

Curriculum Vitae

Personal Details

Name **Dr. Vladimir Bratov**

Date of Birth **07 September 1978**

Citizenship **Russian Federation**

Present Affiliations **1 Senior Research Fellow, Institute of Problems in Mechanical Engineering of the Russian Academy of Sciences**
2 Associate Professor, St. Petersburg State University
3 Associate Professor, Peter the Great St. Petersburg Polytechnic University

Marital Status **Married to Natalia Bratova, 2 children (Viktor, born 2004 and Fjodor, born 2008)**

Languages Russian (native), English (fluent), Swedish (fluent), Spanish (good command), Chinese (intermediate), French (beginner), Turkish (beginner)

Contact information

Address **IPME RAS, Bolshoy pr. V.O., 61, 199178, St. Petersburg, Russia**

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Education

- Master's Degree in Applied Mathematics and Mechanics, June 2000
St. Petersburg State University
- Doctor's Degree in Solid Mechanics, May 2004
St. Petersburg State University, PhD title: "Energetic Peculiarities of Dynamic Fracture of Materials"

WORK EXPERIENCE

2000-2001: St. Petersburg State University, Postgraduate Student, Research Scientist;

2001-2006: Malmö University, Sweden, Postgraduate Student, Research Scientist, Research and teaching

09.2016-08.2017: Middle East Technical University, Ankara
Aerospace Engineering,
Visiting Associate Professor,
Research and teaching

2004-Present: **Russian Academy of Sciences,
Institute for Problems of Mechanical Engineering,
Department of Extreme States of Materials and Structures
St. Petersburg, Senior Research Fellow, Research**

2008-Present: **St. Petersburg State University,
Faculty of Mathematics and Mechanics,
Department of Elasticity
Associate Professor,
Research and teaching**

2020-Present: **Peter the Great St. Petersburg Polytechnic University,
Institute of Applied Mathematics and Mechanics,
Associate Professor,
Research and teaching**

Research Interests

- Finite Element Method
- Numerical Methods in Solid Mechanics
- Dynamic Fracture
- Multiscale Fracture
- Fracture of Rocks and Concrete
- Problems of High-Speed Transportation
- Fracture of Steel and other Metals
- Transient Processes
- Severe Plastic Deformation
- Dislocation Plasticity and Models of Dislocation Kinetics
- Dynamic Yielding
- Optimization of Energy Input for Fracture
- Gas Transportation Problems

Professional memberships:

- ESIS (European Structural Integrity Society) (since 2007)
- EUROMECH (since 2012)
- Scientific Secretary of ESIS Technical Committee “Dynamics of fracture and structural transformations” (elected 2015)

Regular Reviewer:

- International Journal of Solids and Structures
- Engineering Fracture Mechanics
- Technical Physics
- Shock and Vibration
- Engineering Science and Technology

Grants and awards

Principal investigator:

- 2016-2018 Russia-Slovenia Bilateral Research grant ARRS-MS-BI-RU-JR-Prijava/2016/12
- 2012-2013 RFBF Research grant № 12-01-31224
- 2012-2013 President Grant for Young Russian Scientists MK-1262.2012.1
- 2012 St. Petersburg State University Collaboration Grant 6.44.218.2012
- 2009-2010 President Grant for Young Russian Scientists MK-1610.2009.1
- 2009 Research Grant of Government of St. Petersburg

- 2008 Research Grant of Government of St. Petersburg
- 2007 Research Grant of Government of St. Petersburg

