on the possibility of a sound film begin to be established (Gelmetti 2000, 6).*[16]

15 Among these, we recall (Gelmetti 1964a, 146–47; 1964b, 570–73; 1967, 173–76; 1968, 21–28; 1985; 2000, 6–8).

16 "I have often stated that cinema does not need 'music' but 'sound'. And this leads us to consider music in its own right, as an autonomous and self-sufficient organism, as the most extraneous form possible in the process of forming the visual product" (Gelmetti 2000, 6).

It was Di Carlo, with whom the composer had collaborated on the documentary *Terezin* (1964), who introduced Gelmetti to Antonioni who, at first, seems to have thought of Karlheinz Stockhausen instead.[17] "Fragments of my electronic compositions that continue the sonic presence of machine noises (refineries, ships, etc.)", the musician confided in an interview, later adding that, for the film's soundtrack, the music was not applied "as it was", as one sometimes reads, but rather adapted over a long series of work sessions. "I spent a month together with Antonioni adapting and editing. Antonioni, who welcomed suggestions, was eventually satisfied" (Comuzio 1988, 13).[18]

Gelmetti proposed two of his compositions to the director: *Treni d'onda a modulazione d'intensità* and *Modulazioni per Michelangelo*.[19] With the first composition, the composer had experimented for the first time with the possibility of applying methods and procedures derived from scientific research with the intention of pursuing a new constructiveness and rational control over the work of the artist.[20] As regards the second composition, *Modulazioni per Michelangelo* (1964), it should be recalled that it was commissioned by the committee created to celebrate Michelangelo with a sound background for

17 This hypothesis is supported by the presence of certain records of Stockhausen's music in the director's library.

18 This clarification stemmed from Comuzio's question: "Antonioni really wanted to pursue his tendency towards the abstraction of music and the mechanicalness of sounds, and to make it clear that objects had the upper hand over feelings. That is why he wanted the music to violently detach itself from Fusco's romantic, nostalgic, dreamy vocals (sung by Cecilia Fusco, his daughter) of the beach sequence on the island. Has your music been applied to the film in the same way?" (Comuzio 1988, 13). This experience was to prove fundamental for the composer himself and the development of his musical poetics. "The next step (and here the influence of the cinema extends from editing to the very quality of the music, i.e. from structure to syntax) was the transition to the use of material that was, so to speak, 'prefabricated in style' (typical of film music)" (Gelmetti 1969, 35). On the genesis of the composer's collaboration with Antonioni, see also Gelmetti (1971, 45).

19 A census of the audio sources of *Treni d'onda* was proposed by Giovanni De Mezzo in his work mentioned above. For an in-depth study of the work, see also De Mezzo (2005, 535–75).

20 During a debate devoted to "the methodology of scientific research in artistic techniques", Gelmetti had described the close links between his own compositional choices and the possibilities offered by sound materials of electronic origin. "Now the instrument with which this investigation can be conducted undoubtedly seems to me to be formal logic, first of all because it frees us from that sort of mimesis of the performer's gesture that has conditioned production in this field for so long. By this I mean that the adoption of compositional techniques derived from earlier music (i.e. instrumental music), as a type of ideation, has led us to formulate musical ideas that were essentially nothing more than mimesis of instrumental music. Exactly this new type of material we use now that we order prefabricated excludes in itself, as hypothesis, precisely this mimesis. But this cannot be done on the basis of choices of taste alone because taste is conditioned by our entire cultural acquisition, and so we needed an instrument that would guarantee this type of investigation using rational structures. The working hypotheses formulated in this way are working hypotheses that must be experimentally verified or discarded: in this sense, there is, evidently, a cognitive attitude towards sound material that is scientific in nature and therefore with hypotheses that can be verified or rejected" (Gelmetti et al., 1964, 18).

the room dedicated to his drawings of the Florentine fortifications, the central moment of the critical exhibition on Michelangelo's works staged in 1964 and curated by Paolo Portoghesi on the occasion of fourth centenary of the famous artist's death.[21] The design of this electronic piece continues the research begun previously and, as a fact of extreme importance in the course of Gelmetti's poetics, represents an initial point of intersection between a theoretical moment and a practical occasion; a circumstance destined to be renewed and expanded over time.[22]

After the running of the opening credits in which the elements of the soundtrack—Gelmetti's music, Fusco's vocals and noises from the industrial soundscape of Ravenna—are presented, Gelmetti's music intervenes a few times during the film following the constants of Antonioni's poetics that gives music a sober and non-invasive presence and comments on the psychic turmoil of Giuliana, the protagonist, thus becoming her ideal leitmotif.

