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The Fire of *Prometheus*: Music–Kinetic Art Experiments in the USSR

Bulat M. Galeyev

Abstract—In this article, the author discusses the principal Soviet experiments in music–kinetic art. As can be judged from the available literature, most of these experiments still remain 'blank spaces' for Western readers. This article testifies to the existence of long-standing traditions that have inspired the Soviet school of music–kinetic art and have contributed to its original features. Perhaps the results have not always been as successful or as extensive as one would want them to be, but the prospects for future developments look promising, if only on the basis of the theoretical foundations that were laid in Russia itself in the beginning of this century. To provide a context for his discussion of music–kinetic art considered in this review, the author has included an article (see Appendix) in which he examines the history of the idea of 'seeing music' in Russia in previous centuries.

I. INTRODUCTION

Nowadays we sometimes sentimentally think of the beginning of this century as some 'ancient' time. But, in fact, it was then that the foundations were laid not only for developments that are taking place today but for those that will take place tomorrow. In 1903, the Russian scientist K.E. Tsiolkovsky published his first theoretical work on space flights, and in 1905 the German physicist Albert Einstein proposed his special relativity theory. Upheavals occurred not just in science but in the arts as well, where the idea of synthesis had a revolutionary impact.

"Russia is a young country and its culture is synthetic", wrote the Russian poet Aleksandr Blok at the beginning of the century, calling upon artists not to withdraw into the guild of one particular art. Indeed, the entire artistic atmosphere of the time was imbued, as though with ozone, with the idea of synthesis. One need only recall the Ballets Russes of Sergei Diaghilev, the theatrical experiments of Vsevolod Meyerhold or the theoretical revelations, theatrical productions and films of the young Sergei Eisenstein. Somehow or other, each was indebted to the impetus provided by the futurological utopias of the Russian composer A.N. Scriabin, who dreamed about a universal synthesis of the arts

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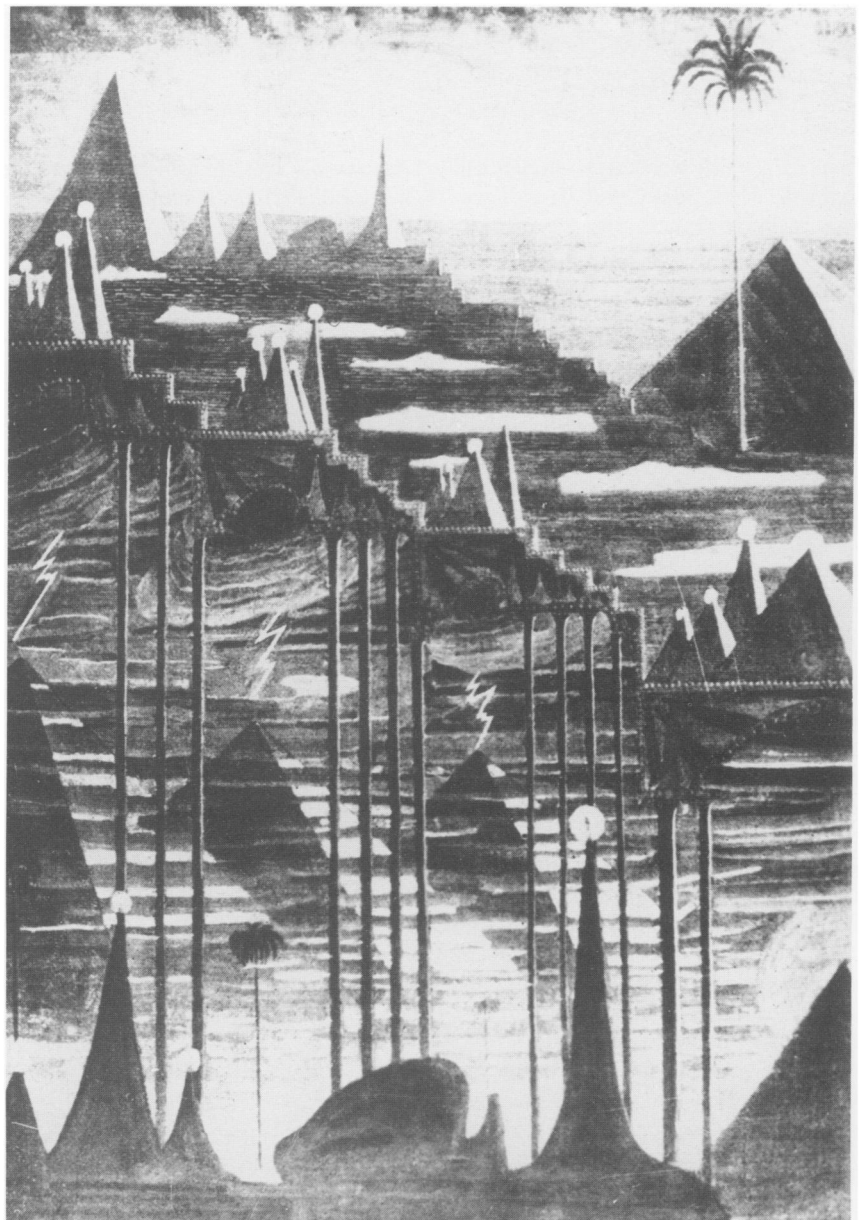


Fig. 1. M.K. Čiurlionis, *Sonata of the Pyramids: Allegro*, tempera, 1908.



Fig. 2. The 'light instrument' manufactured for A.N. Scriabin by his friends, 1911. Now it is in the Scriabin Museum.

through a work entitled *Mysterium*, in which the whole population of our planet was to participate. He envisioned *Mysterium* performed on a global scale in the open air: the sunrise, sunset, stars and all the ambient cosmic space would form part of the score of this unprecedented esoteric action, the effect of which was to bring about social shock. Time itself has introduced corrections into his forecasts: social upheavals, it turned out, do not occur at the sweep of a conductor's baton. Although there is much naiveté in Scriabin's aesthetic futurology, at the same time it contains some brilliant insights, which are being understood only today.

To substantiate this point, I would like to review briefly some of the artistic experiments of the last decades in which the visual and aural components are of 'artificial origin' and the artists achieve mastery over and a synthesis of the new media—light projections and electrified sound. I do not intend to dwell on 'traditional' forms, such as photography, radio, cinema, television, which also owe their origin to the development of technology and have served as a stimulus to culture. In 1921, the Russian Futurist poet V. Khlebnikov wrote: "Radio has solved the problem that the church has failed to resolve—that of giving mankind access to the common soul, to the common daily spiritual wave." Then, as if anticipating the triumph of television, the poet prophesied: "If formerly radio has been the world's ears, it is now become

the world's eyes for which there are no bounds." Perhaps it is not this kind of global unity that Scriabin dreamed of but the condition of "daily spiritual wave" that is provided here.

First, I would like to turn to the artistic forms and phenomena that still figure in science fiction as an invariable feature of the future, namely music-kinetic art (or the 'art of light') and the domains nearest to it which, up to this day, find themselves 'doomed to experimentation'.

II. EARLY EXPERIMENTS

To my homeland's credit, some of the first tangible steps toward this art of the future were taken by M.K. Čiurlionis, V.V. Kandinsky and Scriabin [1]. The Lithuanian composer and artist Čiurlionis (1875–1911) created strikingly picturesque canvases which, through their aspiration toward music, led to a redefinition of the boundaries of art. Suffice it to mention the titles of some of his canvases: *A Fugue*, *A Prelude*, a series of *Sonatas* consisting of, like real sonatas, four parts—"Allegro", "Andante", "Scherzo" and "Finale". His artwork also displayed an affinity to music in its exquisite colouring, structure and composite rhythm. But, as Fig. 1 shows, Čiurlionis's work remained within the realm of realistic, figurative art.

On the other hand, his contemporary Kandinsky (1866–1944) ventured to take, one might say, a desperate step: he decided to abandon figurative, repre-

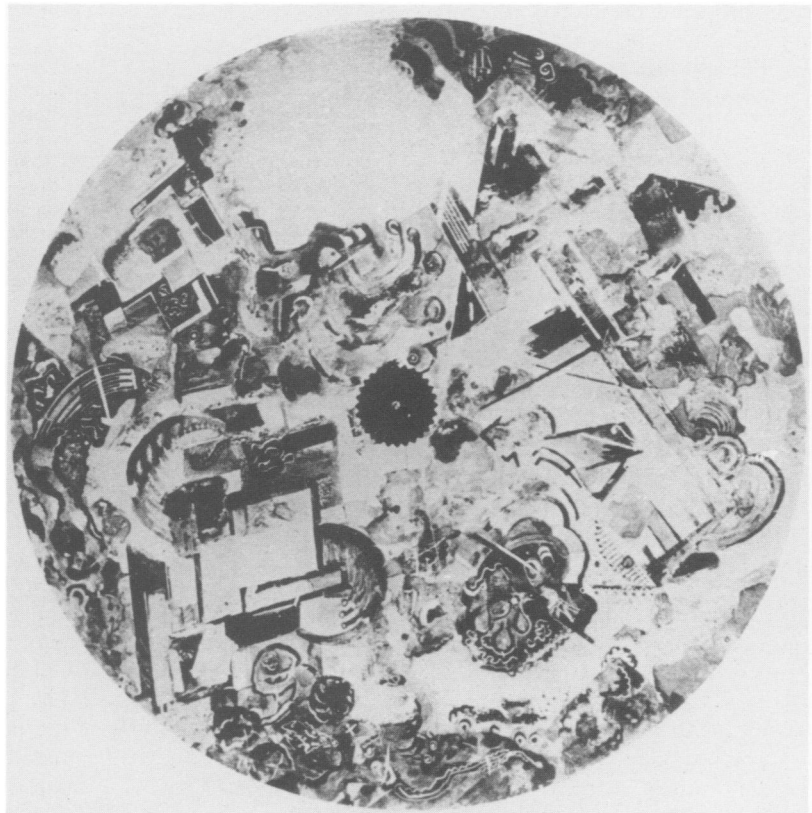


Fig. 3. The disc 'rotor' of V.D. Baranov-Rossine's 'optophon'. He began experimenting with this light instrument in 1914.

sentational art and to turn painting into genuine 'music for the eyes' (*musique oculaire*) by using colourful abstract forms. Here, too, the titles of his opuses reflect his musical aspirations—*Compositions, Improvisations*. He wrote about this in theoretical works, most especially in *On the Spiritual in Art* [2].

