



## REGIONAL MATHEMATICAL CENTER OF SOUTHERN FEDERAL UNIVERSITY ACTIVITIES OF 2021

Regional Mathematical Center was founded on April 5 carries out research and educational work in conformity with the guidelines of the Ministry of Science and Higher Education of the Russian Federation





## I. ABOUT THE CENTER

Regional Mathematical Center of Southern Federal University (RMC of SFedU) was founded in accordance with decree № 39-OD of Southern Federal University. It carries out research and educational work and pursues the policy of Ministry of Science and Higher Education of the Russian Federation. RMC promotes research and professional education in the field of mathematics and its applications.

The head of RMC is Alexey Karapetyants, D.Sc, Professor in the Department of Differential and Integral Equations at the Institute of Mathematics, Mechanics and Computer Sciences of Southern Federal University. The corinating researcher is Vladislav Kravchenko, Professor of mathematics, faculty member of Research Center at the National Polytechnic Institute of Mexico. In 1994 Professor Kravchenko earned a PhD from Rostov State University and since that time has maintained strong collaborative ties with the university now known as Southern Federal University. RMC is an international professional community comprising Russian, Mexican, Cuban, Armenian, Columbian scientists and affiliated researchers from many other countries.

RMC holds conferences, meetings, seminars, olympiads. It invites prominent scientists to give lectures and do research, organizes scientific societies and clubs, arranges postgraduate programs and internship for early career mathematicians and organizes other mathematical research and educational events.

The bulletin highlights major events of 2021.





## RMC OF SFEDU OBJECTIVES ARE:



To promote collaboration between mathematicians, constructors, technologists, venture investors, decision and policy makers of educational and research field in a way that aligns with the Center guidelines.



To establish “mathematicians-in-residence” type of programs that will function on a continuous basis, to provide legislative, regulative framework and conditions to run long term programs like postdoctoral fellowship, visiting professorship, to develop LLL system in Southern Federal University.



To support initiatives and projects aimed at collaboration with various technology companies including joint-stock companies, engineering companies, small and medium-sized enterprises applying advanced technologies in manufacturing and providing technological solutions and high tech products for domestic and foreign markets.



To provide legislative and regulative framework for educational projects and to implement innovations that align with the Center’s philosophy; to foster inclusion of new methods and techniques into research and education as well as to develop and introduce new paradigms into these fields.



To enhance partnership between federal and private agencies and unite forces of the state, business and RMC to work out solutions to pressing issues, to raise funds to support RMC operation.



To collaborate with federal and local agencies, national and foreign companies and professional communities, to organize and host joint events, competitions, programs, to arrange participation of RMC members in federal and local competitions, programs and tenders.



## TO ACHIEVE ITS GOALS RMC OF SFEDU IS INVOLVED IN:



Organization of workshops and conferences;



Partnership with national and foreign institutions, educational establishments, nonprofit professional communities, funds and commercial enterprises in order to start joint programs, projects, events and consortiums and actively participate in them;



Cooperation with federal and local agencies, companies and professional communities in order to arrange and host joint events, competitions and programs and to enable the RMC members, Southern Federal University faculty and students to participate in national federal and local competitions, programs and other events that align with RMC guidelines;



Organization of visits of Russian and foreign distinguished mathematicians to SFedU and their integration into the work of seminars, colloquiums, lectures and short-term professional courses;



Organization of visits of Russian and foreign distinguished mathematicians to RMC of SFedU for short-term research work, lecturing and development of educational programs;



Participation RMC members in international research projects, publication of articles in peer-reviewed journals, sharing research findings at international mathematics forums;



Participation in SFedU curricula modernization, design of new educational programs and online study materials for educational establishments in Russia and abroad;



Organization of mathematics competitions, olympiads and other events for SFedU prospective students;



Engagement of students (mostly mathematics students) into mathematics research, support of undergraduate, postgraduate students and early-career mathematicians;



Design of internship programs for postgraduate students and SFedU faculty members at leading academic institutions including Steklov Mathematical Institute, Saint Petersburg Department of Steklov Mathematical Institute, Federal Research Center for Informatics, Skolkovo Institute of Science and Technology, Moscow State University, Saint Petersburg State University, Moscow Institute of Physics and Technology, National Research University Higher School of Economic; creation of opportunities for active participation of postgraduate students and SFedU faculty members in academic events organized by SFedU and other universities and research organizations;



<https://rmc.sfedu.ru/> - informational website in Russian

<http://otha.sfedu.ru/> - informational website in English (provides information on major conferences, workshops, meetings, international science group OTHA-ISAAC)

<https://msrn.sfedu.ru/> - informational portal in English (regular science seminar of RMC and partner Universities, science projects, international cooperation).



## II. OTHA SCIENCE GROUP

OTHA science group specializing in operator theory and harmonic analysis continued its work in 2021 (OTHA – Operator Theory and Harmonic Analysis) within the framework of ISAAC (International Society for Analysis, its Applications and Computation). Alexey Karapetyants is its founder and leader.

The group does research in numerous fields but is primarily interested in harmonic analysis and its applications. Conducted research aims at establishing theoretical foundation and construction of mathematical models for analysis of objects with complex structure and parameters changing from one point to the other, for instance, under the influence of gravitational, electromagnetic, vibrational and other external fields.

Fundamental basis of the research is transferred to educational settings, the group is in search of young and talented specialists. OTHA topics of interest are included into RMC discussions at conferences, schools and seminars. Leading Russian and foreign researchers are invited and they participate in scientific forums, deliver lectures, do research work and are engaged in scientific collaboration.

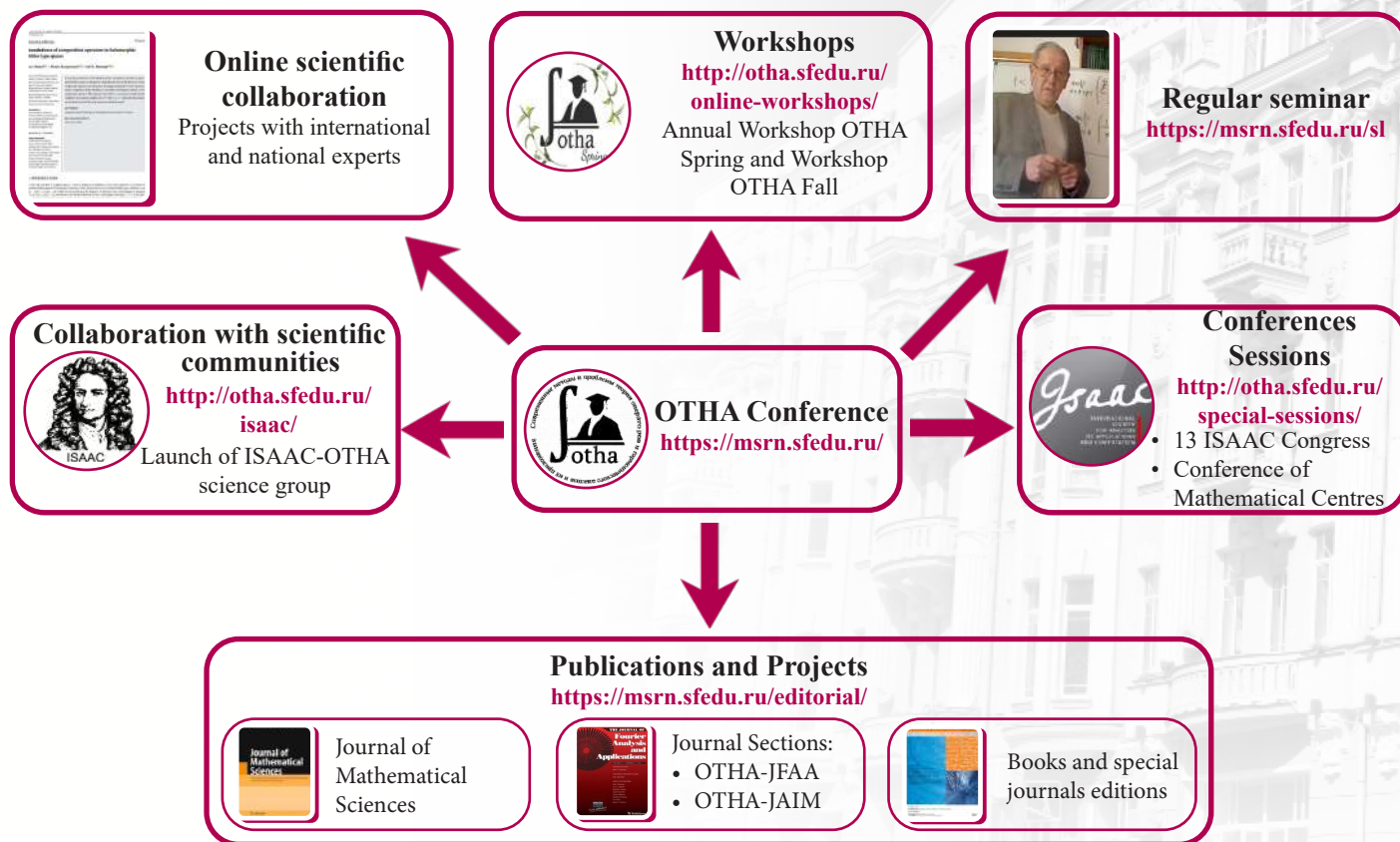
<http://otha.sfedu.ru/isaac/>





## ONLINE SCIENTIFIC COLLABORATION

The formation of the institute centers around the network of interdependent projects, promotion of science, educational initiatives and projects of practical orientation in the field of fundamental mathematics and its applications. Net collaboration offers new diverse academic opportunities to students and early stage researchers.







## CREATION OF MATH SCI RESEARCH NETWORK

The development of Math Sci Research Network started in 2021. The network serves as the platform for RMC of SFedU projects and is used as a tool for enhancing international collaboration, internalization of scientific research, maximizing publishing activity in SFedU, integration of various scientific and academic projects and formation of net institute for mathematical education and mathematics.

Currently the net includes the following projects launched by RMC SFedU:

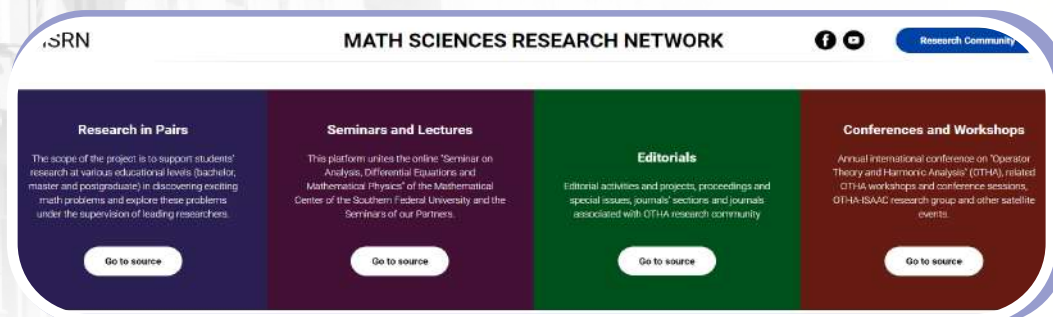
**Research in Pairs** – development of the net group of leading specialists for research work with students of different levels of preparation.

**Seminars and Lectures** – platform for seminars of RMC and its partners - Tbilisi Analysis & PDE Seminar, Seminar of the Nikolsky Mathematical Institute, Yerevan Mathematical Colloquium and OTDE-Seminar of Vladikavkaz Scientific Center.