To this end, Antonioni comments:

> *I would like to say that the neurosis I wanted to describe in* Red Desert *concerns the question of adaptation more than anything else. There are people who can adapt and others who cannot, perhaps because they are too closely bounded to structures, rhythms of life that are now outdated. Giuliana's problem is this. What causes the character's crisis is the irremediable gap, the mismatch between her sensibility, her psychology, and the rhythm imposed on her. It is a criticism that not only concerns her epidermic relations with the world, her perception of noises, colours, and the coldness of the people around her, but the whole system of values (education, morals, religion) that are now outdated and no longer serve to sustain her. She therefore finds herself having to completely renew herself as a woman (Antonioni and Godard 1994, 256).*[23]

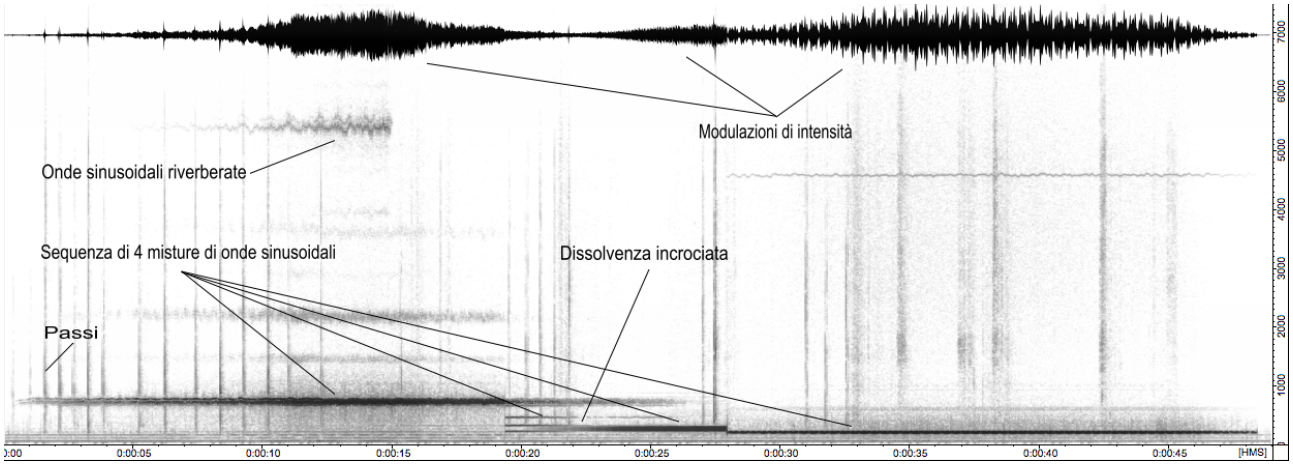
Gelmetti's music appears when, in the middle of the night, Giuliana is gripped in an anguish that seems to suffocate her, so she goes down the stairs clinging to the banister and trudging towards the landing. Here, Gelmetti's modulations are enriched by mixtures of intensity-modulated sine waves. [Fig. 2, next page]

