

Smirnov A., Pchelkina L., *Russian Pioneers of Sound Art in the 1920s*. Catalogue of the exhibition 'Red Cavalry: Creation and Power in Soviet Russia between 1917 and 1945'. La Casa Encendida, Madrid, 2011.

Russian Pioneers of Sound Art in the 1920s

Andrey Smirnov / Liubov Pchelkina

The brief lapse in time between the 1910s and the 1930s was marked in Russia by a series of cataclysms. During this period, a country which throughout its history had imported its system of values and official culture devised totally original conceptions for the development of various technologies in numerous areas of the arts and sciences.



Arseny Avraamov conducting the Symphony of Sirens, Moscow, 7.11.1923. René Fülöp-Müller "Geist Und Gesicht Des Bolschewismus". Amalthea-Verlag, Wien 1926.

The culture of the early 20s was very much based on principles of anarchy. Between 1917 and 1924 the traditional Russian State was almost ruined and society was structured as a sort of anarchical 'network culture' based on numerous cross-connected 'creative units' – artists, scholars, politicians, etc. In 1918, the Federation of Futurists declared: 'Separation of Art from the State. Destruction of control over Art. Down with diplomas, ranks, official posts and grades. Universal Artistic Education.'¹ This artistic Utopia coexisted with the brutal policy of War Communism, conducted by the state during the Civil War and replaced with the NEP (New Economic Policy) in 1921, when socialist ideas were combined with possibilities of free business.

Although Lenin hated 'futurists' (after the Revolution this name was extended to almost all avant-garde arts), at the same time he suffered them. Therefore a unique opportunity arose: the State was keen to encourage art that broke with tradition and was being developed in entirely new ways. In October 1918, Lunacharsky, the People's Commissar of Enlightenment, officially proclaimed

¹ 'Manifest Letucei Federacii Futuristov' ('The Manifesto of the Flying Federation of Futurists'), *Gazeta Futuristov* no. 1, 15 March 1918.

that the arts should be developed on an experimental basis.² As he told the composer Sergei Prokofiev: ‘You are revolutionary in music as we are revolutionary in life – we should work together.’³

Living in famine, extreme cold and poverty, creative people dreamed of the future country, where everything would be different – a perfect man, a universal language, real machines. Artists, poets, musicians and architects rushed enthusiastically into the new reality, studying physics and mathematics, embracing sciences related to the nature of light and sound, and developing theories about what became known as ‘the Art of the Future’. Many were inspired by the analytical minds of the Renaissance.

The ideas, projects and artworks created during the 1910s and 20s are often considered utopian. However, there is no general definition or style that can lay claim to characterise the art of the late 1910s and 1920s. Nor does this time interval fit neatly into any system of representation vis-à-vis the unity of culture or its progressive development.

Projectionism



Solomon Nikritin. A self-portrait. Circa 1930. As with most of Nikritin’s works, this painting is a part of the analytical research into form and techniques he was developing in the 1920-30s. *The State Museum of Modern Art, Thessaloniki*.

A term that sought to capture the essence of the period was proposed by the artist and philosopher Solomon Nikritin (1898-1965). Projectionism (from the Latin *projectus*) was intended to reflect the urge to rush ahead, or more accurately, to rush into the future. Nikritin applied this term not only to new approaches in painting and art criticism, but also to the methodology of constructing a new society, to which it was considered necessary to aspire. In 1919, Nikritin developed his basic theory of Projectionism. According to his philosophy the highest goal of technology and culture is the rational essence of nature. In his manifesto he asserted: ‘The Artist is not a producer of consumer goods (a cupboard, a picture), but of ‘projection of the method’ – the organization of matter.’⁴ The method, therefore, invented by the artist, becomes the purpose of the creative process. The intention was for new ideas to transfer creative energy into further development. In the context of ‘projecting the method’, even faults and paradoxes gained a new constructive sense and value. In the early 1920s, much project-based research took place that could be considered within the framework

of Projectionism, including Alexei Gastev's *Art of Movement* exhibitions, the concert-lectures of Léon Theremin and Arseny Avraamov's series *Music of the Future*, in which the author demonstrated his practical ideas regarding the future of musical harmony and techniques, rather than presenting finished musical pieces.

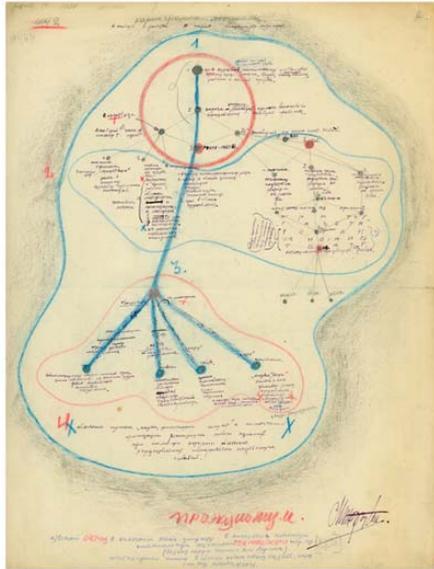
In fact Nikritin's ideas are reminiscent of Alexander Bogdanov's tectology project. What they shared was a desire to develop a universal science of organisation and analysis through a search

² A. V. Lunacharsky, ‘Chem dolzhen bit visshiy institute iskusstv’, *Iskusstvo* no. 3, October 1918, p.17.

³ S. A. Morozov, *Prokofiev*, Molodaya Gvardia, Moscow, 1967, p.64.

⁴ Catalogue of the First Discussion Exhibition of Active Revolutionary Art, Tverskaya 34, Moscow, 1924, p. 9.

for structural similarities in all spheres of knowledge. Rejecting traditional arts, Nikritin proclaims the universal principles, common to all future arts, as being related to subjects such as sound, image, biomechanics and social engineering. For him, the new language of art was based on terms such as ‘stream’, ‘dynamics’ and ‘density’.