**Editorials** – platform for publishing projects, editorial and review activities, it centers around books, special editions, journals and journal sections related to scientific activity of OTHA group.

**Conferences and Workshops** – platform of the international conference “Operator Theory and Harmonic Analysis” (OTHA), related seminars and OTHA workshops, research group OTHA-ISAAC and other satellite activities.

<https://msrn.sfedu.ru/>





## MATH SCI RESEARCH IN PAIRS PROGRAM

Since 2021 Math Sci Research in Pairs has been launched.

The main idea of the Research in Pairs project is to form an international network of leading researchers from different countries in order to offer undergraduate and graduate students opportunities to work on research problems in collaboration.

### **The core of the program:**

A dynamically updated international board of Coordinating Researchers from the Russian and foreign partners of the RMC - leading researchers in different fields of mathematics - initiates and coordinates mathematical research projects of the Research in Pairs program.

Each Coordinating Researcher sets forth a number of research objectives at different educational levels in the area of his or her scientific interests. Further research objectives can be discussed in accordance with student's educational qualifications.

After reviewing the offered research projects and program requirements, the student submits an application on this site to one or two Coordinating Researchers. The applications are considered on a competitive basis. If and when the application is approved, the student is enrolled at the RMC as a research trainee and can begin their research activities in collaboration with chosen Coordinating Researcher(s).

**More information about the program: <https://msrn.sfedu.ru/msrp>**

SEMINARS AND LECTURES / EDITORIALS / CONFERENCES AND WORKSHOPS / RESEARCH COMMUNITY



Zhirayr Avetisyan



Alexey Karapetyants



Sergei Grudsky



### III. LECTURES BY LEADING SCIENTISTS

III



RMC offers leading Russian and foreign mathematicians a position of a short term visiting professor. Visiting professors deliver lectures and masterclasses, conduct tutorials and seminars for undergraduate, postgraduate students and faculty and undertake collaborative research.

In November 2021 Southern Federal University and the University of Padua (Italy) held lecture exchange program as part of memorandum of understanding which presupposes academic and scientific partnership of the universities. The memorandum was initiated by RMC and signed in 2019 during III Caucasian Mathematical Conference.

#### MASSIMO LANZA DE CRISTOFORIS

Professor, the University of Padua

**Italy**

In October and November he delivered lectures on “Integral operators in Hölder spaces on Ahlfors regular sets” to SFedU undergraduate and postgraduate students majoring in mathematics. The series of lectures were also part of the memorandum of understanding between SFedU and the University of Padua.



#### ALEXEY KARAPETYANTS

Professor of SFedU

**Russia**

In November 2021 he delivered a series of lectures on “Operators and Spaces in Complex Analysis” to students of the University of Padua, Italy. Postgraduate audience of the lectures also included students from Mexico, Vietnam. The lectures were conducted within the memorandum of understanding signed between SFedU and the University of Padua in 2019.







## VISITING SCIENTISTS



### **GAUTAM RAKHOLIA**

is a young researcher from the University of California,  
**USA**

He did an internship under the supervision of Zhirayr Avetisyan in November of 2021. He took part in joint research on confluence of Lie theory and analysis.



### **ADOLF MIROTIN**

Professor, Francisk Skorina Gomel State University,  
**Belarus**

He served as a visiting professor in SFedU in August 2021 and gave lectures on “Hausdorff operators on homogeneous spaces”.



### **SUHEIL KHOURY**

Professor of the American University of Sharjah,  
**UAE**

In August of 2021 took the position of a visiting professor in Southern Federal University.



## SENIOR VISITING RESEARCHERS

### **ZHIRAYR AVETISYAN**

Senior visiting researcher, PhD, USA



He has been working in RMC since 2021 in collaboration with Karapetyants A.N, D.Sc, Professor. He defended his PhD thesis in 2013 at University of Leipzig, Germany, and worked in universities of the UK, USA and Armenia. His research interests are in partial differential equations on manifolds, spectral theory, microlocal analysis, non-Euclidian and noncommutative harmonic analysis, mathematical cosmology, integrability and quantization.

### **LIANET DE LA CRUZ TORANZO**

Postdoctoral researcher, PhD, Cuba



The specialist has been working in RMC since 2020 under the supervision of Karapetyants A.N, D.Sc, Professor. The research of Lianet De la Cruz Toranzo is based upon academician F.D. Gakhov works. The academician is the founder of the Department of Differential and Integral Equations of Southern Federal University and the originator of research in the field of boundary value problems theory. The work of the young mathematicians is linked to the traditions of SFedU research.



## IV. REGULAR SCIENTIFIC SEMINAR

The international seminar of RMC “Seminar on Analysis, Differential Equations and Mathematical Physics” continued its work in 2021. The seminar focuses on various fields of mathematical analysis, differential equations and mathematical physics.

Among seminar attendees normally including from 45 to 85 mathematicians are representatives of leading scientific and academic world centers of Russia, USA, Belgium, Portugal, Germany, Israel, Spain, Italy, Poland, Hungary, Slovenia, Czech Republic, China, Korea, Japan, Mexico, Cuba, Ecuador, India, Belarus, UAE, Armenia, Georgia, Azerbaijan, Kazakhstan and other countries. SFedU postgraduate students, young researchers and students of the Institute of Mathematics, Mechanics and Computer Sciences of SFedU also take part in the events.

**The seminar’s website: <https://msrn.sfedu.ru/sl>**

**Seminars and Lectures**

Online seminars and lectures by Math Center of the Southern Federal University and seminars of our Partners

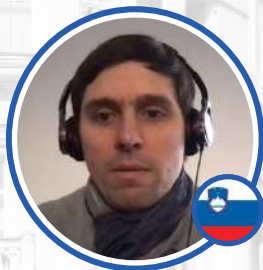
Upcoming Events   Recent Events

- ✓ Seminar on Analysis, Differential Equations and Mathematical Physics
- ✓ Tbilisi Analysis & PDE Seminar  
Seminar of our partner
- ✓ Seminar of the Nikolsky Mathematical Institute  
Seminar of our partner





## 2021 SEMINAR LECTURERS



**ALEKSEY KOSTENKO**

University of Ljubljana,  
Slovenia.



**ALEXEI KARLOVICH**

NOVA University Lisbon,  
Portugal.



**VOLKER MEHRMANN**

Technical University of Berlin,  
Germany.



**SUNDARAM THANGAVELU**

Indian Institute of Science,  
India.



**STEFAN SAMKO**

University of Algarve,  
Portugal.



**HUMBERTO RAFEIRO**

United Arab Emirates University,  
UAE.



**HELMUTH MALONEK**

University of Aveiro,  
Portugal.



**MAXIM ZINCENKO**

University of New Mexico,  
USA.



**LUBOS PICK**

Charles University,  
Czech Republic.



**WINFRIED SICKEL**

Friedrich Schiller University  
Jena,  
Germany.



**TIBOR POGÁNY**

University of Rijeka,  
Croatia.



**LARS DIENING**

Bielefeld University,  
Germany.



**MICHAEL RUZHANSKY**

Ghent University,  
Belgium.



**YURI ANTIPOV**

Louisiana State University,  
USA.



**KONSTANTIN DYAKONOV**  
University of Barcelona,  
Spain.



**RICARDO ABREU BLAYA**  
Autonomous University of Guerrero,  
Mexico.



**FERENC WEISZ**  
Eötvös University,  
Hungary.



**ROMAN NOVIKOV**  
Center for Applied Mathematics,  
École Polytechnique,  
France.



**ELIJAH LIFLYAND**  
Bar-Ilan University,  
Israel.



**VLADIMIR MITYUSHEV**  
Cracow University of Technology,  
Poland.



**LAURENT BARATCHART**  
Insitute for Research INRIA,  
France.



**SWANHILD BERNSTEIN**  
Freiberg University of Mining  
and Technology,  
Germany.





**LARS-ERIK PERSSON**  
UiT The Arctic University of  
Norway and Karlstad University,  
Sweden.



**YURI LUCHKO**  
Technical University of Berlin,  
Germany.



**TUNCAY AKTOSUN**  
the University of Texas at Arlington,  
USA.



Photo: 2021 online research seminar.



## V. OTHA CONFERENCES

Southern Federal University organizes and hosts prestigious annual International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis (OTHA)”. The conference brings together researchers from Russia and abroad for continuous collaboration, workshops and joint projects.

On August 22-27, 2021 the conference was held in both on-line and off-line formats and was dedicated to the 80th anniversary of Professor Stefan Grigorievich Samko, D.Sc. Foreign presenters made up more than half of the speakers. Around 70 participants attended the offline event, over 120 attendees from many countries took part in the conference. 3 special sessions operated within the conference: analysis session (fundamental math); differential equations and mathematical physics session (applied math) and probabilistic analytical models and methods session (organized in collaboration with Don Technical University).

Starting from 2015 selected conference papers are published in top-ranked journals and in special editions of Springer, Wiley, in national journals as well.

For more information on the event, its schedule and recorded lectures visit:  
<http://otha.sfedu.ru/conf2021/>

**Conference series website: <http://otha.sfedu.ru/>**



## WORKSHOP OTHA SPRING 2021

The event was held offline on April 25-28, 2021 in Southern Federal University as part of series of conferences “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis” and comprised lectures of leading scientists in the field of analysis, differential equations, mathematical physics and financial mathematics. Experts from Moscow, Saint Petersburg, Rostov-on-Don, Yaroslavl, Belarus and Mexico took part in the conference.

Invited speakers were Abanin Alexander (Rostov-on-Don), Berezhnoy Evgeny (Yaroslavl), Vatulyan Alexander (Rostov-on-Don), Grudsky Sergey (Rostov-on-Don/Mexico), Karapetyants Alexey (Rostov-on-Don), Mirotin Adolf (Belarus), Nazarov Alexander (Saint Petersburg), Petrov Vladimir (Saint Petersburg), Rokhlin Dmitry (Rostov-on-Don), Skubachevsky Alexander (Moscow), Soldatov Alexander (Moscow), Suslina Tatyana (Saint Petersburg), Skopina Maria (Saint Petersburg), Shkalikov Andrey (Moscow).

**Website:** <http://otha.sfedu.ru/workshop-spring-2021/>



Photo: Workshop OTHA Spring 2021 participants.





## WORKSHOP OTHA FALL 2021

On December 13-17, 2021 one more event was held in Southern Federal University within international conferences “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis”. The conference united speakers from Armenia, Belarus, Spain, Finland, Kazakhstan, Mexico, Russia and apart from presentations included coordination and planning of upcoming scientific events.

Invited speakers: Oleg Avsyankin (Rostov-on-Don, Russia), Zhirayr Avetisyan (Rostov-on-Don, Russia / Armenia / USA), Francisco Javier García Pacheco (Spain), Håkan Hedenmalm (Sweden), Alexey Karapetyants (Rostov-on-Don, Russia), Vladislav Kravchenko (Rostov-on-Don, Russia / Mexico), Fernando León-Saavedra (Spain), Adolf Mirotin (Belarus), Andrey Muravnik (Voronezh, Russia), Dmitry Rokhlin (Rostov-on-Don, Russia), Alexandre Soldatov (Moscow, Russia), Elina Shishkina (Voronezh, Russia), Armen Vagharshakyan (Armenia), Alexander Vatulyan (Rostov-on-Don, Russia).

**Seminar website:** <http://otha.sfedu.ru/workshop-otha-fall-2021/>



Photo: Workshop OTHA Fall 2021 participants.