Co-investigator

- 2020-2022 RSF Research Grant 20-49-08002
- 2020-2022 RSF Research Grant 20-11-20133
- 2020-2021 RFBF Research grant № 19-51-45016
- 2016-2018 RFBF Research grant № 14-01-00814
- 2014-2016 RFBF Research grant № 13-01-00598
- 2014-2016 RFBF Research grant №12-01-33049
- 2006-2013 around 15 RFBR Research grants
- 2014-2015 St. Petersburg State University Research Grant 6.39.319.2014
- 2014-2015 St. Petersburg State University Research Grant 6.38.243.2014
- 2013-2014 St. Petersburg State University Research Grant 6.37.671.2013
- 2012-2013 St. Petersburg State University Research Grant 6.39.1053.2012
- 2012-2013 St. Petersburg State University Research Grant 6.37.137.2011
- 2012-2013 St. Petersburg State University Research Grant 6.37.134.2011
- 2010-2012 Russian Ministry of Education Project № 02.740.11.0619
- 2010-2011 Russian Ministry of Education Project № 02.740.11.5171
- 2009-2010 Russian Ministry of Education Project № 2.1.1/1935
- 2008-2013 Four Royal Society of London Collaboration Grants (with Universities of Loughborough and Cardiff)
- 2009-2014 Three Swiss Scientific Foundation Collaboration/Research Grants (with EPFL, Lausanne and SUPSI, Lugano)
- 2008-2012 Three Chinese National Science Foundation Collaboration Grants

Industrial Projects:

- **Russian Railways** (“Investigation of Upper Railway Track Dynamics on the Basis of Model Problems of Elasticity and Modern Computational (Program) Facilities”, 2009-2010, ~€ 220.000)
- **GAZPROM** (“Experimental and Analytical Investigation of Crack Resistance and Strength Under High-Rate loading”, 2007-2010, ~€ 150.000)
- **St. Petersburg Asphalt Factory** (“Erosion-Type Fracture of Asphalt by Impacts of Automobile Tyre Studs”, 2013, ~€ 20.000)

Supervision of graduate students

2011–2014 Supervision of a PhD student (awarded a PhD in June 2014)

2008–present Supervision of 2-3 BSc/MSc students each year

Undergraduate Teaching:

- General Mechanics (Malmö Högskola, 2003-2005)
- Statics (Middle East Technical University, 2016-)
- Applied Elasticity (Middle East Technical University, 2016-2017)

- Dynamics (Middle East Technical University, 2016-2017)
- Strength of Materials (Middle East Technical University, 2016-2017)

Graduate Teaching:

- Mathematical methods in mechanics (St-Petersburg State University, 2008 -)
- Advanced fracture mechanics (St-Petersburg State University, 2010 -)
- Computational mechanics (St-Petersburg State University, 2011 -)
- Numerical methods (Peter the Great St. Petersburg Polytechnic University, 2018 -)

Postgraduate Teaching:

- Computational fracture mechanics (St-Petersburg State University, 2015 -)
- Computational plasticity (St-Petersburg State University, 2015 -)

Conference organization

- Topical Problems of Solid Mechanics (2013), 36 Participants (Chair and Principal Organizer)
- BEM&FEM (2010-2014) (member of the Organizing Committee)
- MCM (2015-2017) (member of the Organizing Committee)

Invited Speaker:

- APM-2013, Actual Problems in Mechanics, 2013, St. Petersburg, Russia
- ISRM Workshop on Rock Dynamics, 2009, Lausanne, Switzerland
- MCM-2017, Mathematical and Computer Simulation in Mechanics of Solids and Structures, 2017, St. Petersburg, Russia

Recent Conference Presentations:

- APM-2019, Advanced Problems in Mechanics, June 24– 29, 2019, St. Petersburg, Russia.
- XXII International Scientific Conference on Advanced In Civil Engineering CONSTRUCTION THE FORMATION OF LIVING ENVIRONMENT 2019, TASHKENT, UZBEKISTAN, 18.04.2019 - 21.04.2019
- XII ВСЕРОССИЙСКИЙ СЪЕЗД ПО ФУНДАМЕНТАЛЬНЫМ ПРОБЛЕМАМ ТЕОРЕТИЧЕСКОЙ И ПРИКЛАДНОЙ МЕХАНИКИ, Уфа, Россия, 19.08.2019 - 24.08.2019
- APM 2018, Advanced Problems in Mechanics, June 25– 30, 2018, St. Petersburg, Russia.
- MCM-2017, Mathematical and Computer Simulation in Mechanics of Solids and Structures, September 25-27, 2017, St. Petersburg, Russia
- COMPLAS 2017, XIV International Conference on Computational Plasticity, September 5-7, 2017, Barcelona, Spain
- IMPLAST 2016, the 11th International Symposium on Plasticity and Impact Mechanics, December 11 - 14, 2016 New Delhi, India
- 21st European Conference on Fracture, June 20th-24th, 2016, Catania, Italy
- International conference “Strength of Structures, Seismodynamics of Buildings and Constructions”, 2016, September 12th-14th, Tashkent, Uzbekistan
- Annual International Conference “Days on Diffraction 2016”, June 27th-July 1st, St.Petersburg, Russia