Solomon Nikritin. Cartogram of the Program. 1924. State Tretyakov Gallery, Moscow.

on principles of Projectionism, carried out by means of cultural and artistic influences, and includes a typology of human creative energy.

Nikritin tried to develop a typology and classification system of human movements and gestures, colour palettes, sounds (mainly related to the human voice) as well as emotional states, based on the principles and terms of biomechanics, musical harmony and acoustics. For instance, he developed biomechanical temperaments and scales for body movements. He also introduced a number of neologisms, combining the languages of acoustics and biomechanics. Nikritin went so far as to attempt in 1924 to chart the process of evolution of consciousness and creative energy of society from simple, primitive states to the perfection of the future classless society.

Based on a creative human network, it existed without any central authority. Anticipating cybernetics, he called these diagrams ‘the cartogram of the programme’ – synonymous with the term ‘algorithm’. According to the diagram, the evolution of the system is by society passing through dots, called ‘stages’ – analogous to steady states or attractors of some kind in a dynamical system. The evolution is based



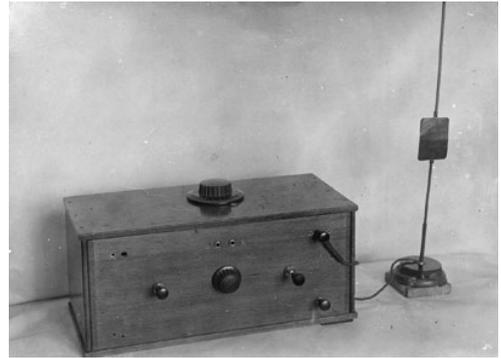
Leon Theremin playing the theremin in Kazan, 1975. Scanned original photograph. Andrei Smirnov archive, Moscow.

Léon Theremin

While the dramatic history of post-revolutionary pictorial and musical avant-garde is for the most part well-known, the names and destinies of a small community of researchers working in the field of sound — ‘machine music’ enthusiasts and designers of new musical technologies — have remained until now a virtually unexplored page in the history of Russian artistic life at the beginning of the 20th century. Their sole representative of worldwide fame is the inventor Léon Theremin,⁵ who around 1919 created the Thereminvox (also known as the

⁵ Starting with his real name, Lev Teremen, his life reads like a novel. He presented his instrument to Lenin in 1922 and legend has it that Lenin even tried it out! In 1928, he moved to the United States, where he continued his research while, according to certain sources, spying for the USSR. In late 1938 Leon Theremin secretly returned to Soviet Russia. In the United States he was officially believed to be dead. In 1939, he was arrested and sentenced to eight years in a prison camp. He was interned in a ‘sharashka’ like the one described by Solzhenitsyn in *The First Circle*, where he dedicated himself to research, mainly in the military field. He was released in 1947 and received the Stalin Prize. In the 1980s, at over 90 years of age, he began a tour of Europe and the United States. The American director Steven M. Martin made a film about him entitled *Theremin: An Electronic Odyssey*. To crown it

Theremin), the first electronic instrument marketed on the world stage.⁶ Theremin worked on countless projects, striving to bring music, light, movement, smell and touch together in a single technology.⁷ Today, his inventions can be found in the most varied of fields, ranging from espionage techniques to music acoustics and the most innovative interactive music technologies. Even so, it is only when we read personal documents and journals in private archives, leaf through albums and catalogues from forgotten exhibitions, examine architectural projects that have never become reality and discover plans and descriptions of extraordinary inventions in libraries, that we can fully appreciate the scale of the intellectual and artistic ‘explosion’ of the 1920s in the field of sound and beyond. The names of those who brought about this explosion are virtually unknown to the world and have been completely forgotten in Russia. And yet even today, nearly one hundred years later, the research conducted during that period continues to astound us.



The very 1-st Theremin, demonstrated by Leon Theremin at GIMN in 1921. Later it was passed to Konstantin Kovalsky. *Andrei Smirnov archive.*

The Mechanical Orchestra

In 1914, the composer and journalist Arseny Avraamov came to the conclusion that a revolution was necessary in the field of art. In his articles published between 1914 and 1916 in the leading music journals, Avraamov developed his theory of ultrachromatic music.⁸ In his view, Johann Sebastian Bach ‘was a great criminal who slowed down the logical evolution of sound perception by two centuries by deforming the hearing of millions of people’.⁹ Not long after the October Revolution, Avraamov proposed that all pianos should be burned; his proposal was directed at none other than the People’s Commissar of Enlightenment, Anatoly Lunacharsky, but it was never taken up.

In his 1916 article ‘Upcoming Science of Music and the New Era in the History of Music’,¹⁰ Avraamov predicted some approaches to synthesizing sound and presented a mathematical model of musical process that is reminiscent of the now popular technique of physical modelling.

In spring 1917, Arseny Avraamov, Sergei Dianin and Evgeny Sholpo formed the Leonardo da Vinci Society in Petrograd. The members shared a single faith in the power of science and mathematics and aspired to create an objective knowledge of the laws of art. According to

all, on the eve of the disintegration of the USSR, he joined the Communist Party, saying he had promised Lenin. (Trans.)

⁶ An electronic machine equipped with two aerials, the Theremin produces sound without being touched by the performer, who controls the pitch of the note with the right hand and the volume with the left hand. (Trans.)

