XLVI International Summer School – Conference Advanced Problems in Mechanics

June 25–30, 2018,
St. Petersburg, Russia

APM 2018 PROGRAMME

http://apm-conf.spb.ru

IPME RAS

POLYTECH
Peter the Great
St.Petersburg Polytechnic
University

ГАЗПРОМ НЕФТЬ

Russian Academy of Sciences

РФФИ

The Conference is organized by Institute for Problems in Mechanical Engineering of Russian Academy of Sciences (IPME RAS) and Peter the Great St. Petersburg Polytechnic University (SPbPU) under the patronage of Russian Academy of Sciences (RAS), St. Petersburg Scientific Center, Ministry of Education and Science of Russian Federation, and Federal Agency for Scientific Organizations.

APM 2018 is partially supported by Russian Foundation for Basic Research.

Location:
Peter the Great St. Petersburg Polytechnic University, Research Institute of new materials and technologies, Polytechnicheskaya 29, St. Petersburg.

General Information

The International Conference **"Advanced Problems in Mechanics 2018"** is the forty sixth in a series of annual summer schools held by Russian Academy of Sciences. The Conference is organized in commemoration of its founder, Ya.G. Panovko by the Institute for Problems in Mechanical Engineering of the Russian Academy of Sciences (IPME RAS), Peter the Great St. Petersburg Polytechnic University (Institute of Applied Mathematics and Mechanics), Scientific Council on Solid Mechanics (RAS) (chairman N.F. Morozov), Russian National Committee on Theoretical and Applied Mechanics (chairman I.G. Goryacheva) under the patronage of the Russian Academy of Sciences (RAS). The main purpose of the meeting is to gather specialists from different branches of mechanics to provide a platform for cross-fertilisation of ideas. The list of problems under investigation is not limited to questions of mechanical engineering, but includes practically all advanced problems in mechanics, which is reflected in the name of the conference. The main attention is given to problems on the boundary between mechanics and other research areas, which stimulates the investigation in such domains as micro- and nanomechanics, material science, physics of solid states, molecular physics, astrophysics and many others. The conference "Advanced Problems in Mechanics" helps us to maintain the existing contacts and to establish new ones between foreign and Russian scientists.

Young scientists' school-conference "Modern Ways in Mechanics" (MWM), which is held in the frame of the annual international conference "Advanced Problems in Mechanics" (APM), is meant for broadening scientific outlook of young researchers in the field of mechanics and also for organizing their scientific dialogue. It is supposed that students, PhD students and young PhD's under 30 (date of birth is later than 12/31/1987) from different all over the world, specializing in the sphere of theoretical and applied mechanics become the main participants of the conference. In order to attract the largest possible number of various scientific areas and schools, organizing committee suggests a partial compensation for the costs connected with participation in conference, as well as extensive cultural program. One of the major purposes of conference is transfer of scientific experience from well-known scientists to their young colleagues.

History of the School

The first Summer School was organized by Ya.G. Panovko and his colleagues in 1971. In the early years the main focus of the School was on nonlinear oscillations of mechanical systems with a finite number of degrees of freedom. The School specialized in this way because at that time in Russia (USSR) there were held regular National Meetings on Theoretical and Applied Mechanics, and there existed many conferences on mechanics with a more particular specialization. After 1985 many conferences and schools on mechanics in Russia were terminated due to financial problems. In 1994 the Institute for Problems in Mechanical Engineering of the Russian Academy of Sciences restarted the Summer School. The traditional name of "Summer School" has been kept, but the topics covered by the School have been much widened. The School has been transformed into an international conference. The topics of the conference cover now all fields of mechanics and associated into interdisciplinary problems.

Scientific Committee

- D.A. Indeitsev (IPME RAS, Peter the Great St. Petersburg Polytechnic University, Russia) — Co-Chairman
- A.M. Krivtsov (Peter the Great St. Petersburg Polytechnic University, IPME RAS, Russia) — Co-Chairman
- P.A. Dyatlova (Peter the Great St. Petersburg Polytechnic University, IPME RAS, Russia) — Scientific secretary
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- V.A. Babeshko, Southern Scientific Center RAS, Rostov-on-Don, Russia
- A.K. Belyaev, IPME RAS, Peter the Great St. Petersburg Polytechnic University, Russia
- I.E. Berinskii, Tel Aviv University, Israel
- I.I. Blekhman, IPME RAS, Mekhanobr-Tekhnika, St. Petersburg, Russia
- A.A. Burenin, Institute of Metallurgy and Mechanical Engineering Far-Eastern Branch of RAS, Komsomolsk-na-Amure, Russia
- A.V. Cherkaev, University of Utah, Salt Lake City, USA
- V.A. Eremeyev, Rzeszow University of Technology, Poland
- A.B. Freidin, IPME RAS, Peter the Great St. Petersburg Polytechnic University, Russia
- M.E. Frolov, Peter the Great St. Petersburg Polytechnic University, Russia
- S.N. Gavrilov, IPME RAS, St. Petersburg, Russia
- I.G. Goryacheva, Institute for Problems in Mechanics RAS, Moscow, Russia
- E.F. Grekova, IPME RAS, St. Petersburg, Russia; University of Seville, Spain
- N. Gupta, Indian Institute of Technology Delhi, India
- H. Irschik, Johannes Kepler University of Linz, Austria
- M.L. Kachanov, Tufts University, Medford, USA
- B.L. Karihaloo, Cardiff University, UK
- V.A. Levin, Lomonosov Moscow State University, Russia
- A.M. Linkov, IPME RAS, Russia; Rzeszow University of Technology, Poland
- I.I. Lipatov, Moscow Institute of Physics and Technology, Russia
- O.S. Loboda, Peter the Great St. Petersburg Polytechnic University, IPME RAS, Russia
- E.V. Lomakin, Lomonosov Moscow State University, Russia
- A.V. Manzhirov, Institute for Problems in Mechanics RAS, Moscow, Russia
- B.E. Melnikov, Peter the Great St. Petersburg Polytechnic University, Russia
- G. Mishuris, Aberystwyth University, UK
- N.F. Morozov, St. Petersburg State University, IPME RAS, Russia
- W.H. Müller, Technical University of Berlin, Germany
- U. Nackenhorst, Leibniz University of Hannover, Germany
- V.A. Palmov, Peter the Great St. Petersburg Polytechnic University, IPME RAS, Russia
- E. Pavlovskaia, University of Aberdeen, UK
- S.V. Petinov, IPME RAS, Peter the Great St. Petersburg Polytechnic University, Russia
- Y.V. Petrov, St. Petersburg State University, IPME RAS, Russia

