

PROGRAM  
OF THE XLV INTERNATIONAL SUMMER  
SCHOOL – CONFERENCE  
ADVANCED PROBLEMS IN MECHANICS 2017



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 the University of Seville (Universidad de Sevilla). APM 2017 is partially supported by Russian Foundation for Basic Research. Minisymposium in memoriam of Antonio Castellanos Mata is partially sponsored by the Vicerrectorado de Investigación de la Universidad de Sevilla (Vice-Rectorate for Research, University of Seville, Spain).

<http://apm-conf.spb.ru>

JUNE 22, THURSDAY (ST. PETERSBURG SCIENTIFIC CENTRE)

ROOM A  
*Morning Session*  
PLENARY LECTURES  
CHAIRPERSON A.M. KRIVTSOV

- 9:00 – 9:20    **Opening ceremony**
- 9:20 – 9:55    **Wiercigroch M.** Grazing induced bifurcations: innocent or sinister?
- 9:55 – 10:30   **O'Brien P.** Relativistic gravity in a Newtonian context
- 10:30 – 11:05   **Müller W.H., Vilchevskaya E.N.** Micropolar media with structural transformations — theory and example problems

*Coffee break*

MINISYMPOSIUM IN MEMORIAM OF ANTONIO CASTELLANOS MATA

ORGANIZERS: ANTONIO RAMOS, FRANCISCO PONTIGA, ELENA GREKOVA  
CO-CHAIRMEN F.J. GARCÍA, A. RAMOS

- 11:25 – 12:00   **Pontiga F., Ramos A., Grekova E.F.** Antonio Castellanos: a great scientist and a great man
- 12:00 – 12:25   **Ramos A.** Flow of electrolytes induced by AC electric fields in microsystems
- 12:25 – 12:50   **Boyko E., Gat A.D., Bercovici M.** Deformations of a pre-stretched and lubricated finite elastic membrane driven by non-uniform electro-osmotic flow

*Evening Session*

MINISYMPOSIUM IN MEMORIAM OF ANTONIO CASTELLANOS MATA  
ORGANIZERS: ANTONIO RAMOS, FRANCISCO PONTIGA, ELENA GREKOVA  
CHAIRPERSON A. RAMOS

- 13:50 – 14:25   **Morgan H.** AC electrokinetics: Theory and applications
- 14:25 – 14:50   **Stishkov Yu.K., Vasilkov S.A.** On the structure of electrohydrodynamic flows caused by field-enhanced dissociation in various system configurations
- 14:50 – 15:15   **Nishikawara M., Shomura K., Yanada H.** Effect of interaction between ion drag and conduction on electrohydrodynamic pumping

15:15 – 16:00    **Welcome party**

ROOM B  
*Morning Session*  
ROUND TABLE FOR YOUNG SCIENTISTS  
CHAIRPERSON V.A. LEVIN

11:25 – 12:50 Discussion (in Russian).

*Evening Session*  
YOUNG SCIENTISTS' SESSION (MWM)  
CHAIRPERSON I.E. BERINSKII

- 13:50 – 13:57 **Tegtmeyer S., Fau A., Benet P., Nackenhorst U.** On goal oriented feature extraction strategies for Proper Orthogonal Decomposition based reduced order modeling in structural dynamics
- 13:57 – 14:04 **Belova E.Y.** Stability assessment of a tibia fracture fixation in the case of thermal stresses
- 14:04 – 14:11 **Lukin A.V., Popov I.A., Skubov D.Yu.** Nonlinear dynamics and stability of electrostatically actuated elements of MEMS
- 14:11 – 14:18 **Abdullaev R.A., Lukin A.V., Skubov D.Yu.** Analytical and numerical methods in the mass-position determination MEMS problem
- 14:18 – 14:25 **Koludarov P.U.** Finite element analysis of coupled-field electroelastic problems of MEMS
- 14:25 – 14:32 **Shumova M., Korolev D.V., Smolyanskaya O.A., Chivilikhin S.A.** Investigation of the occlusion blood vessel magnetic nanoparticles
- 14:32 – 14:39 **Izyumov R.I., Garishin O.K.** Investigation of elastic-plastic deformation in polymer nanocomposites based on structural model of spherulites
- 14:39 – 14:46 **Golovina D.S., Chivilikhin S.A.** Determination of the pore size distribution in inhomogeneous nanoporous medium for reproducing the liquid front propagation
- 14:46 – 14:53 **Smirnov A.M., Krasnitckii S.A., Gutkin M.Yu.** Generation of rectangular glide dislocation loops in core-shell nanowires with parallelepipedal cores
- 14:53 – 15:00 **Eliseeva A.Yu., Svistkov A.L.** Modeling the state peculiarities of the polymer chains around the carbon black nanoparticles
- 15:00 – 15:07 **Sokolov A.K., Garishin O.K., Svistkov A.L.** Structural modeling of nanostrands formation in dispersedly filled elastomers
- 15:07 – 15:14 **Konakov Ya.V., Ovid'ko I.A., Sheinerman A.G.** Collective migration of two low-angle grain boundaries in nanocrystalline and ultrafine-grained metals driven by periodically applied mechanical load

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15:15 – 16:00 Welcome party (room A)

JUNE 23, FRIDAY  
(PETER THE GREAT ST.PETERSBURG POLYTECHNIC UNIVERSITY)

ROOM A  
*Morning Session*  
PLENARY LECTURES  
CHAIRPERSON M.E. FROLOV

- 10:00 – 10:35 **Levin V.A., Zhuravskaya T.A.** Detonation control in a supersonic gas flow in a plane channel
- 10:35 – 11:10 **Linkov A.M., Rejwer E., Rybarska-Rusinek L.** On using fast multipole methods for solving problems of continuum mechanics
- 11:10 – 11:45 **Sun Q.** Control phase transition behavior of polycrystalline media by grain size engineering — Roles of internal and external length scales