Kandinsky's works continue to provide a subject for discussion even today, for they bear out in an obvious manner Goethe's observation that "the sculptor can be confused by the painter who, in turn, can be confused by the mimick, and the three of them can muddle one another so that none will keep his feet". To expand upon Goethe's idea, one might argue that Kandinsky was 'muddled' not so much by music as by his natural elemental anticipation of music-kinetic art. Whatever the case, Kandinsky's experiments, being risky borderline phenomena as far as the fine arts were concerned, became, through the 'unrepresentation' of painting, one of the cornerstones for another new kind of art, music-kinetic art.

Traditional painting overcomes its convention (here it is immobility) owing to the presence of image (figuration). But in abstract, colourful non-figurative images, 'spirituality' is achieved by introducing motion. Only by gaining motion can abstract forms be filled with meaning, become 'spiritual', 'humane'. Music-kinetic art, like music itself, is an *intonational* art; and intonation apart from motion does not exist. If music, due to its origins, is linked with the intonation of human speech and other natural sounds, then the dynamic plasticity of light must be substantiated equally by the intonation of human gesture. It should be noted that dance once was, and remains, an actual form of *musique oculaire*, the human body being the natural and, alas, the only instrument of visible music. It is not accidental that antiquity has given the common denomination *musika, chorea*, to the unity of music, word and dance; and in Hindu aesthetics, this syncretic harmony is preserved in the still-valid notion of *sanghit*, where both music and word are perceived equally by hearing and by eye. In the past, the merging of *musique orale* and *musique oculaire* was natural. This unity later disintegrated, only to acquire a new content on a new spiral of evolution, that of 'instrumental' synthesis. Cinematography, using new artificial material, revived the unity of the 'visible word'; and genuine 'visible music' has become music-kinetic art, which can be characterized conventionally as the art of 'instrumental light choreography'. *Musique oculaire* could become instru-

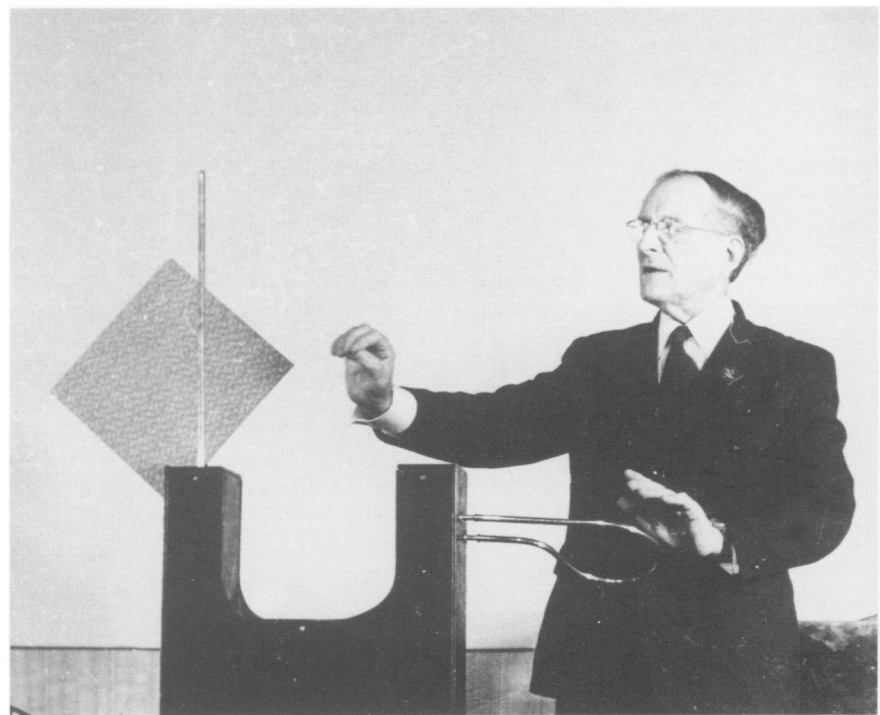


Fig. 4. L.S. Termen showing how his 'termenvox' operates during the fourth All-Union Conference on 'Light and Music', 1979.

mental only when using the technique of light projections [3].

It is noteworthy that the Marxian art historian A.V. Lunacharsky understood all this long before others had. In 1913, after visiting an exhibition of works by the abstract painters known as Orphists, he wrote:

Music of colours, a symphony of tints and linear melodies is quite conceivable, particularly when merged with the music of sounds. But it is dynamics that form the foundation of music—to draw level with it the subtle artistic kaleidoscope of the best Orphists should also become dynamic. . . . Let innovators of painting give us a chance to observe the splendid play of lines and colours engaged in that struggle of dancing sounds, that abstract round dance which is found in music [4].

It is worth noting that Kandinsky himself was oppressed by the immobility of his abstract paintings and voiced the idea of 'animating' colourful shapes by uniting them with word, gesture and music on a theatre stage (he termed this synthesis, not very aptly, 'monumental art'). As early as 1914, his script of the composition *Yellow Sound* was published in the anthology *Der Blaue Reiter* [5]. Unfortunately, he overlooked the possibilities offered by the use of immaterial, easily controlled light projection [6]. Instead, he endeavoured to make heavy scenery mobile, as exemplified by his stage production of the Mussorgsky/Ravel

"Pictures at an Exhibition", which he presented at the Bauhaus in 1928.

Kandinsky's lot was tragic and his quest doomed to reach a deadlock. However, Western readers may be interested to learn that while he was still in Russia during the years immediately following the revolution, Kandinsky was co-head of the Institute for Artistic Culture where, in a special laboratory for 'monumental art', he explored the objective regularities of the synthesis of music and painting and studied colour hearing (*synaesthesia*), the psychological basis of this synthesis [7]. Later, in the West, he was unable to realize his plans. Nevertheless, music-kinetic art is indebted to him in many ways, most significantly for anticipating methods of audio-visual polyphony (internal counterpoint), which would form the foundation for the development of a viable new art.

At about the same time, and completely independently of Kandinsky, Aleksandr Scriabin (1872–1915) asserted the significance of audio-visual polyphony. In 1910, as a first step toward his *Mysterium*, he wrote the symphonic poem *Prometheus* with the special light-line *Luce* in its score. The idea of the *Luce* was quite simple: colour was to change in unison with tonal dynamics in accord with a system of colour-tonal associations suggested by the composer [8].

The naturalness of such analogies has been pointed out by many composers [9]. Associations between mood and light,

tonality and colouring, timbre and colour, determined the structure of works by the Russian composer A.N. Rimsky-Korsakov, whose 'picturesque' music stands close to the works of Claude Debussy. Incidentally, in 1890, even earlier than Scriabin's experiments, Rimsky-Korsakov wrote the ballet-opera *Mlada* whose score contains verbal instructions regarding colour changes in the stage lighting. These colour changes, analysis has confirmed, precisely correlated with his system of 'colour-tonal' hearing. Rimsky-Korsakov did not claim to have discovered a new art, and this 'light-music' intention went unnoticed. As for Scriabin, his first though naive experience with *Prometheus* served as an impetus for his subsequent rejection of the idea of duplicating music with colour, i.e. the idea of audio-visual 'unison'. He turned instead to the idea of organizing colour into complex spatial patterns that would interact with music in complex counterpoint relationships [10].

Scriabin's untimely death in 1915 checked work on his new synthetic composition of this kind—*The Preliminary Action*. There is no way of knowing either what Scriabin's intention was or what limits he could have reached. His obituary read: "The Gods have not pardoned Prometheus, and the Gods have not pardoned *Prometheus* for bringing the people the fire of the New Art. . . ." Ultimately, Scriabin's significance for the 'New Art' lay not so much in his light score for *Prometheus* but in his subsequent ideas, which remained unknown to the general public [11].

From today's vantage point, it seems clear that no matter how thoroughly Scriabin may have thought out his ideas, it was highly improbable that he could have realized them alone. Ideally, one could picture some congenial alliance between Scriabin and Kandinsky (or Čiurlionis), but unfortunately they never met, even though they were contemporaries. Today, it is taken for granted that music-kinetic art (as well as the art of the theatre, cinema and television) is the product of collective creative efforts: therefore, the prospects for music-kinetic art being produced by one person do not seem favourable [12].

The vicissitudes of *Prometheus* serve as a vivid indication of the dramatic road of music-kinetic art. In 1915, while Scriabin was still alive, the first performance of *Prometheus* with light was held in New York's Carnegie Hall. Up until then, the work had been realized with light only in 'home conditions' by Scriabin himself (Fig. 2). The Carnegie Hall concert provoked discrepant reactions. Probably,

if Scriabin himself had taken part in the premiere, he might have made corrections to the *Luce* part as a result of a more mature consideration of the work. But, at the time, the war in Europe impeded communications between America and Russia.

At the beginning of 1917, an attempt was made to perform *Prometheus* at Moscow's Bolshoi Theatre using ordinary theatrical lighting techniques. The next performance was also held at the Bolshoi Theatre; the concert, commemorating the anniversary of the October Revolution, took place on 6 November 1918: the young republic celebrated its first anniversary with a work that had brought about its own revolution in the arts.