- M.B. Rubin, Israel Institute of Technology, Haifa, Israel
- A.I. Rudskoi, Peter the Great St. Petersburg Polytechnic University, Russia
- S.H. Sargsyan, Gyumri State Pedagogical Institute, Armenia
- V.V. Sergeev, Peter the Great St. Petersburg Polytechnic University, Russia
- E.N. Vilchevskaya, IPME RAS, Peter the Great St. Petersburg Polytechnic University, Russia
- M.V. Zakrzhevsky, Riga Technical University, Latvia

Local Organizing Committee

- Polina Dyatlova (Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia)
- Anna Kuznetsova (Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia)
- Mikhail Babenkov (Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia)
- Anna Morozova (Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia)
- Maria Fomicheva (Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russia)

The conference is organized with help of our **service agency "Monomax PCO"**: `www.monomax.ru`

Scientific Programme

Presentations devoted to fundamental aspects, or spreading the field of applications of mechanics, are invited. We are particularly keen to receive contributions that show new effects and phenomena or develop new mathematical models. The topics of the conference cover all fields of mechanics, including, but not restricted, to

- mechanics of media with microstructure
- nano-and micromechanics
- molecular and particle dynamics
- biomechanics and mechanobiology
- phase transitions
- computational mechanics
- wave motion
- nonlinear dynamics, chaos and vibration
- dynamics of rigid bodies and multibody dynamics
- solids and structures
- fluid and gas
- mechanical and civil engineering applications
- aerospace mechanics

Minisymposia

MS1 "Theory and Simulation of Hydraulic fracturing and related processes"

Organizers: **Kuzkin V.A.** (Peter the Great St. Petersburg Polytechnic University, IPME RAS, Russia), **Linkov A.M.** (IPME RAS, Russia; Rzeszow University of Technology, Poland), **Rybarska-Rusinek L.** (Rzeszow University of Technology, Poland)

MS2 "Extreme loading on structures"

Organizers: **Gupta N.** (IIT Delhi, India), **Morozov N.** (St. Petersburg State University, Russia).

The Summer School — Conference has two main purposes: to gather specialists from different branches of mechanics to provide a platform for cross-fertilization of ideas, and to give the young scientists a possibility to learn from their colleagues and to present their work. Thus the Scientific Committee encouraged the participation of young researchers, and did its best to gather at the conference leading scientists belonging to various scientific schools of the world.
We believe that the significance of Mechanics as of fundamental and applied science should much increase in the eyes of the world scientific community, and we hope that APM conference makes its contribution into this process.
We are happy to express our sincere gratitude for the help in organization to Russian Foundation for Basic Research, Russian Academy of Sciences (RAS), the Ministry of education and science of the Russian Federation. This support has helped substantially to organize the conference and to increase the participation of young researchers.

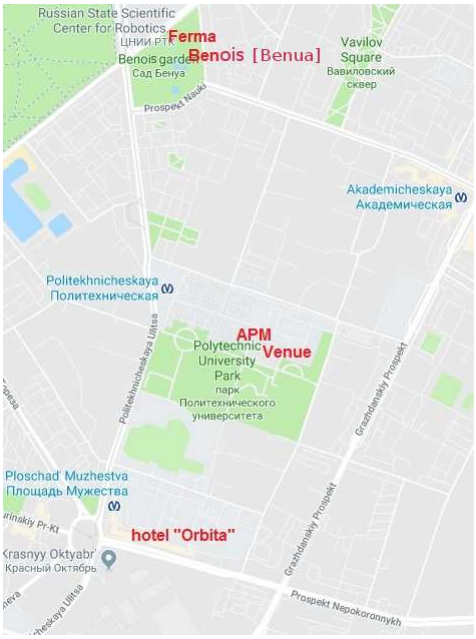
APM Venue:
Research Institute of new materials and technologies, Peter the Great St. Petersburg Polytechnic University,
29 Polytekhnicheskaya str.

Orbita hotel: 4 Nepokorennyh Prospect

Oktiabrskaya hotel:
10 Ligovsky prospect

Graffiti L Hostel:
33–35 Ligovsky Prospect

Banquet at the restaurant Ferma Benois [Benua]:
17 Tikhoretskiy Prospekt



June 25, Monday

Room A

Morning Session

Plenary lectures

Chairperson Krivtsov A.M.

9:00 – 10:00 **REGISTRATION**

10:00 – 10:20 **Opening ceremony**

10:20 – 10:55 **Lurie K.A.** Energy accumulation and release in a dynamic material model of worm-like crawling

10:55 – 11:30 **Goryacheva I.G.** Friction of elastomers

11:30 – 12:05 **Roshchektaev A. P.** Important problems of mechanics in petroleum science

Coffee break

12:25 – 13:00 **Müller W.H., Vilchevskaya E.N.** On vorticity and other angular velocity phenomena in generalized continuum theories

13:00 – 13:35 **Sevostianov I.B.** Replacement relations in micromechanics

13:35 – 14:10 **Dell'Isola F.** Description versus design: describing metamaterials and fabrics with continuum and/or discrete models

14:10 – 14:45 **Grekova E.F.** Elastic reduced Cosserat media and gyrocontinua as acoustic metamaterials

Room A

Evening Session

Micropolar media

Chairperson Grekova E.F.

15:40 – 16:00 **Sargsyan S.H., Zhamakochyan K.A.** Mathematical model of micropolar elastic thin beams with constrained rotation and the finite element method

16:00 – 16:10 **Morozova A.S., Vilchevskaya E.N.** Interrelation of angular velocity and heat propagation in micropolar media

16:10 – 16:20 **Fomicheva M.A., Vilchevskaya E.N.** Modeling the process of grinding granular media in the framework of spatial description

16:20 – 16:40 **Porubov A.V., Osokina A.E.** Simulation of two-dimensional wave processes in crystal lattices

16:40 – 17:00 **Murashkin E.V., Radayed Y.N.** Type-III thermoelastic waves in reduced hemitropic micropolar media

Coffee break

Nano- and micromechanics

Chairperson Sevostianov I.B.