*Coffee break*

CHAIRPERSON E.N. VILCHEVSKAYA

- 12:05 – 12:40 **Ankudinov A.V., Khalisov M.M.** Reaction of living cells to pharmacological agents: identification by AFM
- 12:40 – 13:15 **Onck P.R.** Protein mechanics: from amino-acid to swimming cells
- 13:15 – 13:50 **Nackenhorst U.** Biomechanics of bones in a global picture



ROOM B

*Evening Session*

MINISYMPOSIUM IN MEMORIAM OF ANTONIO CASTELLANOS MATA

ORGANIZERS: ANTONIO RAMOS, FRANCISCO PONTIGA, ELENA GREKOVA

CHAIRPERSON A. RAMOS

- 14:45 – 15:10 [Korobeynikov S.M.](#) Study of prebreakdown processes in liquids with the help of Kerr effect
- 15:10 – 15:35 [Garcia F.J.](#), [González H.](#), [Vázquez P.A.](#) Modal description of capillary jets and reduced models
- 15:35 – 16:10 [Gat A.D.](#), [Matia Y.](#), [Tсах E.](#) Leveraging internal viscous flow to extend the capabilities of soft-robots
- 16:10 – 16:45 [Goryacheva I.G.](#), [Makhovskaya Yu.Yu.](#) Contact interaction models taking into account elastic and surface properties of contacting bodies

*Coffee break*

CO-CHAIRMEN M.A.S. QUINTANILLA, E. GREKOVA

- 17:05 – 17:30 [Davé R.N.](#) Surface engineering for property enhancement of pharmaceutical powders
- 17:30 – 17:55 [Muzzio F.](#) Role of powder material properties on the performance of pharmaceutical continuous manufacturing systems
- 17:55 – 18:20 [Mishin M.V.](#), [Alexandrov S.E.](#) Synthesis of silicon dioxide nanoparticles in RF discharge sustained at atmospheric pressure
- 18:20 – 18:45 [Quintanilla M.A.S.](#), [Pérez-Vaquero J.](#) Charge accumulation and dissipation in micrometer sized powders
- 18:45 – 19:10 [Tiurikov K.S.](#), [Alexandrov S.E.](#), [Filatov K.D.](#), [Speshilova A.B.](#), [Kirilenko D.A.](#) Formation of tungsten and molybdenum disulfide micro and nanoparticles by spray pyrolysis

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18.30 - 19.30 Informal conversation between young scientists and professors. Debates. Intellectual games. (Room C)

ROOM C

*Evening Session*

MINISYMPOSIUM “NONLINEAR WAVE DYNAMICS OF GENERALIZED CONTINUA”  
(IN MEMORIAM OF E. AERO AND G. MAUGIN)

ORGANIZERS: ALEXEI PORUBOV AND VLADIMIR EROFEEV

CHAIRPERSON V.I. EROFEEV

- 14:45 – 15:10 [Manevitch L.I.](#) Free oscillations of discrete membrane in the conditions of acoustic vacuum
- 15:10 – 15:35 [Erofeev V.I.](#), [Pavlov I.S.](#) Nonlinear waves in microstructured media
- 15:35 – 16:00 [Aizikovich S.M.](#), [Erofeyev V.I.](#), [Leonteva A.V.](#) Plane longitudinal waves in a liquid saturated porous geometrically nonlinear medium
- 16:00 – 16:25 [Porubov A.V.](#), [Osokina A.](#), [Michelitsch T.](#) Local and nonlocal modeling of square lattice
- 16:25 – 16:50 [Chetverikov A.P.](#), [Ebeling W.](#), [Velarde M.G.](#) Localized lump-soliton-like excitations in quadratic and triangular Morse lattice

*Coffee break*

CHAIRPERSON A.V. PORUBOV

- 17:10 – 17:35 [Korzniikova E.A.](#), [Dmitriev S.V.](#) Relation between delocalized and localized nonlinear vibrational modes in crystals
- 17:35 – 18:00 [Erofeev V.I.](#), [Leontieva A.V.](#), [Malkhanov A.O.](#) The influence of dislocations and point defects on the spatial localization of nonlinear waves propagating in materials
- 18:00 – 18:25 [Aero E.L.](#), [Bulygin A.N.](#), [Pavlov Yu.V.](#) The solutions of nonlinear equations of flat deformation of the crystal media allowing martensitic transformations

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18:30 – 19:30 Informal conversation between young scientists and professors. Debates. Intellectual games.

ROOM D  
*Evening Session*  
 ROCKS AND SOILS AS COMPLEX MEDIA  
 HYDRAULIC FRACTURE  
 CHAIRPERSON V.A. KUZKIN

- 14:45 – 15:05 Markov N.S. On numerical solution of problems for layered media with holes, cracks and inclusions
- 15:05 – 15:25 Lapin R.S., Kuzkin V.A., Kachanov M. L. Determining the effective elastic properties of solid with randomly oriented cracks
- 15:25 – 15:45 Stepanov A.D., Linkov A.M. Study of various numerical schemes for tracing hydraulic fractures
- 15:45 – 16:05 Tolmacheva K.I., Boronin S.A., Osiptsov A.A., Galeev R.R., Belozorov B.V., Yakovlev A.A., Sitnikov A.N. Multi-fluid modelling of suspension filtration in the near-wellbore zone of injection wells
- 16:05 – 16:25 Rybarska-Rusinek L., Rejwer E., Linkov A.M. Accelerated numerical simulation of seismicity accompanying hydraulic fracture and mining
- 16:25 – 16:45 Dayan A. Advantage of soil remediation from volatile contaminants by hot air injection

*Coffee break*

- 17:05 – 17:35 Osiptsov A.A. On the multi-fluid approach to multiphase flow modeling in hydraulic fracturing applications
- 17:35 – 17:55 Boronin S.A., Osiptsov A.A., Desroches J. Flow of viscoplastic suspensions in a hydraulic fracture
- 17:55 – 18:15 Budenny S., Sidtikov R., Nikitin R., Bochkarev A., Erofeev A., Mitrushkin D., Demo V. Pseudo 3D hydraulic fracturing model with account for vertical viscous dissipation

