Barbora Benešová

Curriculum Vitae

Department of Mathematical Analysis
Faculty of Mathematics and Physics
Charles University, Prague
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Born: August 5, 1985–Prague, Czech Republic
Nationality: Austrian

Research interests

Minimization of energy functionals, existence of minimizers
Modeling of smart funcional alloys on single and polycrystalline level
Numerical methods

Positions

2018–now **Assistant professor**, *Charles University*, Prague, Czech Republic.
At the Department of Mathematical Analysis, Faculty of Mathematics and Physics

2014–2018 **Research associate**, *University of Würzburg*, Würzburg, Germany.
In the group of Prof. Dr. Anja Schlömerkemper.
Work on magnetoelasticity and injectivity questions in elasticity as well as on modulations of martensite.
Career breaks : 06/15-03/16 and 08/17-05/18 (maternity leave), 02/17-08/17 (reduced work load to 50% due to child-care)

2012–2014 **Postdoctoral researcher**, *RWTH Aachen University*, Aachen, Germany.
In the group of Prof. Dr. Christof Melcher.
Work on variational methods in elasticity (incorporating the det > 0 constraint into quasiconvexity) and numerical solution of the Cahn–Hilliard equation by spectral methods.

2009-present **Research associate**, *Institute of Thermomechanics, Academy of Sciences of the Czech Republic*, Prague, (part-time, 2012-2018 on leave).

Education

2008–2012 **Doctorate in Applied Analysis**, *Charles University in Prague*, Czech Republic.
Advised by Prof. Dr. Tomáš Roubíček and co-advised by Priv.-Doz. Dr. Martin Kružík and Dr.-Ing. habil. Hanuš Seiner.
Thesis title: Mathematical and computational modeling of shape-memory alloys

2006–2008 **M.Sc. (Mgr.)**, *Charles University in Prague*, Czech Republic.
M.Sc. in *Mathematical modelling in science and technology* focusing on partial differential equations in continuum mechanics.

2007 **Socrates/Erasmus exchange**, *Oulu University*, Finland.

2003–2006 **B.Sc. (Bc.)**, *Charles University in Prague*, Czech Republic.
B.Sc. obtained in *General Physics*.

Publications

Journal publications/preprints with a mathematical focus

B. Benešová, J. Forster, C. Liu, and A. Schlömerkemper. Existence of weak solutions to an evolutionary model for magnetoelasticity. *SIAM J. Math. Anal.*, 50(1):1200–1236, 2018.

B. Benešová, M. Kružík, and A. Schlömerkemper. A note on locking materials and gradient polyconvexity. *Math. Mod. Meth. Appl. Sci.*, 28(12):2367–2401, 2018.

B. Benešová and M. Kružík. Weak lower semicontinuity of integral functionals and applications. *SIAM Rev.*, 59(4):703–766, 2017.

B. Benešová and M. Kružík. Characterization of gradient Young measures generated by homeomorphisms in the plane. *ESAIM: Contr. Optim. Calc. Var.*, 22(1):267–288, 2016.

M. Frost, B. Benešová, and P. Sedlák. A microscopically motivated constitutive model for shape memory alloys: formulation, analysis and computations. *Math. Mech. Solids*, 21(3):358–382, 2016.

B. Benešová and M. Kampschulte. Gradient Young measures generated by quasiconformal maps in the plane. *SIAM J. Math. Anal.*, 47(6):4404–4435, 2015.

B. Benešová, S. Krömer, and M. Kružík. Boundary effects and weak* lower semicontinuity for signed integral functionals on BV. *ESAIM: Contr. Optim. Calc. Var.*, 21(2):513–534, 2015.

B. Benešová, M. Kružík, and G. Pathó. A mesoscopic thermomechanically-coupled model for thin-film shape-memory alloys by dimension reduction and scale transition. *Cont. Mech. Thermodyn.*, (26(5)):683–713, 2014.

