The Russian Electronic Musical Synthesizer as a Tool of Cultural and Creative Interaction and A Means to Ensure Information Security in the Process of Training and Retraining of Scientific and Pedagogical Personnel in the Digital Space

Irina B. Gorbunova, Andreas Kameris, Imina G. Alieva

***Abstract*— The article presents the problems of research related to the formation of an intellectual cataloging system of music of the peoples of the world as an element of cultural and creative cooperation in the digital space and a means of ensuring the information and psychological security of all participants in cultural and educational interaction carried out in the process of training and retraining of scientific and pedagogical staff. The authors note that the use of music computer technologies (MCT) in scientific research on this issue serves as the basis for the possibility of creating new theoretical and experimental-practical means of studying music, including uncertainty factors in music and approaches based on them based on the theory of fuzzy sets and the theory of groups, which are widely used in the process of digital signal processing, software engineering, theory of automated systems, etc. The article describes the role of music computer technologies in the creation of a Russian electronic musical synthesizer, the development of which, with the participation of foreign colleagues, allows solving the problems of creating high-quality domestic software and import substitution of foreign analogues, which is becoming especially relevant in the current conditions. The article analyzes the issues of personnel training and retraining in the context of the digital transformation of the modern educational system and the related problems of ensuring information security.**

***Keywords*— Music Computer Technologies (MCT); Digital Musical Instruments; Transdisciplinarity; Information Security; Training and Retraining Of Personnel.**

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Author: Irina B. Gorbunova. She is now with the Department of Information Technology and Technological Education and Research and Methods Laboratory *Music Computer Technologies* of the Herzen State Pedagogical University of Russia, St. Petersburg

Author: Andreas Kameris. He now with the Research and Methods Laboratory *Music Computer Technologies*, Herzen State Pedagogical University of Russia

Author: Imina G. Alieva, Ph.D. (Arts). She is with the Laboratory *Research on Azerbaijani Professional Music of Oral Tradition and Its New Directions: Organology and Acoustics* at the Baku Music Academy named after Uzeyir Hajibeyli, Baku, Republic of Azerbaijan

I. Introduction

The process of training and retraining of scientific and pedagogical personnel, carried out using the resources of the information educational environment, is associated today with the need to take into account and develop tools that ensure the information security of all participants in the educational process in the digital space.

An integrated ecosystem approach to the process of replacing foreign software Russian developments in cooperation with foreign partners, with whom scientific and pedagogical cooperation has been taking place for a long time, determines one of the possible ways of high-quality and mutually beneficial cooperation, ensures the formation of approaches to information security in the process of training and retraining scientific and pedagogical personnel in the digital space, involving a painless transition, use and protection from large the number of threats to all system components using integrated solutions from several reliable vendors. Special attention is paid to the prospects of import substitution and the development of domestic solutions in the field of digital audio processing. One of Russia's National Goals until 2030 is import substitution in the IT sector, which began to receive special attention after a series of high-profile statements by foreign IT companies about leaving the Russian market began. This also applies to the field of music technology, since the vast majority of professional and widely used solutions are foreign," note the authors of the article *Import Substitution of Software* [1] with reference to the program documents adopted in Russia [2-3].

II. The Russian electronic musical synthesizer

The creation of a Russian electronic music synthesizer (REMS) with the participation of foreign colleagues makes it possible to solve the problems of developing high-quality domestic software and import substitution of foreign analogues, which in the current conditions is especially important in the field of software development that provides modeling of difficult-to-formalize processes related to creativity and the dissemination of relevant information. The development of such software can be used to actualize a wide range of modeled

processes: creative, behavioral, when considering biological and social phenomena and processes, and many others.

An intelligent system for analyzing and cataloging music of the peoples of Russia and the world has been developed over the years (see for more details in a number of scientific and creative works with the participation of the authors of the article [4-6]) and implemented in the modern educational and creative space:

- The main educational programs for the preparation of masters and bachelors in the educational field "Information Systems and Technologies" are "Digital Technologies in Music and Sound Design" and "Information Technologies in Music and Sound Design", respectively (see [7-9] for more information);
- The main educational programs for the preparation of masters and bachelors in the educational field of "Art Education" are "Music Computer Technologies" and "Music Computer Technologies in Education", respectively (see [10-12] for more information);
- Additional professional education programs such as the professional retraining program "Technologies for Creating and Artistic Processing of Sound Information" and a number of advanced training programs, including "Technologies for Creating Audiovisual Projects", "Musical Sound Engineering", "Musical Informatics", "Computer Musical Creative Work", etc.