17:20 – 17:40 **Abaimov S.G., Trofimov A., Sergeichev I.V., Akhatov I.S., Sevostianov I.B.** The two-step homogenization in the Mori-Tanaka-Benveniste theory: The necessity, applicability, and accuracy

17:40 – 18:00 **Trofimov A., Sevostianov I., Abaimov S.G.** Overall elastic properties of a material containing inhomogeneities of concave shape

18:00 – 18:10 **Kolesnikova A.L., Mikheev D.S., Gutkin M.Yu, Romanov A.E.** Stress fields and their relaxation in an elastic sphere with an axisymmetric truncated spherical inclusion

18:10 – 18:30 **Krasnitckii S.A., Smirnov A.M., Gutkin M.Yu.** Stress fields in an elastic cylinder with an inclusion in form of long triangular prism subjected to dilatational eigenstrain

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WELCOME PARTY

Room B

Evening Session

Fluid – solid interaction

Chairperson Dyatlova P.A.

15:50 – 16:10 **Grishaev V., Bakulin I., Akhatov I.S.** Drop splashing on substrates caused by solid additives

16:10 – 16:20 **Kordos A., Kucaba-Pięta A.** Molecular dynamic study of nanoflows in chromatography columns

16:20 – 16:40 **Chivilikhin S.A., Melikhov I.F., Amosov A.S.** Thin fluid layer with variable viscosity flowing over inclined plane

16:40 – 16:50 **Alabuzhev A.A.** Axisymmetric oscillations of a drop between inhomogeneous surfaces

16:50 – 17:00 **Dyakova O.A., Borzenko E.I., Shrager G.R.** Free surface formation during the pipe filling with a viscous fluid taking into account the surface tension

Coffee break

17:20 – 17:40 **Shumova M.A., Alfimov A.V., Chivilikhin S.A.** Investigation of the targeted drug delivery with the use of magnetic nanoparticles

17:40 – 18:00 **Mirantsev L.V.** Equilibrium structures and flows of polar and nonpolar fluids and their mixtures in carbon nanotubes with rectangular cross sections

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WELCOME PARTY

Room C

Evening Session

Nonlinear and multibody dynamics, chaos and vibration

Chairperson Loboda O.S.

15:40 – 16:00 **Perchikov N., Gendelman O.V.** Transient dynamics in strongly nonlinear systems: optimization of initial conditions on the resonant manifold

16:00 – 16:20 **Moshkin R.P.** Algebraic Poincaré equations

16:20 – 16:40 **Shamolin M.V.** Non-smooth first integrals of dissipative systems with four degrees of freedom

16:40 – 17:00 **Gladkov S.O., Bogdanova S.B.** On the problem of synchronization of physical pendulums

Coffee break

17:20 – 17:40 **Kevorkov S.S., Khamidullin R.K., Koroleva I.P., Smirnov V.V., Manevich L.I., Gusarova E.B.** Efficiency of three-particle energy sink: experimental study and numerical simulation

17:40 – 17:50 **Yachum N., Srisertpol J., Russamee N.** Automatic frequency control of the magnetron system for medical linear accelerator using fuzzy logic control

17:50 – 18:10 **Smirnov V.V., Kovaleva M.A., Manevitch L.I.** Nonlinear torsional dynamics of weakly coupled oscillatory chains

18:10 – 18:30 **Koroleva I.P., Manevitch L.I.** Nonlinear dynamics of two-dimensional discrete membrane in conditions of acoustic vacuum

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WELCOME PARTY

Room D

Evening Session

Solids and structures

Chairperson Polyanskiy V.A.

15:40 – 15:50 **Yakovenko A.A., Goryacheva I.G.** Forceps surface geometry effect in contact with soft tissue

15:50 – 16:00 **Veretennikova I.A., Smirnov S.V., Smirnova E.O., Konovalov D.A., Pestov A.V.** Adhesional characteristics and mechanical properties of epoxy coatings based on the epoxy glue determined by instrumented microindentation and scratch-test

16:00 – 16:20 **Karpov E.V.** Damage to a multilayer woven composite by low-velocity indentation with a rigid spherical indenter

16:20 – 16:30 **Bouleklab M., Djarri Y., Djarri A., Naoui Y., Sahli M., Revo S., Hamamda S.** Multiwall carbon nanotubes introduced in cement

16:30 – 16:50 **Kolesnikova A.L., Gutkin M.Yu., Romanov A.E.** Progress in the theory of defects in 3D and 2D elastic continua and crystalline media

16:50 – 17:00 **Rzhavtsev E.A., Gutkin M.Yu.** Computer simulation of dynamics of threading dislocations in porous epitaxial layers of gallium nitride

Coffee break

17:20 – 17:30 **Kartvelishvili T.A., Yumashev M.V.** Destruction of materials in the case of rapid local impulse heating and methods of its prevention

17:30 – 17:40 **Naoui Y., Djarri Y., Boubertakh A., Bouleklab M., Dorbani T., Revo S., Hamamda S.** Thermodynamic study of nanocellulose containing oxides

17:40 – 18:00 **Hakem Ahmed, Hakem Amayas, Bouafia Y.** Study of tensile and impact behaviour of $AlSi_9Cu_3ZnMg$ alloy

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WELCOME PARTY

June 26, Tuesday

Room A

Morning Session

Plenary lectures

Chairperson Indeitsev D.A.

10:00 – 10:35 **Abramian A.K.** Ice-induced vibrations of an offshore structure

10:35 – 11:10 **Dmitriev S.V.** Nonlinear excitations in crystals

11:10 – 11:45 **Krivtsov A.M.** Ballistic heat conduction at nano- and microscale

Coffee break

Chairperson Freidin A.B.

12:05 – 12:40 **Le K.C.** Thermodynamic dislocation theory and applications in crystal plasticity

12:40 – 13:15 **Guzev M.A.** Is Fourier law true for harmonic crystal?

13:15 – 13:50 **Indeitsev D.A., Morozov N.F., Muratikov K.L., Vavilov D.S., Sudenkov Yu.V.** Mathematical modelling of thermoelastic phenomena in metals under laser excitation

Room A

Evening Session

Waves and thermal processes in crystals

Chairperson Krivtsov A.M.