## OTHA 2021 PLENARY LECTURERS



**HANS FEICHTINGER**

University of Vienna,  
Austria.



**YOSHIHIRO SAWANO**

Chuo University,  
Japan.



**VIRGINIA KIRYAKOVA**

Institute of Mathematics and  
Informatics at the Bulgarian  
Academy of sciences,  
Bulgaria.



**EIICHI NAKAI**

Ibaraki University,  
Japan.



**CARLO SBORDONE**

University of Naples Federico II,  
Italy.



**YURI GLIKLIKH**

Voronezh State University,  
Russia.



**SERGEI GRUDSKY**  
RMC of SFedU and Center for  
Research and Advanced Studies of  
the National Polytechnic Institute  
in Mexico,  
Russia/Mexico.



**ALEXANDER NAZAROV**  
Saint Petersburg State University,  
Saint Petersburg Department of  
Steklov Mathematical Institute at the  
Russian Academy of Sciences,  
Russia.



**ALEXEY KARAPETYANTS**  
Southern Federal University,  
Russia.



**KAZAROS KAZARIAN**  
Autonomous University of Madrid,  
Spain.



**ISSAM LOUHICHI**  
American University of Sharjah,  
UAE.



**ADOLF MIROTIN**  
Francisk Skorina Gomel State  
University,  
Belarus.



**ALEXANDER SOLDATOV**  
Federal Research Center for  
Information and Computational  
Technologies at the Russian Academy  
of Sciences,  
Russia.



**MARIA SKOPINA**  
Saint Petersburg State University,  
Russia.





**IGOR SHEIPAK**  
Lomonosov Moscow State  
University,  
Russia.



**ALEXANDER BENDIKOV**  
University of Wroclaw,  
Poland.



**ZHIRAYR AVETISYAN**  
RMC of SFedU, University of  
California, Santa Barbara,  
Russia/USA.



Photo: Conference OTHA 2021 participants.

## OTHA unites mathematicians from all over the world



About **100** plenary speakers in **10** years

4 special issues in journals, 3 proceedings

## 11 related events (workshops, schools, special sessions)



## OTHA SESSION AT ISAAC CONGRESS

Special OTHA Session was successfully organized within 13 ISAAC Congress of the mathematical society. The congress was held online in Ghent University, Belgium on August 2-6, 2021.

The OTHA Session was attended by about 80 mathematicians. Among the speakers were leading researchers from many countries. The OTHA Session was a successful project of OTHA-ISAAC research group (<http://otha.sfedu.ru/isaac/>) established in 2019.

Session coordinators: Alexey Karapetyants and Vladislav Kravchenko.

Congress website: <https://cage.ugent.be/isaac2021/>

OTHA website: <http://otha.sfedu.ru/special-sessions-isaac2021/>

Photo: lecture by Eiichi Nakai.

**Boundedness of integral operators**  
Generalized fractional integral and maximal operators

Let  $\rho(r) = r^\alpha$ ,  $\Phi(t) = t^p$ ,  $\Psi(t) = t^q$ ,  $\varphi(r) = 1/r^n$ .  
Then  $I_\rho = I_\alpha$ ,  $L^{(\Phi, \varphi)}(\mathbb{R}^n) = L^p(\mathbb{R}^n)$ ,  $L^{(\Psi, \varphi)}(\mathbb{R}^n) = L^q(\mathbb{R}^n)$  and

$$\int_0^r \frac{\rho(t)}{t} dt \Phi^{-1}(\varphi(r)) + \int_r^\infty \frac{\rho(t) \Phi^{-1}(\varphi(t))}{t} dt \leq A \Psi^{-1}(\varphi(r))$$

$$\Leftrightarrow \int_0^r \frac{t^\alpha}{t} dt \times r^{-n/p} + \int_r^\infty \frac{t^{\alpha-n/p}}{t} dt \leq A r^{-n/q}$$

$$\Leftrightarrow r^{\alpha-n/p} \leq A r^{-n/q}$$

$$\Leftrightarrow r^{\alpha-n/p+n/q} \leq A \quad \forall r \in (0, \infty)$$

$$\Leftrightarrow \alpha - n/p + n/q = 0.$$

This is the case of Hardy-Littlewood-Sobolev theorem:  
 $-n/p + \alpha = -n/q \Rightarrow I_\alpha : L^p(\mathbb{R}^n) \rightarrow L^q(\mathbb{R}^n).$





## 13th ISAAC Congress

August 2–August 6, 2021  
Ghent, Belgium



**ALEXANDRE ALMEIDA**  
University of Aveiro,  
Portugal.



**OSCAR BLASCO**  
University of Valencia,  
Spain.



**VICTOR BARRERA-FIGUEROA**  
National Polytechnic Institute of  
Mexico, UPIITA,  
Mexico.



**NATALIA BONDARENKO**  
Sartov State University,  
Russia.



**LUCA ZAMPOGNI**  
University of Perugia,  
Italy.



**ISMAIL ASLAN**  
Hacettepe Univeristy,  
Turkey.



**LYUBOV BRITVINA**

Yaroslav-the-Wise Novgorod State University,  
Russia.



**CLAUDIA CAPONE**

National Research Council “M. Picone” (C.N.R.),  
Italy.



**KONSTANTIN DYAKONOV**

ICREA and University of Barcelona,  
Spain.



**RADOUAN DAHER**

University of Hassan II,  
Morocco.



**CARLOS PEREZ MORENO**

University of the Basque Country,  
Spain.



**MICHAEL HITRIK**

California State University,  
Los Angeles,  
USA.



**GRIGORI KARAGULYAN**

Institute of Mathematics of the  
Armenian National Academy of  
Sciences,  
Armenia.

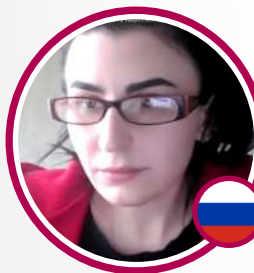


**MIKHAIL KARAPETYANTS**

RMC of SFedU and the  
University of Vienna,  
Russia/Austria.



**ALEXEI KARLOVICH**  
NOVA University Lisbon,  
Portugal.



**ZALINA KUSRAEVA**  
RMC of SFedU/ Southern  
Mathematical Institute of the  
Vladikavkaz Scientific Center of the  
Russian Academy of Sciences,  
Russia.



**VAKHTANG KOKILASHVILI**  
Ivane Javakhashvili Tbilisi State  
University,  
Georgia.



**PIER DOMENICO  
LAMBERTI**  
University of Padua,  
Italy.



**FERNANDO LEON  
SAAVEDRA**  
University of Cadiz,  
Spain.



**SAMANTHA LOREDO**  
UPIITA-IPN,  
Mexico.



**ANNA MAZZUCATO**  
The Pennsylvania State University,  
USA.



**ALEXANDER MESKHI**  
Kutaisi International University,  
Georgia.





**EIICHI NAKAI**  
Ibaraki University,  
Japan.



**JOEL E. RESTREPO**  
Nazarbayev University,  
Kazakhstan.



**BENOIT FLORENT SEHBA**  
University of Ghana,  
Ghana.



**ELINA SHISHKINA**  
Voronezh State University,  
Russia.



**EUGENE SHARGORODSKY**  
Imperial College London,  
UK.



**IOANNIS STRATIS**  
Kapodistrian University  
of Athens,  
Greece.



**ALEXANDER  
SKUBACHEVSKII**  
Peoples' Friendship University  
of Russia,  
Russia.



**JARI TASKINEN**  
University of Helsinki,  
Finland.



**SUNDARAM THANGAVELU**  
Indian Institute of Science,  
India.



**SERGII TORBA**  
CINVESTAV del IPN,  
Mexico.



**OTHMAN TYR**  
University of Hassan II,  
Morocco.



**RUYA USTER**  
Istanbul University,  
Turkey.



**JANI VIRTANEN**  
University of Reading,  
UK.



**SAWANO YOSHIHIRO**  
Chuo University,  
Japan.



## OTHA SESSION AT CONFERENCE OF INTERNATIONAL MATHEMATICAL CENTERS

On August, 9-13, 2021 Operator Theory and Harmonic Analysis session was organized and held at the Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”. The Session was coordinated by Karapetyants A.N. and Kravchenko V.V.

The conference participants were represented by Russian and overseas mathematicians including faculty members, undergraduate and postgraduate students of local and international mathematical centres. Among participants of the Operator Theory and Harmonic Analysis session were leading and young specialist of RMC of SFedU, invited mathematicians from Moscow, Saint Petersburg, Armenia, Mexico and Cuba.

**Conference website:** <https://siriusmathcenter.ru/all-russian-conference/>

**OTHA session website:** <http://otha.sfedu.ru/special-sessions-sirius2021/>



Photo: OTHA Session participants at Conference of International Mathematical Centers.





## VI. CONFERENCE “MATHEMATICS. ECONOMICS. EDUCATION” AND SYMPOSIUM “FOURIER SERIES AND THEIR APPLICATIONS”

XXVII International conference “Mathematics. Economics. Education”, XI International Symposium “Fourier Series and Their Applications” were organized jointly with the Institute of Mathematics, Mechanics and Computer Sciences of Southern Federal University on May 27 – June 8, 2021 in Durso settlement.

The conference included round table discussions on contemporary education issues. The conference events were both online and offline.

The events attracted participants from Moscow, Saint Petersburg, Rostov-on-Don, Ufa, Grozny, Velikiy Novgorod, Vladikavkaz, Gomel, Dolgoprudny, Zelenokumsk, Naberezhnye Chelny, and other cities.



Photo: 2021 Conference participants.



## VLADIKAVKAZ YOUTH MATHEMATICAL SCHOOL

RMC supports projects of the Vladikavkaz Scientific Center of the Russian Academy of Sciences aimed at the development of scientific societies, sharing research findings to form a joint scientific society, establishment of international collaboration, organization of joint science projects, support of talented young researchers and creation of conditions fostering their professional growth.

XVI Vladikavkaz Mathematical School was run on September 24-27, 2021 in Republic of Northern Ossetia-Alania. The event comprised talk session and lecture session, the lectures were delivered by leading specialists. All School lectures were in online format and the audience included 50 participants from 9 countries: Russia, Germany, India, Spain, Portugal, Uzbekistan, Ukraine, Ecuador. Along with professional mathematicians the event was attended by undergraduate and postgraduate students and early stage researchers from 11 Russian cities: Vladikavkaz, Bataisk, Elabuga, Maykop, Makhachkala, Moscow, Naberejnye Chelny, Rostov-on-Don, Stavropol, Ufa.

Photo: 2021 Mathematical School participants.







## VLADIKAVKAZ INTERNATIONAL CONFERENCE

Supported by RMC of SFedU XVI International Science Conference “Numerical order and related problems of mathematical modelling” was hosted by Vladikavkaz Scientific Center of the Russian Academy of Science on September, 20-25, 2021.

The conference included over 130 speakers presented by Russian and overseas specialists in fundamental and applied mathematics and didactics and over 20 participants. Over one third of all talks (around 40) were given by early stage researchers.

Overseas conference audience included scientists from Azerbaijan, Algeria, Germany, Holland, India, Spain, Italy, Canada, Kazakhstan, Mexico, UAE, Portugal, Belarus, Turkey, Uzbekistan, Ukraine and Japan and more than 20 Russian cities.

Selected articles based on the conference talks will be published in 2022 in Vladikavkaz Mathematical Journal.



Photo: participants of 2021  
Vladikavkaz International  
Conference.