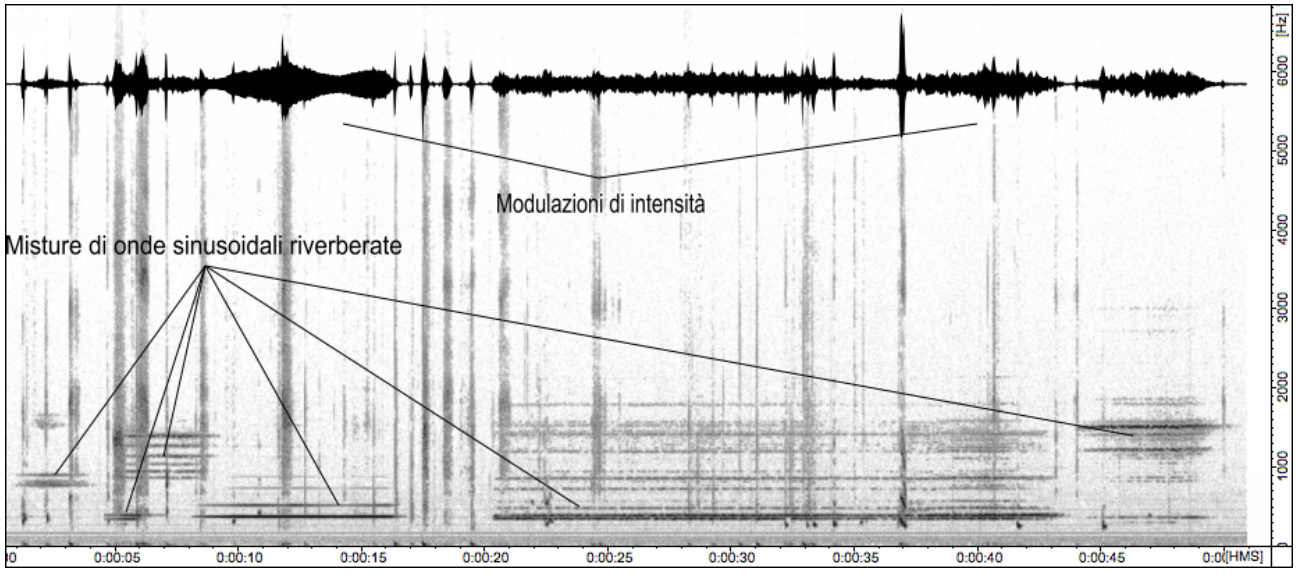
21 Gelmetti dedicated a number of texts to describing the work: Gelmetti (1964e; 1964d; 1964c, 81–82).

22 "It is no coincidence that in first piece of writing, the composer had identified three perspectives opened up by this research: a) the mutation of the destination of the finished musical object; b) the functionalisation of the research; c) the possibility of an interdisciplinary coordination of the research, hitherto conducted in specific fields, on the basis of the operational elements of formal logic" (Gelmetti 1964e, 71).

23 "However, it is clear that certain psychological effects can be better achieved with a language that comes from the avant-garde than with everyday language (precisely because the language of the avant-garde, among a large stratum of the public, is less consumed)" (Gelmetti 1971, 45).

Fig. 2.
The scene's analysis





Giuliana reappears together with Corrado when she crosses a street in Ravenna next to the stall of an old man stirring roasted chestnuts or, finally, in the scenes in which she grapples with her son's apparent illness. In the latter case, the reference to *Treni d'onda* is evident.

Her mental disorder makes Giuliana's vision of reality a subjective one that charges the filmic language with other elements of expression,[24] such as the colour that reveals the world as perceived by the protagonist. In this context, electronic music plays a relevant function and moves within an ambiguous condition. In the course of the film, its recurrences in some moments seem to be external to the protagonist's mind, therefore diegetic, and address the viewer to manifest her state of unease; in others, they are clearly Giuliana's own sound hallucinations without any justification instead.

The long sequence in the hotel room where Giuliana visits Corrado comes to mind: the music is openly extradiegetic and punctuates the images in perfect synchronism. At the same time however, the music can also be interpreted as a transfiguration of a reality from outside. At the further occurrence of a sound, in fact, Giuliana interrupts Corrado's attempts and turns her gaze from him, almost as if searching for the origin of this sound and inviting the imagination of a possible location off-screen. This possibility is promptly disregarded in the shots that follow, however, as Giuliana, at the window, draws back the curtain to reveal a glimpse of Ravenna's Piazza del Duomo and not the harbour one would expect to see. A few moments later, the two are in bed, motionless in an unreal pink light. The whole room is pink.