14:50 – 15:10 **Indeitsev D.A., Kudriavtsev A.A., Fedorenko R.V., Vavilov D.S.** Problems in description of thermoacoustic waves

15:10 – 15:30 **Kuzkin V.A., Krivtsov A.M.** Transition to thermal equilibrium and non-equipartition of energy in harmonic crystals

15:30 – 15:50 **Gavrilov S.N., Krivtsov A.M., Tsvetkov D.V.** Heat transfer in a one-dimensional harmonic crystal in a viscous environment subjected to an external heat supply

15:50 – 16:10 **Starobinskii E.B., Shvaryov N.G., Tsvetkov D.V., Krivtsov A.M.** Mechanical and thermal oscillations in crystals of different dimensions

16:10 – 16:30 **Korznikova E.A., Shepelev I.A., Dmitriev S.V.** Mass transfer in crystals by subsonic and supersonic crowdions

Coffee break

16:50 – 17:10 **Murachev A.S., Krivtsov A.M., Tsvetkov D.V.** Non-stationary thermodiffusion processes in a finite one-dimensional crystal

17:10 – 17:30 **Podolskaya E.A., Krivtsov A.M., Tsvetkov D.V.** Fundamental solution of heat transfer problem in one-dimensional diatomic harmonic crystals

17:30 – 17:50 **Panchenko A.Yu.** Stability and thermal effects in crystalline materials at large deformations

17:50 – 18:10 **Sokolov A.A., Krivtsov A.M., Müller W.H.** Entropy production for sinusoidal initial thermal perturbation in ballistic heat conduction model

18:10 – 18:30 **Sergeyev A.D.** Substantiation of the Einstein Quantum hypothesis in the theory of the heat conductivity of solids in the framework of classical mechanics.

Walking city tour

Room B

Evening Session

Geomedia

Chairperson Nazarov L.A.

15:10 – 15:30 **Nazarov L.A., Nazarova L.A., Golikov N.A.** Estimating rheological properties of bazhenite based on inverse problem solution by the thermobaric test data

15:30 – 15:50 **Babenkov M.B.** Heat exchange processes between an oil reservoir and fracturing fluid

15:50 – 16:10 **Sadovskii V.M., Sadovskaya O.V.** Supercomputing analysis of fan-shaped waves in the Earth's crust at the depths of seismic activity

16:10 – 16:30 **Sadovskaya O.V., Sadovskii V.M., Polyakov V.S.** Analysis of acoustic waves excited in near-surface soils by means of the electromagnetic pulse source "Yenisei"

Coffee break

Computational mechanics

Chairperson Nazarov L.A.

16:50 – 17:10 **Brigadnov I.A.** Global multi-criteria estimation of load-bearing capacity of solids

17:10 – 17:30 **Trofimov V.A., Filippov U.A., Makeeva T.G.** Iterative model of destruction

17:30 – 17:50 **Dmitriev A.I., Grigoriev A.S.** Sliding simulation of zirconia based composites. The influence of composition

17:50 – 18:00 **Savikovskiy A.V., Semenov A.S., Getsov L.B.** Thermo-electro-mechanical modeling of thermal fatigue failure process of corset samples from single crystal nickel superalloys

18:00 – 18:20 **Ellermeier W.F.** Wave propagation in dielectrics with mass diffusion and chemical transformation

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Walking city tour

Room C

Evening Session

Position sensors

Chairperson Lukin A.V.

15:00 – 15:10 **Kiryan D.G.** Decimal-by-decimal analysis of the gravitational constant value as exemplified by torsion balance

15:10 – 15:20 **Lukin A.V.,, Papirovskiy A.A., Popov I.A.** Analytic and numerical modeling of the solid-state microgyroscope on surface acoustic waves

15:20 – 15:40 **Loginov A.A., Ambrosovskaya E.B., Tsvetkov D.V.** Modeling of reference positioning sensor "Taut wire"

15:40 – 16:00 **Koludarov P.Y., Lukin A.V., Popov I.A.** Analytical and numerical analysis of MEMS vibratory torsional gyroscope non-linear dynamics

Mechanical and civil engineering applications

Chairperson Gusev M.P.

16:00 – 16:20 **Melkumova E.V., Golubev Yu.F.** An analogy of the problem of the equilibrium of a two-legged robot on an inclined rough cylinder for the problem of transfer by a manipulator with a two-finger grasp of a rough cylinder

16:20 – 16:30 **Buldakov P.Yu., Starobinskii E.B., Pereverzev A.E., Maistro A.S.** Applying environmental conditions' model to optimize control of an unmanned surface vehicle (USV)

Coffee break

16:50 – 17:10 **Gusev M.P., Nikolaev S.M., Padalitsa D.I., Uzhinsky I.K.** Tube-deployable unmanned aerial vehicle multiphysical simulation

17:10 – 17:20 **Kuzminova Y.O., Gusev M.P., Uzhinsky I.K.** Multi-disciplinary optimization of a wing structure for a small unmanned aircraft vehicle

17:20 – 17:40 **Honorato D., Mozhenkov E.R., Nikolaev S.M., Uzhinsky I.K.** Development of Hardware-in-the-loop (HIL) set up for the control system testing of a deployable unmanned aerial vehicle (UAV)

17:40 – 18:00 **Bosak M., Mantic M., Kulka J., Tarca A.** Alternative seating of the drum in a separation line

18:00 – 18:20 **Kolykhalin V.M.** Electro-acoustic estimation of the compensatory method of electric motor noise decrease

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Walking city tour

Room D

Evening Session

Mechanics of media with microstructure

Chairperson Loboda O.S.