## VII. THE INTERNATIONAL COMPETITION OF EARLY CAREER SCIENTISTS

RMC of SFedU in partnership with ISAAC (International Society for Analysis, its Applications and Computation) jointly organized a competition among young researchers and selected those to be presented with life ISAAC membership award. Among the awardees were: Zhirayr Avetisyan (Armenia/Russia/USA) and Lianet De la Cruz Toranzo (Cuba/Russia).

The award ceremony took place on OTHA-2021 conference first day after plenary talks.

Professor Uwe Kähler, the University of Aveiro, ISAAC President, described the selection procedure and congratulated the winners.

Photo: Uwe Kähler, Alexey Karapetyants, Lianet De la Cruz.



Photo: Uwe Kähler.

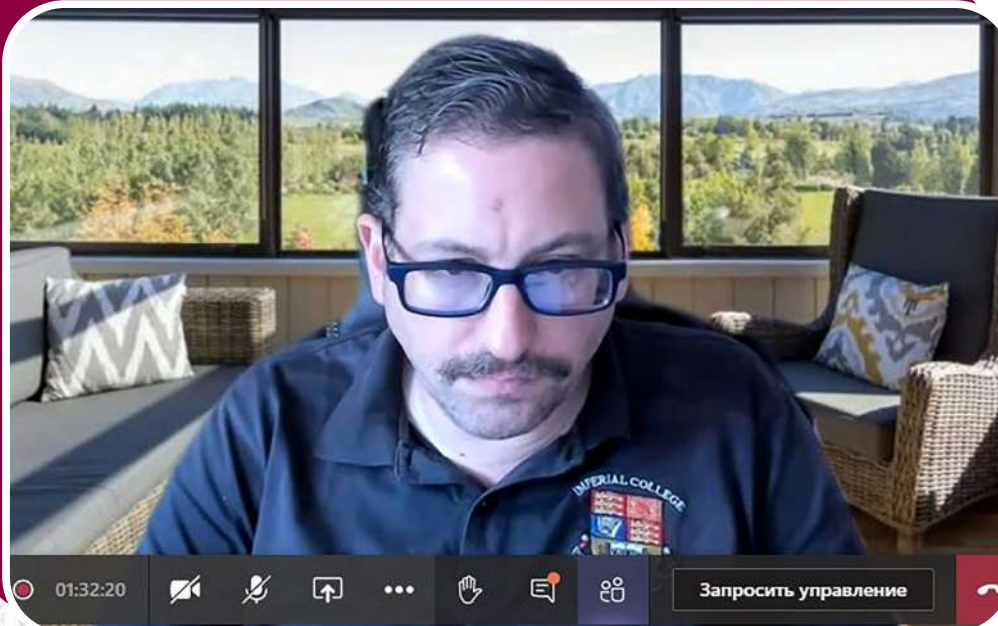


Photo: Alexey Karapetyants,  
Zhirayr Avetisyan.





## VIII. JOURNAL OF MATHEMATICAL SCIENCES

RMC of SFedU is actively involved in publishing on the international level. The work in this sphere received international recognition and Alexey Karapetyants, the director of RMC of SFedU was offered the position of the editor in chief of Journal of Mathematical Sciences (Springer). The announcement was made by Thomas Hempfling, editorial director of Springer Mathematics Journals, at the online plenary opening of the international ISAAC congress (August 2-6, 2021 Ghent University, Belgium).



Journal of Mathematical Sciences publishes articles in English. Articles present outstanding findings in theoretical and/or applied mathematical research. Until recently Journal of Mathematical Sciences has included translated articles from 11 Russian and Ukrainian journals. Since 2021 the journal has started accepting articles to section A and also continues to accept articles from Russian journals and locate them in section B.

The presentation of Journal of Mathematical Sciences took place at OTHA-2021 conference. The event was conducted by Clemens Heine, Executive Editor in Applied Mathematics and Computer Sciences at Birkhäuser/ Springer and Professor A.N. Karapetyants, D.Sc, Editor in Chief.



Photo: presentation of the scientific journal “Journal of Mathematical Sciences”.



The editorial board of section A is currently made up of leading experts from various countries: Alexey Karapetyants (Southern Federal University, Russia) – editor in chief, Robert Csetnek (University of Vienna, Austria); Pavel Exner (Czech Academy of Sciences, Czech Republic); Anatoly Golberg (Holon Institute of Technology, Israel); Uwe Kähler (University of Aveiro, Portugal); Alexei Karlovich (NOVA University Lisbon, Portugal); Vladislav Kravchenko (Center for Research and Advanced Studies of the National Polytechnic Institute, Mexico); Massimo Lanza de Cristoforis (University of Padua, Italy); Changpin Li (Shanghai University, China); Elijah Lifyand (Bar-Ilan University, Israel); Michael Ruzhansky (Ghent University, Belgium and Queen Mary University London, Great Britain); Yoshihiro Sawano (Chuo University, Japan); Armen Sergeev (Steklov Mathematical Institute of the Russian Academy of Sciences, Russia); Maria Skopina (Saint Petersburg State University, Russia); Ioannis Stratis (National and Kapodistrian University of Athens, Greece).



## IX. PUBLISHING

Currently project teams in editorial boards of prominent journals are being formed and operator theory and harmonic analysis sections are being introduced into journals.

Journal of Fourier Analysis and Applications now includes OTHA-JFAA section. The section is edited by A.N. Karapetyants, V.V. Kravchenko, I.R. Liflyand (Israel), V.Y. Protasov (Moscow/Italy), I.M. Spitkovsky (UAE), A.A. Shkalikov (Moscow).

**Journal website:** <https://www.springer.com/journal/41>

**OTHA section website:** <http://otha.sfedu.ru/editorial/>



Journal of Applied and Industrial Mathematics now comprises OTHA-JAIM section. The section is edited by A.N. Karapetyants, V.V. Kravchenko, Massimo Lanza de Cristoforis (Italy), Leon Saaverda Fernando (Spain)

**Journal website:** <https://www.springer.com/journal/11754>

**OTHA section website:** <http://otha.sfedu.ru/editorial/>



## PARTNERSHIP WITH INTERNATIONAL PUBLISHING HOUSES

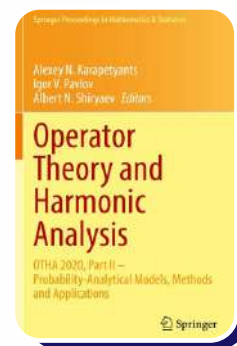
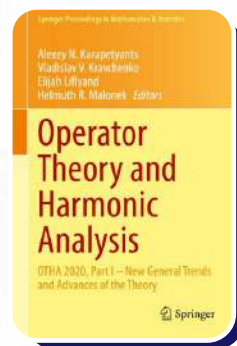
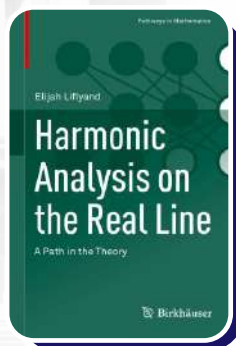
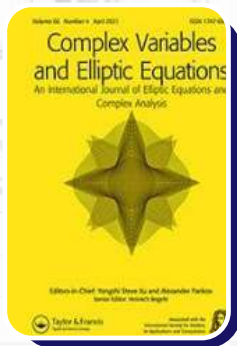
The special issue of Complex Variables and Elliptic Equations journal was dedicated to the 80th anniversary of V.S. Rabinovich and edited by A.N. Karapetyants, V.V. Kravchenko, M.Porter (Mexico), S. Torba (Mexico).

In 2021 special issue Operator Theory and Fourier analysis of Journal of Fourier Analysis and Applications was prepared for publication under the editorship A.N. Karapetyants, V.V. Kravchenko, I.R. Liflyand (Israel). Journal of Fourier Analysis is ranked Q1 in Scopus.

In 2021 I. Liflyand monograph “Harmonic Analysis on the Real Line. A Path in the Theory” was published by Birkhauser. The book of the affiliated RMC of SFedU member is a nonconventional combination of study material and contemporary research material.

I volume “New General Trends and Advances of the Theory” edited by A.N. Karapetyants, V.V. Kravchenko, I.R. Liflyand (Bar-Ilan University, Israel) and H. R. Malonek (The University of Aveiro, Portugal);

II volume “Probability-Analytical Models, Methods and Applications” under the editorialship of A. Karapetyants, I. Pavlov (Don State Technical University) and A. Shiryaeva, Russian Academy of Sciences academician (Moscow State University).





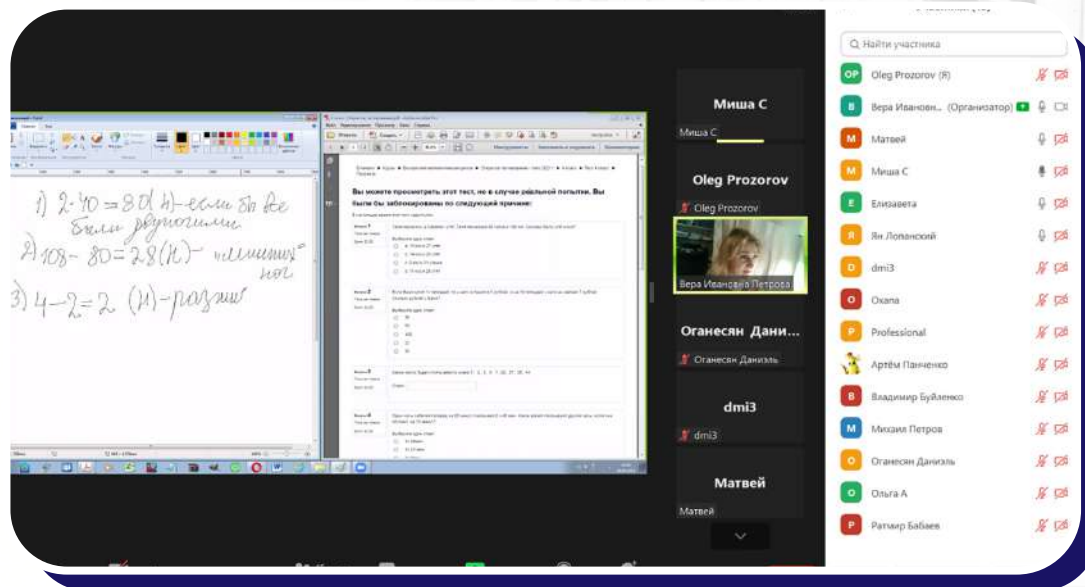


## TESTING OF STUDENTS

RMC of SFedU supports projects aimed at developing mathematics skills of children. The center partners with the Institute of Mathematics, Mechanics and Computer Sciences of SFedU and Sunday Mathematical School of Southern Federal University and supports projects of students of grades 4-11.

In 2021 5 testing events were organized in cooperation with RMC. The tests were designed in the form of a mini-Olympiad for 4-10 graders. As soon as the test works are checked the contestants can analyze the results and think about alternative solutions to the mathematical problems. Test math assignments are of more complicated level than standard ones and are meant for approximately 150 contestants. Tests are official Olympiads held by Southern Federal University.

Photo: in 2021 tests and analysis of results were held online which allowed to attract participants from different regions.