III. CHRONOLOGY 1918–1987

I would like to recapitulate briefly the

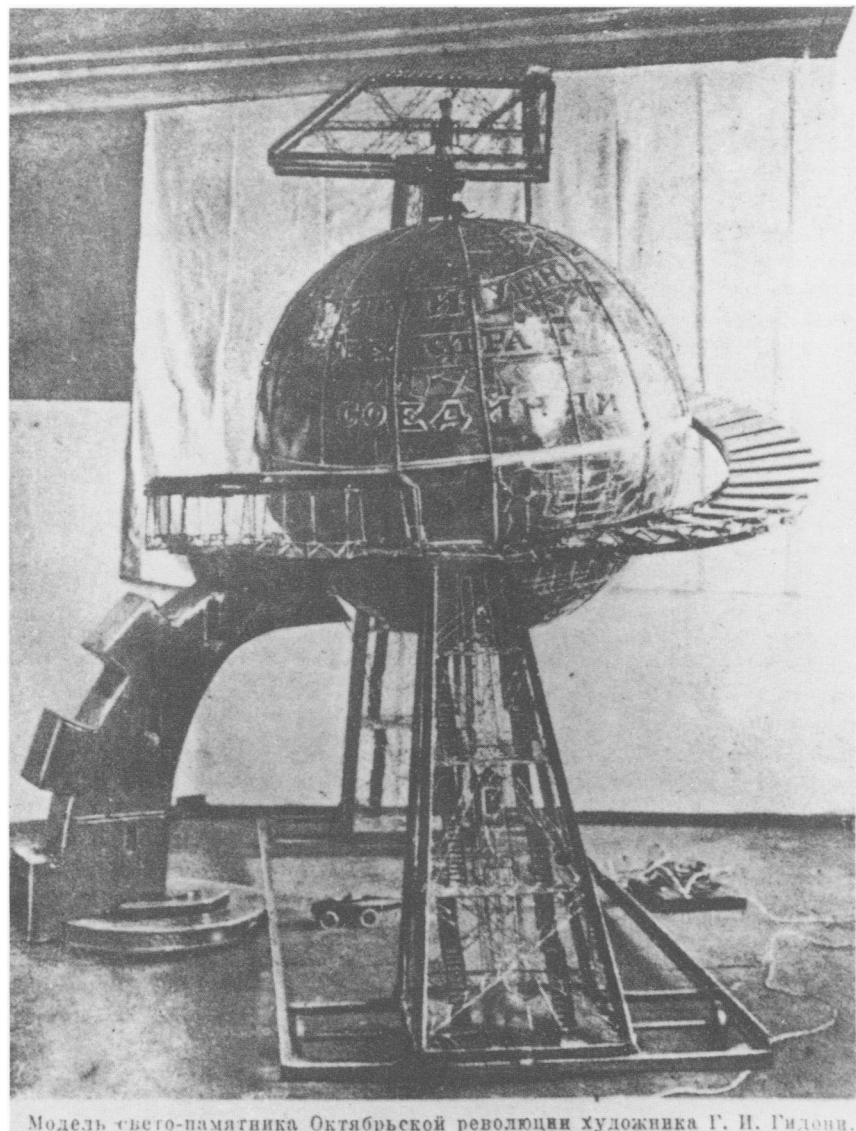
principal landmarks in the development of music-kinetic art in the post-revolutionary years.

1918

At the Academy of Arts, the artist M.V. Matiushin explored the law of colour movement and its interaction with sound. Similar investigations were carried out simultaneously at the Moscow Institute for Musical Science (L.L. Sabaneev, E.A. Maltseva) and the Leningrad Institute of the History of Arts (V.V. Karatigin, G.M. Rimsky-Korsakov).

1919

The artist V.D. Baranov-Rossine, associated with Meyerhold's theatre in Moscow, demonstrated his 'optophon', a light instrument, in combination with



Модель свето-памятника Октябрьской революции художника Г. И. Гидони.

Fig. 5. A model of G.I. Gidoni's light monument to the Revolution, 1928. The globe is a hall for some thousands of spectators. (Archive photo)



A



B

Fig. 6. (a) Scriabin's daughter at the control panel of her music-kinetic art device, 1948. The device is now dismantled. (b) The light apparatus on the ceiling of the museum. (Archive photo)

music (Fig. 3). In 1924, he held other light concerts at the Bolshoi Theatre. Soon thereafter, he moved to Paris and later perished during the Nazi occupation. The 'optophon' is now in the collection of the Centre Pompidou in Paris.

1922

The Soviet inventor and musician L.S. Termen (a.k.a. Theremin) demonstrated his Diamond Fund alarm system to Lenin: as soon as one's hand approached the antenna, the generator produced a sound signal. If one moved one's hand in a smooth pattern, the device changed into an astonishing instrument. Lenin showed an interest in this extraordinary music that seemed to be coming 'from the air' and performed Glinka's "Skylark". Later, this instrument became known worldwide under the name 'termenvox' (Fig. 4).

Interestingly, Termen usually performed his electronic music concerts in combination with light. During his residence in the United States (1928–1938), he set up a Soviet–American joint-stock company to produce termenvoxes. He also organized an art studio in New York and worked on a new instrument called a 'terpsiton' which created music in response to a dancer's movements. He continued to carry out his experiments with light, and, he has related, Albert Einstein, accompanied by the English artist M.-A. Bute, visited his studio to participate in music-kinetic performances [13]. Termen has recently celebrated his ninetieth birthday and has many plans which may hold yet more surprises.

1928

G.I. Gidoni, an artist from Leningrad, delivered an unusual lecture at the Academy of Sciences to demonstrate his light grandpiano:

At last the radiant Febus Apollo (leader of all muses) acquires, apart from his lyre, the art rightfully belonging to him, the great art of light and colour. He may at last give up his lyre. Sacrilegious though it may sound, today the rheostat shall take the place of Apollo's lyre!

(Just think what Gidoni might say were he to see one of today's laser devices.)

During the period 1930–33, Gidoni published his book *The Art of Light and Colour* [14] and organized a laboratory bearing the same name as his book (and staffed by only one person) affiliated with the Academy of Sciences. Here he designed a model of a huge light monument to the Revolution: a semi-transparent globe placed on top of a structure made up of a

cog-wheel, a hammer and a sickle (Fig. 5). The spectators would be able to perceive audio-visual music both within and without this gigantic globe. The model was shown to government members, and they endorsed it. Unfortunately, realizing the project proved an insurmountable task at the time; only much later, at the exhibitions Expo-58 and Expo-70, did something along the same lines appear, but on a smaller scale.

Gidoni's life had much in common with that of the American 'lumia' artist Thomas Wilfred, who in 1930 set up the Art Institute of Light (with a staff just as 'large' as Gidoni's) and dreamed about building a 'Temple of Light' with a huge visual carillon, a project that also remained unrealized. Nevertheless, the names of both Gidoni and Wilfred will be remembered in the history of 'space-age art' just as those of Gagarin and Armstrong have entered into the history of astronautics [15].

1932

In the ancient small town of Tver (now Kalinin) near Moscow, P.P. Kondratsky's book *Colorostatics*, which deals with, among other things, the prospects of colour dynamics, was published. Experiments with lumia music instruments supported his findings.

1934

The 'Kinemachrome' system was developed at the Leningrad State Optical Institute for use in the huge Palace of Soviets of the USSR, which was being designed for the center of Moscow. In the assembly hall, capable of accommodating 15,000 spectators, lumia concerts were to be performed. At last, it seemed that the moment had come for realizing the dreams of Scriabin's followers.

The outbreak of World War II put an end to all these plans. It was no longer an auspicious time for dreams, not even in the United States, far from the hostilities; Wilfred's Art Institute of Light was mobilized for the aims of military medicine. The fate of his Soviet colleagues was harsher still. As for the steel framework of the Palace of Soviets, on which construction already had begun, it was used for making anti-tank devices to defend Moscow—this time it was the god Mars who interfered with the dream of the radiant Apollo.

1940s and 1950s

There remained only a handful of individuals who, by fits and starts,



Fig. 7. The control panel of the music-kinetic art instrument set up in the 'Rossiya' cinema-concert hall, where *Prometheus* was performed, 1975.

endeavoured single-handedly to maintain the fire of *Prometheus*. In 1940, the film director Sergei Eisenstein presented a lumia music production of Wagner's *Die Walküre* and published his book *The Vertical Editing* [16]; he then began work on a new concept, that of 'non-indifferent nature'. Both this concept and his book are devoted to audio-visual film editing, but because of Eisenstein's profound analyses, they go even further and delve into the theory of light and music synthesis.

The fire of the new art was barely glimmering in the Scriabin Museum, located on a quiet Moscow lane. The composer's daughter was designing lighting equipment for a performance of *Preliminary Action*. In 1946–48, her lighting device, though not complex, was being assembled in one of the museum's rooms (Fig. 6). This timid little flame drew around it all those who still believed in the 'art of luminous sounds'.

E.A. Murzin, a war veteran and engineer, came to work for the Scriabin Museum. As early as the 1930s, he had begun working on a photo-electronic music synthesizer. (When he completed the instrument in 1957, he named it 'ANS' in honour of Aleksandr Nicolaevich Scriabin.) Whereas with the 'termenvox' the music is created by moving one's hand in the air, here it is drawn, like an engraving upon glass, and something unprecedented emerges—space timbres.

Both Murzin and Termen realized that electronic music has an inherent affinity with light. Unusual concerts were held in the Scriabin Museum. Not all efforts were immediately successful; the search was difficult and many musicians were only just beginning to comprehend Scriabin's daring ideas.

Since 1960

The cybernetic boom of the 1960s, when engineers began to speak seriously about the possibility of machines engaging in creative activities, rendered the situation more complex. Norbert Wiener, the father of cybernetics, warned of the emergence of a tribe of vehement 'machine worshippers', which he saw as a threat for the USSR as well [17].

A laboratory of 'colour music' was set up at one of the institutes of the Academy of Sciences in Moscow. Its director, K.L. Leontiev, maintained that composers and artists were no longer necessary; one needed only to 'input' into his apparatus the music of Scriabin or any other composer and the computer would put out the single 'most reliable' version of the light accompaniment [18]. However, he overlooked the fact that it was a human being, after all, who prepared the computer program he used for his compositions. After a few years, Leontiev relinquished this idea, and his performances of *Prometheus* in 1962 and

1975 were given under manual control in keeping with Scriabin's score (Fig. 7).

But at that time, in the 1960s, many people, both in the USSR and abroad, believed in the idea of music-kinetic art created 'by a machine'. Some automatic psychedelic toys are left over from this period of electronic expansion, such as the devices used with dance music in discotheques. Throughout the world, industrialized countries were producing

quantities of unsophisticated music and light 'synchronizers'—hardly the type of fire *Prometheus* was meant to engender.