These swings between diegesis and extradiegesis allow the music to assume a mediated level, using a famous category of Sergio Miceli's,[25] to define the auditory hallucinations and sonic ghosts stirring in Giuliana's mind. A far cry from the stereotypes crowding cinema at the time, this use of electronic music playing within the different levels of the film proves most effective in interacting with the particular nature of its images and dramaturgy.

24 Using an effective definition pertinent to Pasolini borrowed from literary criticism, we could define the procedure "indirect free subjective". To this end, see Pasolini (1977, 179–81).

25 It will be useful to briefly recall the meaning of this category used by Miceli in his analyses, which proved particularly effective in those dedicated to Nino Rota's soundtracks for Fellini in which internal and external levels matched the oppositional diegetic level and extradiegetic pair level used in linguistics. Speaking of this pair, Miceli—and here lies the peculiarity of his own code—also speaks of mediated level to indicate "the substitution of verbal language with musical language. […] One could speak, therefore, of a double empowerment: that which is inherent in musical language and capable of acting on the listener regardless of the logical contingencies of the narration; that which arises from the interaction, capable of placing the spectator into communication with the inner dimension of the characters, who themselves become musical instruments of some kind" (Miceli 1994b, 9). The greatest interactive potential of music with filmic image lies in this function. For an in-depth study of the theory of levels, see again Miceli (1994a, 517–44).

TARKOVSKY, SOLARIS, ANS

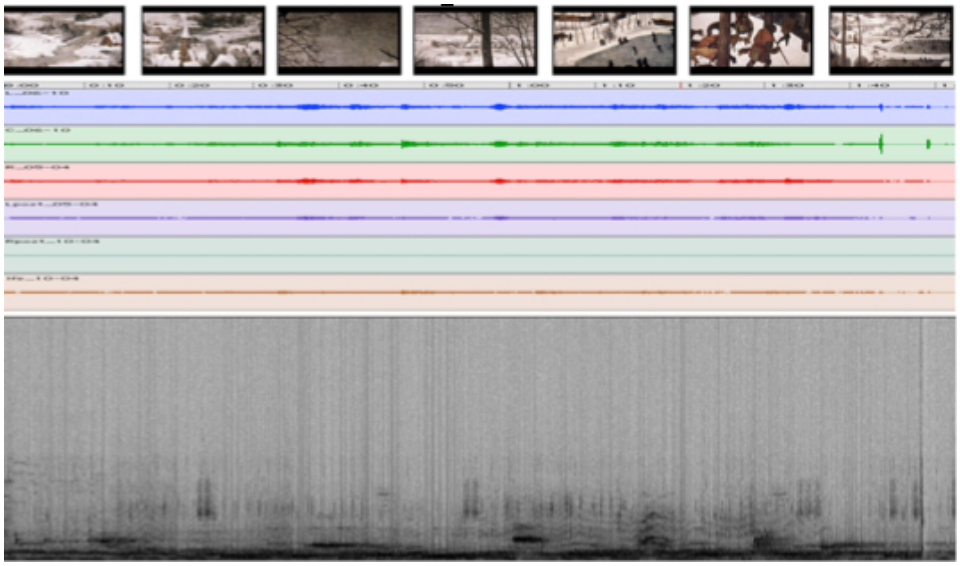
In Tarkovsky's cinema, electronic music is an element of primary importance within the soundscape which, as is well known, consists of many pages of repertoire, especially those of his beloved Bach, synthesis sounds, ambient noises or those recreated in post-production, and any other component capable of giving life to "totally new sound combinations", in the words of Edgar Varèse (1985). The path that led Tarkovsky to develop a soundscape like this is very complex and, above all, constantly evolving. If in the early films Vyacheslav Ovchinnikov's music embraced long segments of narrative, outlining the usual but still original thematic paths, Tarkovsky increasingly reduced its presence, almost as if he wanted to approach the myth of a film shot without music; If the soundtrack was initially an element in the film's narrative context, it then became an integral part of an overall sound system of this whole audiovisual reality, "disappearing as autonomous expression to become an element of a single sensory expression", as Antonioni (Antonioni and Billard 1994, 134) puts it.