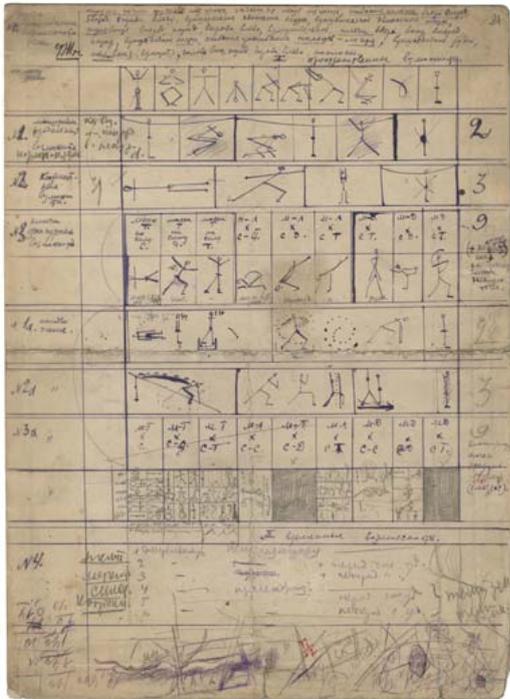
⁷ For more details, see the booklet of the exhibition *Génération Z*. OSA Archivum at Central European University, 2011, pp. 9-11.

⁸ In the 1920s, the Mexican composer Julián Carrillo, the Czech composer Alois Hába and the French-born Russian composer Ivan Wyschnegradsky were the true pioneers as well as the first theorists of ultrachromatic music, characterised by the use of micro-intervals. (Trans.)

⁹ Arseny Avraamov, ‘Ultraxromatizm ili omnitonálnost’, in *Muzykalny sovremennik*, nos. 4-5, 1915, p. 158.

¹⁰ Arseny Avraamov, ‘Grjaduščaja muzykal’naja nauka i novaja era istorii muzyk’, in *Muzykalny sovremennik*, no. 16, 1916, pp. 84-85.

Sholpo: ‘The work was oriented towards a revolution in music theory and techniques based on a close link between art and science. The Conservatoire’s ideas on music theory were declared scholastic and music technique traditional; in the 20th century, both were outmoded. The members of the music section were all convinced of the need for a scientific analysis of music phenomena with regard to creation, performance and perception.’¹¹



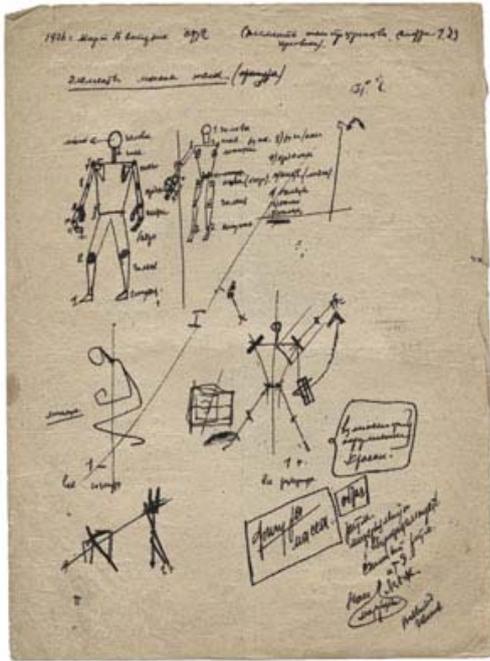
Solomon Nikritin. Manuscript. 1922. The draft manuscript illustrates an attempt to develop a typology and classification system for human movements according to the principles and terms of biomechanics and acoustics. *RGALI*.

In the summer of 1917, Evgeny Sholpo wrote an essay entitled ‘The Enemy of Music’ in which he described a ‘mechanical orchestra’, a music machine capable of automatically synthesising the most complex sound spectra and transcribing them onto a music score. According to Sholpo's description the instrument incorporated a set of sine wave oscillators, forming a discrete scale, covering the whole audible range with intervals between successive pitches unperceivable to the human ear. Control over the system and the process of sound synthesis was to be achieved by means of a special graphical score with the diagram, representing a spectrum of a sound by means of cut-out transparent strips, having appropriate shape and slopes, which should be read by special electro-optical system, allowing a complete set of sine wave tones to be operated synchronously and independently, controlling the sound on a spectral level, directly manipulating the overtones, and erasing the difference between the pitch-based harmony structures and the spectral tissue of a sound. In fact the instrument was based on the same principles as the ANS Synthesizer, built 35 years later by Evgeny Murzin.

To conduct his projects, in 1927, Sholpo built and patented¹² a device called the Melograph, which was designed to record the rhythmic nuances of performers. Meanwhile, Arseny Avraamov was experimenting with pianos and harmoniums, prepared by means of special retuning, noise instruments and a symphony orchestra, calculating the connections between harmonics, synthesising complex sound ensembles, noise from aeroplane engines and chimes of bells. Sergei Dianin investigated new timbres which would allow strings to vibrate despite the laws of mechanics.

¹¹ Evgeny Sholpo, ‘Iskusstvennaja fonogramma na kinoplenke kak texničeskoe sredstvo muzyki’, in *Kinovedčeskie zapiski*, no. 53, 2001. Pp. 334-335.

¹² Patent #7162, class 51c, 5: “Device for the registration of keyboard performance”. Applied 11.04.1927



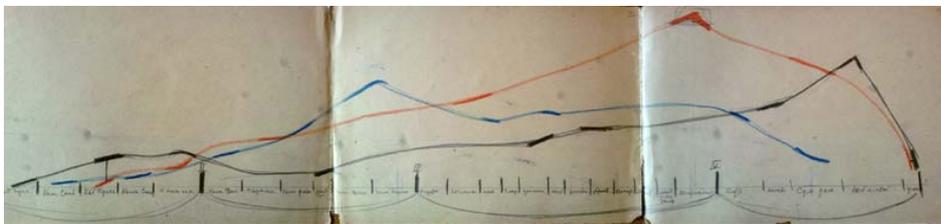
Solomon Nikritin. Diagrams of movements of the Projection Theatre actors, based on principles of Biomechanics. Middle 1920-s. At that time the theatre was based at the CIT Institute. *RGALI*.