- 11th International DYMAT Conference, September 7th-11th, 2015, Lugano, Switzerland
- IX Russian Congress on Theoretical and Applied Mechanics, August 19th-24th, 2015, Kazan, Russia
- 12th International Conference on the Mechanical Behavior of Materials, May 10th-14th, 2015, Karlsruhe, Germany
- Euromech Colloquium №574 «Recent trends in modeling of moving loads on elastic structures», April 15th-17th, 2015, Eskisehir, Turkey
- XXX International Conference on Interaction of Intense Energy Fluxes with Matter, March 1st-6th, 2015, Elbrus, Kabardino-Balkaria, Russia
- The 6th International Conference on Nanomaterials by Severe Plastic Deformation, June 30th - July 4th, 2014, Metz, France

Major collaborators:

- Prof. J.D. Kaplunov, School of Computing and Mathematics, Keele University, UK
- Prof. S. Kralj, Faculty of Natural Sciences and Mathematics University of Maribor, Slovenia
- Assoc. Prof. A. Iqbal, IIT Roorkee, India
- Prof. V. Silberschmidt, School of Mechanical and Manufacturing Engineering, Loughborough University, UK
- Prof. E. Cadoni, Head of DynaMat Laboratory, University of Applied Sciences and Arts of Southern Switzerland.
- Prof. Ya-Pu Zhao, State Key Laboratory of Nonlinear Mechanics, Institute of Mechanics, Chinese Academy of Sciences.

Publications:

1 book, 1 book chapter and more than 60 peer-reviewed journal publications

Books and Book Chapters:

1. V. Bratov, N. Morozov, Y. Petrov, Dynamic Strength of Continuum, 2009, St.-Petersburg University Press, ISBN 978-5-288-04932-1, 223 p.
2. Y. Petrov, V. Bratov, G. Volkov, E. Dolmatov, Incubation Time Based Fracture Mechanics and Optimization of Energy Input in the Fracture Process of Rocks. Chapter in: Advances in Rock Dynamics and Applications, Eds: Yingxin Zhou, Jian Zhao, 2011, CRC Press, New York, pp.163-184.

List of Selected Publications

1. V.A. Bratov, A.V. Ilyashenko, S.V. Kuznetsov, T.-K. Lin, N.F. Morozov (2020) Homogeneous Horizontal and Vertical Seismic Barriers: Mathematical Foundations and Dimensional Analysis . Materials Physics and Mechanics, 44 :61-65
2. N.A.Kazarinov, V.A.Bratov, N.F.Morozov, Y.V.Petrov, V.V.Balandin, M.A.Iqbal, N.K.Gupta (2020) Experimental and numerical analysis of PMMA impact fracture. International Journal of Impact Engineering, 143 :103597
3. G.A. Volkov, V.A. Bratov, E.N. Borodin, A.D. Evstifeev and N.V. Mikhailova (2020) Numerical simulations of impact Taylor tests. Journal of Physics: Conference Series, 1556 :012059
4. M.K. Khan, M.A. Iqbal, V. Bratov, N.F. Morozov, N.K. Gupta (2020) An investigation of the ballistic performance of independent ceramic target. Thin-Walled Structures, 154 :106784