15:00 – 15:20 **Safonov A.A., Saratov A.A., Gusev S.A., Akhatov I.Sh.** Mathematical simulation of pultrusion technological process of large-scale structures

15:20 – 15:30 **Safonov A.A.** Topology optimization of three-dimensional continuous fiber-reinforced structures via natural evolution method

15:30 – 15:40 **Garishin O.K., Shadrin V.V., Belyaev A.Yu., Kornev Yu.V.** Microshungite — perspective filler for rubber compounds used in the tire industry

15:40 – 15:50 **Svistkov A.L., Eliseeva A.Yu.** A new hypothesis for filler's network formation in an elastomer material

15:50 – 16:10 **Mokhireva K.A., Svistkov A.L.** Modeling of the equilibrium component of the stress tensor of filled elastomeric materials with consideration of the Mullins softening effect

16:10 – 16:30 **Vorobiev R.I., Sergeichev I.V., Zharinov A.N., Mironova E.A., Karabutov A.A., Akhatov I.Sh.** Experimental analysis of effects of voids onto fatigue strength of fiber-reinforced polymer composites

Coffee break

16:50 – 17:00 **Golovina D.S., Kucher D.A.** Estimation of the random pore size distribution in inhomogeneous nanoporous media

17:00 – 17:10 **Konovalenko Ig.S., Shilko E.V., Konovalenko Iv.S.** Computer study of the features of the mechanical response of a brittle material with an inhomogeneous pore structure and various content of plastic filler (soft matter)

17:10 – 17:30 **Nasedkina A.A., Nasedkin A.V., Rybyanets A.N.** Numerical analysis of effective properties of heterogeneously polarized porous piezoceramic materials with local alloying pore surfaces

17:30 – 17:40 **Ostapovich K.V., Trusov P.V.** On the texture component analysis of polycrystals using statistical multi-level models

17:40 – 17:50 **Morozov I.A., Beliaev A.Yu, Kameneckih A.S.** Structural-mechanical study of magnetron-sputtered folded carbon layer on soft polyurethane substrate

17:50 – 18:10 **Koleukh D.S., Krutikov V.I., Spirin A.V., Paranin S.N., Russkikh P.A.** Behavior of steel inductors with nitrided surface under strong magnetic field generation

18:10 – 18:20 **Shadrin V.V., Garishin O.K., Kornev Yu.V.** Biaxial tests of elastomeric nanocomposites with various types of dispersed fillers

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Walking city tour

June 27, Wednesday

Room A

Morning Session

Plenary lectures

Chairperson Müller W.H.

10:00 – 10:35 **Glazov A.L., Morozov N.F., Muratikov K.L.** Laser thermoelasticity of brittle and ductile materials in the initial and modified states

10:35 – 11:10 **Altenbach H., Eisenträger J.** Modeling and simulation of tempered martensitic steels at high temperatures

11:10 – 11:45 **Johansson D., Hansson P., Ahadi A., Melin S.** Shear anisotropy in Si-Cu interfaces on the atomic scale

Coffee break

12:05 – 12:40 **Linkov A.M.** Novel in theory and modeling of hydraulic fractures

12:40 – 13:15 **Kucaba-Pięta A.** Fluid flow in confined, nanoscale geometries. Peculiarities and modeling

13:15 – 13:50 **Roux J.-N.** Basic properties of granular materials, from numerical simulations of simple systems. An overview

Room A

Evening Session

Minisymposium

"Theory and simulation of hydraulic fracturing and related processes"

Organizers:

Vitaly Kuzkin, Alexander Linkov, Liliana Rybarska-Rusinek

Chairperson Linkov A.M.

14:40 – 15:05 **Trimonova M.A., Zenchenko E.V., Zenchenko P.E., Turuntaev S.B, Baryshnikov N.A.** Hydraulic fracture numerical and laboratory simulation: experience, problems and results

15:05 – 15:30 **Markov N.S., Linkov A.M.** Correspondence principle for simulation hydraulic fractures by using pseudo 3D model

15:30 – 15:55 **Lapin R.L., Kuzkin V.A.** Quasistatic propagation of a three-dimensional crack in a three-layered medium: a numerical study

15:55 – 16:20 **Rybarska-Rusinek L., Rejwer E., Linkov A.M.** On speeding up numerical simulation of multiple truly 3d hydro fractures

Coffee break

Chairpersons: Rybarska-Rusinek L., Kuzkin V.A.

16:40 – 17:05 **Chigarev G.A., Lapin R.L.** Fracture of three-dimensional materials with cracks: a particle dynamics study

17:05 – 17:30 **Savenkov E., Borisov V., Ivanov A., Kritskiy B., Menshov I.** Computational techniques for 3D hydraulic fracture simulation

17:30 – 17:55 **Romenski E., Perepechko Y., Reshetova G., Kireev S.** Thermodynamically compatible conservative model for saturated porous media with small-scale fracturing

17:55 – 18:20 **Matias D.V.** A continuum model for predicting final crack form after hydraulic fracture

18:20 – 18:40 **Stepanov A.D.** Statistical method for tracing hydraulic fracture front without evaluation of the normal

18:40 – 19:00 **Antonov I.D., Porubov A.V.** Modelling of hydraulic fracturing with gas–liquid systems

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Excursion to FabLab Polytech

Room B

Evening Session

Plasticity

Chairperson Keller I.E.

15:00 – 15:20 **Alexandrov S.** Ideal flow theory for pressure-dependent materials

15:20 – 15:40 **Larichkin A.Yu., Shutov A.V., Iyavoynen S.V.** Unified anisotropic model of creep-plasticity interaction for large strain applications

15:40 – 16:00 **Mayer A.E., Krasnikov V.S., Pogorelko V.V.** Atomistic and continuum modelling of dislocation plasticity in metals

16:00 – 16:20 **Bryukhanov I.A.** The molecular dynamics study of the mechanisms and kinetics of plasticity of aluminum-copper alloys under high-strain rate loading

Coffee break

Chairperson: Alexandrov S.E.