The educational programs we have listed and many others are also related to the interaction and mutual influence of all participants in the educational process included in the educational space of the emerging high-tech creative educational environment (the term was introduced into the scientific and educational space by Russian scientists V.V. Laptev, T.N. Noskova, T.B. Pavlova) and various facets determined by the problems of research related to the formation of an intellectual cataloging system of music of the peoples of the world as an element of cultural and creative cooperation in the digital space.

Today, it is becoming obvious that it is necessary to maintain a natural balance between preserving the identity of the peoples of Russia and the world, their cultural code, and the ability to take into account new trends and new technologies in various activities, including science and creativity, which, on the one hand, can preserve existing potential and, on the other, provide an opportunity for the development of new ideas., new directions based on the creative, creative principle of cultural interaction in the emerging scientific and educational space. "We must strive for a balance between preserving national values and being open to those influences that contribute to development and progress," Vladimir Putin said in his speech at the plenary session of the 11th St. Petersburg International Forum of United Cultures on September 12, 2025 [13]. "It is obvious that technology contributes to the accelerated dissemination of ideas. Artificial intelligence, for example, analyzes huge amounts of data and predicts trends. However, I believe that original solutions that can lead to discoveries and breakthroughs in science, art, and the social sphere can only provide inspiration and the genius of a person, a true master and creator. And of course, the interaction and mutual trust of representatives of different cultures <*I.G., A. G., K. A., H.S.*>," Vladimir Putin noted during his speech at the St. Petersburg International Cultural Forum of United Cultures at one of the venues in the Great Catherine Palace on the territory of the Tsarskoye Selo State Museum-Reserve." [14]. The forum was attended by about 2,000 representatives from more than 100 countries, including leading figures in culture, art, business structures and government. The forum was held at various venues in our city, including the Marble Palace, a branch of the State Russian Museum in St. Petersburg, from September 10 to September 13, 2025.

III. The Development of an Intelligent System for Analyzing and Cataloging the Music of the Peoples of Russia and the World

The development of an intelligent system for analyzing and cataloging the music of the peoples of REMS, which allows you to demonstrate the sound of instruments of various peoples of Russia and the world and contains most of the timbres of musical instruments of the peoples of multinational Russia.

Note also that the existing models of foreign-made digital synthesizers do not contain many of the timbres of the peoples of the world. "The dialogue of cultures is becoming particularly important now, in an era of rapid development of technologies, including artificial intelligence. They make today's world more interconnected, open up enormous opportunities for creativity, bold experiments and innovation, including in culture," the head of Russian Federation said [14].

Such a tool will be of interest to scientists researching the problems of musical culture and the development of musical instruments, as well as to a wide range of musicians interested in performance, instrumentation, arrangement, and the development and preservation of folk music in the context of the digital transformation of science, education, and society.

Today, it is necessary to create such a bank, an intelligent system that is ready to deposit samples of the traditional musical culture of the peoples of Russia and the world for future use.

Currently, the collections and archives created by musicologists are fragmented and scattered around the world, and the existing systems for storing and processing musical information are not intelligent. In addition, they are unable to take into account the fuzziness, uncertainty, and partial reliability of musical information that takes into account a rich, very diverse intonation aspect, as well as respond to user queries generated in linguistic form using fuzzy estimates. The purpose of this part of the project is to create a kind of intellectual system for cataloging and analyzing folk music, ensuring the preservation of the musical creative work of the oral tradition as an intangible cultural heritage and providing a new form of existence, new ways of creative use of this heritage in modern conditions by composers, performers and music researchers (musicologists) [15].

IV. Implementation Of A Project To Create A Russian Electronic Musical Synthesizer With The Inclusion Of Timbres Of Traditional Musical Instruments Of The Peoples Of Russia And The World

The project to create a REMS with the inclusion of timbres of traditional musical instruments of the peoples of Russia and

the world is being implemented in several stages:

1. Digitization with further interpretation and description of unique ethnographic materials – samples of the musical culture of the peoples of Russia, collected in the field by researchers of traditional musical culture.

2. Creation of a software environment that will make it possible to process and further apply digitized material.

3. Creation of a software and hardware complex (actually a Russian electronic musical synthesizer), into which digitized and processed material will be loaded.