YOUNG SCIENTISTS' SESSION (MWM)  
 CHAIRPERSON V.V. VANIUSHKINA

- 18:15 – 18:22 Da Fies G., Mishuris G. Fracture as a result of solid and fluid interaction, effective numerical model
- 18:22 – 18:29 Staroverov O.A., Wildemann V.E. Analysis of damage accumulation processes of composite materials and identifying of failure features
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- 18:30 – 19:30 **Informal conversation between young scientists and professors. Debates. Intellectual games. (Room C)**

ROOM E  
*Evening Session*  
 CHAIRPERSON P.A. DYATLOVA

- 14:45 – 15:20 Gendelman O.V., Savin A.V. Heat conductivity in one dimension — microstructure versus hydrodynamics

BIOMECHANICS AND MECHANOBIOLOGY  
 CHAIRPERSON U. NACKENHORST

- 15:20 – 15:40 Maslov L.B., Sabaneev N.A. Finite-element simulation of bone regeneration inside porous implant
- 15:40 – 16:00 Borodin E.N., Gutkin M.Yu., Mikaelyan K.N., Panfilov P.E. Mechanisms of plasticity and plastic zone at the I-mode crack tip in dentine

YOUNG SCIENTISTS' SESSION (MWM)  
 CHAIRPERSON S.A. LYCHEV

- 16:00 – 16:07 Melikhov I.F. Dynamics and buckling analysis of a thin viscous sheet
- 16:07 – 16:14 Mordasova E.A., Gutkin M.Yu., Kolesnikova A.L., Romanov A.E. Stress fields in an elastic cylinder with a cylindrical inclusion of finite length
- 16:14 – 16:21 Krasnitckii S.A., Trofimov A.S., Sevostianov I.B., Radi E. Effective elastic properties of a composite material containing rigid toroidal inhomogeneities
- 16:21 – 16:28 Yankin A.S., Bulbovich R.V. Experimental research of viscoelastic properties of highly-filled polymers under complex harmonic loadings
- 16:28 – 16:35 Ostapovich K.V., Trusov P.V. On identifying elasticity classes of polycrystalline materials
- 16:35 – 16:42 Eliseev V.V., Oborin E.A. On power transmission of drive belt as rod with shear

*Coffee break*

SOLIDS AND STRUCTURES  
 CHAIRPERSON K.P. FROLOVA

- 17:05 – 17:25 Lychev S.A., Koifman K.G. Geometrical models of structurally inhomogeneous solids
- 17:25 – 17:45 Rudoy E.M. On a rigid inclusions problem in 2D elasticity
- 17:45 – 18:05 Vasiliev A.S., Aizikovich S.M., Belov A.A., Litvinchuk S.Yu. Contact problem on indentation of a conical punch into an elastic transversely-isotropic functionally-graded half-space

- 18:05 – 18:25 Aizikovich S.M., Vasiliev A.S., Sadyrin E.V. Contact problem on indentation of a conductive punch into an electro-elastic piezoelectric functionally-graded half-space
- 18:25 – 18:45 Banichuk N.V., Ivanova S.Y. Mechanics of penetration and structural protection in the frame of optimization game theory

18.30 - 19.30 Informal conversation between young scientists and professors.  
Debates. Intellectual games. (Room C)



JUNE 24, SATURDAY  
(PETER THE GREAT ST.PETERSBURG POLYTECHNIC UNIVERSITY)

ROOM A  
*Morning Session*  
PLENARY LECTURES  
CHAIRPERSON W.H. MÜLLER

- 10:00 – 10:35 Eckhardt B. Exact coherent structures: from transitional pipe flow to fully developed turbulence
- 10:35 – 11:10 Ness H., Stella L., Lorenz Ch., Kantorovich L. Generalised Langevin equation (GLE) as a tool to study dynamics of non-equilibrium open nanoscale systems
- 11:10 – 11:45 Babeshko V.A., Evdokimova O.V., Babeshko O.M., Zaretskaia M.V., Pavlova A.V., Uafa G.H. Hidden defects in materials, faults in seismology and prevention of hazards

*Coffee break*

CHAIRPERSON M. WIERCIGROCH

- 12:05 – 12:40 Kachanov M.L., Sevostianov I.B. On the mechanics of cracks having partial contacts between crack faces
- 12:40 – 13:15 Krivtsov A.M. Nonlocal interaction and anomalous heat conduction
- 13:15 – 13:50 Le Khanh Chau. Dislocation mechanism of microstructural changes in ductile single crystals



ROOM B  
*Evening Session*

MINISYMPOSIUM IN MEMORIAM OF ANTONIO CASTELLANOS MATA  
ORGANIZERS: ANTONIO RAMOS, FRANCISCO PONTIGA, ELENA GREKOVA  
CO-CHAIRMEN E.F. GREKOVA, D. HARRIS

- 14:50 – 15:15 [Boltachev G.Sh.](#), [Chingina E.A.](#), [Lukyashin K.E.](#), [Markov V.M.](#), [Volkov N.B.](#) 2D granular dynamics simulations of uniaxial and uniform compaction of polydisperse nanopowders
- 15:15 – 15:50 [Harris D.](#) A plasticity Cosserat model for granular materials and soils
- 15:50 – 16:25 [Kuznetsov S.V.](#), [Ilyashenko A.V.](#), [Goldstein R.V.](#) Seismic barriers utilizing concept of a broadband phononic crystal: mathematical models and numerical simulations
- 16:25 – 16:50 [Ruíz Botello F.](#), [GrekoVA E.F.](#), [Quintanilla M.A.S.](#), [Tournat V.](#) Wave dispersion in granular media: heterogeneous packing?
- 16:50 – 17:15 [Blekhman I.I.](#), [Semenov Y.A.](#) On the stability problem of bulk and unfixed cargo on a rolling ship