5. Borodin E.N., Morozova A., Bratov V., Belyakov A., Jivkov A.P. (2019) Experimental and numerical analyses of microstructure evolution of Cu-Cr-Zr alloys during severe plastic deformation, *Materials Characterization*, 156:109849, doi: 10.1016/j.matchar.2019.109849
6. Bratov V., Krivtsov A. (2019) Analysis of energy required for initiation of inclined crack under uniaxial compression and mixed loading, *Engineering Fracture Mechanics*, doi: 10.1016/j.engfracmech.2019.106518
7. M.K. Khan, M.A. Iqbal, V. Bratov, N.K. Gupta, N.F. Morozov (2019) A Numerical Study of Ballistic Behaviour of Ceramic Metallic Bi-Layer Armor Under Impact Load. *Materials Physics and Mechanics*, 42 :699-710
8. Egor Shel, Vladimir Bratov, Igor Chebyshev, Grigory Paderin, Ildar Bazyrov (2019) Conditions of Secondary Fracture Reorientation for Cases of Vertical and Horizontal Wells, *SPE Russian Petroleum Technology Conference*, doi: 10.2118/196966-MS
9. Vladimir Bratov, Nikita Kazarinov (2019) Dynamic Fracture of Ceramic Plates due to Impact Loading. Numerical Investigation, *Materials Physics and Mechanics*, 42:389-395, doi: 10.18720/MPM.4242019_3
10. Bratov Vladimir, Ilyashenko Alla, Morozov Nikita, Rashidov Tursunbai (2019) Seismic barriers: theory and numerical simulations, *E3S*, doi: 10.1051/e3sconf/20199703005
11. M.K. Khan, M.A. Iqbal, V. Bratov, N.K. Gupta, N.F. Morozov (2019) A numerical study of ballistic behaviour of ceramic metallic bi-layer armor under impact load, *Materials Physics and Mechanics*, 42:699-710, doi: 10.18720/MPM.4262019_2
12. Bratov Vladimir (2018) Numerical Models for Hydraulic Refracturing on Vertical Oil Wells, *International journal of engineering & technology*, doi: 10.14419/ijet.v7i4.26.27937
13. E.N. Borodin, V. Bratov (2018) Non-equilibrium approach to prediction of microstructure evolution for metals undergoing severe plastic deformation, *Materials Characterization*, 141, 267-278, doi:10.1016/j.matchar.2018.05.002
14. Anna Morozova, Elijah Borodin, Vladimir Bratov, Sergey Zhrebtsov, Andrey Belyakov and Rustam Kaibyshev (2017) Grain Refinement Kinetics in a Low Alloyed Cu–Cr–Zr Alloy Subjected to Large Strain Deformation, *Materials*, 10, 1394, doi:10.3390/ma10121394
15. V. Bratov, E.N. Borodin, G. Volkov (2017), Numerical simulations of Taylor anvil-on-rod impact tests using classical and new approaches, *Procedia Structural Integrity*, 10, 6:330–335 , doi:10.1016/j.prostr.2017.11.050
16. J. Venkatesana, , M.A. Iqbal, N.K. Gupta, V. Bratov, N. Kazarinov, F. Morozov (2017) Ballistic Characteristics of Bi-layered Armour with Various Aluminium Backing against Ogive Nose Projectile. *Procedia Structural Integrity*, 6:40–47, doi:10.1016/j.prostr.2017.11.007
17. V. Bratov, E.N. Borodin (2016) Non-equilibrium features of continuous recrystallization process at severe plastic deformation of copper. *Materials Physics and Mechanics*, 26:38-41
18. Yuri Petrov, Nikita Kazarinov, Vladimir Bratov (2016) Dynamic crack propagation: quasistatic and impact loading. *Procedia Structural Integrity*, 2:389-394, doi:10.1016/j.prostr.2016.06.050
19. V. Bratov, E. Borodin (2015), Comparison of dislocation density based approaches for prediction of defect structure evolution in aluminium and copper processed by ECAP, *Materials Science & Engineering A*, 631:10-17.
20. V. Bratov, Y. Petrov, B. Semenov, I. Darienko (2015) Modelling the high-speed train induced dynamic response of railway embankment. *Materials Physics and Mechanics*, 22 (1):69-77.
21. V. Bratov, N. Kazarinov, Y. Petrov (2015) Numerical simulation of ZrO₂(Y₂O₃) ceramic plate penetration by cylindrical plunger. *EPJ Web of Conferences*, 94 (4056), doi:10.1051/epjconf/20159404056
22. V.A. Bratov, N.A. Kazarinov and Y.V. Petrov (2015) Numerical implementation of the incubation time fracture criterion. *Journal of Physics: Conference Series*, 653 (12049), doi:10.1088/1742-6596/653/1/012049
23. Y. Petrov, V. Smirnov, A. Utkin, V. Bratov (2014) Energy of a solid sphere under nonstationary oscillations. *Science China, Physics, Mechanics and Astronomy*, 57 (3):469-476, doi:10.1007/s11433-013-5370-4
24. N. Kazarinov, V. Bratov, Y. Petrov (2014) Modelling dynamic propagation of a crack at quasistatic loading. *Doklady Physics*, 59 (2):99-102, doi:10.1134/S1028335814020116