Scriabin's flame was taken up by other hands. In 1962, the group Prometei (Prometheus), of which I am a chief member, was formed in Kazan. We chose the name 'Prometei' to underscore our objectives. After an initial performance of Scriabin's "Poem of Fire", we presented a series of lumia music concerts (Scriabin,

Rimsky-Korsakov, Mussorgsky, Stravinsky, Boulez) and of lumia-music films [19], the most recent being *Space Sonata* (1981) (Color Plate B, No. 2), which was accompanied by electronic music. The films are unusual not only because of their images but because of the techniques used: although black-and-white objects are shot using standard black-and-white film, the resulting positive film is multi-coloured.

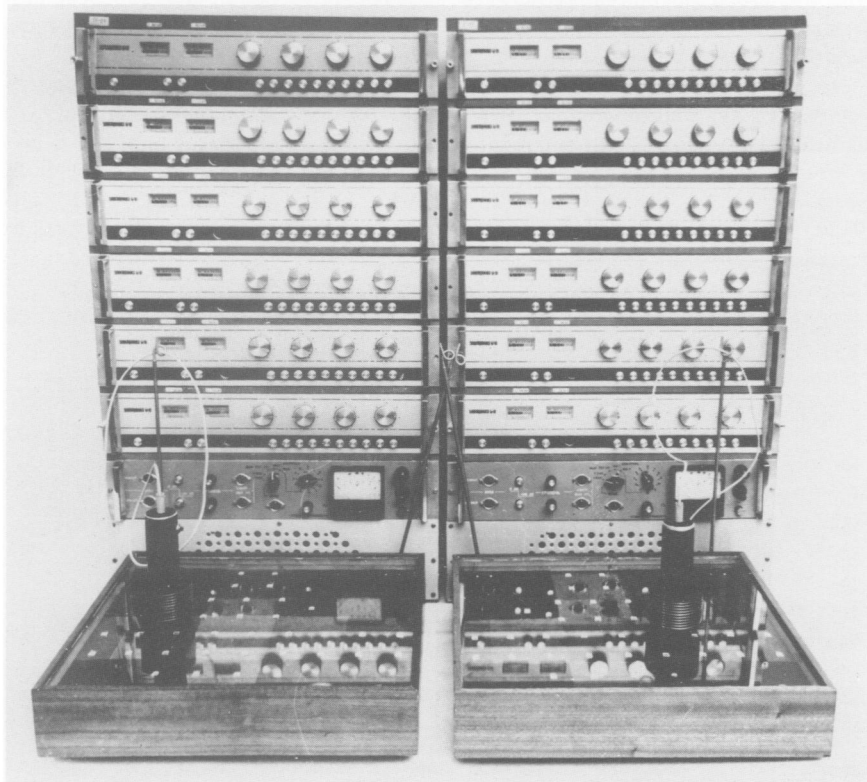
In 1979 our group Prometei established a studio and music-kinetic art museum in Kazan; though the museum is small, it proves that the new art has deep historical roots (Fig. 8a). A unique 'spatial music' device operates in the main hall: the sound shifts smoothly along any conceivable trajectory within the hall in response to the movement of one's hand over the control panel (Fig. 8b). Prometei has used light in the design of some of the new architecture (Fig. 9), and we have produced decorative music-kinetic devices (Fig. 10) [20]. We also carry out research into colour hearing (synaesthesia) and experiments with children 'painting music'. The group publishes monographs on the history, theory and technique of the new art as well [21].

Similar activities were pursued by the members of the Kharkov music-kinetic art studio, which was organized in 1969 by Yu. A. Pravdiuk. His technique is close to those used by Wilfred (U.S.A.) and F. Bentham (England) for their music-kinetic art concerts. The repertoire of the Kharkov studio includes dozens of light-painting interpretations of music by Scriabin, Tchaikovsky, Shostakovich, Wagner, Dvořák. Among Pravdiuk's recent works is the music-kinetic art production of A. Ribnikov's rock opera *Juno and Happy-go-lucky* (1984), based on Andrei Voznesensky's poem telling of the long-standing ties between Russia and the U.S.A.

In the last two decades, music-kinetic art concerts have been held regularly in Leningrad, Uzhgorod, Alma-Ata, etc. Laser art concerts are given in a hall of the Cosmonautics Memorial Museum in Moscow. In a number of universities and institutes, such halls function as part of an intensive teaching program. Several documentary films devoted to music-kinetic art have been released recently, for example, *Colour and Music by Scriabin* (Moscow) and *Possession* (Kazan). There is a similarity between music-kinetic art and the experimental film *Space-Earth-Space* (Moscow), which recalls the time travel episode from S. Kubrick's *2001: A Space Odyssey*. Music-kinetic art forms the basis for the plot of the 1981 feature film *The Nemukhin Musicians*, derived



A



B

Fig. 8. (a) One of the rooms in the Kazan Music-Kinetic Art Studio. (b) The equipment that operates the 'space music' in the main hall of the Kazan Music-Kinetic Art Studio.

from a fairy tale by V. Kaverin. And in 1982, a television production of *Prometheus* with light was realized under the auspices of Leningrad television.

Today's forms of the art of dynamic light are diverse; Scriabin hardly could have foreseen all that modern technology has made possible today. But in a more general way, his predictions are coming true. His dream of some form of fluid architecture prefigured, for example, the music-kinetic art fountains that today decorate squares and public gardens in many Russian cities (and even in some collective farms and settlements).

His idea of synthesizing architecture and light and of fusing them with speech and theatre resembles the dramatized *son et lumière* performances in which voices and noises shifting in space 'act' in place of actors. The Prometei group first experimented with *son et lumière* in 1970 with the presentation of *Forever in People's Memory*, performed in Kazan and dedicated to the twenty-fifth anniversary of the victory over Nazi Germany. More recently, our colleagues have installed a permanent light-and-sound complex in Samarkand [22].

Scriabin dreamed of bringing his 'acts' not merely into the open air but into heaven and the clouds as well. A similar type of aspiration seemed present in the laser experiments that were conducted at the most recent World Festival of Youth and Students, especially when the festival's 'ox-eye daisy' started rotating in the night sky over thousands of people.

Most of these experiments were demonstrated at the All-Union Festival of 'Light and Music', which was held 20-30 September 1987 in Kazan to commemorate the twenty-fifth anniversary of Prometei's founding. Music-kinetic art concerts were held in conjunction with the exhibition 'Art and Technology' (similar to the 'Electra' exposition held at the Museum of Modern Art in Paris in 1984).

IV. CONCLUSION

Although I have tried to give a broad view of the subject, my account is incomplete due to its brevity. I should point out that both in the USSR and in other countries, music-kinetic art, the art of light, has not become an accessible and everyday phenomenon and its achievements leave much to be desired. It is, however, a new art still in its early stages of development. An encouraging sign is that the public's interest in the problem of synthesis is not waning. This is borne out by publications that point to the need for coordinating all individual kinetic-art

experiments within the framework of a special research center [23]. It is also substantiated by bibliographic surveys on music-kinetic art [24]. Since 1742, it turns out, there have been more than 1000 publications in Russian, counting just books and articles alone. And each year sees an increase in the number of works devoted to the new art. Moreover, the standards governing the theoretical considerations of the problem have risen noticeably [25].

Now to ask a simple yet perplexing question: why has music-kinetic art lagged behind the cinema and television in its development, especially considering that all three were conceived at roughly the same time, i.e. the beginning of the twentieth century? The answer I would give is that the techniques used for the cinema and television are open to unification and standardization. A film produced in the USSR, for instance, can be shown in any American cinema theatre and vice versa. The situation is different for music-kinetic art. One cannot separate the act of creating the work of art from producing the instruments. The techniques of music-kinetic art (if one leaves out psychedelic toys) are not susceptible to unification; each music-kinetic art instrument is unique, as is any work of art. And each time a new work is produced, one is obliged to think once again of new techniques, methods and technology. And the closest possible unity between artistic and technical creativity is essential, be it for an individual or a team [26].

Are these specific features and difficulties really insurmountable? They certainly are not, provided a community

is ready to ensure the proper conditions (socio-economic, pedagogical, etc.) for achieving the desired harmonic development of humanity and hence of an individual. The road to this objective is neither easy nor straight. One thing is certain, though: it is possible to arrive at this long-awaited and fruitful union of science, technology and art provided the god Mars does not interfere with the god Apollo.

I was shocked to see a recent television presentation of a U.S. documentary video-recording that featured the first test of the orbital laser weapon: a dazzling green flash accompanied by Tchaikovsky's majestic chords! Is this the type of light and music synthesis on a global scale that humankind is to look forward to?

"We who have worked with lumia", wrote Wilfred in 1947, "firmly believe it will someday symbolize the emergence of a humanity with a right to the name, quite possibly", he continues with bitter misgivings, "the chastened survivors of the last atomic rampage". I can only agree with his words that "to lay the smallest stone in the foundation, to bring the tiniest flame from the eternal fire to light the way, is a truly noble calling" [27]. If there is no threat of war, if nuclear testing grounds fall silent, if humankind's intellectual powers serve the cause of peace, then perhaps our most fantastic dreams can become reality.

The father of Soviet 'practical cosmonautics', S.P. Korolev, after having read a description of a 'light symphony' in science-fiction writer I. Efremov's novel *The Nebula of Andromeda*, proposed to use music-kinetic art on board future

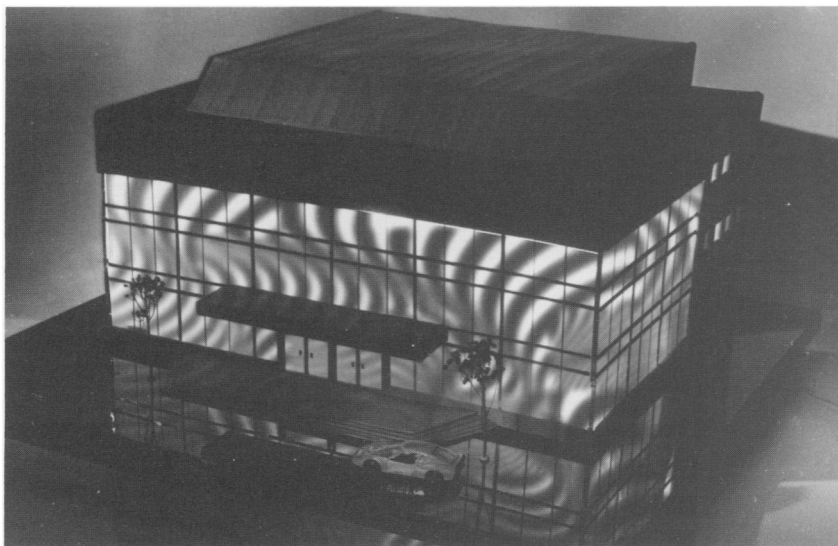


Fig. 9. A model designed by Prometei showing the music-kinetic art design for the exterior of the Kazan Conservatory, 1975.