*Coffee break*

- 17:35 – 18:35 POSTERS: Minisymposium poster session and general poster session
- 18:40 – 21:40 Walking city tour



ROOM C  
*Evening Session*

MINISYMPOSIUM “NONLINEAR WAVE DYNAMICS OF GENERALIZED CONTINUA”  
(IN MEMORIAM OF E. AERO AND G. MAUGIN)  
ORGANIZERS: ALEXEI PORUBOV AND VLADIMIR EROFEEV  
CHAIRPERSON V.I. EROFEEV

- 14:45 – 15:10 [Bochkarev A.V.](#), [Zemlyanukhin A.I.](#) Padé approximants and exact solutions to nonintegrable equations of nonlinear wave mechanics
- 15:10 – 15:35 [Soldatov I.N.](#), [Klyueva N.V.](#) Wave disturbances of the micropolar Rankine vortex
- 15:35 – 16:00 [Christov I.C.](#) Traveling waves in fluids: kink solutions and bifurcations with respect to the wave speed
- 16:00 – 16:25 [Sargsyan S.H.](#), [Aslanyan N.S.](#) Thermoelasticity of micropolar thin plates
- 16:25 – 16:50 [Igumnov L.A.](#), [Zaytsev M.V.](#), [Metrikin V.S.](#), [Novikov V.V.](#) On the theory of the vibration systems with a hereditary type dry friction forces and an oscillation limiter
- 16:50 – 17:15 [Kovaleva M.A.](#), [Kosevich Yu.A.](#), [Smirnov V.V.](#), [Manevitch L.I.](#) Two and three harmonically coupled pendulums

*Coffee break*

- 17:35 – 18:35 POSTERS
- 18:40 – 21:40 Walking city tour





ROOM D  
*Evening Session*  
MOLECULAR AND PARTICLE DYNAMICS  
CHAIRPERSON V.A. KUZKIN

- 14:50 – 15:20 **Dmitriev S.V.** Discrete breathers in crystals: new results and open problems
- 15:20 – 15:50 **Kuzkin V.A., Krivtsov A.M.** An analytical description of unsteady heat transfer in harmonic scalar lattices
- 15:50 – 16:10 **Babenkov M.B., Krivtsov A.M., Tsvetkov D.V.** Heat propagation in an ideal one-dimensional crystal heated by a short thermal pulse
- 16:10 – 16:30 **Loboda O.S., Krivtsov A.M.** Thermal processes in a one-dimensional crystal with regard for the second coordination sphere
- 16:30 – 16:45 **Murachev A.S., Krivtsov A.M., Tsvetkov D.V.** The thermal echo effect in one-dimensional crystals
- 16:45 – 17:00 **Sokolov A.A., Krivtsov A.M., Müller W.H.** Entropy production for one-dimensional heat transfer
- 17:00 – 17:15 **Starobinskiĭ E.B., Tsvetkov D.V., Krivtsov A.M.** Conversion of mechanical energy to thermal energy in a one-dimensional crystal

*Coffee break*

- 17:35 – 18:35 POSTERS
- 18:40 – 21:40 Walking city tour



ROOM E  
*Evening Session*  
YOUNG SCIENTISTS' SESSION (MWM)  
CHAIRPERSON P.A. DYATLOVA

- 14:50 – 14:57 **Beliaev A.P., Beliakova T.A., Chistiakov P.V., Iniukhin A.V., Mossakovsk P.A., Zein Yu.P.** Experimental investigation and numerical estimate of interface friction in aramid woven fabrics
- 14:57 – 15:04 **Galanin M.P., Gliznutsina P.V., Lukin V.V., Rodin A.S.** Variants of lagrange multiplier method implementations for two-dimensional contact problems
- 15:04 – 15:11 **Domanskaya T.O., Malkov V.M., Malkova Yu.V.** The analysis of stress-strain state of a composite plane with interface crack for John's harmonic material
- 15:11 – 15:18 **Gorbushin N., Mishuris G.** A crack propagation at a constant speed in a discrete bi-material
- 15:18 – 15:25 **Grigoriev A.S., Shilko E.V., Psakhie S.G.** Development of kinetic model of dynamic inelastic behavior of brittle solids
- 15:25 – 15:32 **Zinovieva O., Zinoviev A., Ploshikhin V.** Three-dimensional cellular-automata finite-difference model to evaluate grain structure during laser additive manufacturing
- 15:32 – 15:39 **Dubov A.L., Nizkaya T.V., Vinogradova O.I.** Local slip boundary conditions over superhydrophobic textures with trapezoidal grooves

- 15:40 – 17:15 Engineering competitions

*Coffee break*

- 17:35 – 18:35 POSTERS
- 18:40 – 21:40 Walking city tour

1. Boltachev G.Sh., Spirin A.V., Chingina E.A., Volkov N.B. Compaction rate influence on nanopowder yield stress: 2D simulation by granular dynamics method
2. Demidov I.V. On the theory of electromagnetic separation of granular materials
3. García-Sánchez P., Ramos A. Electro-rotation of semiconducting particles
4. Gómez-Aguilar F.J., González H., García F.J., Castrejón-Pita J.R., Castrejón-Pita A.A. Gaussian pressure pulses on capillary jets
5. Melnikova N., Samusenko A., Safronova Iu. Efficiency of ionocrafts: experimental investigation
6. Pontiga F., Moreno H., Fernández-Rueda A., Yanallah K., Moss M. Dissociation of carbon dioxide using pulsed dielectric barrier discharge
7. Polyanskiy V.A., Pankratyeva I.L. The structure of the interelectrode layers in polarized liquid flows in microchannels with the ion source affected by the applied field
8. Renev M.E., Safronova Iu.F. Drag reduction on a circular cylinder by corona discharge
9. Reznikova M.P., Lashko A.V., Chirkov V. A. Experimental verification of the computer model for simulation of water droplet electrical coalescence and non-coalescence
10. Ruiz Botello F., Castellanos Mata A., Quintanilla M.A.S., Greko E.F., Tournat V. Effect of contact orientation on ultrasound velocity in magnetic powders
11. Stishkov Yu.K., Nechaev D.A., Chirkov V.A., Vasilkov S.A. Specifics of charge accumulation on and transport along the interface between a low-conducting liquid and a solid perfect insulator
12. Yagoobi J. Electrohydrodynamically driven two-phase heat transport devices
13. Zakirianova R.E., Stishkov Yu.K. Four-ion model of an electrohydrodynamic flow in the two-wire electrode system