16:40 – 17:00 **Yants A.Yu., Trusov P.V.** Comparison of efficiency of linear equations sparsity systems solving on GPGPU and CPU in finite elements method of elastoplastic nonlinear boundary value problem

17:00 – 17:20 **Orlova T.S., Skiba N.V., Mavlyutov A.M., Murashkin M.Yu., Valiev R.Z., Gutkin M.Yu.** Micromechanics of the effects of hardening by annealing and softening by deformation in ultra-fine grained aluminum

17:20 – 17:30 **Emelianova E.S., Sergeev M.V., Romanova V.A., Balokhonov R.R.** Crystal plasticity-based model development for titanium single crystals with different orientations

17:30 – 17:50 **Keller I.E., Kazantsev A.V., Petukhov D.S.** Limit diagrams under hot sheet metal forming: a review of constitutive models of material, viscous failure criteria and standard tests

17:50 – 18:00 **Vindokurov I.V., Keller I.E., Oshchepkova Yu.D., Petukhov D.S.** Reconstruction of the stress-strain state of a shot peened plate according to experimental data

18:00 – 18:10 **Sudenkov Yu.V., Zimin B.A., Smirnov I.V., Suslikov A.I.** Influence of strain rate on heat dissipation at quasi-static stretching of metals

18:10 – 18:30 **Zimin B.A., Smirnov I.V., Sudenkov Yu.V., Suslikov A.I.** A study of the coefficients of transverse deformation of metals during elastoplastic deformation

18:30 – 18:40 **Kopeina A.V., Smirnov S.V., Vichuzhanin D.I., Nesterenko A.V.** Chart of plasticity limit metal matrix B95/SiC composite with SiC particles content 30% at a temperature of 450°C

Excursion to FabLab Polytech

Room C

Evening Session

Young scientists' session (Modern Ways in Mechanics)

Chairperson Babenkov M.B.

15:00 – 15:20 **Dvornikova A.A., Lukin A.V., Popov I.A.** Wave rigid body gyro resonator forced oscillations under electrostatic excitation

15:20 – 15:40 **Melikhov I.F., Chivilikhin S.A., Amosov A.S.** Flow of viscous lubrication layer over rotating inclined cylinder

15:40 – 16:00 **Krauchanka M.Yu., Krasnitckii S.A, Gutkin M.Yu., Kolesnikova A.L., Romanov A.E.** Generation of prismatic misfit dislocation loops in decahedral "core-shell" nanoparticles

16:00 – 16:10 **Kucher D.A., Chivilikhin S.A.** Two-scale model of nanoscrolls synthesis

16:10 – 16:20 **Zinovieva O., Zinoviev A., Ploshikhin V., Romanova V., Balokhonov R.** Modeling approach to predict grain structure and mechanical behavior of additively manufactured materials

Coffee break

16:40 – 17:00 **Ivashchenko A.T.** Experimental determination of shear stiffness of granular media

17:00 – 17:10 **Sergeev M.V., Emelianova E.S.** Mechanical behavior of Zr-Nb alloys under quasistatic loading. Numerical simulation

17:10 – 17:20 **Nuzhdin K.A., Musalimov V.M.** Investigation and development of an actuator based on an elastic element

17:20 – 17:40 **Karamov R.I., Sergeichev I.V., Zharinov A.N., Mironova E.A., Karabutov A.A., Akhatov I.Sh.** Experimental analysis of residual strength of fiber-reinforced polymer composites

17:40 – 18:00 **Voloskov B.S., Sergeichev I.V., Kalyaev V.Yu., Abaimov S.G., Akhatov I.Sh.** Static, low-, high- and giga-cycle fatigue behavior of 3D printed stainless steel specimens

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Excursion to FabLab Polytech

Room D

Evening Session

Molecular and particle dynamics

Chairperson Krivtsov A.M.

15:00 – 15:20 **Ivanov K.S., Demidov I.V., Vaisberg L.A.** Generalization of the direct separation of motions method for modelling dynamics of vibrofluidized granular material's particles

15:20 – 15:40 **Gerasimov R.M., Volegov P.S.** MD approach to the analysis of the grain boundaries structure

15:40 – 15:50 **Boltachev G.Sh., Chingina E.A., Volkov N.B., Lukyashin K.E.** Elastic properties of nanopowders within granular dynamics method

15:50 – 16:00 **Boltachev G.Sh., Chingina E.A., Volkov N.B., Spirin A.V.** 3D simulations of nanopowders high-speed compaction processes by granular dynamics method

16:00 – 16:20 **Salman N., Wilson M., Neville A., Smolin A.** LIGGGHTS-MCA for 3D simulation of complex solid behaviour

Coffee break

16:40 – 17:00 **Zhilyaev P.A., Iakovlev E.S., Akhatov I.Sh.** Atomistic study of the graphene nanobubbles

17:00 – 17:20 **Mayer P.N., Mayer A.E.** Size distribution of cavities in metal melts at tension with high strain rates

Minisymposium "FabLab"

Chairperson Dyatlova P.A.

17:20 – 17:30 **Miroshnik G.** Specifics of prototyping devices for visually impaired people

17:30 – 17:40 **Opochansky A.** Mathematical modeling for design of coordinate-measuring machine

17:40 – 17:50 **Kulagin I.A., Sultan R.A., Smolnykov P.S., Reymers S.A.** Automated warehouse development

17:50 – 18:00 **Buldakov P.Yu., Maistro A.S., Pereverzev A.E., , Starobinskii E.B., Zarubin I.A.** Researching in improving battery lifetime by using cell balancing technologies

18:00 – 18:10 **Tomilin K.** How to make an electro longboard

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Excursion to FabLab Polytech

June 28, Thursday

Room A

Morning Session

Plenary lectures

Chairperson Belyaev A.K.

10:00 – 10:35 **Polyanskiy V.A.** Modern advances in mechanics of materials with hydrogen

10:35 – 11:10 **Akhatov I.S.** Mechanics and physics of advanced manufacturing

11:10 – 11:45 **Lipatov I.I.** Selfoscillations in separated flows. Buffet onset, stall flutter, pseudoshock

Coffee break

Chairperson Polyanskiy V.A.

12:05 – 12:40 **Belyaev A.K.** Dynamics and stability of axially loaded elastic rods

12:40 – 13:15 **Banichuk N.V., Ivanova S.Yu., Makeev E.V.** On axial movement and transverse vibrations of layered thin-walled membrane-plate structures and the problems of stability

13:15 – 13:50 **Aizikovich S.M.** Asymptotic solution of electromechanically coupled contact problems for electroelastic functionally-graded solids

Room A

Evening Session

Minisymposium "Extreme loading on structures"

Organizers: Narinder Gupta and Nikita Morozov

Chairperson Bratov V.