Fig. 10. 'Disco', 1983, one of the music-kinetic art devices designed by Prometei that has been produced in quantity.

space stations. In fact, the three-volume joint Soviet-American publication *Space Biology and Medicine*, published a few years ago, actually contains a section on music-kinetic art—the art of the space age, of a peaceful space age. Permit me to fantasize: spaceships are being launched from Cape Canaveral and the Baikonur launch site to repeat the 'Apollo-Soyuz' handclasp—a joint Mars venture, perhaps; in the comfortable spaceship compartments, audio-visual music will flicker on the screens—possibly Prometei's *Space Sonata*. And why not...?

These, of course, are not the only things that might happen. At the beginning of this century, a Russian poet forecast

that in 1980 all the bells of a white-walled Moscow would ring out Scriabin's *Prometheus*. Was this fantasy? Already in the 1920s, there were attempts to perform 'hooter symphonies' actually using factory hooters. Permit me again to give free rein to my fancy: over the transparent parallelepipeds of skyscrapers, over the cities, there arise in the night sky enormous northern lights—an aurora borealis controlled by a music-kinetic artist performing Scriabin's *Prometheus*. Again, why not? In accord with the joint research program 'Arax', Soviet and French scientists already have stimulated artificial flashes of northern lights in the sky.

Visionary artists dream of huge artificial

moons—Earth satellites of different designs and colours. And this has almost become a reality. If one were to take even the smallest share of the sums currently being spent on armaments, it would suffice for staging a performance of a genuine space sonata, using superpowerful continuous-action lasers and the face of the Moon forming a natural screen surrounded by shimmering stars joined in a round dance—a space sonata for the entire planet—Scriabin's *Mysterium*. It could be timed to the beginning of the third millenium, already near at hand. Surely humanity is worthy of such a holiday. At any rate, we are striving towards it!

APPENDIX

At the Sources of the Idea of 'Seeing Music' in Russia

Bulat M. Galeyev

The entire issue of the newspaper *Sanktpeterburgskie vedemosti*, No. 35, 29 April 1742, is dedicated to the coronation of Elizabeth I. Among other news items is the following brief communication from the world of science:

This morning the Imperial Academy of Sciences held a public meeting to bring the festivities to a close. Mr. Kraft, professor of physics, delivered a speech on the eye-pleasing clavichord recently invented in France. He also endeavored to resolve, on a physical basis, the following question: Can colours, if arranged in a particular manner, provide a deaf person with the same type of enjoyment as we experience when our ears perceive a harmonious consonance of musical tones? This was answered by Doctor Weitbrecht, professor of physiology. . . .

These "Speeches delivered during the public meeting of the Imperial Academy of Sciences on 29 April 1742" have been preserved. Up until now, they have not been given due attention, having received only brief mention [28]. However, familiarity with the "Speeches" makes it evident that they deserve a more thorough consideration—especially in light of the present revival of interest in the idea of 'seeing' music . . .

What is this *clavichord oculaire* devised by the French Jesuit monk L.-B. Castel, known for his work in mathematics and physics? For clarification, one must turn to even more distant times.

Pythagoras (6th century B.C.), through his experiments with string, discovered that the structure of the musical scale is in keeping with strict numerical proportions. As is obvious today, Pythagoras's discovery represented for European science in general the first physical law to be expressed in an explicit mathematical form [29]. Thus it is not surprising that, considering this law as unique and universal, Pythagoreans used the proportions of musical acoustics to explain

all other phenomena of nature including the cosmos, which they thought of as a huge harmonically tuned instrument of divine origin. According to the Pythagoreans all the 'planets' (including both the Moon and the Sun) rotated around the Earth along orbits proportional to the gradations of the scale, continually producing the inaudible sounds of the so-called 'music of the spheres'. The students of Pythagoras even managed to obtain concrete data about this extraterrestrial space music: according to one version, Saturn produced a sound similar to the note B, Jupiter—C, Mars—D, the Sun—E, Mercury—F, Venus—G, the Moon—A. It is amazing that a similar type of musical cosmology developed, independently of the Pythagoreans, in ancient Oriental cultures, principally in India and in China [30]. This yet again testifies to the existence of a distinct unity in the development of diverse cultures [31].

During the Middle Ages and the Renaissance, the 'music of the spheres' experienced a revival. Its most noticeable recurrence was in the teachings of J. Kepler who, in his "Harmony of the Universe" ("Harmonices Mundi", 1619), which contained his three famous laws, revealed again and 'definitively' the score of this planetary symphony, this time, however, not in its geocentric but in its heliocentric version [32].

Isaac Newton, who fell under the spell of Kepler's "Harmony of the Universe", compelled himself to 'hear' echoes of the 'music of the spheres' in the spectrum as well, dividing it specifically into seven colours, and not any other number of colours (even though in Europe at the time it was customary to single out five independent colours; other peoples, by the way, even today divide the spectrum differently).

Newton was by no means thinking of creating a new art on the basis of this analogy of "seven tones of the scale—seven colours of the spectrum" (a fortuitous analogy, as we see it, devoid of any true physical content). This was left to Castel (1688–1757) who, after reading Newton's "Optics", proposed devising a 'colour clavichord' which, when its keys were pressed, would produce simultaneously both the sound and the colour 'corresponding' to the given tone. His

project brought about a storm of discussions in scientific circles all over Europe. His extraordinary ideas were received favorably by the composers Rameau, Telemann, Gretry. Critics of Castel's *musique oculaire* included such celebrated contemporaries as Rousseau, d'Alembert and Diderot, who expressed their sharply negative attitudes toward his ideas in the famous *Encyclopaedia*. Voltaire sarcastically nicknamed him the 'Don Quixote of mathematics'.

The above-mentioned academicians from St. Petersburg subjected Castel's *musique oculaire* to a thorough analysis. The discussions were based on Castel's well-known publications in French journals as well as on a certain letter 'from Paris', which had been received, as reported by Kraft, by the Russian Academy of Sciences in 1741, exactly one year earlier. (Judging by the evidence, Russia at the time was not familiar with Castel's principal work [33] nor with the book of his interpreter G.-F. Telemann [34].)

Kraft began his criticism by turning to Galileo, who had noted a definite relationship between the observed oscillations of the pendulum and its length, an indisputable fact yet one that irritated Kraft in that Galileo used relationships and terms such as 'fifth' and 'octave'. "It is true", reasoned Kraft, "that he has presented an agreement, but it is one that is lifeless, neither alive nor musical. Instead of a living and fullblooded body there are dead and dry bones; instead of magnificent palaces, a base shelter of branches". In his criticism, Kraft, speaking as a physicist, argued seriously that the low frequency of the oscillations of Galileo's pendulum accounted for their inaudibility and consequently the impossibility of admitting them into the realm of music. And he linked the emergence of an audible sound with the frequent 'vibrations' of the string. He saw the ideas of transferring musical proportions into the realm of colours as providing an even greater basis for criticism: "I do not believe", he said, "that there would exist a physicist who could prove that light also possesses vibratory motions" (i.e. Kraft denied light its wave property). As a result, since there is no basis for proportion in 'vibrations', since "there is

Translated from the Russian "У истоков идеи «видения музыки» в России", originally published in *Вопросы истории естествознания и техники* (The Questions of Natural Sciences and Technology History) No. 2, 130–135 (Moscow: 1985). Reprinted here by permission of the All-Union Agency on Copyright, Moscow.

no fifth”, Kraft concludes, “there is no music. . . .”

Nor did Kraft ignore the above-mentioned fact of dividing the spectrum into seven colours, which had been undertaken by Newton. However, attempting to justify Newton, he pointed out that “we do not immediately perceive” the zones dividing the spectrum into separate colours but rather discover them “by means of our mind”, and that Newton himself “did not think of establishing musical agreement from colours”. One might just as well, maintained Kraft, imagine a person “who on sheets of paper would write down numbers forming a harmonic or some other progression and then, after shuffling them, would expect them to yield some form of musical enjoyment”. Kraft’s arguments remain valid even today.

The arguments of the second speaker, academician I. Weitbrecht, “doctor of medicine and professor of physiology”, were more fundamental. He spoke more sharply than Kraft, who had been fascinated at times, during this discussion, by physical analogies and often had been ‘under the influence’ of Castel, arguing about insignificant details. “I have always been of the opinion”, said Weitbrecht, as he took the floor, “that it is easier and simpler for a legless man to learn to walk on his hands than for us to perceive with our eyes sounds presented in various colours and to perceive them with the very same sweetness with which they enter our ears”.

Discriminating between the abilities to see, hear and reason, Weitbrecht backed Kraft in that, by its physical nature, colour cannot affect eyesight the way sound affects hearing. He also pointed out that the organs of vision and of hearing have different structures, which rules out the possibility for them to affect ‘our soul’ in the same way. And, finally, he came to his main argument that it is impossible for “our thoughts about diverse and specific objects represented in different ways to evoke the same or similar reactions (either positive or negative)”.

Thus he arrived at the following conclusion: “Accords in music are pleasing, and colors are also pleasing, but in a completely different way.” Music is constructed on the change of tones, whereas the effect of colour is based on constancy:

A single colour may be quite pleasant by itself, yet, as the saying goes, one string does not make much noise. And, vice versa, their frequent and rapid change will sooner dazzle our eyes than provide enjoyment. So, when desiring

to amuse the eyes by the hearing we will undoubtedly get a revolt.

Weitbrecht believed that if Galileo did wish to hear ‘music’ in the oscillations of the pendulum, then this music was “imaginary and philosophical”. This is precisely how Castel regarded his own idea, for he considered himself a philosopher and readily renounced his fame as the inventor of the new instrument.