1. Evlampieva S.E., Maltcev M.S., Svistkov A.L. Analysis of temperature regimes for high-temperature curing of an inflatable antenna in the Earth orbit
2. Petrov V.E. Properties of turbulence driven by random external force in the modified KLB model
3. Sevodin M.A. Representation of some integral characteristics of potential fields by their values at some points
4. Voronin D.V., Istomin V.L., Khlebus K.A. Estimation of the most probable zones of deterioration of the pipeline pulse pneumotransportation

NONLINEAR DYNAMICS, MULTIBODY DYNAMICS, CHAOS AND VIBRATION

5. Kiryan D.G., Kiryan G.V. The evolution of the system of gravitating bodies
6. Schipitsyn V.D., Vlasova O.A. On the repulsion of solid, oscillating in fluid, from the rigid boundary. The role of the amplitude of vibrations
7. Prozorova E. Some paradoxes of mathematical theory of continuum mechanics and of kinetic theory

MECHANICAL AND CIVIL ENGINEERING APPLICATIONS

8. Sviyazheninov E.D. Multislot low-speed internal combustion engine ignition transducer
9. Vavilov A.V., Doudkin M.V., Kim A.I., Guryanov G.A. Impact of the new vibroexcitation method to the screening process intensification of bulk materials
10. Veretennikova I.A., Smirnov S.V., Smirnova E.O., Fomin V.M., Brusentseva T.A., Filippov A.A. Studying mechanical properties of heterogeneous material based on epoxy oligomer filled with silica by microindentation
11. Veretennikova I.A., Smirnova E.O., Pugacheva N.B., Michurov N.S. Studying mechanical properties of materials in welded joints of the VT1-0 titanium alloy and the 12Cr18Ni10Ti austenitic corrosion resistant steel with an intermediate copper insert by kinetic indentation
12. Veretennikova I.A., Vichuzhanin D.I., Michurov N. S., Smirnov S.V. Mechanical properties and fracture behavior of the bimetal produced by explosion welding under low-cycle fatigue



13. Borodin E.N., Bratov V. Dislocation kinetics based approach to prediction of microstructure evolution of ultrafine-grained copper alloy undergoing multi-directional forging
14. Garishin O.K., Shadrin V.V., Svistkov A.L., Sokolov A.K. Studies of mechanical properties of rubbers with a layered clay nanofiller
15. Morozov I.A., Komar L.A. Structural-mechanical model of filled rubber: influence of interphase layers

## MOLECULAR AND PARTICLE DYNAMICS

16. Dmitriev A.I., Nikonov A.Yu., Filippov A.E., Psakhie S.G. Molecular dynamics study of the spatio-temporal evolution of vortex-like atomic motion in a loaded solid body
17. Mistry S., Kammara K., Kumar R. A comprehensive study of water transport mechanisms through carbon nanotubes

## NANO- AND MICROMECHANICS

18. Fedorovsky G.D. A study of the relationships and mathematical modelling of defining functional physical and mechanical properties of advanced materials and nanomaterials
19. Gutkin M.Yu., Romanov A.E., Mikheev D.S., Kolesnikova A.L. Stress fields and strain energy of a circular loop of radial disclination in an elastic sphere
20. Kolomoets D.R., Krasnitckii S.A., Smirnov A.M., Gutkin M.Yu. Eccentric parallelepipedal inclusion with different dilatation eigenstrains in a long elastic cylinder
21. Kryzhevich D.S., Korchuganov A.V., Zolnikov K.P. Role of partial dislocations and twins in mechanical response of copper nanocrystal during severe plastic deformation
22. Mikaelyan K.N., Gutkin M.Yu. Dislocation emission from the edge of a parallelepipedal inclusion embedded in a nanolayer
23. Panchenko A., Berinskii I., Podolskaya E. On the simulation of the elastic behavior of single-layer molybdenum disulfide
24. Zolnikov K.P., Kryzhevich D.S., Korchuganov A.V. Atomic mechanisms of nucleation and development of plasticity in vanadium under mechanical loading

25. Argunova T.S., Gutkin M.Yu., Je J.H., Kalmykov A.E., Kazarova O.P., Mokhov E.N., Mikaelyan K.N., Myasoedov A., Sorokin L.M., Shcherbachev K.D. Freestanding highly crystalline AlN layers grown on evaporating SiC substrates
26. Atroshenko S.A. Effect of the aero-thermo-acoustic treatment on the properties of rapid steels
27. Belyaev A.K., Morozov N.F., Tovstik P.E., Tovstik T.P. Dynamics of thin rod after the longitudinal impact of rigid body
28. Borodin E.N., Mayer A.E., Gruzdkov A.A., Selyutina N.S. Numerical simulation of micro-localization behind the shock wave front and physical interpretation of the parameters of strain rate sensitivity of aluminum and copper
29. Hamamda S., Saadallah S., Khelil S., Revo S., Dorbani T., Boubertakh A. Thermal expansion coefficient of Al + 1.5%NTCM
30. Matveenko V.P., Oshmarin D.A., Sevodina N.V., Iurlova N.A. Terms of search optimal parameters of shunt electric circuits
31. Baltov A.I., Yanakieva A.Ya. Numerical modelling of surface-reinforced tube rod structures