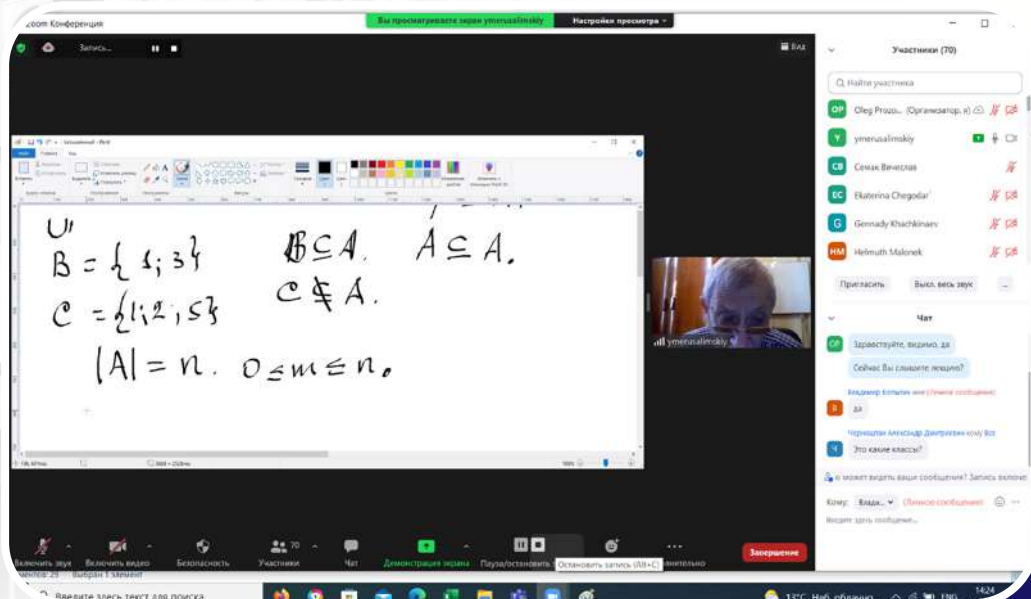




## “AUTUMN UNIVERSITY GAMES”

RMC of SFedU and the Institute of Mathematics, Mechanics and Computer Sciences of SFedU annually organize Autumn University Games. The games held in October-December comprise 2 levels and Southern Federal University awards winners with additional points to their total state exams score. In 2021 about 120 students (classes 5-11) from Rostov and other regions took part in the olympiad. Apart from the olympiads Southern Federal University offers workshops and trainings to prospective students. Considerable number of Autumn University Games winners are currently studying at the university.

Photo: Professor Y.M. Erusalimsky is delivering a lecture to the olympiad participants.





## MATH OLYMPIAD CLUB

Secondary school students doing courses at the Institute of Mathematics, Mechanics and Computer Sciences of SFedU regularly take part in mathematical competitions. Students compete in events organized by the educational center Sirius and participate in olympiads recommended by the Ministry of Education of the Russian Federation and other educational events.

In 2021 RMC in partnership with the Institute of Mathematics, Mechanics and Computer Sciences of SFedU launched the Math Olympiad Club that prepares school students for top math competitions. RMC focuses on selection of gifted students and further development of their mathematical skills and creativity.

Photo: M.I. Karyakin, the Director of I.I. Vorovich Institute of Mathematics, Mechanics and Computer Sciences, is giving a speech to the Math Olympiad Club students.







## PARTNERSHIP WITH MOSCOW INSTITUTE OF PHYSICS AND TECHNOLOGY: CLUB OF ADVANCED MATHEMATICS

Along with Olympiad preparation, RMC of SFedU is actively engaged in the development of advanced school education. Since 2018, the Club of Advanced Mathematics, the joint project of RMC and Moscow Institute of Physics and Technology, has been operating on the premises of RMC. 8-9 graders started the course and in 2021 11-graders completed it. The club curriculum is similar to those offered by part-time and full-time preparatory training courses of Moscow Institute of Physics and Technology and requires intense self-study and regular progress reports. Those who successfully completed the course acquired profound knowledge in mathematics. The course program proved effective in National State Exam preparation. 11-graders' achievements were due to consistent long-term preparation.

Photo: Oleg Prozorov at the Club of Advanced Mathematics.





## SUMMER OLYMPIAD MATH SCHOOL

In late July and early August RMC and Institute of Mathematics, Mechanics and Computer Sciences of SFedU ran the 3rd ten day Summer Mathematical Schools. The classes of Summer School were given by SFedU Sunday Mathematical School faculty. Competition training was combined with lots of fun. Students played various mathematical games such as a mathematical battle, a mathematical fight, mathematical dominoes and a mathematical square.

In 2019 1st-year university students of the pedagogical department did a training course at the Summer Math School. They organized and conducted classes and helped to arrange contests. They got invaluable experience of work with gifted children.

Around 30 winners of various olympiads attended the summer event. Among the participants were the winners of Autumn University Games 2020, Online University Games 2021, two open tests organized by RMC and the Institute of Mathematics, Mechanics and Computer Sciences of SFedU in 2020 and 2021 and also Olympiads recommended by the Russian Ministry of Education.

In 2021 Summer School was held both online and on the premises of the Institute of Mathematics, Mechanics and Computer Sciences of SFedU.

Photo: Summer Schools traditionally included mathematical competitions and Olympiads.





## SUMMER SCIENCE SCHOOL

XVI Summer Science School supported by RMC of SFedU took place in Vladikavkaz on August 2-12, 2021. Students from grades 5-10 selected by two preceding competitive stages participated in the event. 120 students took part in portfolio competition as the first stage of the school (the school is meant for prize winners and winners of city level, regional and interregional and All-Russia Olympiads conducted in the last two years). The second stage competition for 77 students was run a day prior to the School official opening and was performed in the form of the math olympiad.

Photo: Summer Science School participants.







## SUMMER MATH SCHOOL FOR TEACHERS

XI Republican Summer Math School for Teachers took place on July 19-24, 2021 within the program of XI International Mathematical Science and Educational Forum. RMC of SFedU coorganized the event.

The theme of the Summer Math School for Teachers (SMST) was “Modelling in Teaching Mathematics”. Secondary school and lyceum teachers and educators from additional education establishments participated in the online event. The school offered lectures, seminars, master classes, discussions and consultations for teachers. Teachers also shared their professional insights and methods of work within specially devised teacher sessions. Successful participants of the 36-hour teacher refresher course received a certificate.

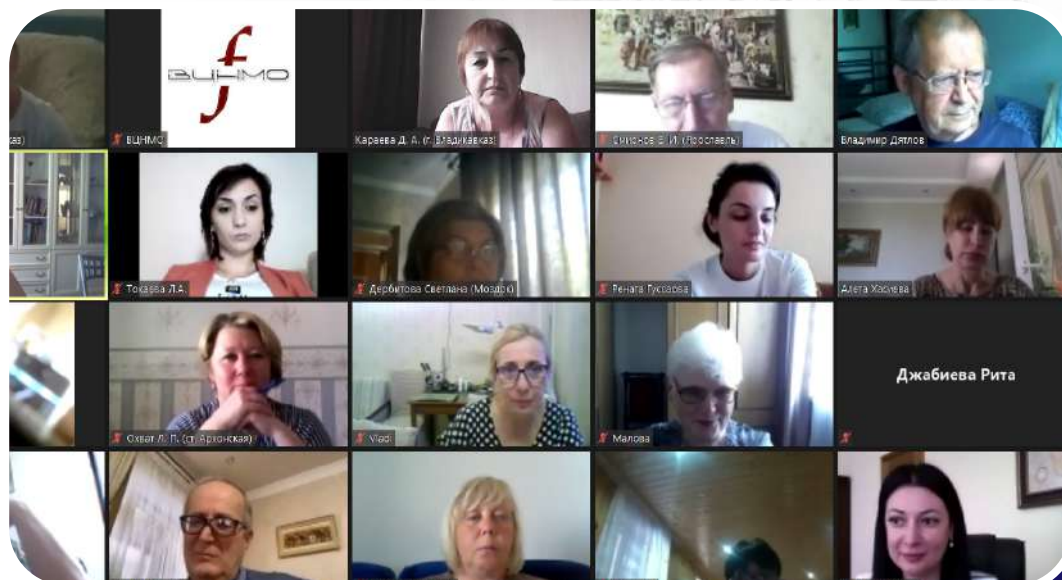


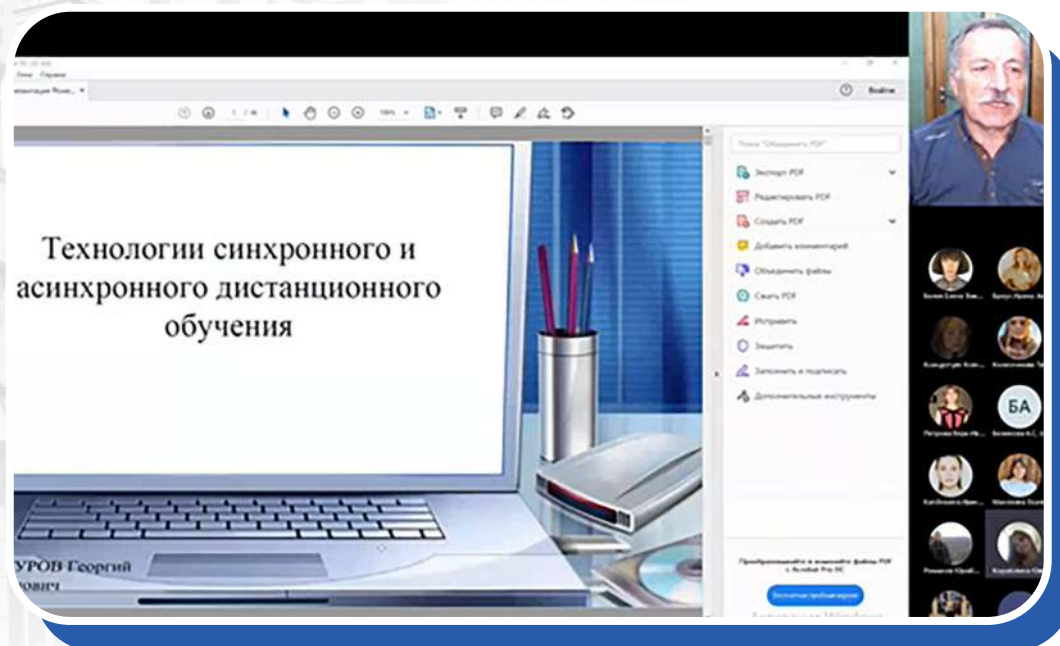
Photo: Summer Math School for Teachers participants.



## X. “MATH COMPETITIONS PREPARATION” SEMINAR

“Math Competition Preparation” seminar was developed on the basis of the Institute of Mathematics, Mechanics and Computer Sciences of SFedU in cooperation with Sunday Mathematical School of SFedU and RMC. Among seminar attendees were mathematics teachers from Rostov-on-Don and Rostov region. The seminar included discussions of preparation strategies for math Olympiads and competitions and support of students’ research projects. Seminar participants familiarized themselves with books published by the faculty of the Institute of Mathematics, Mechanics and Computer Sciences of SFedU and supported by RMC.

Photo: seminar presentation of  
G.O. Astvatsurov (Krasnodar).