Until the end of the nineteenth century, it was a matter dealing only with the *ideas* of seeing music (and not with the art itself). I should also point out that for Castel’s supporters and critics this idea was first and foremost a philosophical problem and, more specifically, one that concerned the natural sciences. Castel’s ideas of seeing sounds and of a ‘music for the eyes’, which he intended only for the ‘philosophical’ eye, not merely became known as fancies of the mind [35] or as the symbol of the absurd but turned into a touchstone of sorts on which the blade of polemics was sharpened: Condillac in his arguments with the rationalist school in philosophy (“Treatise on systems”); Diderot and d’Alembert arguing with Rameau about whether harmony is a science (*Encyclopaedia*); Rousseau supporting the ‘encyclopaedists’ in their criticism of the ‘mathematicization’ of art and pointing to the difference in the perception of sound and colour according to the role played by, to use current terminology, the “reflex to the relation of the irritants” (“A study on the origin of language”); Goethe and Buffon pointing to the fortuity of Newton’s analogy and stressing that, in nature and for human organs, sound and colour appear as independent processes (“Theory of colour” and “Observation of random colours”, respectively); it becomes Herder’s argument in his dispute with Lessing concerning the difference between ‘action’ and ‘consequence’ in classifying the arts (“Critical scaffolding, or considerations relating to the science of the beautiful and art, on the basis of recent investigations”); etc.

It is plain to us today that Castel’s ideas are non-artistic and non-aesthetic in content and natural-philosophical by origin, following the course of a metaphysical quest for confirmation of the unity of the universe, apprehending it as the discovery of universal constants and analogies of a Pythagorean kind. All the opponents of Castel mentioned above, both foreign and Russian, analyzed and criticized in the main this natural-philosophical analogy of ‘spectrum—scale’, the idea of the simple mechanistic transformation of music into colour. At

the same time, however, many of them questioned the hypothetical possibility of seeing music altogether; many, but not all. Weitbrecht, although he had leveled harsh criticism at Castel, concluded his speech with the following words: “It may easily come about that some kind of enjoyment will be found for our eyes that will delight us no less than music. . . .”

M.V. Lomonosov, who was present at this memorable session, also did not ignore this problem. He subsequently noted in one of his physics papers: “Colours agree amazingly with music . . .” [36]. And in an ode commemorating the anniversary of the coronation of empress Elizabeth I, he introduced these lines, which were incomprehensible to readers:

Hush, ye flaming sounds,
Stop shaking light! . . .

Soon after the discussion of Castel’s ideas, L. Eiler, another academician from Petersburg, presented his special investigation “Physical observations relating to the propagation of sound and light”, which contained meticulous computations of the frequencies of musical tones. In consequence, he is commonly regarded as an adherent of Castel’s ideas. But in his papers, he did not draw any analogies between definite sounds and colours, although, for the first time in science, the difference in colours was related to the difference in the frequency of the corresponding vibrations of ether [37]. (By the way, Castel’s followers, if they had known this fact, could have deprived Kraft of his principal critical argument.) Naturally, he did not have thoughts of devising a *musique oculaire*. Comparing sound and light was necessary only for comparing their methods of propagation. Of course, light propagates in a different medium, and if air were as “thin and elastic” as ether, maintained Eiler, sound would have a speed of propagation equal to that of light.

It is of interest to pursue further the destiny of Castel’s ideas in Russia and to compare the new criticism with the conclusions of the Petersburg academicians.

For Russian readers, another significant impetus stimulating their interest in *musique oculaire* was the book by the German writer K. Eckartshausen, *The Key to the Mysteries of Nature*, which was widely known in Europe during the late eighteenth century and was translated into Russian many times. The film director S. Eisenstein cites vast passages of it in *The Vertical Editing*:

For a long time I have been investigating the harmony of all sensuous impressions. To make it more

obvious, I have amended the musical machine invented by Father Castel so as to make it possible to produce all chords of colour exactly as chords of tones. Here is a description of the machine: I had some glass cylinders made, all equal in their dimensions and half an inch in diameter, and filled them with coloured liquids in keeping with the theory of colours. I arranged these cylinders just as strings in a clavichord are positioned, dividing tints of colour in the same way that tones are divided. The cylinders were closed by copper flaps placed behind them. As the flaps rose, colours were revealed. . . . The clavichord was lit from behind by tall candles. It is impossible to describe the beauty of the emerging colours for they surpass the most valuable jewels. He who was the first to speak of a music for the eyes was held in derision . . . , nevertheless this did not frighten me [38].

But the principle proposed by Eckartshausen differs substantially from the ideas of Castel. Eckartshausen abandoned speculative physical analogies: “Just as musical tones should be in accord with the author’s narration in a melodrama”, he supposed, “so too should colours correspond to words”, for “colours can express the sentiments of the soul. . . .”

The Italian theatre artist P. Gonzaga (1751–1831), who had worked for many years in Russia and published his work *Musique Oculaire* [39] here, came even closer to an artistic treatment of the problem of seeing music. In his numerous productions, he sought to give a plastic presentation of music and drama, attempting to obtain a harmonious audio–visual unity; and in some performances, even the changing of scenery occurred in accordance with the music. He stated that the musical element was predominant in the theatrical culture of his time and noted the lack of interest in the visible, which, so he thought, had a ‘music’ of its own. Gonzaga did not rule out the existence of analogies between the spectrum and the octave, but he considered it wrong to use them to produce *musique oculaire* in accordance with Castel’s principle:

[Castel] did not take into consideration that colours act in space while sounds act in time, that our ears like to perceive sounds in succession, one after the other, whereas our eyes like to observe colours arranged simultaneously side by side. He failed to appreciate that this momentary process is contrary to the peculiarities of vision, which wishes to dwell on things and finds it just as difficult to grasp the instantaneous relationships between objects that follow one after the other as it would be for the ear to perceive persistent non-alternating sounds.

(We may note that this has much in common with the anti-Castel arguments of Rousseau, Weitbrecht and Herder.) Gonzaga compared space and colour to musical accents and tones and believed that for making visual music “spatial rhythm and colour modulations are required”. He proposed to divide space in a manner similar to the division of time.

If Castel’s works became widely known in Europe in due time and his analogy, his ‘music of colour’, became even a sort of trite metaphor in the literature and poetry of the eighteenth and nineteenth centuries, then Gonzaga’s contribution to the development of the concept of visual music is known but little among specialists in aesthetics and musicologists, especially among foreign ones. It was Gonzaga who was the first to point to the feasibility of an actual ‘musical’ vision. At the same time, he realized the triviality and emptiness of Castel’s colour modulations. He compared music with the richest realm of visible shapes, and it was with contours, drawings, that he compared, as did Rousseau, melody—the principal ‘information carrier’ in music. He could also discern the hypothetical possibility of realizing the ‘music for the eyes’ metaphor when paying attention to the unique non-objective light–dynamic phenomenon of artificial origin and intended for purposes of art—fireworks. Gonzaga believed that fireworks possess a striking similarity to music in the proper sense of the word:

Fireworks contain, along with the other musical characteristics already noted, the great advantage of never being constant, durable; combinations of shapes and colours develop in time, undergo changes and vanish rapidly, similar to tones, modulations and musical rhythm. Consecutive development and motion are essential here and contribute to the momentary enjoyment of changes. And, lastly, this is just the optical clavichord and, by its very essence, music for the eyes. . . .

This period of direct critical appraisal of Castel’s ideas in Russia can be regarded as finished. As shown above, these ideas were called into being not because of the requirements of art but rather because of the attitude of the past centuries that was ready to treat music as ‘one of the applications of mathematics’ (as V.F. Odoevsky put it). This detailed account of Castel and his critics is not presented here merely to provide a complete historical background. We are dealing with an amazing experiment staged by history: Castel with his theory (even though it has no direct bearing on

art) literally forced his contemporaries, though prematurely, and as if ‘accidentally’, to state their opinions on the very idea of seeing music. True, many of his critics could not go by themselves beyond the framework of metaphysical speculations; however, the explanations as to why Castel was wrong contained many correct observations.

The concept of instrumental ‘music for the eyes’, lacking the stimulus of genuine aesthetic inquiry and the technical prerequisites for testing, stiffened in a scholastic stupor and developed no further, although in Russia as well as in the West from time to time information was published about either Castel himself (in reference books) or fresh discoveries of the idea of the ‘color clavichord’ [40]. But the largest publication along this line at the beginning of the nineteenth century was a satirical article that derided not only Castel but his supporters—Gretry, etc. [41]. Russian readers were familiar with the later criticisms of Castel contained in the works of J.W. Goethe, H. Helmholtz, W. Ostwald, M. Mendelssohn. T. Seemann’s musicomorphous concept of pictorial colouring had revived a short-lived interest in the problem; it had been popularized in various forms by Russia’s own followers of Castel up until 1910, the year the composer A.N. Scriabin created *Prometheus*, the first light-musical composition in the world [42–47]. They are mentioned here merely to illustrate the belated and unmotivated recurrence of mechanicalism and reductionism in art. Already by the late nineteenth century, after electricity had been mastered and attempts were being made to build working ‘colour organs’, spectators could see for themselves that the flashing of colours according to the ‘law’ of Newton (Castel, Seemann, etc.) in no way coincided with the artistic and emotional influence of the music that had been ‘translated’ into colour: the experiments of B. Bishop in the U.S.A., B. Taillet in France, A. Rimington in Britain, A. Scriabin in Russia. The conclusions of the Petersburg academicians proved prophetic.