## WAVE MOTION

32. Gerasimenko E.A., Kovtanyuk L.V. On interaction of unloading wave with a moving elastoplastic boundary in cylindrical tube
33. Ivanova Yu.E., Ragozina V.E. Ray series method in multidimensional problems of shock deformation of elastic arrays



JUNE 25, SUNDAY: FREE DAY

9.00 - 17.30 Excursion to Peterhof

9.30 - 14.30 Water city tour

17.00 - 20.00 City quest



JUNE 26, MONDAY

(PETER THE GREAT ST.PETERSBURG POLYTECHNIC UNIVERSITY)

ROOM A

*Morning Session*

PLENARY LECTURES

CHAIRPERSON A.B. FREIDIN

- 10:00 – 10:35 **Posch H.A.** Hydrodynamics of one-dimensional particle systems
- 10:35 – 11:10 **Churilova M.A., Frolov M.E., Repin S.I.** A posteriori error estimates for approximate solutions and adaptive algorithms for plane problems of elasticity theory
- 11:10 – 11:45 **Corigliano A., Ardito R., D'Alessandro L., Zega V.** Metamaterials with auxetic and ultra-wide band gap properties
- 11:45 – 12:20 **Lurie S.A., Aifantis E.C.** Towards internal length gradient for couple problems of mechanics

*Coffee break*

CHAIRPERSON S.A. LURIE

- 12:40 – 13:15 **Melin Petersson S., Ahadi A., Hansson P.** Size influence on the tensile response of single-crystal nano-sized copper beams
- 13:15 – 13:50 **Chudnovsky A., Zhang H., Dudley J.W., Schreiber Yu.** Time-dependent behavior of granular media
- 13:50 – 14:25 **Freidin A.B., Sharipova L.L., Antimonov M.A., Cherkaev A.** Equilibrium two-phase microstructures and optimal composite microstructures

ROOM B

*Evening Session*

MINISYMPOSIUM IN MEMORIAM OF ANTONIO CASTELLANOS MATA

ORGANIZERS: ANTONIO RAMOS, FRANCISCO PONTIGA, ELENA GREKOVA

CHAIRPERSON F. PONTIGA, F. GORDILLO

- 15:25 – 16:00 Gordillo-Vázquez F.J. Electrical activity in the atmosphere of the Earth and other planets of the Solar System
- 16:00 – 16:25 Kostin P.A., Poluektova K.D., Elagin I.A., Markovskii P.Y. The comparison of two types of boundary conditions for the active electrode in simulation of ionic wind
- 16:25 – 16:50 Arrayás M. Self-similarity in negative ionization fronts and geometrical diffusion

*Coffee break*

- 17:10 – 17:35 Samusenko A.V., Stishkov Yu.K. The opposite mode of streamer-to-leader transition
- 17:35 – 18:00 Moss M.S., Yanallah K., Allen R.W.K., Pontiga F. Carbon dioxide splitting using nanosecond pulsed corona discharge
- 18:00 – 18:25 Chirkov V.A., Vasilkov S.A., Stishkov Yu.K. The assessment of the role of the Wien effect in the electrohydrodynamic flow formation in a classical electrode configuration

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19.45 BANQUET



ROOM C

*Evening Session*

YOUNG SCIENTISTS' SESSION (MWM)

CHAIRPERSON A.D. SERGEYEV

- 15:35 – 15:42 Minton J.J., Brambley E.J. Predicting curvature in asymmetrical rolling: comparing predictive models
- 15:42 – 15:49 Subbotin S.V., Dyakova V.V. Inertial waves and pattern formation in librating cylinder with liquid
- 15:49 – 15:56 Vladiev A.V., Chivilikhin S.A. Mathematical modeling of a multiply connected border of the Stokes viscous fluid
- 15:56 – 16:03 Sabirov R.R., Subbotin S.V. On the regimes of average flow appearing in an elastic oscillating spheroidal container

NONLINEAR DYNAMICS, CHAOS AND VIBRATION

CHAIRPERSON A.D. SERGEYEV

- 16:05 – 16:25 Shamolin M.V. Cases of integrability corresponding to the motion of a pendulum in the four-dimensional space
- 16:25 – 16:45 Munitsyna M.A. The dynamics of an ellipsoid with displaced mass centre on a horizontal plane

*Coffee break*

CHAIRPERSON M.V. SHAMOLIN

- 17:05 – 17:25 Sulimov V.D., Shkapov P.M., Sulimov A.V. Jacobi stability and updating parameters of the Lorenz system using hybrid algorithms
- 17:25 – 17:45 Zhilenko D.Yu., Krivososova O.E. The role of synchronization in transition to two-dimensional and three-dimensional turbulence
- 17:45 – 18:05 Krivososova O.E., Zhilenko D.Yu. DNS of turbulent flows in spherical layer, driven by torsional oscillations of boundaries
- 18:05 – 18:25 Sergeyev A.D. A closed string and the stability of its reference circular configuration

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19.45 BANQUET

ROOM D  
*Evening Session*

MINISYMPOSIUM “FINITE ELEMENT AND ISOGEOMETRIC ANALYSIS OF  
ADVANCED PROBLEMS IN MECHANICS”

ORGANIZERS: JARKKO NIIRANEN AND ANTTI NIEMI  
CHAIRPERSON J. NIIRANEN

- 15:30 – 15:55 Niemi A.H., Fedorik F. Dynamic finite element analysis of pedestrian bridges
- 15:55 – 16:20 Morozov A., Khakalo S., Balobanov V., Niiranen J., Freidin A.B., Müller W. Numerical modelling of transformation front propagation based on isogeometric analysis procedure

CHAIRPERSON A. NIEMI

- 16:20 – 16:45 Niiranen J., Balobanov V., Yaghoubi S.T., Mousavi S.M. Variational formulations, model comparisons and isogeometric analysis for Euler-Bernoulli, Timoshenko and higher-order beam models of strain gradient elasticity