X



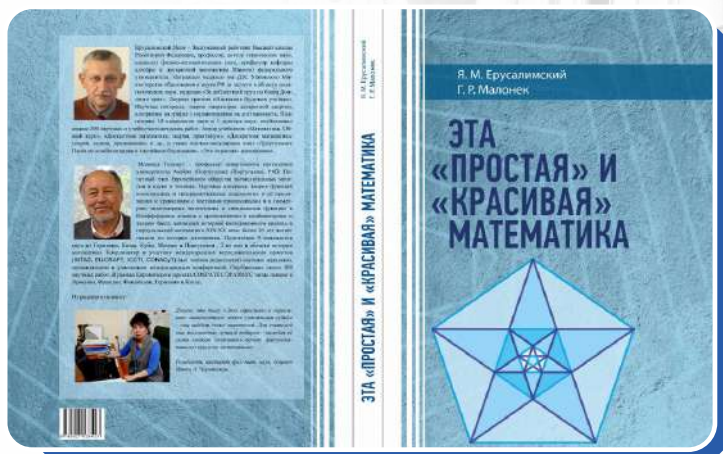
## PUBLICATION OF BOOKS FOR STUDENTS

The center considers popularization of mathematics among school students its priority.

To achieve the goal RMC invites specialists to give lectures and write books for school students. Thus, the book “This “Simple” and “Beautiful” Mathematics” of Professor Helmuth Malonek (Portugal) and Professor, D.Sc Yacov Michailovich Erusalimsky (SFedU) appeared in print.

The book is clearly and simply written due to exceptional professional experience and love of science of its authors. The book complements previously printed Y.M. Erusalimsky's book “This “Simple” Mathematics” that was also written in collaboration with RMC of SFedU 3 years ago. It is still widely used by educators of RMC, the Institute of Mathematics, Mechanics and Computer Sciences of SFedU, Sunday Mathematical School of SFedU.

The presentation of “This “Simple” and “Beautiful” Mathematics” was held in Southern Federal University on August 24, 2021.







## TRAINING AND RESEARCH WORK OF STUDENTS IN RMC

To promote mathematical research and to enhance preparation programs RMC organizes training sessions in leading science centres of Russia and performs joint research projects with students. Some projects are given below.

In June 2021 Anpilov Anton, the student of the Institute of Mathematics, Mechanics and Computer Sciences of SFedU, did the training course in Euler International Mathematical Institute within the conference on spectral theory in mathematical physics and asymptotic methods.

Ecuador student Evelyn Morales is doing research at RMC under the supervision of A.N. Karapetyants, D.Sc. Her research interests include harmonic analysis and operator theory. In 2021 she gave talks at several international conferences.

Master student from Italy Nicola Hu, studying at SFedU on exchange, developed and delivered a mini-course of two lectures in English “Solving Olympiad Problems” for schoolchildren.

Photo: Alexey Karapetyants and Evelyn Morales.





## RESEARCH WORK

RMC research areas are presented by numerous traditional and contemporary directions of fundamental and applied mathematics.

They include the following:

- Development of contemporary directions of harmonic analysis. Integral operators and classes of integral operators are being studied, important results characterizing properties of such operators in various spaces of functions of non standard growth were obtained.
- Development of the theory of multidimensional integral operators with homogenous kernels. Fundamental properties of integral operators and equations with homogenous kernels, appearing in various physical models were thoroughly studied and interaction in various functional spaces was analyzed.
- Methods of solving direct and inverse spectral problems. Method of construction of transformation operators was devised that led to the development of numerical methods of solving direct and inverse Sturm-Liouville problems on bounded and unbounded intervals.
- Research methods in optimization problems. Mathematical theory of pricing and stimulation and theory of decision-making under conditions of uncertainty are being developed.
- Research of homogenous orthogonally additive polynomials. New research methods were introduced, new findings on compact domination, factorization and monomial division of positive polylinear and polynomial operators were obtained, full description of positive polynomials class generated by polynomials of weighted shift operators type was given.



## JOINT PROJECTS WITH OVERSEAS PARTNERS

RMC prioritizes work with overseas partners and development of network projects. Network collaboration provides an opportunity to attract additional resources to carry out research more effectively and be part of the global science community.

In 2021 the listed below projects were carried out within the outlined RMC program. The projects were fulfilled by leading and emerging mathematicians and the results were published or accepted for publication in topranked international journals.

- **Natasha Samko, Arctic University of Norway.**

Projects: “Weighted boundedness of certain sublinear operators in generalized Morrey spaces on quasi-metric measure spaces under the growth condition”, “Commutators of weighted fractional Hardy operators on generalized Morrey spaces over quasi-metric measure spaces”.

- **Elijah Liflyand, Bar-Ilan University, Israel.**

Projects: “Harmonic Analysis on the Real Line”, “Asymptotics of the Lebesgue constants for a  $d$ -dimensional simplex”, “Wiener algebras and trigonometric series in a coordinated fashion”, “The Wiener algebra and singular integrals”.

- **Alexei Karlovich, NOVA, University Lisbon, Portugal.**

Project “A lower estimate for weak-type Fourier multipliers”.



- **Adolf Mirotin, Francisk Skorina Gomel State University, Belarus.**

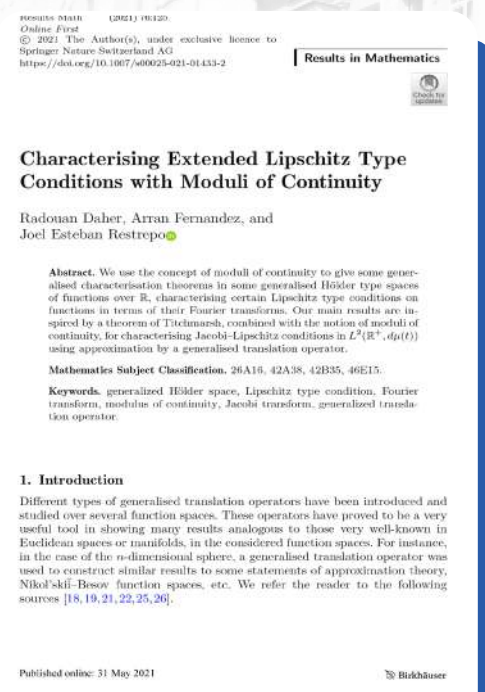
Projects: “Generalized Hankel operators in Hilbert spaces”, “Boundedness of Hausdorff Operators on Hardy Spaces over Homogeneous Spaces of Lie Groups”.

- **Joel Restrepo, Nazarbaev University, Kazakstan.**

Project “Characterising extended Lipschitz type conditions with moduli of continuity”.

- **Armen Jerbashian, Jesus Pejendino, Daniel Vargas. University of Antioquia, Columbia.**

Project “Investigation of general, weighted classes and spaces of functions, in one sense or another, regular in the canonical domains of the complex plane”.





## XI. PARTICIPATION IN CONFERENCES, SEMINARS AND MATHEMATICAL SCHOOLS

1. Avsyankin O.G., online presentation Integral Convolution Type Operators in Morrey Spaces // Online Seminar on functional analysis and differential equations in the People's Friendship University of Russia. Supervisors: Professor V.I. Burenkova and Professor M.L. Goldman, March 2021.
2. Avsyankin O.G., plenary talk Convolution Type Operators in Morrey Spaces // International Scientific Conference "OTHA Workshop Spring-2021", 25-28 April, 2021.
3. Grudsky S.M., plenary talk Asymptotics of All Eigenvalues of Large Toeplitz Matrices. From selfadjoint case to non selfadjoint // International Scientific Conference "OTHA Workshop Spring-2021", 25-28 April, 2021.
4. Karapetyants A.N., plenary talk Composition Operators in Holomorphic Holder spaces // International Scientific Conference "OTHA Workshop Spring-2021", 25-28 April, 2021.

Photo: Alexey Karapetyants at the annual national exhibition VUZPROMEXPO-2021.



5. Karapetyants A.N., RMC of SFedU 2018-2020 progress report delivered at general meeting of the Department Of the Russian Academy of Sciences, April 19, 2021, Moscow.
6. Karapetyants A.N., round table presentation “Preparation and Organisation of Satellite Mathematical Science Events in 2021-2022”, April 28, Maykop.
7. Karapetyants A.N., plenary talk Composition Operators in Holomorphic Hölder Spaces // XXVII Conference “Mathematics. Economics. Education”, May 27 – June 3, 2021.
8. Karapetyants A.N., presentation at Springer and JFAA meeting.
9. Kravchenko V.V., online lecture on Direct and Inverse Sturm–Liouville Problems: A Method of Solution at the seminar Applied Analysis and PDEs Seminar, organized in University of Athens, Department of Mathematics by Nicholas Alikakos and Ioannis Stratis, May 21, 2021.
10. Kusraeva Z.A., online report “Extension and Factorization of  $n$ -Riesz Homomorphisms on Pre-Riesz Spaces” // International Science Conference on Ordered Structures and Their Applications in Economy and Finance’, conducted online on May 3-7, 2021.

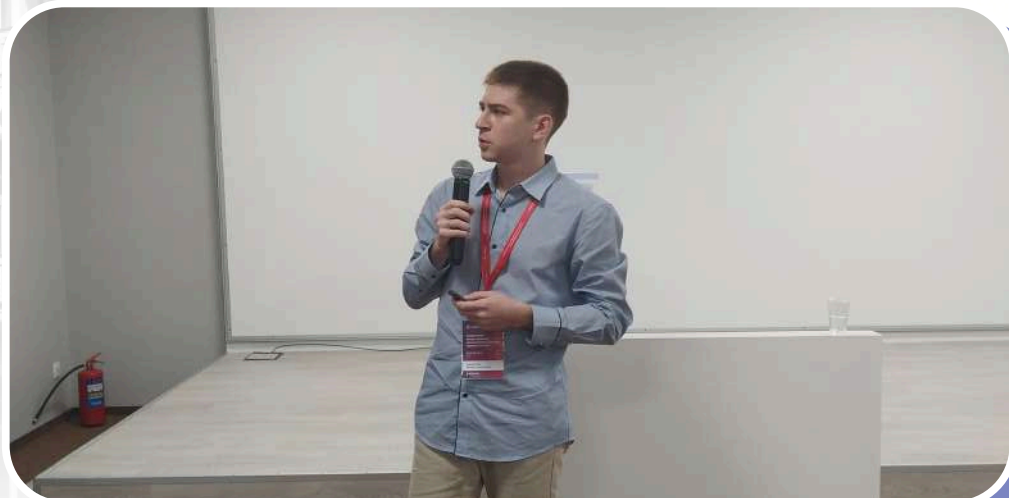
Photo: Zalina Kusraeva is giving a talk at the international online conference.





11. Rokhlin D.B. Dynamic Regularization in Online Convex Optimization and Some Applications// International Scientific Conference “OTHA Workshop Spring-2021”, 25-28 April, 2021.
12. Rokhlin D.B. plenary talk Dynamic Regularization in Online portfolio selection //Mini symposium “New Trends of Stochastic Analysis -2021”, Divnomorskoe, 01–05 June, 2021.
13. Karapetyants A.N., plenary talk New Mixed Norm Spaces of Analytic Functions on Unit Disk of Complex Plane, “12th St.Petersburg Conference in Spectral Theory”, held in memory of Birman M.S., June 23-26, Saint-Petersburg.
14. Skopina M.A., plenary talk Uniform Approximation by Sampling-type Operators // International Scientific Conference “OTHA Workshop Spring-2021”, 25-28 April, 2021.
15. Skopina M.A., plenary lecture “Approximation by Quasi-projection Operators” at Voronezh Winter Mathematical School “Modern Methods of Function Theory and Related Problems”, 28.01-02.02, 2021.
16. Skopina M.A., talk “Approximation by Frame-like Wavelet System in Orlicz Spaces” at Saint Petersburg seminar “Constructive Function Theory”, 14.03. 2021.