Projection Theatre. Biomechanics

The practical implementation of the theory of Projectionism was realised at the Projection Theatre, established by Solomon Nikritin and Sergey Luchishkin on 10 January 1922, at the VKhUTEMAS¹³ and since October 1923 functioned in close collaboration with Alexei Gastev's Central Institute of Labour (TsIT). The purpose of the Projection Theatre was to teach the whole of society to master the human mind and body. To master the most complicated scores of sounds, gestures, movements and emotional states, actors were involved in a daily routine of exercises and psychological training.

The painter Sergey Luchishkin described the preparation of the abstract show *The Tragedy of A.O.Y* (1923) as follows: 'We started to implement our experimental concepts by working up action scores by analogy with a piece of music, composing them out of different parts together with different rhythmodynamic characteristics. After that, we looked for the

form of plastic expression in each part within the movement of the body, for the development of this movement, and for its nuances and transitions, including vocal resonance. All this was tinged by the emotional score which became the basis of the entire action'.¹⁴



Sergei Luchishkin. Diagram of excitement (emotional states) of three actors during a study on excitement at the Projection Theatre. Mid 1920-s. *Department of manuscripts of the State Tretyakov Gallery*.

Nikritin's ideas were supported by the poet Aleksei Gastev, founder of the Central Institute of Labour, who in 1921 had devised the concept of biomechanics used both in the field of

theatre and in the area of labour psychology.¹⁵ In 1923, the Projection Theatre moved into the basement of the TsIT and became a testing ground for the development of the ideal 'Man of the Future.' It incorporated the methods of the TsIT and worked on biomechanical scores, writing into them gestures, movements, sounds and emotions through daily exercises and psychological training.

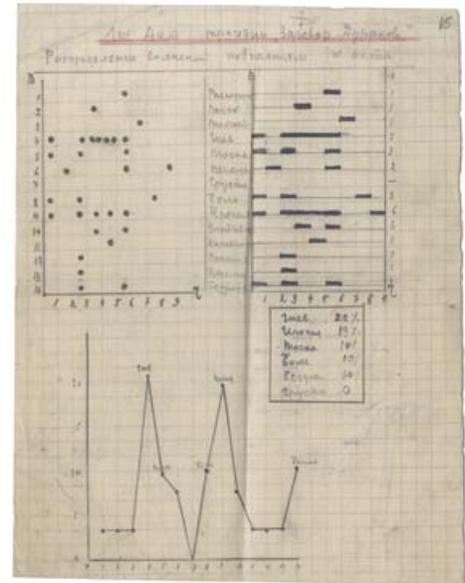
¹³ VKhUTEMAS - *Vysshiy Khudozhestvenno-Tekhnicheskoye Masterskiye* (Higher Art and Technical Studios), the Russian state art and technical school founded in Moscow in 1920.

¹⁴ Sergey Luchishkin, *Ya ochen' ljublyu zizn', stranicy vospominaniy (I Love Life Very Much: Memoirs)*, Sovecki xudozhnik', Moscow, pp. 78-79.

¹⁵ For more details, see the booklet of the exhibition *Génération Z*, op. cit.

The actors were supposed to embody living models of the ‘human machine’ of the future, the product of the alliance of humanity and engineering.

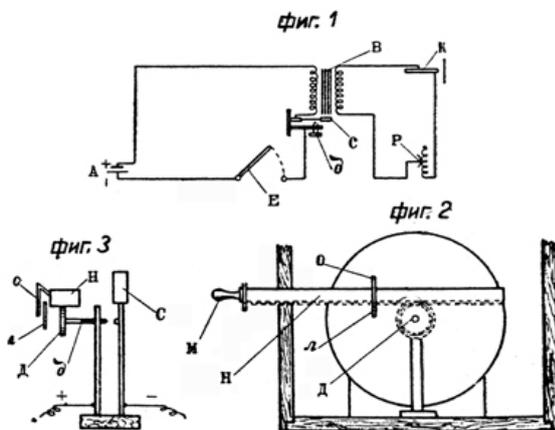
Besides gymnastic apparatus and a ‘noise orchestra’, the Projection Theatre made use of mobile scenery and moving constructions designed by Nicolai Triaskin. Special projectors were included in the script of the theatrical production *Pressing and Impact* in 1923 as well as large screens behind the stage to produce a dynamical film projection as part of the performance. Virtual characters from the film projection appeared to interact with the actors on the stage.¹⁶ Many instances of the use of current multimedia technologies were already being explored in the performances of the Projection Theatre in the 1920s.



Solomon Nikritine. Diagrams specifying the distribution of various emotions in time such as anger, melancholy and sadness by representing them as percentages on a graph.

Machine Worshipers

From 1921 to 1923 in Moscow the performances of the Projection Theatre and Nikolai Forreger’s Theatre-Workshop (MastFor), as well as the sound experiments undertaken by the First Worker’s Theatre of Proletkult conducted by Sergei Eisenstein, gave rise to a tendency which would continue for a whole decade: noise music and orchestras.