Starting with *Solaris*, Tarkovsky began collaborating with Artemyev and the Moscow Experimental Studio of Electronic Music, inaugurating, as we have seen, a new phase in the sound poetics of his own cinema. The many interviews given by Artemyev on his collaboration with Tarkovsky reveal how they worked together on film sound design. The director, Artemyev complains, never attended the recording sessions while he scrupulously followed the post-production stages in which the music was joined to the images. The pre-production stages were very difficult and he would continually select the recorded material and very often only use a fraction of what had been created. Artemyev, on the other hand, always read the film script and analysed the filmed material but never participated in the shooting. This is why discussions and confrontation similar to what happens in any music workshop arose only in post-production.

In the course of the film, electronic music is the privileged sound language to enter into perfect symbiosis with the images. This is therefore real film music: "THE WORLD OF SOUNDS organised in film in a real way" (Tarkovsky 1995, 174, 146. Capitals are featured in the original) as the director categorically affirms. Beyond instrumental music, an art so autonomous that it is hard for it to be completely dissolved in images and so its vertical relationships become effective with them, Tarkovsky is now aware of the infinite resources inherent in electronic music. Although he does not renounce the use of his beloved themes inspired by Bach or other pages of the repertoire, he now entrusts Artemyev and other musicians/sound engineers with almost all the sound accompaniment.

Far from being a sampler of effects typically used in science-fiction cinema or a sound commentary on images to describe conditions of unease as is in *Red Desert*, the electronic music in this film is instead the image of stasis, the absence of a linear evolution of time, and arises from a process of layering that produces an accumulation of sound events by juxtaposition and contrast without a line of development that can be perceived in the sequence of Kelvin's journey

to the planet. The constantly moving aquatic images are also accompanied by Artemyev's music, whereby "the ocean is revealed in film and music as an image of the cosmos, the image of the creator" (Salvestroni 2005, 95). The processes of layering that distinguish Artemyev's language are even more evident in the scene where Harey contemplates Bruegel's *The Hunters in the Snow* (1565) in the library. The tonal layering here is very complex: on one hand, it presents the sounds the visual representation would seem to suggest: crows cawing, men's voices, dogs barking, bells tolling; on the other, "the electronic processing goes beyond the mere reproduction of sounds and noises, suggesting an organic link between the subject and the object of listening" (Fasolato 2004, 80).



(The scene's analysis[26])

The music achieves a true acoustic subjectivity in which the sequence's sonic images is reflected in Harey's willingness to listen: "Harey, the phantom of the earth woman loved by Kelvin and generated from the most secret part of his mind 'undergoes' the fascination of the Bruegelian composition not only through the image, but also through the sound" (Fasolato 2004, 80).

The music, the great "wind harp", will become the icon of Nature in *Stalker* (*Stalker*, Andrei Tarkovsky, 1979) and throughout the film will not only serve the function of conducting motif but also prove to be inextricably linked to the Zone, resonating and vibrating in the soul of the listener. Over the course of the film, electronic music recurs continuously. Singular is the way it appears at the end of the three protagonists' journey on the railway carriage in which the noise of the wheels on the tracks is transformed with an electronic modulation to give voice to the Zone. In this sequence, the footage of the three travellers is focused on their heads, which are distinguished by a luminosity different from the background. The Zone reveals its presence only through the rhythmic metallic pounding of the wheels on the tracks: it is the space in which the sound spreads and, just when the seamless rhythmic beat turns into an electronic modulation,

26 The sonogram of the scene is created by Alberto Carlesi.

the soundtrack unveils to us the change in space that has taken place.