Photo: Mikhail Karapetyants at the Conference of International Mathematical Centres in Sochi.



17. Shkaikov A.A., plenary talk Differential operators generated by systems and operators of involution // International Scientific Conference “OTHA Workshop Spring-2021”, 25-28 April, 2021.
18. Karapetyants A.N., online talk Dyadic analogue of the Paul Erdos problem, 13th ISAAC Congress, 2-6 August 2021 Ghent, Belgium.
19. Kusraeva Z.A., online talk Extension and Factorization of Riesz Multimorphisms Between Pre-Riesz Spaces, 13th ISAAC Congress, 2-6 August 2021 Ghent, Belgium.
20. Karapetyants A.N., talk Composition Operators in Analytic Hölder Spaces, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.
21. Rokhlin D.B., talk SOLO FTRL Algorithm for Transfer Pricing, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.
22. Kusraeva Z.A., talk Regularity of Continuous Multilinear Operators and Homogenous Polynoms, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.

Photo: Oleg Avsyankin  
and Sergey Grudsky at the  
Conference of International  
Mathematical Centres in Sochi.



23. Kusraeva Z.A., talk Regularity of Continuous Multilinear Operators and Homogenous Polynoms, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.
24. Avetisyan Zh., talk The Resolvent of a First Order Elliptic System and Spectral Asymptotics, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.
25. De la Cruz Toranzo L., report A Note on Potentials of Imaginary Order in Holomorphic Holder Spaces, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.
26. Karapetyants A.N., talk Binary Analog of a Paul Erdos Problem, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.
27. Grudsky S.M., talk Asymptotics of Eigenvalues and Eigenvectors of Toeplitz Matrices, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.
28. Avsyankin O.G., talk On Multidimensional Integral Operators with Bihomogeneous Kernels, Conference of International Mathematical Centers at Innovative Technological and Science Center “Sirius”, August 9-13, 2021.

Photo: Tatyana Andreeva is giving a talk at the Conference of International Mathematical Centres in Sochi.





29. Karapetyants A.N., online talk Composition Operators in Generalized Holomorphic Hölder Spaces, International Workshop on Operator Theory and its Applications (IWOTA 2021), August 16-20, 2021, Lancaster University, Great Britain.
30. Karapetyants A.N., plenary talk Hadamard-Bergman Convolution Operators and Generalized Holder, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August 22-27, 2021.
31. Kusraeva Z.A., talk of an invited speaker Regularity of Continuous Multilinear Operators and Homogeneous Polynomials, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August 22-27, 2021.
32. Skopina M.A., plenary talk Wavelet Approximation in Orlicz Spaces, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August 22-27, 2021.
33. Grudsky S.M., plenary talk Double Barrier Options under Lévy Processes and the Theory of Toeplitz Operators, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August, 22-27, 2021.

Photo: Dmitry Rokhlin at OTHA-2021 Conference.



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34. Prozorov O.A., talk Codimension-two Bifurcations in the Couette-Taylor Problem, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August 22-27, 2021.
  35. Karapetyants A.N., talk Convergence of the Damped Inertial Dynamics Governed by a Moreau Envelope of a Convex Proper Semi-continuous Function, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August 22-27, 2021.
  36. De la Cruz Tornazo L., talk Polyanalytic Hardy Decomposition of Higher Order Lipschitz Functions, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August 22-27, 2021.
  37. Avetisyan Zh., plenary talk The Resolvent of a First Order System and Spectral Asymptotics, International Scientific Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis X”, August 22-27, 2021.
  38. Karapetyants A.N., plenary talk Variable Order Fractional Integrals in Variable Generalized Holder Spaces of Holomorphic Functions, International Conference “Crimea Fall Mathematical School Symposium (CFMSS-2021)”, September 17-26, 2021, Alushta, Republic of Crimea, Russia.
  39. Avetisyan Zh., plenary talk The Resolvent of a First Order System and Spectral Asymptotics, International Conference “Crimea Fall Mathematical School Symposium (CFMSS-2021)”, September 17-26, 2021, Alushta, Republic of Crimea, Russia.
  40. De la Cruz Tornazo L., talk A Note on Potentials of Imaginary Order in Holomorphic Holder spaces, International Conference “Crimea Fall Mathematical School Symposium (CFMSS-2021)”, September 17-26, 2021, Alushta, Republic of Crimea, Russia.
  41. Evelyn Morales, talk Weighted Estimates for Operators of Fractional Integration of Complex Plane in Generalised Holder Spaces, International Conference “Crimea Fall Mathematical School Symposium (CFMSS-2021)”, September 17-26, 2021, Alushta, Republic of Crimea, Russia.

42. Grudsky S.M., talk Soliton theory and Hankel operators. 19th International Conference of Numerical Analysis And Applied Mathematics, Greece, September 20-26, 2021.
43. Karapetyants A.N., plenary report “Fractional integrals of variable order in variable generalized Hölder spaces of holomorphic functions” at the seminar of the Armenian Mathematical Society, November 29, 2021, Yerevan State University, Armenia.
44. A. Karapetyants, report at the round table at the Annual National Exhibition VUZPROMEXPO-2021, December 8-10, 2021, Sochi.
45. Karapetyants A.N., plenary talk Hadamard-Bergman operators and generalized Holder spaces, International Scientific Conference “OTHA Workshop Fall-2021”, 13-17 December, 2021.
46. Kravchenko V.V., plenary talk Direct method for the inverse scattering problem on the line, International Scientific Conference “OTHA Workshop Fall-2021”, 13-17 December, 2021.
47. Avetisyan Zh., plenary talk Homogeneous operators and homogeneous integral operators, International Scientific Conference “OTHA Workshop Fall-2021”, 13-17 December, 2021.
48. Avsyankin Oleg, plenary talk Multiplicative discrete convolution operators, International Scientific Conference “OTHA Workshop Fall-2021”, 13-17 December, 2021.
49. Rokhlin Dmitry, plenary talk Introduction to the signature transform and an application to time series prediction, International Scientific Conference “OTHA Workshop Fall-2021”, 13-17 December, 2021.





## PUBLICATIONS

### **Books and journals edited by RMC:**

1. A. Karapetyants, V. Kravchenko, E. Liflyand, H.Malonek (eds.), Operator Theory and Harmonic Analysis. Vol. 1: New General Trends and Advances of the Theory. Springer Proceedings in Mathematics & Statistics, 2021, 357. ISBN: 978-3-030-77493-6. <https://doi.org/10.1007/978-3-030-77493-6>.
2. Alexey Karapetyants, Igor Pavlov, Albert Shiryaev (eds.) Operator Theory and Harmonic Analysis. Vol. 2: Probability-Analytical Models, Methods and Applications. Springer Proceedings in Mathematics & Statistics, 2021, 358. ISBN: 978-3-030-76828-7 <https://doi.org/10.1007/978-3-030-76829-4>.
3. A. Karapetyants, V. Kravchenko, M. Porter, S.Torba (eds.) Complex Variables and Elliptic Equations. Special Issue: Modern problems of operator theory and mathematical physics, in honour of Professor Vladimir S. Rabinovich on the occasion of his 80th birthday (accepted for publication).
4. A. Karapetyants, V. Kravchenko, E. Liflyand (eds.) The Journal of Fourier Analysis and Applications, Special Issue: Operator Theory and Fourier Analysis (accepted for publication).

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1. Skopina M.A., Farkov Y. Walsh Functions M-positive sets in  $\mathbb{R}^d$  // *Matematicheskoye Zametki*.
2. Kusraeva Z.A. On Linear Operators Practically Preserving Intervals // *Siberian Mathematical Journal*.
3. A. Karapetyants, L. De la Cruz Toranzo A note on potentials of imaginary order in variable generalized holomorphic Holder // *Journal of Applied and Industrial Mathematics*.

### Papers Published in Proceedings:

1. Smbat A. Aghekyan and Alexey N. Karapetyants Weighted Hadamard–Bergman Convolution Operators. // in: Karapetyants A.N., Kravchenko V.V., Liflyand I., Malonek H.R. (eds) *Operator Theory and Harmonic Analysis. OTHA 2020. Springer Proceedings in Mathematics & Statistics*, vol. 357. Springer, Cham. 2021, pp. 1-20. [https://doi.org/10.1007/978-3-030-77493-6\\_1](https://doi.org/10.1007/978-3-030-77493-6_1) (Scopus).
2. O. G. Avsyankin On Multidimensional Integral Operators with Homogeneous Kernels in Classes with Asymptotics. // in: Karapetyants A.N., Kravchenko V.V., Liflyand I., Malonek H.R. (eds) *Operator Theory and Harmonic Analysis. OTHA 2020. Springer Proceedings in Mathematics & Statistics*, vol. 357. Springer, Cham. 2021, pp. 39-54. [https://doi.org/10.1007/978-3-030-77493-6\\_3](https://doi.org/10.1007/978-3-030-77493-6_3) (Scopus).
3. Sergei M. Grudsky, Egor A. Maximenko, and Alejandro Soto-González, Eigenvalues of Tridiagonal Hermitian Toeplitz Matrices with Perturbations in the Off-diagonal Corners // in: Karapetyants A.N., Kravchenko V.V., Liflyand I., Malonek H.R. (eds) *Operator Theory and Harmonic Analysis. OTHA 2020. Springer Proceedings in Mathematics & Statistics*, vol. 357. Springer, Cham. 2021, pp. 179-202. [https://doi.org/10.1007/978-3-030-77493-6\\_11](https://doi.org/10.1007/978-3-030-77493-6_11) (Scopus).
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## XII. FORTHCOMING EVENTS

Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis (OTHA-XI).

Conference “Modern Methods, Problems and Applications of Operator Theory and Harmonic Analysis XI” (OTHA-2022, <http://otha.sfedu.ru/conf2022>) is due to take place in April of 2022 at Southern Federal University. The conference will be held in honour of the 80th anniversary of Professor Nikolay Karapetovich Karapetyants (1942-2005).

OTHA-2022 conference received the status of a satellite conference of the International congress of mathematicians (ICM 2022, <https://icm2022.org>).

International Congress of Mathematicians is one of the major and oldest world events in the field of fundamental and applied mathematics. The first congress took place in 1897 in Zurich, Switzerland. International Mathematical Union (<https://www.mathunion.org/>) in partnership with the organizing committee of the host country organizes ICM once in four years.

Saint Petersburg congress will traditionally be combined with multiple minor conferences held both in Russia and abroad. Satellite conferences will be held in Saint Petersburg, Moscow, Nizhny Novgorod, Rostov-on-Don and other venues in Russia. Funds raised by OTHA-2022 committee from ICM2022 will be directed to support OTHA-2022 participants and primarily young and female mathematicians.

**For more information visit: <http://otha.sfedu.ru/>**



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### VOLUNTEER





### XIII. RMC MEMBERS



#### HEAD

#### KARAPETYANTS ALEXEY

#### Professor, Doctor of Sciences

In 1997 he earned a PhD and in 2007 a D.Sc from the Ural Department of RAS. He successfully completed Retraining Managers Federal Program of the Russian Federation (retraining diploma PP 696252, 2004). He underwent the program “Emerging Leaders of Higher Education” of “Skolkovo” Moscow School of Management on demand of Ministry of Education and Science of the Russian Federation (2013). Editor in Chief “Journal of Mathematical Sciences”. In 2018 he participated in Fulbright Program and received the position of a visiting professor at State University of New York at Albany, USA. He participated twice in Outreach Lecture Fund. He has been presented with national and international awards (Mexican, USA, and Germany) for academic and scientific excellence. He performs academic work in the spheres of science, education and innovations and is engaged in international activity. Since 1996 he has been working at Department of Differential and Integral Equations of SFedU (previously known as Rostov State University). He started his career as an assistant lecturer, then became an associate professor and was finally appointed full professor. From 2004 to 2007 he did a doctoral course at Rostov State University. In 2004 served as head of International Affairs Department of the Southern Scientific Center of RAS (SSC RAS). In 1998-2007 he worked as a visiting professor at the universities of Mexico, USA, Portugal, and Germany. In 2008 – 2012 Alexey Nikolaevich served as the vice rector of Informatization of Southern Federal University.