4. Development of methodological materials for mastering the various capabilities of the created tool. The listed stages are conditionally divided into two parts, which are closely interrelated: Part I and Part II.

Part I involves a lot of work with timbral and intonational material that needs to be digitized and catalogued.

We will conventionally designate this stage as "The development of an intelligent cataloging and analysis system for the music of the peoples of the world (creation of a "music bank of sounds")" (includes the 1st and 2nd stages).

Part II – Creation of a musical instrument (synthesizer) (stages 3 and 4 of the project) involves work on the creation of a software and hardware complex and methodological recommendations for the use of the instrument by both professional musicians and wide circles of music lovers.

Work is underway to include the musical timbres of the following peoples of Russia:

Russian Russian folk instruments: balalaika, kugikly (kuvikly) or tsevnitsa, rubel (rebrak, sling), bilo, tambourine, tambourine (diminutive form of tambourine), harp, double-row chromatic harmonica, "khromka", Livenskaya accordion, Russian seven-string guitar, Saratov accordion, gusli, domra, fife, zhaleika (keychain), wooden spoons, mandolin, rattle, wad, horn, pipe, whistle.

Tatar national musical instruments: gusli (gosla), kurai kubyz (harp), dumbira (tambour), sornai def, kangyrau (bell), tavyshly asma, tash sybyzgy, sholder, humpty, mandolins, folk violins, talian garmun.

Bashkir national musical instruments: kurai, hornai (sornai), borgo, kamysh-kurai, accordion, bayan, kubyz, mandolin and violin, agas-kubyz, dybla, gazle, scimitar.

Chuvash national musical instruments: сметe kupăs (violin), kĕle (gusli), tămra (domra), špăr (bagpipes), škhlich (pipe), palnai (multi-barrel flute), nahra (trumpet), tăm škhlich (whistle, ocarina), parappan (drum), hutkupăs (accordion)

Mari national musical instruments: tumyr (drum), ratchet, puch (horn), shushpyk (whistle), shiyaltysh (pipe), olym shuvyr (straw), shuvyr (bagpipes), kong kong (musical bow), kusle-karsh (gusli), iya kovyzh (violin).

Jewish national musical instruments: kinor (a kind of triangular harp), nebel (a kind of lyre), zither (kinnor-gusli, ten-stringed instrument), dulcimer (psalter, tympanum), shofar (horn bent trumpet), organ or pipe, reed pipe, flute (khalil), tambourine or tympanum (kind timpani), "shaishim", tar, kemancha, harmonica (komoncha, argan), wind instrument (govol), tambourine (tepe), duduk and zurna.

As well as the inclusion of collected unique timbres.:

– ancient musical instruments (Greece) restored by modern Greek craftsmen (experimental material was presented at the Herzen State Pedagogical University of Russia: Terpandros https://www.herzen.spb.ru/news/09-12-2015_5 /);

– national Belarusian instruments (there is an agreement with the information department of the Belarusian State Academy of Music and the rector of the Belarusian State Academy of Music, Candidate of Art History, Associate Professor E.V. Kurakina; a unique collection collected by the scientific and creative staff of the cabinet was donated to the staff of the researche and methods laboratory *Music Computer Technologies* of the Herzen State Pedagogical University of Russia traditional musical cultures with the personal participation of the head of the office, Candidate of Art History, Associate Professor T.L. Berkovich);

– musical folklore of the peoples of the North (Yakuts, Chukchi, Eskimos, Aleuts, Koryaks, etc.; the RML *Music Computer Technologies* of the Herzen University has digital recordings made by students of the Institute of the Peoples of the North of the Herzen State Pedagogical University of Russia);

– musical folklore of the peoples of the North-West of the European part of Russia (Karelians, Izhorians, Veps, Vod, Setu, Sami, Komi, Nenets, etc.); the beginning is the timbres of national Karelian instruments: kantele and others (there is an agreement);

– music of the peoples of the Near and Middle East (Azerbaijan, Armenia, Iran): kimanchi, tar, santur and many other instruments (joint activity of the RML *Music Computer Technologies* of the Herzen State Pedagogical University of Russia and the Azerbaijan Academy of Music named after U. Based on the developments of the laboratory "Research of Azerbaijani professional music of oral tradition and their new directions: organology and acoustics", which is part of its structure, with the participation of the Honored Artist of Azerbaijan, national experts of Azerbaijan in the UNESCO Committee on Intangible Cultural Heritage, members of the European Cultural Parliament);

- The horn Chapel at Herzen University is one of the musical symbols of the Russian cultural tradition;

– carillons (St. Petersburg) and bells (from various regions of Russia); other peoples of Russia and the world.