*Coffee break*

- 17:05 – 17:30 Balobanov V., Niiranen J., Khakalo S. Shell models in strain gradient elasticity: variational formulations and isogeometric implementation
- 17:30 – 17:55 Khakalo S., Niiranen J. Isogeometric analysis of Mindlin’s Form II second strain gradient elasticity: from nano to macro scales
- 17:55 – 18:20 Michitsch C.M., Nackenhorst U.N. Augmented and virtual reality in mechanics. About the professional usage in teaching and science communication

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19.45 BANQUET

ROOM E  
*Evening Session*

YOUNG SCIENTISTS’ SESSION (MWM)  
CHAIRPERSON M.B. BABENKOV

- 15:20 – 15:27 Begun A.S., Kovtanyuk L.V., Lenza A.O. Creep and viscoplastic flow in the cylindrical layer of a material at nonuniform rotation of an internal boundary surface
- 15:27 – 15:34 Krauchanka M.Yu., Krasnitskii S.A., Gutkin M.Yu., Kolesnikova A.L., Romanov A.E. Stress relaxation in decahedral small particles through formation of circular prismatic dislocation loops
- 15:34 – 15:41 Belonogov N.S., Wildemann V.E. Experimental study of aluminum alloy durability under multiaxial fatigue loading
- 15:41 – 15:48 Emelianova E.S., Sergeev M.V., Skripnyak N.V. Mechanical behavior of Fe-Cr steels for generation IV nuclear reactors. Numerical simulation

MECHANICS OF MEDIA WITH MICROSTRUCTURE

CHAIRPERSON M.YU. GUTKIN

- 15:50 – 16:10 Yakovlev Yu.A., Mansyrev D.E., Polyanskiy S.V. Skin effect of redistribution of dissolved hydrogen in metals under tension
- 16:10 – 16:30 Grigorieva P.M., Vilchevskaya E.N. Influence of stress-dependent diffusion and chemical affinity on chemical reaction front kinetics under mechanical loads
- 16:30 – 16:50 Shubin S.N., Freidin A.B. Self-adapted elastomer composites preventing temporary overcooling of a seal

*Coffee break*

- 17:10 – 17:30 Trofimov A., Sevostianov I., Drach B. Effective elastic properties of composites with particles of polyhedral shapes

NANO- AND MICROMECHANICS

CHAIRPERSON S.P. MELIN

- 17:30 – 17:50 Lurie S.A. Modeling of properties of multifunctional composites with CNTs “fuzzy” fibers across the length scales
- 17:50 – 18:10 Gutkin M.Yu., Kolesnikova A.L., Yasnikov I.S., Vikarchuk A.A., Aifantis E.C., Romanov A.E. Stress relaxation and fracture in hollow decahedral small particles under chemical etching
- 18:10 – 18:30 Bobylev S.V., Ovid’ko I.A. Plastic deformation through stress-induced migration of high-angle grain boundaries in metal-graphene nanocomposites

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19.45 BANQUET

JUNE 27, TUESDAY  
(PETER THE GREAT ST.PETERSBURG POLYTECHNIC UNIVERSITY)

ROOM A  
*Morning Session*  
PLENARY LECTURES  
CHAIRPERSON B. DESMORAT

- 10:00 – 10:35 Guzev M.A., Dmitriev A.A. Heat flux for finite linear chain of N-particles  
10:35 – 11:10 Liu X., Zhou Y., Wang J. A space-time fully decoupled wavelet Galerkin method for studying nonlinear structural dynamics  
11:10 – 11:45 Travis K. Applications of particle dynamics — from the molecular scale to the continuum

*Coffee break*

CHAIRPERSON J. WANG

- 12:05 – 12:40 Cailletaud G., Yastrebov V., Tkalich D. Deriving constitutive behavior laws for composites and polycrystals using direct microstructure-respective finite-element simulations and uniform field homogenization method  
12:40 – 13:15 Desmorat B., Desmorat R., Kolev B., Olive M. Micromechanics based framework with second order damage tensors



ROOM B  
*Evening Session*  
DAMAGE AND FRACTURE  
CHAIRPERSON L.A. NAZAROVA

- 14:15 – 14:35 Nazarov L.A., Nazarova L.A., Petrov M.N. Mass transfer and deformation of porous-fractured media  
14:35 – 14:55 Nazarova L.A., Nazarov L.A., Vandamme M., Pereira J.-M. Determination of deformation and filtration properties of coal based on coefficient inverse problem solution using adsorption test data  
14:55 – 15:15 Arutyunyan A.R., Arutyunyan R.A. On the conditions of transition to the unstable state of the compressible plastic and elastic-viscous materials  
15:15 – 15:35 Arutyunyan R.A. Formulation and experimental justification of high-temperature creep fracture criterion  
15:35 – 15:55 Petinov S.V., Melnikov B.E. Stress-life criteria for fatigue assessment of structures: advantages and drawbacks  
15:55 – 16:15 Stigh U., Biel A. Studies of fracture in shear of a constrained layer  
16:15 – 16:35 Mayer A.E., Mayer P.N., Krasnikov V.S., Pogorelko V.V., Borodin E.N. Microstructure evolution in metals and metal melts during dynamic tensile fracture

*Coffee break*

COMPUTATIONAL MECHANICS  
CHAIRPERSON N.S. MARKOV

- 16:55 – 17:15 Korneev V.G., Kostylev V.S. A posteriori error bounds for numerical solutions of plate in bending problems  
17:15 – 17:35 Wang J., Liu X., Zhou Y. Solutions of mechanics problems with strong nonlinearity  
17:35 – 17:55 Liu W., Yang X., Zhou Y., Ge M., Zeng M. Numerical study on high-lift multi-element configurations with fifth-order accurate HWCNS  
17:55 – 18:15 Closing ceremony