He carried out research in Russia and abroad, taught in English and Spanish in different universities of the world (Mexico, USA, Germany, Portugal), he presented talks at seminars and colloquiums, was invited as a thesis opponent to universities of Mexico, USA, UAE, Germany, Spain, Italy, Serbia, Portugal, Sweden, Belarus, Armenia, and Georgia. From 1998 to 2013 he did 12 internship courses on science, education, management in national and international institutions (5 international, 5 national and 2 joint programs). Alexey Karapetyants speaks Russian, Spanish, English and Italian.



**DIRECTOR OF RESEARCH**  
**KRAVCHENKO VLADISLAV**

**PhD, a Professor of mathematics, graduated from Rostov State University in 1994**

He published four monographs and over a hundred scientific articles in international indexed journals. His research interests include mathematical analysis, differential equations, mathematical physics, wave propagation in complex structures. He received the award of ISAAC, International Society for Analysis, its Applications and Computation, Germany, (2001), the Best Research prize of the National Polytechnic Institute of Mexico (1998 and 2005), the Best Research Instructor of the National Polytechnic Institute of Mexico (2001 and 2004). He is an editorial board member of indexed journals such as Mathematical Methods in the Applied Sciences (published by Wiley) and Advances in Applied Clifford Algebras (published by Springer). Vladislav Victorovich is a program committee member of the conference “Contemporary Methods and Problems of Operator Theory and Harmonic Analysis and Their Applications” and since 2016 has been presiding over the section “Differential Analysis and Mathematical Physics” which is held annually in SFedU. He speaks Russian, Spanish and English.



### **CHIEF RESEARCHER (EXTERNAL EXPERT)**

**SHKALIKOV ANDREY**

**Professor, D.Sc. and a Corresponding Member of RAS**

Since June 2020 A.A. Shkalikov has been holding the position of a RMC senior researcher and an external expert. He is a prominent Soviet and Russian mathematician who gained world recognition in the field of operator theory and its applications in mechanics and mathematical physics, theory of spaces with an indefinite metric, function theory, function theory of one complex variable. His research findings shaped the vision on contemporary spectral theory of operators.

Approaches and methods introduced by the scientist allow to solve new problems of abstract operator theory and are applicable to mathematical physics, quantum mechanics, theory of elasticity and hydrodynamics. He speaks Russian and English.



### **CHIEF RESEARCHER (EXTERNAL EXPERT)**

**SKOPINA MARIA**

**is a Professor and a Doctor of Science**

Since July 2020 she has been holding the position of a RMC senior researcher. Currently she is performing research in the field of theory of a real variable. She is one of leading wavelet theory specialists and published 2 monograp.

hs on the topic. She is also the author of approximately 70 scientific articles most of which were published in prestigious international journals. She speaks Russian and English.





**CHIEF RESEARCHER**  
**GRUDSKY SERGEY**  
**Professor, Doctor of Sciences**

He started his active cooperation with RMC in May 2020. He did research work, published 3 monographs and over 140 scientific articles, taught at universities, supervised PhD dissertations that were successfully defended, coordinated the work of scientific groups and projects. He speaks Russian, Spanish and English.



**CHIEF RESEARCHER**  
**AVSYANKIN OLEG**  
**D.Sc., is head of the Department of Differential and Integral Equations of SFedU**

In 1997 he defended PhD thesis entitled “Multidimensional Integral Operators with Homogenous Kernels” (specialty 01.01.01), in 2009 he defended doctoral thesis entitled “Development of Theory of Multidimensional Integral Operators with Homogenous and Bihomogenous Kernels” (specialty 01.01.01).

He has published several textbooks and devised new educational programs that vary in levels of complexity. He has been working in scientific and academic fields for 24 years. He published over 90 research papers, including 27 works indexed in Scopus and Web of Science journals. His research interests lie in integral operators and equations with homogenous kernels, convolution operator, integral operators with periodic kernels, Banach algebras of operators, projection methods for solving operator equations, Morrey type spaces. Oleg Gennadievich is a member of SFedU degree committee 06.01 and expert council “Mathematics, Mechanics and Computing” (SFedU). He is head of postgraduate course 01.06.01 “Mathematics and Mechanics” (2018).

He is cochair of the organizing committee of the international conference “Contemporary Methods and Problems of Operator Theory and Harmonic Analysis and Their Applications”, a member of the organizing committee of VII-IX International Conferences “Mathematics. Economics. Education”. He is a jury member of the annual conference “Don Academy of Science of Young Researchers”. He speaks Russian and English.

### **SENIOR RESEARCHER**

**KUSRAEVA ZALINA**

**PhD**



Her thesis was entitled “Orthogonally Additive Polynomials in Vector Lattices”. She earned a PhD in 2013. Her research interests are vector lattices, Banach lattices, degree of vector lattice, universal completeness, d-basis, local one dimensionality, bornology, homogenous polynomial, orthogonal additivity, Maharam polynomial, Wickstead problem, complex structures, involution. Her basic findings in representation and applications of orthogonally additive polynomials appeared in 50 papers. She speaks Russian and English.

### **SENIOR RESEARCHER**

**ROKHLIN DMITRI**

**Professor, Doctor of Sciences**



In 1998 defended a PhD thesis entitled “Asymptotic Study of Linear Equations of Shallow Water Hydrodynamics”, specialty: 01.02.05 – Mechanics of Fluids and Plasma (Saint Petersburg State University) and in 2010 he defended a doctoral thesis entitled «Arbitrage pricing theory in stochastic models of financial markets” specialty: 01.01.05 – Probability Theory and Mathematical Statistics (Steklov Mathematical Institute of RAS).

From 1998 to 2011 he worked at SFedU in a variety of positions ranging from assistant lecturer, associate professor, to professor at the Department of Mathematics and Operations Research. He is a member of SFedU degree committee 01.05. He is head of bachelor's course 01.03.02 "Applied Mathematics and Informatics" (20170).

His research interests lie in optimization, decision making in conditions of uncertainty, finance mathematics, optimal management. He has 38 publications in Scopus database. Research findings relate to no arbitrage markets criteria, Kreps-Yan theorem about coneseperation, stochastic Perron method, central limit theorem in model uncertainty, optimal pricing mechanisms and incentives. He speaks Russian and English.



**SENIOR RESEARCHER**  
**PROZOROV OLEG**  
**PhD**

Is head of SFedU Sunday Math School, organizer and coorganizer of events for school and university students. He is a jury member of SFedU Mathematical Olympiad for secondary school students. He was an advisory board member of University Games (2015-2019).

He presides over "General Mathematics" jury of Don Academy of Science of Young Researchers named after Y.A. Zhdanov. He is a member of the regional jury of all Russia Mathematical Olympiad for school students and an advisory board member of Interuniversity Mathematical Olympiad. He speaks Russian and English.



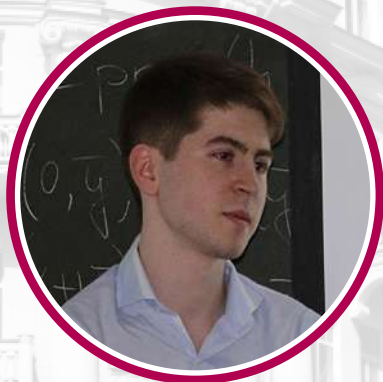


### **JUNIOR RESEARCHER**

**ANDREEVA TATIYANA**

**PhD**

In Science, an early stage researcher. She defended the thesis in 2019 on “Duality of spaces of holomorphic functions of given growth near the border and generic classes Denjoy-Carleman and their applications”. She speaks Russian and English.



### **JUNIOR RESEARCHER**

**KARAPETYANTS MIKHAIL**

**PhD student**

An early stage researcher, postgraduate student. He published articles in peerreview journals and gave talks at international conferences. His research interests include: problems of binary analysis, approximation theory, harmonic analysis and operator theory. He speaks Russian and English.



### **LEAD PROGRAMMER**

**PICHUGINA OLGA**

**PhD**

Was an organizing committee member of 15 international and national conferences. In 2013-2018 she was program chair of Russian-Chinese conference “Numerical Algebra with Applications (CRC-NAA)”. She is a coordinator of 3 grand programs of Russian Foundation of Basic Research (RFBR), and is involved in over 10 grant programs of RFBR, “Universities of Russia” program of Ministry of Education. She was a member of expert council of youth policy from 2012 to 2015. She published over 30 works including monographs, textbooks and scientific articles in indexed journals. Her research interests are in iterative methods, Krylov subspace methods and preconditioning. She speaks Russian and English.



**LEAD ENGINEER**  
**VASILIEVA-BAGLER ELENA**

Is responsible for administrative oversight of RMC activities, including document management, provision of legislative and regulative framework. She also oversees dissemination of information related to events organized by RMC of SFedU, translation of materials into English. She speaks Russian and English.



**LEAD PROGRAMMER**  
**ZAICHENKO ALEXANDER**

Promotes the establishment of legislative and regulative framework required for the development of educational projects and implementation of initiatives that align with RMC guidelines.



## XIV. 2021 HIGHLIGHTS



**36 ARTICLES** were published by RMC members in peer-reviewed journals indexed in the Web of Science/Scopus, 25 were published in Q1 and Q2 journals, 8 articles were written by young researchers or coauthored by young researchers.



**6 INTERNATIONAL CONFERENCES AND SCHOOLS** were organized. Approximately 1,000 mathematicians from over 25 countries attended the events. Around 50 plenary and invited speakers gave talks, international scientists constituted 50% of the total number of speakers.



**ACADEMIC MOBILITY** RMC invited 7 visiting professors from abroad, 2 young career scientists from abroad worked for a period from 1 year, 3 students from abroad.



**PUBLICATIONS:** 5 books were prepared by project participants, editorial board of Journal of Mathematical Sciences was formed as well as work groups in Journal of Fourier Analysis and Applications and Journal of Applied and Industrial Mathematics.



**24 SCIENTIFIC SEMINARS**, uniting mathematicians from over 40 countries were held by RMC. The seminars were conducted by prominent lecturers from various world scientific centers.



**AROUND 50 SPEECHES WERE DELIVERED BY RMC MEMBERS** at international scientific forums.



**WORK WITH SECONDARY, UNDERGRADUATE AND POSTGRADUATE STUDENTS:** over 600 students, 65 undergraduate and postgraduate students took part in RMC events. In the course of its operation, RMC has organized 3 summer schools, 3 clubs, over 10 mathematical contests and olympiads. Approximately 30 undergraduate and postgraduate students are conducting research at RMC. 1 RMC supported dissertation was defended, 5 educational modules were launched or modernised.



**OTHER ACHIEVEMENTS:** 4 overseas researchers joined the staff of RMC, 2 agreements about scientific collaboration were signed, 9 projects performed by young and leading specialists are completed.

**For more information visit: [rmc.sfedu.ru](http://rmc.sfedu.ru).**