14:40 – 15:00 **Kazarinov N., Bratov V., Morozov N., Balandin V., Bragov A., Iqbal M.A.** Impact of brittle targets. Experimental and numerical study

15:00 – 15:20 **Senthil K., Iqbal M.A., Gupta N.K.** Impact strength of mild steel and armox 500T steel

15:20 – 15:40 **Kazarinov N., Petrov Y., Bratov V.** Stress intensity — crack velocity relationship. Numerical investigation

15:40 – 16:00 **Iqbal M.A., Khan M.K., Bratov V., Gupta N.K., Morozov N.F.** Numerical study of fracture mechanism in ceramic armor under impact load

16:00 – 16:20 **Iqbal M.A., Venkatesan J., Madhu V.** The compressive response of boron carbide ceramic under high strain rate

Coffee break

16:40 – 17:00 **Lamzin D.A., Bragov A.M., Lomunov A.K., Konstantinov A.Yu.** Comparative analysis of the dynamic behavior of lime-sand brick and ceramic brick

17:00 – 17:20 **Atroshenko S.A., Evstifeev A.D.** Influence of the metal type on fracture under dynamic erosion

17:20 – 17:40 **Igumnov L.A., Markov I.P., Boev A.V.** A static boundary element analysis of 3D anisotropic elastic problems

17:40 – 18:00 **Metrikin V.S., Igumnov L.A., Grigoryev M.V.** Dynamics of a friction system, taking into account the hereditary type friction and the mobility of a vibration limiter

18:00 – 18:15 **Volkov G., Bratov V., Mikhailova N.** Numerical modelling of Taylor test

18:15 – 18:35 **Gupta P.K., Singh S.S.** A study on the tube expansion using a conical-cylindrical die

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BANQUET

Room B

Evening Session

Mechanical and civil engineering applications

Chairperson Belyaev A.K.

15:00 – 15:20 **Zegzhda A.S., Polyanskiy V.A.** Model of the effect of low concentrations of diffusion — mobile hydrogen on the cracks propagation

15:20 – 15:30 **Zinovieva T.V.** Influence of hydrogen on stress-strain state of pipeline

15:30 – 15:40 **Tretyakov D.A., Belyaev A.K., Polyanskiy V.A., Yakovlev Yu.A.** Dynamic instability of the concentration of bound hydrogen in metallic samples under the action of cyclic loading

15:40 – 16:00 **Yakovlev Yu.A., Tretyakov D.A., Mansyrev D. N., Polyanskiy S.V.** Accumulation of hydrogen in the surface layers and its influence on the mechanical properties of materials

16:00 – 16:20 **Petinov S.V., Guchinsky R.V.** Fatigue assessment of structures based on the damage accumulation principle

Coffee break

16:40 – 16:50 **Konovalov D.A., Veretennikova I.A., Michurov N.S., Bikova T.M.** Representative volume estimation for description of aluminium alloy with silicon carbide

16:50 – 17:10 **Arutyunyan A.R., Arutyunyan R.A.** The condition of transition to unstable state of polymer materials

17:10 – 17:30 **Arutyunyan R.A., Arutyunyan A.R.** Damage and long-term strength of viscous media

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BANQUET

Room C

Evening Session

Computational mechanics

Chairperson Babenkov M.B.

15:00 – 15:20 **Zeng M., Jin P., Wang D.F., Yang X.L., Liu W.** Effects of mesh resolution on the numerical simulation of nonequilibrium flow over compression corner

15:20 – 15:40 **Yang X.L., Liu W., Zeng M., Chai Z.X., Yang Q.** Numerical investigation of leading-edge configuration and roll-axis installation influence on slender delta wing rock

15:40 – 16:00 **Sulimov V.D., Shkapov P.M., Sulimov V.D.** Geometric structures and updating parameters of dynamical systems using hybrid algorithms

16:00 – 16:20 **Rogozin O.A., Fanaskov V.S., Sharaborin E.L., Vezolainen A.V., Vasilyev O.V.** Adaptive wavelet collocation method for multi-scale and multiphysics simulations

Coffee break

16:40 – 16:50 **Shmidt I.A., Rogozin O.A., Vasilyev O.V.** Modeling and simulation of the single-track formation problem in the process of selective laser melting using adaptive wavelet collocation method

Aerospace mechanics

Chairperson Babenkov M.B.

16:50 – 17:00 **Pelevin A.G., Svistkov A.L., Beliaev A.Yu., Evlampieva S.E.** Investigation of the particularities of hot hardening of a nanosatellite inflatable antenna in low earth orbit

17:00 – 17:10 **Iakovlev E., Zhilyaev P., Akhatov I.** Atomistic modeling of graphene nanobubbles

17:10 – 17:20 **Abobaker M., Krivtsov A.M.** Equilibrium and dynamics of gravitating system of gas-dust cloud

17:20 – 17:40 **Zeitlin M.G., Fedorova A.N.** Coherent structures and localized modes in collective models of accelerator physics

17:40 – 18:00 **Fedorova A.N. , Zeitlin M.G.** Wigglers: nonlinearities in multiscales. From smart storage rings to synchrotronradiation in pulsar wind nebulae

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BANQUET

June 29, Friday

Room A

Morning Session

Plenary lectures

Chairperson Vilchevskaya E.N.

10:00 – 10:35 **Lurie S., Vasiliev V.** Nonlocal differentiation in singular problems of deformable solids

10:35 – 11:10 **Freidin A.B., Morozov A.V., Müller W.H., Poluektov M., Figiel Ł., Sharipova L.L., Izmaylova Y.O.** Configurational forces in stress-induced phase transformations, mechanochemistry of chemical reaction fronts and biomechanics of growth

11:10 – 11:45 **Kukushkin S.A., Osipov A.V.** New phase nucleation of solids in a chemical conversion process. Master and slave phase transitions

Coffee break

12:05 – 12:40 **Bauer S.M.** Mathematical modelling in ophthalmology

12:40 – 13:15 **Smirnov N.N., Nikitin V.F., Stamov L.I.** Multiscale non-equilibrium processes in chemically reacting media

13:15 – 13:50 **Gorkunov E.S.** Estimation of parameters of the stress-strain state of steel products by means of magnetic and acoustic non-destructive techniques

Room A

Evening Session

Wave motion

Chairperson Abramian A.K.