> *The viewer must sense that something is changing; it is reality that is changing at the expense of another. After thinking for a long time, I realised that this had to be represented by the noise of the rails. At first, I simply added reverberation, then I replaced the natural sound with an "artificial" one. [...] The result is that in the beginning the sound of wheels clattering is natural and later, with regular pauses, it takes on an increasingly alienated, otherworldly character (Petrov 1996).*[27]

The regularity of the knocks on the rails is gradually transformed into a sound fabric that makes the environment resonate in a radically different way: the viewer can now realise arrival in the Zone and perceive the new space-temporal dimensions established by the mysterious place where the protagonists are destined. Electronic music recurs during the three protagonists' journey as the "theme" accompanying the Stalker's ecstasy, in the film's central moment, and reappears in the epilogue when the little girl, the figure who most embodies the Zone, appears. Over the rumble of the train we hear the notes of Ludwig van Beethoven's *Symphony No. 9*, music that the Russian Symbolists considered to be the path to ecstasy, but the fraternal communion and union with Nature offered by the music is promptly disrupted by the clatter of a train.

27 Philip Brophy's short review of the film's music also refers to this scene (Brophy 2004, 220–21).

REFERENCE LIST

Accademia Nazionale di Santa Cecilia, n.d. "L'Accademia Nazionale di Santa Cecilia inaugura il laboratorio di musica elettronica dedicato a Paolo Ketoff, il 'liutaio elettronico', una delle figure più in vista della ricerca e avanguardia nella Roma degli anni '60". Last accessed November 14, 2024. https://santacecilia.it/studiopaoloketoff/https://santacecilia.it/studiopaoloketoff/.

Antonioni, Michelangelo. 1994. "La malattia dei sentimenti." In *Fare un film è per me vivere. Scritti sul cinema*, edited by Carlo di Carlo, and Giorgio Tinazzi, 20–46. Venezia: Marsilio.

Antonioni, Michelangelo, and André S. Labarthe. 1994. "All'origine del cinema c'è una scelta." In *Fare un film è per me vivere. Scritti sul cinema*, edited by Carlo di Carlo, and Giorgio Tinazzi, 121–28. Venezia: Marsilio.

Antonioni, Michelangelo, and Jean-Luc Godard. 1994. "La notte, l'eclisse, l'aurora." In *Fare un film è per me vivere. Scritti sul cinema*, edited by Carlo di Carlo, and Giorgio Tinazzi, 255–63. Venezia: Marsilio.

Antonioni, Michelangelo, and Pierre Billard. 1994. "L'idea mi viene attraverso le immagini." In *Fare un film è per me vivere*, edited by Carlo di Carlo, and Giorgio Tinazzi, 129–35. Venezia: Marsilio.

Artemyev, Eduard. 2002. "Dalla tecnologia della musica concreta alla musica computeristica: nuovi metodi del pensiero musicale." In *Musica e tecnologia domani*, edited by Roberto Favaro, Lucca: LIM.

Beer, David. 2006. "Solaris and the ANS Synthesizer: on the relations between Tarkovsky, Artemiev, and music technology." In *Through the Mirror. Reflections on the films of Andrei Tarkovsky*, edited by Jonnson A. Gunnlaugur, and Ottarson A. Thorke, 103-08. Newcastle: Cambridge Scholars Press.

Berio, Luciano. 1953. "Musica per Tape Recorder." *Il Diapason* 4 (3–4): 10–13.

Bernardo, Mario. 1967. "Un generatore elettronico di suoni: il Synket." *Note di tecnica cinematografica* 17.

Bizzaro, Nicola. 2011. "Il contributo di Pierre Schaeffer alla teoria dell'audiovisione." *WAV*, http://www-5.unipv.it/wav/pdf/WAV_Bizzaro_2011_ita.pdf.

Bresson, Robert. 1992. *Note sul cinematografo*. Venezia: Marsilio.

Brophy, Philip. 2004. "Stalker." In *100 Modern Soundtracks*, 220–21. London: BFI Screen Guides.

Calabretto, Roberto, and Federico Savina. 2022. *L'esperienza del suono*, Roma: Centro Sperimentale di Cinematografia.

Comuzio, Ermanno. 1988. "Vittorio Gelmetti, avanguardia ma non dentro alle mode". *Cineforum* 28 (12): 13.