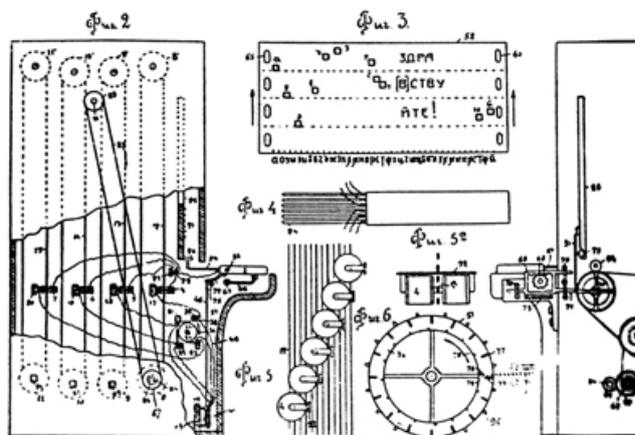


Electro-Musical Device. *J.A. Pakhuchi. Patent #19675, filed December 26, 1929.* It is therefore an object of this invention to provide an electro-musical device primarily for the noise orchestra with application of a buzzer and a pedal rheostat for change of intensity of a sound, characterized by the gear rod H with a handle M for the influence through a cogwheel on a contact screw of a buzzer with the purpose of changing of sounding of the last.

As René Fülöp-Miller noted in 1926: ‘The same idea also ruled the true proletarian music: it, too, emphasised the rhythms which corresponded to the universal and impersonal elements of humanity. The new music had to embrace all the noises of the mechanical age, the rhythm of the machine, the din of the great city and the factory, the whirring of driving-belts, the clattering of motors, and the shrill notes of motor-horns. Therefore, the Bolsheviks very soon proceeded to construct special noise instruments, to form noise orchestras, to give the public a “real new music” instead of the usual old bourgeois individualistic “patchwork”, and in this way to prepare the collective soul for the revelation of the holiest. They imitated all conceivable sounds from industry and technology and united them in peculiar fugues, in which a whole world of noise deafened the ear. In increasingly extended forms the new “machine music” made

¹⁶ The script of the show *Nazhim i udar (Pressing and Impact)*, c. 1923. RGALI, f. 2717, op. 1, ed. khr. 12.

itself felt, and soon noise symphonies, noise operas, and noise festive performances were composed.¹⁷



Proto-Sampler. Mechanical Keyboard Instrument for the Reproduction of Speech and Various Sounds. D.G. Tambovtsev. Patent N6309. Filed May 9, 1925.

So great was the passion for noise instruments that many inventors registered patents for new sound machines, now forgotten but designed specifically for the performance of ‘noise music’. Many such devices were several decades ahead of their time. Some of the new inventions included the electro-musical device created by Y. Pakhutchi¹⁸ for noise orchestras, the device designed by I. Sergeyev¹⁹ (precursor to Léon Theremin’s Rhythmicon), A. Machkov’s various acoustic and electro-optical installations and, most notably, D. Tambovtsev’s ‘instrument for reproducing sounds and speech’,²⁰ a direct prototype of the Mellotron²¹ and contemporary samplers, as well as all possible

‘multimedia’ installations, the forerunners of modern-day television.

One of the most important projects of the noise music era was the legendary *Symphony of the Factory Sirens* by Arseni Avraamov, performed for the first time on 7 November 1922 in Baku to mark the fifth anniversary of the October Revolution. This spectacular performance encompassed the entire city: hydroplane motors, sirens of factories, boats and locomotives formed a gigantic orchestra, with two artillery batteries replacing the percussion section, the machine guns playing the part of the snare drums and the heavy artillery the bass drums. The conductor was perched on a special platform, directing the action with coloured flags. The central sound machine, referred to as ‘Magistral’ (the steam main), was made up of fifty locomotive whistles directed by a crowd of musicians following special scores, the ‘text-notes’. The content of the symphony was not strictly fixed and depended on the context of the performance. The second performance took place in Moscow on 7 November 1923.



Arseni Avraamov before the performance of the *Symphony of Sirens*. Moscow, 7.11.1923

¹⁷ Fülöp-Miller. R, *The Mind and Face of Bolshevism*, Harper & Row, New York, 1962, pp. 183-84. Firstly published "Geist Und Gesicht Des Bolschewismus". Amalthea-Verlag, Wien 1926.

¹⁸ An electro-musical device, patent no. 19675. Registered 26-12-1929.

¹⁹ An electro-musical device, patent no. 16438. Registered 08-08-1928.

²⁰ A mechanical instrument with a keyboard that reproduces various sounds and speech, patent no. 6309. Registered 09-05-1925.

²¹ A polyphonic musical instrument with a keyboard which reads pre-recorded sounds from magnetic tape. It was widely used in the 1970s. (Trans.)

From the Laboratory of Hearing to the Symphony of Noises



Dziga Vertov. Radio-Ear. Portrait by P. Galadjev, 1926. *The book "Dziga Vertov. Iz nasledia". Vol.2, Eisenstein Center, Moscow, 2008.*

In 1916, a student at the Neurological Institute in Petrograd Denis Kaufman (Dziga Vertov, 1896-1954) attempted what would now be called sound poetry and audio art. As he put it: 'I decided to include the entire audible world into the concept of "Hearing". It was during this time that I attempted to draw up the sounds of a lumber-mill. (...) I tried to describe the audio impression of the lumber-mill in the way a blind person would perceive it. In the beginning I wrote down words, but then I attempted to capture all of these noises with letters. (...) It also concerned my experiments with gramophone recordings, where from the separate fragments of recordings on gramophone disks a new composition was created. But I was not satisfied experimenting with available pre-recorded sounds. In nature I heard considerably more different sounds, not just singing or a violin from the usual repertoire of gramophone disks'²². As Vertov noted: 'Except for sounding vowels and

consonants, different melodies, motifs, could still be heard. They needed to be written down as musical signs. But corresponding musical signs did not exist. I came to the conviction that by existing means I could only achieve onomatopoeia, but I couldn't really analyse the heard factory or a waterfall. (...) The inconvenience was in the absence of a device by means of which I could record and analyse these sounds.'²³ Being frustrated, he switched to film to organise not the audible, but the visible world.