15:00 – 15:20 **Kiselev A.P., Tagirdzhanov A.M.** Two types of localized solutions of the wave equation

15:20 – 15:40 **Lukin A.V., Popov I.A., Skubov D.Yu.** Nonlinear dynamics and stability of elastic elements of N/MEMS in coupled thermoelectrical fields

15:40 – 15:50 **Teplyashin R.V., Lukin A.V., Popov I.A.** Nonlinear dynamics of electrostatic vibration energy harvesters

15:50 – 16:00 **Murtazin I.R., Lukin A.V., Popov I.A., Skubov D.Y.** Analytical and numerical research of rotating shaft bending oscillations and development of vibrations damping methods

Coffee break

16:20 – 16:40 **Filippenko G.V., Wilde M.V.** Backwards waves in a cylindrical shell: comparison of 2D shell theories with 3D theory of elasticity

16:40 – 16:50 **Sviyazheninov E.D.** Specifications of resonant acoustic rotating waves in circular and annular domains

16:50 – 17:10 **Zinovieva T.V., Belyaev A.K., Moskalets A.A.** Turbine blade vibration analysis using helicoidal shell model

17:10 – 17:30 **Korikov D.V.** On linear vibrations of thin plates with corners and cracks

17:30 – 17:50 **Dudko O.V.** On similarities and differences of the nonstationary one-dimensional dynamics of elastic low-porous and multimodulus solids

17:50 – 18:00 **Ragozina V.E., Ivanova Yu.E.** Some mathematical features of the procedure of asymptotics matching in the shock dynamics of centrally symmetric problems

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CLOSING CEREMONY

Room B

Evening Session

Biomechanics and mechanobiology

Chairperson Bauer S.

15:00 – 15:20 **Salary A.** Nonlinear effects on the fast deterministic lateral displacement in blood cell separation

15:20 – 15:40 **Stepanov M.D., Ignatiev M.O., Kharaldin N.A., Stepanov A.V., Borovkov A.I., Karandyshev A.N., Milyaev A.V., Zhukov I.E., Denisov A.V.** Finite element modeling of the human torso for analyzing of contusion injuries during ballistic impact testing

15:40 – 16:00 **Makevnina V.V.** Numerical investigation of the air flow in the first three generations of the human tracheobronchial tree

16:00 – 16:20 **Brazgina O.V.** Gas flow in the porous lungs: biological tissue constitutive equation and interaction between gas and tissue

Coffee break

16:40 – 17:00 **Bosiakov S.M., Yurkevich K.S., Altenbach H.** Analytical modelling of the periodontal ligament behavior during initial displacements of tooth root with different shapes

17:00 – 17:20 **Zverev V.S., Pravdin S.F.** Numerical simulation of the low-voltage cardioversion in a two-dimensional electromechanical model of the anisotropic myocardium

17:20 – 17:40 **Li L., Wang J.Z.** Interfacial adhesion of viscoelastic bodies via molecular bonds

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CLOSING CEREMONY

Room C

Evening Session

Nano- and micromechanics, phase transitions

Chairperson Kukushkin S.A.

15:00 – 15:20 **Svistkov A.L., Izyumov R. I., Garishin O.K.** Features of analysis of structure and properties of elastomeric nanocomposites using an atomic-force microscope

15:20 – 15:30 **Batyrshin E.S., Zamula Yu.S., Sergeichev I.V., Chugunov S.S., Akhatov I.S.** Mechanical characterization of polymer-based composite materials at micro- and nanoscale using AFM

15:30 – 15:50 **Smolin A.Yu., Eremina G.M., Shalomeeva A.A.** 3D simulation of zirconia based composite with soft matter filling using movable cellular automaton method

15:50 – 16:00 **Mikaelyan K.N., Gutkin M.Yu.** Generation of misfit dislocations at an interface step in a composite nanolayer

16:00 – 16:20 **Volegov P.S., Ozernykh V.S., Ovchinnikov E.I.** Description of dislocation mechanisms of damage accumulation within the framework of multilevel models of inelastic deformations of polycrystals

Coffee break

16:40 – 17:00 **Mushchak N.D., Podolskaya E.A., Panchenko A.Yu.** Application of the pair force interaction potentials to simulate FCC-BCC structural transition

17:00 – 17:10 **Davlyatshin R.P., Volegov P.S.** MD investigation of the internal structure evolution of a bicrystal during deformation

17:10 – 17:30 **Bulygin A.N., Pavlov Yu.V.** Solutions of nonlinear non-autonomous Klein-Fock-Gordon equation

17:30 – 17:50 **Kondratev N.S., Trusov P.V., Makarevich E.S.** The model for description of inelastic deformation taking into account the process of static recrystallization and phase transitions

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CLOSING CEREMONY

Room D

Evening Session

Fluid and gas

Chairperson Bykov N.Y.

15:00 – 15:20 **Ryltseva K.E., Frolov O.Yu., Shrager G.R.** Non-isothermal steady power-law fluid flow through an axisymmetric sudden contraction

15:20 – 15:40 **Dyakova O.A., Borzenko E.I.** Numerical simulation of non-Newtonian fluid flow in a t-shaped channel under the given pressure boundary conditions

15:40 – 15:50 **Petrov V.E.** New solutions of stationary quasi 2D turbulence with global reaction

15:50 – 16:00 **Sabirov R.R., Kozlov V.G., Vjatkin A.A.** Averaged thermal convection induced by the inertial waves in a thick cylindrical layer at rotation

16:00 – 16:20 **Ryzhak E.I., Sinyukhina S.V.** Estimates for frequencies of free vibrations of an arbitrary heavy barotropic fluid in closed reservoirs

Coffee break

16:40 – 16:50 **Denisova M.O., Khokhryakova (Bushueva) C.A., Paravina D.K.** Surface waves in two-layered system induced by the magnetic field

16:50 – 17:00 **Vjatkin A.A., Shuvalova D.A.** The effect of inertial waves on the averaged thermal convection of heat-generating fluid in a rotating horizontal cylinder

17:00 – 17:20 **Bykov N.Y., Bulgakov A.V., Leshchev D.V., Starinskiy S.V., Safonov A.I.** Gas-jet method of metal film deposition: direct simulation Monte Carlo of He-Ag mixture flow

17:20 – 17:40 **Prozorova E.V.** The influence of asymmetry of the stress tensor in the continuous mechanics

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CLOSING CEREMONY