Dr Elijah N. Borodin

Manchester, UK
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EDUCATION

Sep 2010 – Jul 2012, PhD, **Chelyabinsk State University**
Thesis: “Numerical simulation of plastic flow of fine-grained metals”

Sep 2004 – Jun 2010, BSc/ MSc, **South Ural State University**
Dissertation: “Numerical simulation of the Marangoni instability in an incompressible liquid”

CURRENT APPOINTMENT

Aug 2023 – Present **University of Manchester**
Lecturer in Solid Mechanics

- 2023/2024 and 2024/2025, *Course lead* Mechanics (MECH11602 and MECH11622)
- 2023/2024 and 2024/2025, *Lecturer* Applied Mechanics & Industrial Robotics unit (EEEN20282)
- 2023/2025, Supervision of 13 BEng projects
- 2023/2025, Supervision of 8 MSci projects
- 2023/2025, Supervision of 3 PhD students
- 2023/2025, Coordinator of the Structures and Extreme Environments (SEE) group for undergraduate (BEng) dissertation projects

Dec 2017 – Jul 2023 **University of Manchester**
Research Fellow

- 2021-2023, Matlab module lead of the undergraduate unit Tools for Engineers: lectures for 450 students, practical classes, and administrative work.
- 2021-2023, Supervision of two PhD students.
- 2021-2023, Supervision of the dissertation projects of seven MSc students and five BSc students.
- 2021-2023, Coordinator of the Structures and Extreme Environments (SEE) group for undergraduate dissertation projects.
- Sep. 2021 – Aug. 2023, PI in the EPSRC-funded project “Patterns recognition inside shear bands: tailoring microstructure against localization (PRISB)” (EP/V022687/1).
- Sep. 2021 – Aug. 2023, Line manager of Dr Oleg Bushuev (PRISB PDRA).
- Coordinator of the “Friday Talks” weekly seminar for PhD students and academics.

PREVIOUS APPOINTMENTS

Nov 2012 – Dec 2017 **Russian Academy of Sciences, Institute of the Problems of Mechanical Engineering**
Senior Researcher

- Research projects

Sep 2009 – Dec 2017 **Chelyabinsk State University, Department of Physics**
Senior Researcher

- Research projects

Oct 2015 – Dec 2017 **Ural Federal University, Institute of Natural Science**
Senior Researcher

- Research projects

Sep 2013 – Dec 2015 **Chelyabinsk State University, Department of Physics**
Assistant Professor

- *Lecturer* in General Physics for undergraduate students.
- Tutorials and laboratory classes with undergraduate students.

MEMBERSHIP

- Since 2019, a member of the ***Institute of Physics*** (MInstP)
- Since 2022, a member of the ***EPSRC Peer Review College***

PROJECT LEAD

2021-2023 "**Patterns recognition inside shear bands: tailoring microstructure against localisation (PRISB)**" (EPSRC, £282,347)

REVIEWER

Materials and Design, International Journal of Plasticity, Materials Characterisations, Computational Materials Science, Metallurgical and Materials Transactions A, Materials, Experimental Mechanics, and several other journals.

ADDITIONAL SKILLS

- *Theoretical Materials Science and Mechanics of Materials:* Microstructure Analysis of Metals and Alloys (Dislocations, Grain Boundaries, Mechanical Twinning, Adiabatic Shear Bands, Pores), Shock Waves, Localization, High Strain Rate, Plasticity, Continuum Mechanics, Nanocrystalline Metals, Severe Plastic Deformation, Dynamic Recrystallization, Material Characterization, Fracture Mechanics, Materials Processing.
- *Numerical Simulations of Physical Processes*: C++, Python, MATLAB, Mathematica programming languages – advanced programmer and software developer;
- *Web des*ign: HTML, CSS, JavaScript.