In 1929, Dziga Vertov made his first recordings of sounds on the ground (streets, tramways, factories, etc.) with the equipment that the inventor Alexander Shorin had created for him to film the 1931 motion picture *Enthusiasm: Symphony of the Donbass* (*Entuziazm [Simfoniya Donbassa]*) The soundtrack to this film would be the first experience of *Musique Concrète*, a tendency 'created' twenty years later by Pierre Schaeffer.

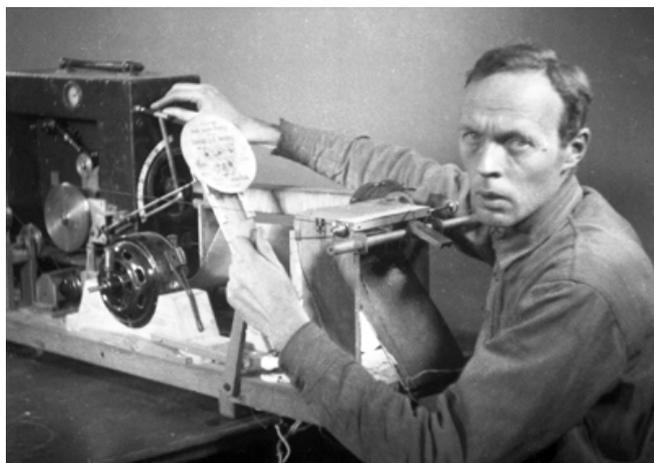
Like the early pioneers of Electronic Music from the 1950s, Vertov was not interested in using imitative instruments to recreate sounds and was irritated by such imitations in early sound films. This film is structured as a programmatic four-movement symphony in which leitmotifs and refrains develop a musical narration. It is remarkable that the film also contains a unique documentary of training of Gastev's TsIT cadets, the 'biomechanical ballet', reminiscent of performances of Solomon Nikritin's Projectionist Theatre.

After the first public screenings in Europe in 1931, the film became a great success. In a note sent to Vertov from London, Charlie Chaplin wrote: 'Never had I known that these mechanical sounds could be arranged to sound so beautiful. I regard it as one of the most exhilarating

²² Dziga Vertov. Draft copy of the article 'Kak eto nachalos?' (How has it begun?). Collection 'Iz Nasledia' (From the Heritage), Vol.2. Eisenstein Centre, Moscow, 2008, p.557

²³ Ibid.

symphonies I have heard. Mr. Dziga Vertov is a musician.²⁴ Nevertheless, given the political circumstances, Vertov never returned to the aesthetics of *Musique Concrète*.



Evgeny Sholpo works with the 1-st version of the Variophone. Leningrad, 1932. *Courtesy of Marina Sholpo.*

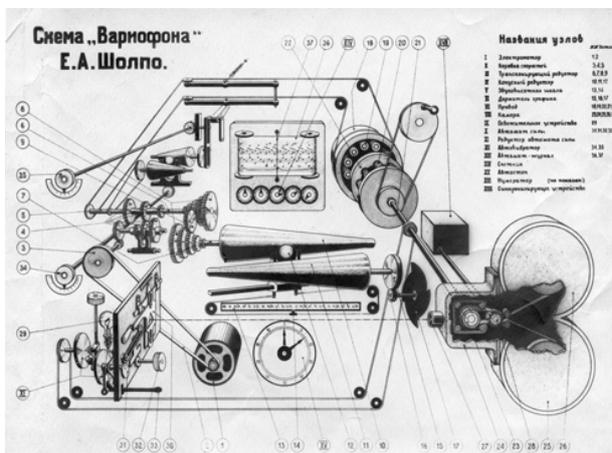
Sound Film and Graphical Sound

During their work on one of the first Soviet films with an added sound track, Abram Room's *Plan for Great Works* (*Pyatiletka. Plan velikih rabot*) of 1930, Avraamov, Sholpo and the painter Mikhail Tsekhanovsky simultaneously arrived at the idea of graphical sound, a unique method of sound synthesis assisted by light and the engraving of sound tracks, allowing complex polyphonic works to be synthesised without using performers, drawing instead on acoustic data and mathematics. Laboratories were soon created which would become the

first prototypes of the future research centres for computer-assisted music.

The earliest experiments were those of Avraamov, which he demonstrated in 1930 by means of the technique of ornamental sound, similar in many ways to the sound ornaments of one of the pioneers of abstract cinema, the German director Oskar Fischinger, who would go on to present his experiences to the public in 1932. In the autumn of 1930, Avraamov founded the Multzvuk laboratory in Moscow, which in addition to an illustrator involved the participation of the chief operator Nikolai Zhelinski, the animator Nikolai Voinov and the acoustician and painter Boris Yankovsky.

Meanwhile, in Leningrad Sholpo patented²⁵ the concept of an electro-optical synthesiser, the Variophone.²⁶ This technique gave instant access to a rich variety of new timbres.



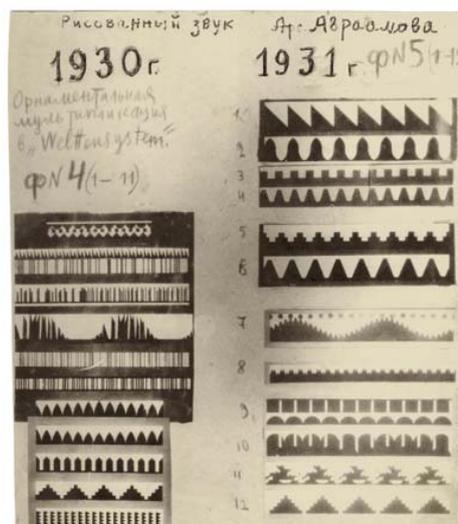
Variophone construction diagram, ver.3, late 1930 -s. *Courtesy of Marina Sholpo.*

²⁴ Film Courier, Berlin, 23.11.1931 quoted by Vertov D., in "Charli Chaplin, Gamburgskie rabochie i prikazi doktora Virta", Proletarskoe kino, 1932, N3.