ROOM C  
*Evening Session*

WAVE MOTION AND NONLINEAR DYNAMICS  
CHAIRPERSON A. L. KORZHENEVSKII

- 14:15 – 14:45 Berinskii I.E., Slepyan L.I. How a dissimilar-chain system is splitting
- 14:45 – 15:15 Kosevich Yu.A. Analytical model of nonlinear wave interactions between thermal acoustic and optical phonons in crystal lattice with cubic anharmonicity
- 15:15 – 15:35 Dudko O.V. The appearance of nonlinear deformation waves in the elastic porous medium under non-stationary uniaxial loading
- 15:35 – 15:55 Zhuchkova M.G. Flexural-gravitational wave propagation through periodic structures in floating plates
- 15:55 – 16:15 Filippenko G.V. Waves with the negative group velocity in cylindrical shell of Kirchoff / Love type
- 16:15 – 16:35 Wilde M.V. Two-dimensional theory for describing of Rayleigh wave field in layered cylindrical shell

*Coffee break*

CHAIRPERSON I.E. BERINSKII

- 16:55 – 17:15 Kolykhalin V.M. Adjustment for decrease of magnetic motor noise
- 17:15 – 17:35 Indeitsev D.A., Meshcheryakov Yu.I., Skubov D. Yu., Vavilov D.S. On structural transformations under mechanical impact
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- 17:35 – 17:55 Korzhenevskii A.L. Dynamic models of propagating interfaces

*Closing ceremony (room B)*

ROOM D  
*Evening Session*

YOUNG SCIENTISTS' SESSION (MWM)  
CHAIRPERSON W.H. MÜLLER

- 14:15 – 14:22 Parfenova E.S., Knyazeva A.G. The non-isothermal mathematical model of ion implantation process with account of internal boundary
- 14:22 – 14:29 Anisimova M.A., Knyazeva A.G. Formation of the transition zone between the matrix and the inclusion during the synthesis of composite
- 14:29 – 14:36 Rzhavtcev E.A., Gutkin M.Yu. Computer simulation of dynamics of threading dislocations in porous epitaxial layers of gallium nitride
- 14:36 – 14:43 Lekanov M.V., Mayer A.E. Simulation of cylindrical shell collapse with considering of the dislocation plasticity of metals
- 14:43 – 14:50 Kucher D.A., Chivilikhin S.A. Modelling hydrothermal synthesis in autoclave with optical access

NANO- AND MICROMECHANICS

CHAIRPERSON A. GAT

- 14:50 – 15:10 Chivilikhin S.A., Kucher D.A. Two-scale model of hydrothermal synthesis of nanoscrolls
- 15:10 – 15:30 Abramyan A.K., Bessonov N.M., Mirantsev L.V. Behavior of polar and nonpolar liquids in different carbon nanotubes
- 15:30 – 15:50 Solyaev Y.O., Lurie S.A. Analytical and numerical simulation of the beam bending within 2D and 3D formulation of different gradient elasticity theories
- 15:50 – 16:10 Skiba N.V., Ovid'ko I.A. Competition between dislocation slip and deformation twinning in ultrafine and coarse-grained metals
- 16:10 – 16:30 Nevskii S.A., Sarychev V.D., Sarycheva E.V., Konovalov S.V. Instability of shear flows in the nanometer wavelength range

*Coffee break*

CHAIRPERSON O.S. LOBODA

- 16:50 – 17:10 Skubov D.Yu., Privalova O.V., Shtukin L.V., Lukin A.V., Popov I.A. Equilibrium forms bifurcation of the nonlinear NEMS/MEMS
- 17:10 – 17:30 Vaniushkina V.V., Shtukin L.V., Berinskii I.E. Development of the electro-mechanical models of the carbon nano-whiskers as mass detectors

*Closing ceremony (room B)*



ROOM E  
*Evening Session*  
YOUNG SCIENTISTS' SESSION (MWM)  
CHAIRPERSON P.A. DYATLOVA

- 14:15 – 14:22 **Blank A.V., Kapranov V.V., Suhareva N.A., Tugaenko V.Yu.** Experimental study of stochastic effects in adaptive tip-tilt correction for horizontal-propagating signal beam in atmosphere
- 14:22 – 14:29 **Ge M., Zeng M., Zhao X., Liu W., Yang X.** Numerical study for the hypersonic shock-boundary-layer interaction flow with ablation

GAS AND AEROSPACE  
CHAIRPERSON P.M. GRIGORIEVA

- 14:30 – 14:50 **Georgievskiy P.Yu., Levin V.A., Sutyryn O.G.** Shock focusing and pressure jumps effects for the interaction of blunt bodies with gas bubbles in a supersonic flow
- 14:50 – 15:10 **Krutova I.Yu., Bautin S.P., Deryabin S.L., Obukhov A.G.** Destructive atmospheric vortices and the Earth rotation around its axis
- 15:10 – 15:30 **Matias D.V.** Hyperbolic thermoelasticity in gas medium under laser impact
- 15:30 – 15:50 **Abobaker M., Krivtsov A.M., Murachev A.** Dynamics of gravitating system of gas and dust cloud
- 15:50 – 16:10 **Zeng M., Zhao X., Ge M., Yang X., Liu W.** Theoretical and numerical analysis of the flow separation criterion for hypersonic nonequilibrium flow over compression corner
- 16:10 – 16:30 **Yang X., Liu X., Chai Z., Ge M.** The lateral stability problem and numerical simulation of a slender delta wing during self-excited wing rock

*Coffee break*

CHAIRPERSON P.YU. GEORGIEVSKIY

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- 16:50 – 17:10 **Fedorova A.N., Zeitlin M.G.** Quasiclassics in Wigner – Moyal – von Neumann framework via multiresolution
- 17:10 – 17:30 **Fedorova A.N., Zeitlin M.G.** Multiscale structure of polynomial dynamics

*Closing ceremony (room B)*