Languages: English (fluent), Russian (native)

RESEARCH STANDING

Publications 50

System	*h-index*	*citations*
Research Gate	*16*	*676*
Google	*18*	*945*
Scopus	*15*	*601*
Web of Science	*15*	*563*

SELECTED PUBLICATIONS

[1] O. Bushuev, **E. Borodin**, A. Bodyakova, S. Zhu, A. P. Jivkov, 2025. *Disorientation-based classification of mesostructures in severely deformed copper alloys.* ***Acta Materialia***, 286, 120714. 10.1016/j.actamat.2025.120714

[2] **E. Borodin**, O. Bushuev, V. Bratov, A. P. Jivkov, 2024. *Discrete model for discontinuous dynamic recrystallisation applied to grain structure evolution inside adiabatic shear bands.* ***Journal of Materials Research and Technology***, 30, 2125-2139. 10.1016/j.jmrt.2024.03.206

[3] **E.N. Borodin**, A.G. Sheinerman, O.Yu. Bushuev, M.Yu. Gutkin, A.P. Jivkov, 2024. *Defect-induced fracture topologies in Al2O3 ceramic-graphene nanocomposites.* ***Materials & Design***, 239, 112783. 10.1016/j.matdes.2024.112783

[4] S. Zhu, **E. Borodin**, A.P. Jivkov, 2024. *Discrete modelling of continuous dynamic recrystallisation by modified Metropolis algorithm.* ***Computational Materials Science***, 234, 112804. 10.1016/j.commatsci.2024.112804

[5] S. Zhu, A. P. Jivkov, **E. Borodin**, A. Bodyakova, 2024. *Triple junction disclinations in severely deformed Cu–0.4%Mg alloys.* ***Acta Materialia***, 264, 119600. 10.1016/j.actamat.2023.119600

[6] S. Zhu, **E. Borodin**, A.P. Jivkov, 2023. *Topological characteristics of grain boundary networks during severe plastic deformations of copper alloys.* ***Acta Materialia*** 259, 119290. https://doi.org/10.1016/j.actamat.2023.119290.

[7] **E. Borodin**, A.P. Jivkov, A.G. Sheinerman, M. Yu. Gutkin, 2021. *Optimisation of rGO-enriched nanoceramics by combinatorial analysis.* ***Materials & Design***, 212, 110191. https://doi.org/10.1016/j.matdes.2021.110191.

[8] D. Zaytsev, **E.N. Borodin**, A.E. Dudorov, *et al., 2021. The Mechanical Properties of Chelyabinsk LL5 Chondrite Under Compression and Tension.* ***Earth Moon Planets***, 125, 2. https://doi.org/10.1007/s11038-021-09539-x.

[9] S. Zhu, **E. Borodin**, A.P. Jivkov, 2021. *Triple junctions network as the key pattern for characterisation of grain structure evolution in metals*. **Materials & Design**, 198, 109352. https://doi.org/10.1016/j.matdes.2020.109352.

[10] **E.N. Borodin**, A.E. Mayer, M.Yu. Gutkin, 2020. *Coupled model for grain rotation, and grain boundary sliding in fine-grained solids dislocation plasticity.* ***International Journal of Plasticity*** 134, 102776. https://doi.org/10.1016/j.ijplas.2020.102776.

[11] **E.N. Borodin**, A. Morozova, V.Bratov, A. Belyakov, A. Jivkov, 2019. *Experimental and numerical analyses of microstructure evolution of Cu-Cr-Zr alloys during severe plastic deformation.* ***Materials Characterization*** 156, 1098495. doi: 10.1016/j.matchar.2019.109849.

[12] **E. N. Borodin**, A. P. Jivkov, 2019. *Evolution of triple junctions' network during severe plastic deformation of copper alloys – a discrete stochastic modelling.* ***Philosophical Magazine*** 100(4), 467-485. doi: 10.1080/14786435.2019.1695071.