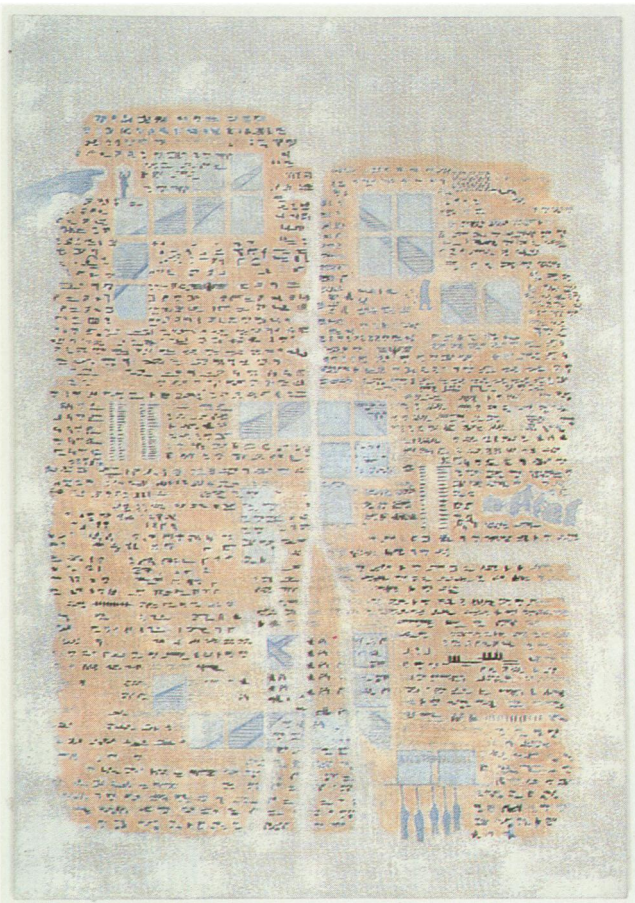
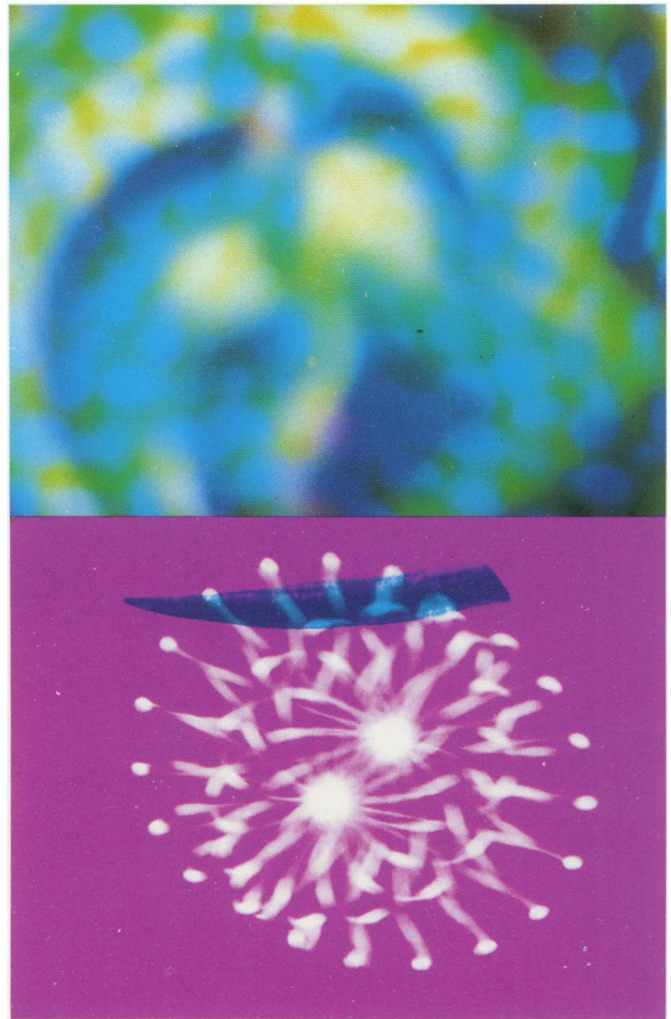
It becomes evident that regularities of ‘audio-visual harmony’ should be sought not in the sphere of physical extra-human analogies [48] but on the basis of comparison of the physiological, psychological and, ultimately, aesthetic influence of light and colour (which correspondingly characterizes the notions of ‘audio-visual unity’ and ‘audio-visual harmony’ as agnoseological category). And it is here that real possibilities exist for the advancement of the ideas of ‘seeing music’, as manifest in the current practice of the so-called music–kinetic art [49–53].

REFERENCES AND NOTES

- It can be argued that the idea of 'seeing' music was first stated by the French monk L.-B. Castel as early as the eighteenth century, but in reality Castel's conception did not deal with art. It is worth noting that Castel's ideas were subjected to profound theoretical analysis in Russia; for a detailed discussion of the history of the idea of 'seeing music' in Russia, see the Appendix for a translation of my article "У истоков идеи 'видения музыки' в России" (At the sources of 'seeing music' in Russia), first published in *Вопросы истории естествознания и техники* (The Questions of Natural Sciences and Technology History), No. 2, 130-135 (1985).
- I would like to correct those Western sources that claim this work was originally published abroad, first in Munich (1912) and then in London (1914), and that a Russian version was published only in 1967 (in the United States). In fact, the paper was delivered in Russian even earlier: in 1911, it was presented at the All-Russian Congress of Artists in Petrograd and was published afterwards in the Proceedings of the congress.
- V.M. Galejev, *Светомузыка: становление и сущность нового искусства* (Music-kinetic art: the formation and essence of the new art) (Kazan: Tatknigoizdat, 1976; *Поющая радуга* (The singing rainbow) (Kazan: Tatknigoizdat, 1980); and *Содружество чувств и синтез искусств* (The harmony of the senses and the synthesis of the arts) (Moscow: Znanie, 1982).
- A.V. Lunacharsky, "Об изобразительном искусстве" (On Fine Art), 2 vols. (Moscow: Sovietyky chudozhnik, 1967) v. 1, p. 184.
- The anthology does not contain the musical score. Years later attempts were made to 'make it up'; the Soviet composer A. Shnitke tried in 1973, and the American composer G. Shuller in 1981.
- This possibility was recognized by the artist R. Delaunay and the sculptor A. Archipenko, both of whom suggested that light be used to 'animate' abstract paintings. The nonfigurationist painter A.B. Klein, who realized the possibilities of light, became a leading British specialist in music-kinetic art; see his book *Colour Music: The Art of Light* (London, 1926). The French artist P. Survage and the Swedish artist and filmmaker V. Eggeling instinctively used the new technique of film projection to achieve these unusual aims.
- S.O. Khan-Magomedov, "В. Кандинский о восприятии и воздействии средств художественной выразительности" (V. Kandinsky on the perception and effect of the means of artistic expressiveness), Vol. 17 of *Труды ВНИИТЭ: Техническая эстетика* (The works of VNIITE: technical aesthetics) (Moscow, 1978) pp. 77-96.
- I.L. Vanechkina, "Строка 'Лусе'—ключ к поздней гармонии Скрябина" (The line 'Luce'—the key to Scriabin's late harmony), *Советская музыка* (Soviet music), No. 4, 100-103 (1977).
- This was also confirmed by the questionnaire that members of Prometei distributed in 1966-71 to Soviet musicians.
- L. Sabaneev, the composer's biographer, mentions that Scriabin had marked by hand on a copy of the *Prometheus* score what his ideas were regarding this kind of revision to the *Luce*. This hand-marked score is not in the collection of the Scriabin Museum. Perhaps it is the copy presently kept in the Bibliothèque nationale in Paris (where it was placed after Sabaneev's death). Verification of this by French scholars would be a worthy endeavour.
- These have been scrupulously collected from the reminiscences of his contemporaries and have been presented in a special monograph; see I.L. Vanechkina and V.M. Galejev, *Поэма огня (концепция светомузыкального синтеза А.Н. Скрябина)* (The poem of fire [Scriabin's idea of the synthesis of light and music]) (Kazan: Izd. Kazanskogo universiteta, 1981).
- The Soviet composer A. Nemtin has 'made up' *The Preliminary Action* on the basis of the musical extracts that have been preserved. The light score is again in keeping with the former principle (rejected by Scriabin) of the *Prometheus Luce*, which makes it possible to dispense with the light accompaniment (as was actually the case with the first performances). The light scores in the music-kinetic artworks of other successors to Scriabin's idea of a 'light symphony' are similarly devoid of organic unity; for example, V. Shcherbatchev's "Nonet" (1919), V. Polevoy's piano "Poem" (1966) and R. Shchedrin's contata "Poetoria" (1970).
- M.-A. Bute later gained fame with her 'visual music' films, which included *The Colour Rhapsody*, *Anitra's Dance*, *The Evening Star* and *Tarantella*.
- G.I. Gidoni, *Искусство света и цвета* (The art of light and colour) (Leningrad, 1930) p. 16.
- In my opinion, Wilfred's achievements have been underrated in America. As is known, his principal theoretical work on 'lumia' still remains unpublished; see D. Stein, *Thomas Wilfred: Lumia* (Washington, DC, 1971) p. 61.
- S.M. Eisenstein, *Избранные сочинения* (Selected works), Vol. 2 (Moscow: Iskusstvo, 1964).
- Norbert Wiener, *God and Golem, Inc.* (Cambridge, MA: MIT Press, 1964).
- K.L. Leontiev, *Музыка и цвет* (Music and colour) (Moscow: Znanie, 1961), and *Цвет "Прометей"* (The colour of "Prometheus") (Moscow: Znanie, 1965).
- See V.M. Galejev, "Music-Kinetic Art Medium: On the Work of the Group 'Prometei' (SKB), Kazan, U.S.S.R.", *Leonardo* 9, 177-182 (1976).
- All these were demonstrated at the All-Union Conferences on 'Light and Music', sponsored by Prometei and held in 1967, 1969, 1975, 1979 and 1986. For the table of contents to the *Proceedings of the Third Conference on 'Light and Music'*, see "Kinetic Art: Third Conference on 'Light and Music', Kazan, U.S.S.R., 27 June-4 July 1975", *Leonardo* 9, 238-239 (1976). See also, *Конференция "Свет и музыка" (тезисы и аннотации)* (Conference "light and music" [theses and abstracts]) (Kazan: KAI, 1969); *Материалы Третьей конференции "Свет и музыка"* (Proceedings of the third conference "light and music") (Kazan: KAI, 1975); *Всесоюзная школа молодых ученых и специалистов "Свет и музыка" (тезисы докладов)* (The All-Union school of young scientists and specialists "light and music" [theses of reports]) (Kazan: KAI, 1979); and *Научно-технический семинар "Светомузыкальные устройства как товары народного потребления"* (Scientific technical seminar "music-kinetic art devices as consumer goods" [theses of reports]) (Kazan: KAI, 1986). Научно-технический семинар "Синтез искусств в эпоху НТР" (тезисы докладов). 20-30 сентября 1987 г.: В программе Всесоюзной школы молодых ученых и специалистов "Свет и музыка". (Scientific technical seminar "The synthesis of the Arts in the epoch of Scientific-and-Technical revolution" [theses of reports]) 20-30 September 1987: Within the bounds of All-Union school-festival of young scientists and specialists "Light and music" (Kazan: KAI, 1987). Concerning similar types of specialized gatherings outside of Russia, the only ones of which I am aware are the three 'Farbe-Ton-Forschungen' congresses held in Hamburg, Germany, in 1927, 1929 and 1931.
- V.M. Galejev and S.A. Andreyev, *Принципы конструирования светомузыкальных устройств* (Principles for designing music-kinetic art devices) (Moscow: Energiya, 1973). *Искусство светящихся звуков* (The art of luminous sounds) (Kazan: KAI, 1973). *Художественные и технические эксперименты СКБ "Прометей"* (Artistic and technical experiments of the designer's office "Prometei") (Kazan: KAI, 1974). V.M. Galejev and R.F. Sajfullin, *Светомузыкальные устройства* (Lumia music devices) (Moscow: Energiya, 1978), and *Техника дискотеки* (Discotheque equipment) (Moscow: APN USSR, 1983). V.M. Galejev, S.M. Zorin and R.F. Sajfullin, *Светомузыкальные инструменты* (Music-kinetic art instruments) (Moscow: Radio i svyaz, 1988).
- It is worth noting that *son et lumière* performances, though infrequent in the USSR, U.S.A., F.R.G. and Japan, are popular in the Mediterranean countries, where they play a role in tourism.
- See, for example, *Pravda*, 5 February 1981, *Sovetskaya Kultura*, 18 November 1980, and *Sovetskaya Kultura*, 21 July 1987.
- Светомузыкальные эксперименты СКБ "Прометей": Библиографический указатель* (1962-1978) (Music-kinetic art experiments of the designer's office "Prometei": bibliographic list [1962-1978]) (Kazan: KAI, 1973), and *Светомузыка в России и в СССР: Библиографический указатель* (1742-1982) (Music-kinetic art in Russia and the USSR: bibliographic list [1742-1982]) (Kazan: KAI, 1983).
- In addition to the books already mentioned, I would like to bring the reader's attention to the following: F.I. Yuriev, *Музыка света* (Music of light) (Kiev: Muzichna Ukraina, 1971). A.G. Dzubyenko, *Цветомузыка* (Colour music) (Moscow: Znanie, 1973). L.N. Melnikov, *Программы, алгоритмы, конструкции: Синтез цвета и музыки* (Programmes, algorithms, constructions: synthesis of colour and music) (Moscow: Nauka, 1980).