²⁵ Copyright Certificate #22312 for the invention "Method and device for the production of the periodic sound track on film" by E. A. Sholpo, applied 19.05.1930.

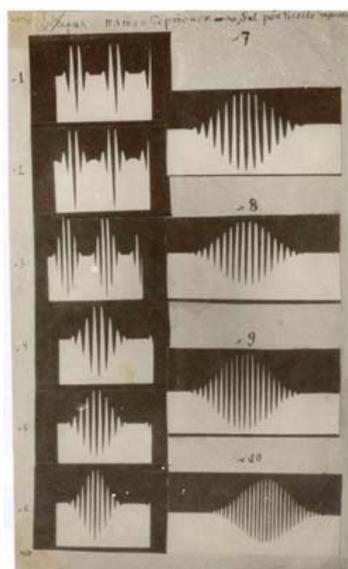
²⁶ An early version of the wooden instrument was made in 1931. The Variophone allowed the performer to alter the pitch of the note, perform glissandos and vibratos, modify the volume of the sound and create polyphony. Unlike Avraamov, Sholpo did not use a frame. The instrument used rotating dentilated discs that adopted the form of a sound wave which periodically crossed a ray of light, 'drawing' the contours of a sound track onto film while synchronously moving forward.

The period from 1932 to 1949 witnessed the creation, with the help of the Variophone, of a vast quantity of artificial phonograms, including those of Georgy Rimsky-Korsakov's *The Caraburettor Suite* (*Sjuita Karburacija*)²⁷, Nikolai Timofeev's *Waltz*, Richard Wagner's *Ride of the Valkyries*, Franz Liszt's *Rhapsody No. 6*, etc. Despite their connection with the prior experiences of Wendy Carlos (née Walter)²⁸ and their sound reminiscent of contemporary 8-bit music,²⁹ the rhythm of these works fundamentally sets them apart. Sholpo used devices that he had invented, the Melograph and the Autopianograph, which allowed the finest rhythmic nuances of live performance to be modulated: *rubato*, *rallentando* and *accelerando*.



First artificial drawn ornamental soundtracks by Arseny Avraamov. Moscow, 1930-31. *Andrei Smirnov archive.*

Disappointed by the technique of ornamental sound, Boris Yankovsky left the Multzuvuk in 1932 and created his own laboratory, Sintonfilm, where he worked on developing methods of spectral analysis and sound synthesis based on



Penta-overtones. 1935-36. Mathematically calculated waveforms of sounds with the strong formant. Prototype of the modern formant synthesis. *Andrei Smirnov archive.*

principles which music technology would not achieve until the mid-1980s.³⁰ Of all the early graphical sound pioneers, Yankovsky alone pursued the approach of spectral analysis, decomposition and re-synthesis. Yankovsky firmly believed in the possibility of creating a universal library of sound elements based on the model of Mendeleev's periodic table of elements. Its graphic curves, the 'spectrostandards', were semiotic units which, when combined, formed new hybrid sounds. He also developed several sound processing methods including pitch shifting and time stretching based on the separation of spectral content and formants, resembling recent computer music techniques of cross synthesis and the phase vocoder. To put his work into practice, Yankovsky developed a special instrument, the 'Videoexponator', which he had hoped to complete in 1940. The war put an end to his projects.

Having been evacuated, Yankovsky returned to Moscow in 1949 but never took up the theme of graphical sound again. The Multzuvuk laboratory closed in 1934 as a non-profitable venture. Its archives (2,000 metres of film) were stored in Avraamov's apartment, where they were destroyed during a long absence by

²⁷ Georgy Rimsky-Korsakov, Russian musician and acoustician, was the grandson of Nikolai. (Trans.)

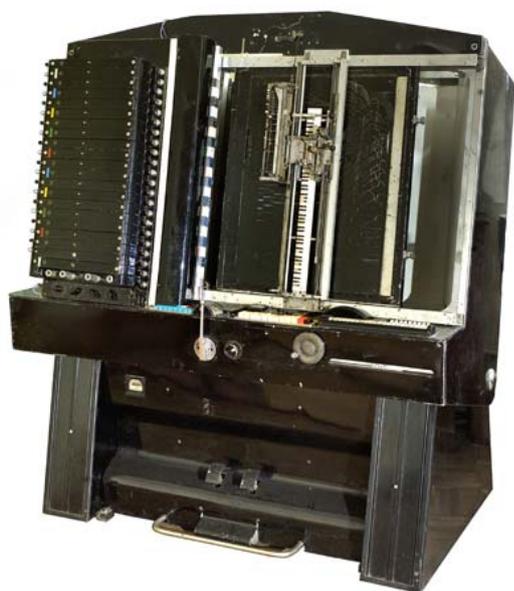
²⁸ Author among other works of the soundtrack to Stanley Kubrick's film *A Clockwork Orange*. (Trans.)

²⁹ A style of electronic music inspired by the sound of old videogame consoles.