For example, the prospect of including evidence of the musical culture of the Sumerians is currently being discussed: Ur lyres and others based on the results of excavations that began in 1922 in Southern Iraq (then the Kingdom of Iraq) on the site of one of the oldest cities in the world, the Sumerian city–state of Ur (see for more details in [15]). Founded in the 4th millennium BC, the city of Ur, or, following the biblical tradition, Ur of the Chaldeans, was located in southern Mesopotamia and played an important cultural, economic, and political role. In the book by the famous British archaeologist L. Woolley's "Ur of the Chaldeans" [16] has these lines: "There were at least four lyres in the second of the surviving tombs.

One of them is the most magnificent of all those found before. Its resonator was bordered by a wide red-white-blue mosaic pattern. The two vertical pillars of the lyre were decorated with belts inlaid with mother-of-pearl, lapis lazuli, and red stone, which alternated with wide gold rims. The upper wooden crossbar is half silver-plated on one side. Mother-of-pearl plates with carved figures of animals were located on the front side of the resonator, above them protruded the magnificent head of a bearded bull, forged from massive gold" [17, pp. 80-81]. The second lyre was made of silver, with a cow's head on the front of the resonator, and the third, also silver, had the shape of a boat in which stood the figure of a deer. The fourth, wooden, with two copper figures of deer, decayed and collapsed. Among other finds, Woolley also describes in detail the "remains of a wonderful harp", moreover, in the 1929 edition he calls the instrument a harp [18, p. 66], and in the 1938 edition by lyre [17, p. 67]: "Its wooden parts have decayed, but the decorations have been completely preserved. The upper wooden bar of the harp (harp/lyre): was lined with gold, in which gold nails were held, and strings were stretched on them." The Urian finds are valuable, among other things, for their evidence that in the third millennium BC, stringed instrument playing was an indispensable and important attribute of secular and ritual events. In translations and publications, lyres are sometimes referred to as harps (and not only in the text, but also in the caption to the photo of the instrument), and the found stringed musical instruments are often presented under the general name "Ursky harps".

Let's add that several variants (transformations) of the instrument, the REMS, are assumed: from children's, amateur to professional due to the "openness" of the instrument system, which allows introducing increasingly complex elements, timbres, samples, methods of working with sound, etc.

The appearance of such an instrument will also support interest in the development of music computer technologies (MCT). as a new professional and creative field of activity for musicians, specialists in the development of artificial intelligence systems, education and machine learning.

V. A TRANSDISCIPLINARY APPROACH IN MODERN SCIENCE AND EDUCATIONAL PRACTICE

The process of joint activity, involving close cooperation between scientists from different countries and the development of unified universal methods of scientific research, perfectly illustrates the need to build a creative community of specialists aimed at solving global challenges facing humanity and ensuring the preservation of the cultural code of each nation: "Humanity has to master a new reality and at the same time preserve the roots that serve us as a support. We believe that the world of the future is not a world of egoists completely immersed in cyberspace, and not of individuals living on the principle of "every man for himself", but of people who still value love and friendship, cherish their loved ones, understand their inseparable connection with society and responsibility to it" [14]. All this can naturally create the necessary conditions for ensuring information technology security based on joint efforts to find mutually acceptable solutions and aimed at creating a unified generalized, integrative system of scientific concepts and their corresponding proposals.

The use of MCT in scientific research on this issue serves as the basis for the possibility of creating new theoretical and experimental-practical means of studying music, including uncertainty factors in music that are studied using MCT. Thus, the authors of the article note the special role of research in the field of the formation of a transdisciplinary approach in the methodology of modern science [19], belonging to the outstanding Russian musicologist Mikhail Sergeyevich Zalivadny (1946-2023) [20], who formulated leading ideas in the development of an integrated model of the semantic space of music — a multicomponent comprehensive study aimed at identifying the problems of using a transdisciplinary approach for qualitative and quantification of musical phenomena using the resources of modern electronic music. We also note the significant contribution of Mikhail Borisovich Ignatiev, Doctor of Technical Sciences, academician, to the development and substantiation of this model, whose works made it possible to quantify the phenomena under consideration (see for more details in [21-22]).