- Yu. V. Pukhnachev, *Число и мысль: Четыре измерения искусства* (Number and thought: four dimensions of art) (Moscow: Znanie, 1981).
- Музыкальные синтезаторы* (Musical synthesizers) (Moscow: Znanie, 1983).
- V.V. Efimov, *Светомузыка? Это очень просто!* (Music-kinetic art? It is very simple!) (Kiev: Radyanska shkola, 1985). Regrettably, none of these books by Soviet authors have been translated, which I feel is to the detriment not of the authors but of Western readers.
26. В.М. Galejev, *Человек, искусство, техника: Проблема синестезии в искусстве* (Man, Art, Technology: the problem of synaesthesia in art) (Kazan: Izd. KGU, 1987).
 27. Stein [15] p. 68.
 28. A. Kirilenko and V. Orlov, "Цветомузыка" (Colour music), *Техника—molodezhi*, No. 10, 37 (1965).
 - A. Ossovskij, *Воспоминания. Исследования.* (Reminiscences. Investigations.) (Leningrad: Muzyka, 1968) pp. 134–135.
 - I. Belza, "Rola Akademii Nauk w rozwoju klasycznej muzyki rosyjskiej i muzyki radzieckiej", *Muzyka*, No. 2, 9 (1975).
 29. *Фейнмановские лекции по физике* (The Feynman lectures on physics), Vol. 4 (Moscow: Mir, 1965) p. 200.
 30. *Музыкальная эстетика стран Востока* (Musical aesthetics of Oriental countries) (Leningrad: Muzyka, 1967) pp. 11–33.
 31. For a more detailed account, see В.М. Galejev, "Античное учение 'музыки сфер' и светомузыка" (Antique doctrine of 'music of the spheres' and music-kinetic art), in *Искусство светящихся звуков* (The art of luminous sounds) (Kazan, 1973); "От натурфилософских концепций 'видения музыки' к искусству светомузыки" (From the natural-philosophic conceptions of 'seeing music' to music-kinetic art), *Filosofskie nauki*, No. 3 (1982); and "Музыкальная акустика и концепции 'универсальной гармонии мира'" (Musical acoustics and concepts of 'the universal harmony of the world') in *Доклады X Всесоюзной акустической конференции* (Reports of the 10th All-Union acoustics conference) (Moscow, 1983).
 32. For a more detailed treatment, see Yu.A. Danilov and Ya.A. Smorodinskij, "Иоганн Кеплер: от 'Мистерии' до 'Гармонии'" (Johannes Kepler: from 'mystery' to 'harmony'), *Uspekhi fiz. nauk* 100, No. 1, 175–209 (1973).
 33. L.-B. Castel, *Optique des couleurs* (Paris, 1740).
 34. Y.Ph. Telemann, *Beschreibung der Augen-Orgel oder Augen-Clavicimbels . . .* (Hamburg, 1739).
 35. It is precisely so: the anonymous posthumous edition of Castel's works was entitled "Esprits, Saillies et singularites du P. Castel. Amsterdam, 1763".
 36. M.V. Lomonosov, *Полн. собр. соч.* (Complete works), Vol. 3 (Moscow-Leningrad: Izd. AN USSR, 1952) p. 252.
 37. "Nova theoria music ac colorum", in L. Euleri *opuscula. Varii argumenti* (Berlin, 1746); and *Lettres à une princesse d'Allemagne sur divers sujets, de physique et de philosophie*, Vol. 2 (1768–1774) pp. 246–259.
 38. Eisenstein [16] p. 200.
 39. The original edition of this book was published anonymously in French in 1800. The first Russian-language account of Gonzaga's views was published in N. Gilyarovskaya. *Музыка для глаз* (Music for the eyes), *Teatr i dramaturgiya*, No. 7 (1935). See P. Gonzaga, "Музыка для глаз (отрывки из книги)" (Music for the eyes [fragments from the book]), *Dekoratивное iskusstvo USSR*, No. 12 (1970). The complete text of Gonzaga's book is given in the supplement of F.Ya. Syrkina, *Жизнь и творчество Пьетро ди Готтардо Гонзага* (Life and creative work of P. Gonzaga) (Moscow: Iskusstvo, 1974) pp. 89–120.
 40. "Изобретение гармоник с 'видимыми' тонами (The invention of a harmonica with 'visible' tones), *Vestnik Evropy* 59, No. 9 (1811); and "Castel" in H. Riemann, *Музыкальный словарь* (Musical dictionary) (Moscow, 1896).
 41. "Фортепиано для глаз, для носа, для рта и для ушей" (Piano for the eyes, nose, mouth and ears), *Biblioteka dlya chteniya*, No. 34 (1830).
 42. F. Petrushevskij, "Гармония красок" (Harmony of colour), in *Entsiklopedicheskij slovar F. Brokgauza i I. Efrona*, Vol. 8 (15) (Petersburg, 1892).
 43. N. Stepanov, "Бертран Каstell и его клавиин для глаз" (Castel and his clavichin for the eyes), *Mir iskusstva*, No. 11–12 (1940).
 44. [A. Unkovskaya], "Метода цвето-звучо-чисел" (The method of colour-sound-number), *Russkaya muzykalnaya gazeta*, No. 6–7 (1909).
 45. M. Lippold, *Опыт популярного изложения элементарной теории музыки* (An attempt at a popular interpretation of the elementary theory of music) (Petersburg, 1906).
 46. D.I. Chmel'nitskij, *Попытки доставить эстетическое удовольствие музыкально-цветовыми комбинациями, основываясь на аналогии цвета и звука* (Attempts at providing aesthetic pleasure by means of music-colour combinations on the basis of the analogy between colour and sound) (Nizhnij Novgorod, 1913).
 47. V. Svetlanov, "Символическая симфония" (Symbolical symphony), in *Bej! (Ego-futuristy)* 6, 1913.
 48. Unfortunately, such analogies are found, strange as it is, even today; for example, see Yuriev [25]; and M.Z. Xodzhaev, *Система музыкально-гармоничных цветов* (A system of musically harmonious colours) (Tbilisi, 1972).
 49. Galejev, *Music-kinetic art* [3].
 50. Galejev and Sajfullin, *Lumia music devices* [21].
 51. Galejev, *The singing rainbow* [3].
 52. Vanechkina and Galejev [11].
 53. Galejev, *The harmony of the senses . . .* [3].

Editor's Note—Interested readers are directed to "Instruments to Perform Color Music" by Kenneth Peacock in this issue of *Leonardo*.



B

No. 1. Top left. Anne Vitale, *Untitled Landscape #130*, oil on canvas, 66 × 54 in, 1985. To accentuate the idea of making a painting *about* landscape and to allow for the free application of paint, the artist has abstracted and schematized the features and used a non-representational color scheme. There are no shadows to pinpoint any specific time of day.

No. 2. Right. Bulat Galeev, two frames from *Prometei's lumia-music film Space Sonata*, 1981. The films are unusual not only because of their images but also because of the techniques used: although black-and-white objects are shot using standard black-and-white film, the resulting positive film is multi-coloured.

No. 3. Bottom left. Beryl Korot, *Let Us Make Bricks—1942*, oil on handwoven canvas, 65 × 45 in, 1983. (Collection of Chase Manhattan. Photo: Fred Scruton.) The language that is derived from the grid of the canvas is here presented in two scales. Enlarged as windows through which train tracks may be seen, it spells out the words 'let us make bricks', alluding to the ancient story of the Tower of Babel. Here it ironically refers to the Nazi phrase 'arbeit mach frei' (work makes free), and thus the dated title '1942'.