Corbella, Maurizio. 2009. "Paolo Ketoff e le radici cinematografiche della musica elettronica romana." AAA TAC. *Acoustical, Art and Artifacts: Technology, Aesthetics, Communication* 6: 65–75.

De Mezzo, Giovanni. 2005. "L'edizione di *Treni d'onda a modulazione d'intensità*. Fonti scritte e documenti sonori." In *Ri-mediazione dei documenti sonori*, edited by Sergio Canazza, and Mauro Casadei Turroni Monti, 535–75. Udine: Forum.

Di Carlo, Carlo. 1988. *Trento Cinema. Incontri internazionali con la musica per il cinema*. Trento: Servizio attività culturali della Provincia autonoma.

Doerschuk, Robert. 1994. "Music in the Air: The Life and Legacy of Leon Theremin." *Keyboard Magazine* 20 (2): 48–51.

Drubachevskaya, Galina. n.d. "Edward Artemiev: I Am Sure That There Will Be A Creative Explosion". Last accessed November 13, 2024. http://electroshock.ru/eng/edward/interview/drubachevskaya/index.html.

Eaton, John. 1967. "Uno strumento elettronico portatile." *Lo Spettatore Musicale* 2 (4): 14–17.

Egorova, Tatyana. n.d. "Edward Artemiev: He Has Been and Will Always Remain a Creator...". Last accessed November 13, 2024. http://electroshock.ru/eng/edward/interview/egorova/index.html/.

Fasolato, Umberto. 2004. "L'organico risuonare del mondo. La musica elettronica da Solaris a Stalker." *AAM TAC. Arts and Artifacts in Movie: Technology, Aesthetics, Communication* 1.

Gelmetti, Vittorio. 1964a. "Aspetti della musica per film." *Filmcritica* 15 (3–4): 143–47.

Gelmetti, Vittorio. 1964b. "La musica nei film di Pasolini." *Filmcritica* 151–52 (11–12): 570–73.

Gelmetti, Vittorio. 1964c. *Modulazioni per Michelangelo. In Mostra critica delle opere Michelangiolesche*, 81–82. Rome: Istituto grafico tiberino. Composition.

Gelmetti, Vittorio. 1964d. *Modulazioni per Michelangelo*. In *Archivio Vittorio Gelmetti*. Typescript.

Gelmetti, Vittorio. 1964e. "Musica elettronica per la Mostra di Michelangelo." *Marcatrè* 4–5: 71–72.

Gelmetti, Vittorio, Filiberto Menna, Armando Plebe, and Paolo Portoghesi. 1964. "Scienza ed Arte. La metodologia della ricerca scientifica nelle tecniche artistiche." *Marcatré* 6–7: 16–21.

Gelmetti, Vittorio. 1967. "Musica, film, struttura." *Filmcritica* 176 (4): 173–76.

Gelmetti, Vittorio. 1968. "Musica-verità." *Filmcritica* 185 (1): 21–28.

Gelmetti, Vittorio. 1969. "L'impurità della musica." *La Battana. Rivista trimestrale di cultura*, March 18.

Gelmetti, Vittorio. 1971. "Da Antonioni a Jarry." Interview by Tommaso Camuto. *Sipario* 307 (12).

Gelmetti, Vittorio. 1985. "La qualità 'inaudita' del suono al computer." In *Il nuovo mondo dell'immagine elettronica*, edited by Guido Aristarco, and Teresa Aristarco. Bari: Dedalo.

Gelmetti, Vittorio. 2000. "Musica e mass media." *Musica/Realtà* 61.

Katunjan, Margarita. n.d. "Interview with Edward Artemiev." Last accessed November 13, 2024. http://www.electroshock.ru/eng/edward/interview/katunjan/index.html.

Kreichi, Stanislav. 1997. "The ANS Synthesizer. Composing on a Photoelectronic Instrument." Last accessed February 22, 2024. https://theremin.ru/archive/ans.htm.