[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] **E.N. Borodin**, S. Seyedkavoosi, D.V. Zaitsev, B. Drach, K.N. Mikaelyan, P.E. Panfilov, M.Yu. Gutkin, I. Sevostianov, 2017. *Viscoelasticity and mechanisms of plasticity of human teeth dentin.* ***Physics of the Solid State*** 60(1), 120-128. doi:10.1134/S1063783418010079

[15] **E.N. Borodin**, M. Yu. Gutkin, K.N. Mikaelyan, P. Panfilov, 2017. *Theoretical model of the plastic zone at the I-mode crack tip in dentin*. ***Scripta Materialia*** 133(5), 45-48. doi:10.1016/j.scriptamat.2017.02.007.

[16] N. Selyutina, **E.N. Borodin**, Y. Petrov, A.E. Mayer, 2016. *The definition of characteristic times of plastic relaxation by dislocation slip and grain boundary sliding in copper and nickel*. ***International Journal of Plasticity*** 82, 97-111. doi:10.1016/j.ijplas.2016.02.004.

[17] **E.N. Borodin**, A.E. Mayer, 2015. *Structural model of mechanical twinning and its application for modeling of the severe plastic deformation of copper rods in Taylor impact tests*. ***International Journal of Plasticity*** 74, 141-157. doi:10.1016/j.ijplas.2015.06.006.

[18] V. Bratov, **E.N. Borodin**, 2015. *Comparison of dislocation density based approaches for prediction of defect structure evolution in aluminium and copper processed by ECAP*. ***Materials Science and Engineering A*** 631, 10-17. doi:10.1016/j.msea.2015.02.019.

[19] Yu.V. Petrov, **E.N. Borodin**, 2015. *Relaxation mechanism of plastic deformation and its justification using the example of the sharp yield point phenomenon in whiskers*. ***Physics of the Solid State*** 57(2), 353–359. doi:10.1134/S1063783415020286.

[20] **E.N. Borodin**, A.E. Mayer, Yu.V. Petrov, A.A. Gruzdkov, 2014. *Maximum yield strength under quasi-static and high-rate plastic deformation of metals*. ***Physics of the Solid State*** 56(12), 2470-2479. doi:10.1134/S1063783414120051.

[21] **E.N. Borodin**, Yu.V. Petrov, 2014. *Relaxation model of dynamic plastic deformation of materials*. ***Mechanics of Solids*** 49(6), 635-642. doi:10.3103/S0025654414060041.

[22] **E.N. Borodin**, S.A. Atroshenko, A.E. Mayer, 2014. *Distribution of dislocations and twins in copper and 18Cr-10Ni-Ti steel under shock-wave loading*. ***Technical Physics*** 59(8), 1163-1170. doi:10.1134/S1063784214080076.

[23] A.E. Mayer, **E.N. Borodin**, P.N. Mayer, 2013. *Localization of plastic flow at high- rate simple shear*. ***International Journal of Plasticity*** 51, 188–199. doi:10.1016/j.ijplas.2013.05.005.

[24] **E.N. Borodin**, A.E. Mayer, 2013. *Localization of plastic flow at dynamic channel angular pressing*. ***Technical Physics*** 58(8), 1159-1163. doi:10.1134/S1063784213080070.

[25] **E.N. Borodin**, A.E. Mayer, 2012. *Yield strength of nanocrystalline materials under high-rate plastic deformation*. ***Physics of the Solid State*** 54(4), 808-815. doi:10.1134/S1063783412040038.

[26] **E.N. Borodin**, A.E. Mayer, V. S. Krasnikov, 2011. *Wave attenuation in microcrystal copper at irradiation by a powerful electron beam*. ***Current Applied Physics*** 11(6), 1315-1318. doi:10.1016/j.cap.2011.03.062.

[27] **E.N. Borodin**, A.E. Mayer, 2011. *A simple mechanical model for grain boundary sliding in nanocrystalline metals*. ***Materials Science and Engineering A*** 532, 245-248. doi:10.1016/j.msea.2011.10.086.