25. N.A. Kazarinov, V.A. Bratov, Y.V. Petrov, G.D. Fedorovsky (2014) Evaluation of fracture incubation time from quasistatic tensile strength experiment. *Materials Physics and Mechanics*, 19:16-24.
26. Y.V. Petrov, B.L. Karihaloo, V.A. Bratov (2012) Multi-scale dynamic fracture model for quasi-brittle materials. *International Journal of Engineering Science*, 61:3-9.
27. Y.V. Petrov, A.A. Gruzdkov, V.A. Bratov (2012) Structural-temporal theory of fracture as a multiscale process. *Physical Mesomechanics*, 15 (3):232-237, doi:10.1134/S1029959912020117
28. V. Smirnov, Y.V. Petrov, V. Bratov (2012) Incubation time approach in rock fracture dynamics. *Science China Physics, Mechanics and Astronomy*, 55 (1):78-85, doi:10.1007/s11433-011-4579-3
29. V. Bratov (2011) Incubation time fracture criterion for FEM simulations. *Acta Mechanica Sinica*, 27:541-549, doi:10.1007/s10409-011-0484-2
30. G.A. Volkov, V.A. Bratov, A.A. Gruzdkov, V. Babitsky, Yu.V. Petrov, V. Silberschmidt (2011) Energy-based analysis of ultrasonically assisted turning. *Shock and Vibration*, 18 (1):333-341, doi:10.3233/SAV-2010-0606
31. V. Bratov, Y. Petrov, A. Utkin (2011) Transient near tip fields in crack dynamics. *Science China Series G Physics Mechanics and Astronomy*, 5 (7):1309–1318, doi:10.1007/s11433-011-4362-5
32. G.A. Volkov, V.V. Silberschmidt, V.I. Babitskii, A.A. Gruzdkov, V.A. Bratov, Yu.V. Petrov (2010) Energy aspects of ultrasonic intensification of treatment of metals. *Doklady Physics*, 55 (4):184-185, doi:10.1134/S1028335810040075
33. G.A. Volkov, V.V. Silberschmidt, A.V. Mitrofanov, A.A. Gruzdkov, V.A. Bratov, Yu.V. Petrov (2009) Minimization of fracture-pulse energy under contact interaction. *Doklady Physics*, 54 (7):322-324, doi:10.1134/S1028335809070040
34. V. Bratov (2009) Numerical models of dynamic fracture. *Computational mechanics of solid state*, 2 (3):5-16
35. V.A. Bratov, N.F. Morozov, Y.V. Petrov (2008) Simulating the SMART1 orbiter impact on the Moon's surface. *Doklady Physics*, 53 (3):152-155, doi:10.1134/S1028335808030099
36. V.A. Bratov, L.M. Isakov, Yu.V. Petrov (2008) A criterion for detonation initiation in gas mixtures. *Doklady Physics*, 53 (10):507-509, doi:10.1134/S1028335808100017
37. V. Bratov, Y. Petrov (2007) Optimizing energy input for fracture by analysis of the energy required to initiate dynamic mode I crack growth. *International Journal of Solids and Structures*, 44:2371-2380, doi:10.1016/j.ijsolstr.2006.07.013
38. V. Bratov, Y. Petrov (2007) Application of incubation time approach to simulate dynamic crack propagation. *International Journal of Fracture*, 146:53-60, doi:10.1007/s10704-007-9135-9
39. V.A. Bratov, Yu.V. Petrov (2007) Application of the incubation time criterion to the description of dynamic crack propagation. *Doklady Physics*, 52 (10):565-567,
40. V.A. Bratov, A.A. Gruzdkov, S.I. Krivosheev, Yu.V. Petrov (2004) Energy balance in the crack growth initiation under pulsed-load conditions. *Doklady Physics*, 49 (5):338-341, doi:10.1134/1.1763630