The authors note that the use of MCT in scientific research on this issue serves as the basis for the possibility of creating new theoretical and experimental-practical means of studying, including uncertainty factors in music investigated using these technologies (see [24-25]).

It should also be noted that the new approach, taking into account the capabilities of the MCT, makes it possible to form appropriate theoretical and technological solutions for including musical samples of Islamic culture from various eras and related to the practical implementation of the transmission of nuances of the music of the peoples of the Near and Far East (see, for example, in [26-27]).

VI. CONCLUSION

Solving the issue of import substitution in the process of joint activities of scientists from Russia and other countries "contribute to the accelerated dissemination of ideas. Artificial intelligence, for example, analyzes huge amounts of data and predicts trends. However, I believe that original solutions that can lead to discoveries and breakthroughs in science, art, and the social sphere can only provide inspiration and the genius of a person, a true master and creator. And, of course, the interaction and mutual trust of representatives of different cultures," Vladimir Putin noted during his speech on September 12, 2025 [14].

One of these solutions was the development of an intellectual cataloging system for the music of the peoples of Russia and the world, which is conducted by scientists of the Herzen State Pedagogical University of Russia and representatives of scientific and educational institutions of other countries [4-5]. This approach, based on many years of mutually beneficial cooperation, creates conditions for the development of a training and retraining system for specialists in the field of modern music and information education in the scientific and methodological laboratory of RML *Music Computer*

Technologies at the Herzen State Pedagogical University of Russia.

The inclusion of MCT in the curricula of educational institutions determines the allocation of MCT into a separate scientific field at the junction of musical acoustics, digital signal processing, software engineering, and the theory of automated systems. Development of specialized musical and technological disciplines, such as: "Technologies of Artistic Sound Processing," "Music Computer Technologies," "Musical Synthesizers," "Computer Musical Creative Work," "Sound-Timbral Programming," "Mathematical Research Methods in Musicology," "Intelligent Systems for Cataloging and Analyzing Music of the Peoples of the World," "Set Theory and Description of Musical Objects," "Information Theory and System Analysis of Music," "Sound Design and Musical Sound Engineering," "Computer Recording Studio and the Basics of Working in It," "Computer Modeling of the Process of Musical Creative Work" testifies to the emergence of a new transdisciplinary scientific and educational direction, driven by the development and establishment of the MCT, and requiring an integrated ecosystem approach to the process of replacing foreign software. Russian developments carried out in cooperation with foreign partners, with whom scientific and pedagogical cooperation has been taking place for a long time, determine one of the possible ways of high-quality and mutually beneficial cooperation, ensuring the formation of approaches to the implementation of information security in the process of training and retraining of scientific and pedagogical personnel in the digital space.

The creation of a REMS with the participation of foreign colleagues makes it possible to solve the problems of developing high-quality domestic software and import substitution of foreign analogues, which in the current conditions is especially important in the field of software development that provides modeling of difficult-to-formalize processes related to creativity and the dissemination of relevant information.

Scientific approaches and technological solutions created during software development can be used to actualize a wide range of modeled processes and phenomena: when considering creative, behavioral, biological and social phenomena, problems related to modeling the musical process, as well as to create computing systems for modeling analytical actions performed by the human brain, and much more.

Information security in the process of training and retraining of scientific and pedagogical personnel (using the example of the implementation of Master's and Bachelor's degree programs in the educational field of Information Systems and Technologies — "Digital Technologies in Music and Sound Design" and "Information Technologies in Music and Sound Design," as well as professional retraining and advanced training programs, such as: "Technologies for Creating and Artistic Processing of Sound Information," "Technologies for Creating Audiovisual Projects," "Musical Informatics," "Computer Music creative Work,” etc.) is today one of the key guiding decisions in the activities of the scientific and teaching community of the RML *Music Computer Technologies* of the Herzen University's projects are carried out directly in the educational process together with students and researchers — undergraduates, students, postgraduates, doctoral students.

The information security of the process of training and retraining scientific and pedagogical personnel in the digital space is also ensured by the presence of a system created by the efforts of a group of specialists from the RML *Music Computer Technologies* to support the learning process carried out using distance learning technologies (distance learning systems such as Moodle, etc., adopted for use in Russia), which makes it possible to create a reliable technological base for building educational learning routes in the online educational space and the formation of technologies for tracking threats to the security of related phenomena and ways to overcome them, used by specialists in our country.