Magni, Federico. 2000. "Musica per antenne. L'odissea elettronica del professor Theremin." *Cineteca* 16 (6): 17–18.

Miceli, Sergio. 1994a. "Analizzare la musica per film. Una riproposta della teoria dei livelli." *Rivista Musicale Italiana* 29 (2): 517–44.

Miceli, Sergio. 1994b. "Musica e cinema: un approccio metodologico." *Musica Domani* 92 (9): 6–10.

Murzin, Evgeni. 2008. *O prirode i zakonomernostiach esteticheskogo vospriyatia i putyach stanovlenia muziki elektronnoy i cveta*, Moskva: Kompositor [On the nature and patterns of aesthetic perception and the ways of establishing music of electronic and colour].

Novichkova, Irina. 2016. "Synthesizer ANS and Evgeny Murzin's Electronic Studio." In *Učenie zapiski, Vipusk*

8, kniga 1, edited by Valentina Rubcova, Moskva: Memorial'ny muzey A.N. Skriabina.

Paradisi, Francesco. 2022. "Il Syn-Ket: storia, tecnica e modalità d'uso del primo sintetizzatore portatile". Last accessed November 16, 2024. https://www.istitutocorelli.com/il-primo-sintetizzatore-portatile-le-origini-della-musica-elettronica-a-roma/.

Pasolini, Pier Paolo. 1977. "Il cinema di poesia." In *Empirismo eretico*, 179–81. Milano: Garzanti.

Patterson, Archie. n.d. "Interview With Edward Artemiev". Last accessed November 13, 2024. http://www.electroshock.ru/eng/edward/interview/patterson/index.html.

Pestalozza, Luigi. 1987. *La musica in URSS: cronaca di un viaggio*. Milano: Ricordi Unicopli.

Petrov, Arkady. 1996. "'Eduard Artemyev and Andrei Tarkovsky' ('I Don't Need Music in the Film...')." *Salon audio video 5*. Last accessed November 13, 2024. http://www.electroshock.ru/edward/interview/petrov3/index.html.

Pizzaleo, Luigi. 2014a. *Il liutaio elettronico. Paolo Ketoff and the invention of the Synket*. Roma: Aracne.

Pizzaleo, Luigi. 2014b. *Musica Elettroacustica a Roma: gli anni Sessanta*. Saarbrucken: Edizioni Accademiche Italiane.

Pizzaleo, Luigi. 2021. "Le invenzioni di Paolo Ketoff." *Il Manifesto*, Last accessed November 13, 2024. https://ilmanifesto.it/le-invenzioni-di-paolo-ketoff.

Resnais, Alain. 2002. "L'Atelier d'Alain Resnais." In *Alain Resnais. Il metodo, la creazione, lo stile*, edited by Maurizio Regosa, 103–27. Venezia: Marsilio.

Salvestroni, Simonetta. 2005. *Il cinema di Tarkovskij e la tradizione russa*. Magnano (BI): Qiqajon.

Suslova, Lilia. n.d. "Edward Artemiev: A Breakthrough To The New Worlds Of Sounds". Last accessed November 13, 2024. http://electroshock.ru/eng/edward/interview/suslova/index.html.

Tarkovsky, Andrei. 1995. *Scolpire il tempo*. Milano: Ubulibri.

Turovskaja, Maria. 1991. *7 ½ ili filmy Andreia Tarkovskogo*. Moskva: Iskusstvo.

Varaldiev, Anneliese. n.d. "Russian Composed Edward Artemiev". Last accessed November 13, 2024. http://www.electroshock.ru/eng/edward/interview/varaldiev/index.html.

Varèse, Edgar. 1985. *Il suono organizzato. Scritti sulla musica italiana*. Translated by Umberto Fiori. Milano: Ricordi Unicopli.

Wierzbicki, James. 2005. *Louis and Bebe Barron's Forbidden Planet: A Film Score Guide*. Lanham: Scarecrow.

Zaccone, Leonardo. 2005. "Gino Marinuzzi jr. e l'elettronica nella Roma del dopoguerra". *Musica/Realtà* 26 (78): 105–32.