³⁰ Andrey Smirnov, 'Graphical Sound and Audio Computing in 1930-s', in *Klangmaschinen zwischen Experiment und Medientechnik*, ed. D. Gethmann, IMA/Transkript, Hainburg/Bielefeld, 2010. Pp. 97-120.

their author:³¹ the composer's young sons used the film made of inflammable nitrate as fuel for their home-made rockets and everything went up in flames. In Stalinist Russia at the end of the 1930s, Avraamov's ideas had become outmoded. He passed away on 19 May 1944, almost completely destitute.

In besieged Leningrad in 1941, Sholpo and the composer Igor Boldyrev created the soundtrack for the animated film *Vultures (Sterviatniki)*. The Variophone was unfortunately destroyed by one of the last enemy shells to hit the city, at the very end of the blockade. Even though after the war Sholpo's laboratory still had premises and funding, the last version of the Variophone was never completed. In 1948³² the laboratory was reorganized and moved to Moscow. Sholpo was dismissed from his post as director and in 1950 the Laboratory was finally closed. In 1951, after a long illness, Sholpo died. The history of graphical sound would lie forgotten for many years.



The second version of the ANS has been constructed in 1964. The Synthesizer generates 720 tones covering the entire audible frequency range. *Andrei Smirnov archive. Photograph by Alexander Dolgin.*

The ANS

In 1938, Boris Yankovsky met Yevgeny Murzin, a young engineer who was fascinated by the idea of a new sound synthesiser. Work on designing the prospective instrument began the following year, but it was not until 1957, almost twenty years later, that Murzin completed the construction of the electro-optic synthesiser known as the ANS (initials of the composer Alexander Nikolayevich Scriabin).³³

The instrument was based on the same principles as the Variophone but had an optic disc which contained 144 sounds resonating simultaneously. The first version, which was made of wood and has not survived to the present day, contained four discs and generated 576 sinusoidal sounds. The second version, completed in 1964, generated 720 sounds whose frequency of vibrations covered the entire sound diapason.

On a conceptual level, the synthesiser was remarkably close to the concept of Evgeny Sholpo's Mechanical Orchestra. Unlike all the electronic instruments that had existed until then, with the ANS synthesiser the composer did not simply use a sound wave but the whole sound spectrum. Murzin's great invention was a special graphical score. On a large pane of glass covered in black putty, the composer drew a sonogram

³¹ He had been sent to Nalchik in the North Caucasus to research and develop the musical heritage of the local communities, a common practice at the time. (Trans.)

³² In 1948 the communist party initiated purges among musicians, widely known as a struggle against formalism. The pressure on the composers Dmitri Shostakovich, Sergei Prokofiev, Nikolai Myaskovsky, Vissarion Shebalin and others reached its peak in the "Party Resolution" of 1948, and the infamous auto-da-fé of the First Congress of the Composers' Union on April 19–25, 1948. Composer Tikhon Khrennikov was chosen by Zhdanov and Stalin for the post of general secretary. He held this position until the collapse of the Soviet Union in 1991. The Laboratory for Graphical Sound was finally closed after the resolution from 23.10.1950, signed by Khrennikov among others.

³³ Copyright certificate N118695, USSR, applied for 24-06-1957.

or the dynamic spectrum of future sound spread out over time by means of scratching transparent strips, having the appropriate shape and slopes, read by special electro-optical system, thus making it possible to operate the set of sine wave tones synchronously and independently, control the sound on a spectral level, directly manipulate the overtones, erase any difference between the pitch harmony structures and a spectral tissue of a sound.

The instrument was based on the scale 72 steps per octave, proposed by Boris Yankovsky, and incorporated a set of sine wave optical oscillators, adjusted on fixed frequencies, forming a discrete scale, covering the whole audible range with intervals between successive pitches unperceivable to the human ear. An analogue principle was the basis for the legendary UPIC computer system devised by Iannis Xenakis in 1977 at the Centre for Automatic and Mathematical Music (CEMAMu) in Paris.

Alfred Schnittke, Sofia Gubaidulina, Edison Denisov, Eduard Artemyev and Stanislav Kreichi are some of the composers who worked with the instrument. It was also used to create the soundtracks for numerous films, particularly the early work of Andrei Tarkovsky.

Despite its good fortune, the ANS synthesiser was the last original creation of Soviet music technology not based on Western prototypes. The last phase of the Stalinist era was completely fruitless and everything that was produced at that time, despite the circumstances, had its roots in the previous era. The new generation of engineers knew nothing of their country's censored history and primarily dedicated themselves to copying, trying to use Soviet electronic components to reproduce Western music technology. This was a time of frustration and poor imitations, but that is another story.

Epilogue

While post-revolution, the relationship between state and pioneers had been a complicated one, the consolidation of Stalin's dictatorship as of the mid 1920s had resulted in a political sea change that gradually increased vertical pressure on the horizontal networks of society and culture, triggering a period of control, antagonism and repression among the most outstanding, skilled and innovative representatives of Russian society. The fate of this community and the work it produced is a most unfortunate one. Its inherent incompatibility with the State's mandate for culture to promote totalitarian ideas soon predetermined its destiny. Some people chose to emigrate but many lost their lives in Stalin's torture chambers. Most survived through assimilation, deleting from their CVs any connections or affiliations to avant-garde or radical activity. At the same time, many of their names and achievements were being written out of much of the 'official' history, forming the surrogate of the 'Soviet Culture'. Meanwhile, life has confirmed the correctness of their foresight. Decades later, many ideas and inventions that have been considered as utopian are being recovered abroad; we use them today not knowing their origin. And many others, apparently, are waiting for rebirth.

Smirnov A., Pchelkina L., *Russian Pioneers of Sound Art in the 1920s*. Catalogue of the exhibition 'Red Cavalry: Creation and Power in Soviet Russia between 1917 and 1945'. La Casa Encendida, Madrid, 2011. (English and Spanish).