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Irina B. Gorbunova was born in Saint Petersburg (Leningrad), Russia.

DipMus, Special Music Higher School of the St. Petersburg State Conservatory named after N.A. Rimsky-Korsakov; BSc in Computer Science: Information Technology, Computer Science and Multimedia, Leningrad State University, Ussurisk State Pedagogical University; MA in Education, the Herzen State Pedagogical University of Russia; PhD in Information Technology and Pedagogical Sciences, the Herzen State Pedagogical University of Russia, St. Petersburg, 1989; Doctor degree: Doctor of Pedagogical Sciences and Information Technology, the Herzen State Pedagogical University of Russia, St. Petersburg, 1999.

Dr., Full Professor, Chief Researcher of the Education and Methods Laboratory *Music Computer Technologies* at the Herzen State Pedagogical University of Russia, St. Petersburg; hold the degree of Honorary Worker of Higher Professional Education of the Russian Federation.

Prof. Dr. Gorbunova is a Chairperson of the annual International Research and Practical Conference *Contemporary Musical Education*: *Creative Work, Research, Technology*, held since 2002; Chairperson of the annual International Research and Practical Conference *Music Computer Technologies in the System of Contemporary Education*, held since 2007; International Research Conference, held since 2017;); Chairperson of the annual International Research Conference *Interdisciplinary East-West Discourse: The 21st Century. Creative Work. Research. Technology. Education*, held since 2020 (Baku, Azerbaijan – St. Petersburg, Russia).

Dr. Gorbunova is a member of the Jury of national and international competitions of musical creative works, including *Electronic Palette* (Saint-Petersburg), *Music and Electronics* (Moscow), *Music of the 21st Century* (Moscow / Saint-Petersburg), International Festivals and Competitions *Musical Electronics and Multimedia* (Moscow / St.-Petersburg), *CLARINE of the 21st Century* (St. Petersburg), *The World of Art without Borders* (Saint-Petersburg, Russia - Szeged, Hungary), *Bridge of Friendship* (Dortmund, Germany), All-Russian Competition of Electroacoustic Music *DEMO* (St. Petersburg, Russia).

Under the guidance of the professor, Dr. Gorbunova developed the first-ever bachelor's degree programs in *Music Computer Technologies* (2004) and *Information Technology in Music and Sound Design* (2023), as well as Master's degree programs in *Music Computer Technologies in Education* (2006) and *Digital Technology in Music and Sound Design* (2022).

Professor Dr. Gorbunova directs a number of doctoral and postdoctoral studies (more than 30) and lectures on music computer technology and information technology in music. She directs research in various fields, including: Theory and history of culture, musical art, information systems and processes, Theory and Methodology of vocational education, mathematical modeling, numerical methods and software systems, Theory and methods of teaching and educational work (in music, computer science, natural sciences). The research results of Prof. Gorbunova has published more than 550 peer-reviewed publications, including more than 50 books and more than 300 articles in various scientific journals.

Her research activities include such directions as:

MCT in professional musical education (as a means to expand creative opportunities);

MCT in general musical education (as one of the means of education);

MCT as a means of rehabilitation of people with disabilities;

MCT as the new direction in preparation of specialists of humanitarian and technological profile;

MCT in the field of digital arts; MCT in information technology, psychoacoustics and musical acoustics; system of training arrangements and the art of performing skills on electronic musical instruments.

Her circle of interests also includes the problems of interrelation of natural and technical sciences and humanities, as well as the possibilities of applying the results of such interrelation for the purposes of music education and upbringing.

She also takes part in working out the specialized software for computer music devices and in application of this software in pedagogical processes.

Her developments and researches also belong to the field of musical pedagogics and musicology, musical informatics, computer modeling of processes of musical creativity, timbre programming, art of performing skills and arrangement on electronic musical instruments, creative work in the field of computer music, mathematical methods in musicology.

Andreas Kameris was born in Nicosia, Cyprus.

2001 - Master of Musical Arts (composition) – St. Petersburg State Conservatory, named after N. A. Rimsky-Korsakov; 2007 – PhD in Pedagogical Sciences, Herzen State Pedagogical University of Russia, St. Petersburg (under the supervision of Doctor of Pedagogical Sciences, Professor Irina B. Gorbunova).

Work experience:

2002 – present – Senior Researcher and Lector at the Research and Methods Laboratory *Music Computer Technologies*, Herzen State Pedagogical University of Russia

2005 – 2012 – visiting Lector at the ARTE Music Academy, Nicosia, Cyprus.

He has more than 50 scientific publications, among them are monographs and handbooks: monographs *The Concept of Music Computer Education in the Training of a Musician Teacher* (co-authored with I.B. Gorbunova, 2011);

Music Computer Technologies in the Training of a Music Teacher (*Information Technology and Psychological and Pedagogical Aspects*) (co-authored with V.V. Belichenko, I.B. Gorbunova, 2011); textbook *Software for Professional Activities of a Musician* (co-authored with M.M. Bryantsev, I.B. Gorbunova, E.V. Kibitkina, O.Y. Prazdnichnikh, 2009); a lot of electronic educational resources in the field of computer music creative work.

His articles have been published in various scientific journals and editions, for example: Gorbunova I.B., Kameris A. Music Computer Technologies in Training a Modern Teaching Musician. *Journal of Advanced Research in Dynamical and Control Systems*. 2020. Vol. 12. No. S6. Pp. 518-531; Gorbunova I.B., Kameris A. Music Computer Education Concept for Teachers: Raising the Problem. *International Journal of Recent Technology and Engineering*. 2019. Vol. 8. No. 2 S4. Pp. 913-918; etc.

In addition to original compositions, he has vocal cycles and arrangements for orchestra and ensembles of various musical instruments, performed in various concert halls in many countries.

Imina G. Alieva, Ph.D. (Arts). Leading researcher of the Laboratory *Research on Azerbaijani Professional Music of Oral Tradition and Its New Directions: Organology and Acoustics*, Baku Music Academy named after Uzeyir Hajibeyl, member of the Union of Composers of Azerbaijan.

Graduated from the Azerbaijan State Conservatory named after U. Hajibeyov (piano class), as well as Azineftekhim named after M. Azizbekov (Faculty of Automation of Production Processes).

She studied at the graduate school of Azineftekhim, worked for about 20 years at the Institute of Mathematics and Mechanics of the Academy of Sciences of Azerbaijan under the guidance of Academician A. Mirzajanzade (development of expert systems in oil production).

Imina Alieva received a diploma from Herzen State Pedagogical University of Russia (St. Petersburg, Russia) on professional retraining programs in the specialties *Teaching Electronic Keyboard Synthesizer* and *Teaching Musical Disciplines Using Music Computer Technologies*).

Doctor of Philosophy in Art History (2012). The topic of the dissertation research is *The Intonation System of Azerbaijani Moods in the Context of Contemporary Musical Theory*.

Her research interests include interdisciplinary research in musicology, cognitive musicology, psychoacoustics, music and computer technology, ethnomusicology, the use of fuzzy sets in musicology. In his scientific publications, he develops theoretical and practical aspects of the concept of the zone nature of musical hearing by N. A. Garbuzov.

Author of numerous articles and reports (including in journals and conference materials included in WOS and Scopus), in which the problems of fret, hearing, musical acoustics, ethnomusicology are considered from the standpoint of cognitive musicology (Hirsch index 5).

She is the author (as well as the developer of the electronic version) of the *Practical Guide to the Study of Azerbaijani Moods and the Development of Ladointonal Hearing* (2010), published in Azerbaijani, Russian, English. The book, made on the basis of fret models, has been approved by the Ministry of Education of Azerbaijan as a textbook.

Participant of more than 50 international scientific conferences, symposiums, congresses in Azerbaijan (Baku), Belgium (Leuven), Great Britain (London, Durham), Israel (Tel Aviv, Jerusalem, Eilat), China (Beijing), Poland (Poznan), Russia (Moscow, St. Petersburg, Kazan, Saratov), Turkey (Cappadocia), Montenegro (Budva), Uzbekistan (Samarkand), etc.

Member and participant of the number of organizing committees of the international conferences, including the annual International Research and Practical Conference *Contemporary Musical Education*: *Creative Work, Research, Technology* (St. Petersburg, Russia); the 16-th International Conference on *Music Perception and Cognition* (hubs were organized and located in Australia, Azerbaijan, Great Britain, India, Colombia, Lithuania, Mexico, Poland, South Africa); the annual International Research Conference *Interdisciplinary East-West Discourse: The 21st Century. Creative Work. Research. Technology. Education*, held since 2020 (Baku, Azerbaijan – St. Petersburg, Russia).