B. Benešová, M. Kružík, and G. Pathó. Young measures supported on invertible matrices. *Appl. Anal.*, (93):105–123, 2014.

B. Benešová, C. Melcher, and E. Süli. An implict midpoint spectral approximation of nonlocal Cahn-Hilliard equations. *SIAM J. Numer. Anal.*, (52(3)):1466–1496, 2014.

B. Benešová, M. Kružík, and T. Roubíček. Thermodynamically consistent mesoscopic model of the ferro/paramagnetic transition. *Zeit. angew. Math. Phys.*, 64(1):1–28, 2013.

B. Benešová and T. Roubíček. Micro-to-meso scale limit for shape-memory-alloy models with thermal coupling. *Multiscale Model. Simul.*, 10(3):1059–1089, 2012.

B. Benešová. Global optimization numerical strategies for rate-independent processes. *J. Global Optim.*, 50(2):197–220, 2011.

Journal publications with a non-mathematical focus in interdiscipliniary collaboration

J. Dostál, B. Benešová, and T. Brixner. Two-dimensional electronic spectroscopy can fully characterize the population transfer in molecular systems. *J. Chem. Phys.*, 145(12):124312, 2016.

B. Benešová, M. Frost, M. Kampschulte, C. Melcher, P. Sedlák, and H. Seiner. Incommensurateness in nanotwinning models of modulated martensites. *Phys. Rev. B (chosen as editor's suggestion)*, 92(18):180101, 2015.

P. Sedlák, M. Frost, B. Benešová, T. Ben Zineb, and P. Šittner. Thermomechanical model for NiTi-based shape memory alloys including R-phase and material anisotropy under multi-axial loadings. *Int. J. Plast.*, 39:132–151, 2012.

Publications in proceedings

B. Benešová, J. Forster, C.J. García-Cervera, C. Liu, and A. Schlömerkemper. Analysis of the flow of magnetoelastic materials. *PAMM, accepted*, 2016.

B. Benešová. A thermodynamically consistent model of shape-memory alloys. *PAMM*, 11(1):355–356, 2011.

B. Benešová. Modeling of shape-memory alloys on the mesoscopic level. In *European Symposium on Martensitic Transformations*, page 03003. EDP Sciences, 2009.

Mentoring

2019-now **PhD Advisor**, *for Jan Scherz.*
In cotutelle de these with A. Schlömerkemper (U. Würzburg)

Grant projects

November 2014 **Principal Investigator**, *Offer of a Newton International Fellowship.*
A highly competitive (at most 8% success rate) postdoctoral fellowship of the Royal Society to be held at the University of Oxford mentored by Sir John M. Ball - declined due to maternity.

2019-now **Team member**, *PRIMUS Research grant.*
a granting scheme of CHarles Universiy to establish new research groups (PI: Sebastian Schwarzacher)

2018-now **Team member**, *GAČR.*
within the projects:
GA18-03834S (PI: Petr Sedlák)
GACR-FWF 2019-21 19-29646L (PI: Martin Kružík)
GA19-U707Y (PI: Sebastian Schwarzacher)

2017-2018 **Team member**, *DFG.*
Project 391682204
PI: Prof. Anja Schlömerkemper

2014-2017 **Investigator**, *DAAD - ASCR.*
within the
bilateral project DAAD/14/11 between the RWTH Aachen University and the Institute of Thermomechanics of the Academy of Sciences of the Czech Republic and the
bilateral project DAAD/15/14 between the University of Wüezburg and the Institute of Information Theory and Automation of the Academy of Sciences of the Czech Republic

2010-2012 **Team member**, *GAČR.*
within the project GAP201/20/0357 (PI: Tomáš Roubíček)

2009-2011 **Principal investigator**, *Grant Agency of the Charles University in Prague.*
Student project GAUK 41110 on mathematical modelling of shape-memory alloys. Led a team of 3-4 investigators.

Selected Awards and Scholarships

2009 **Bolzano prize**, *presented by the rector of the Charles University in Prague for the M.Sc. thesis.*
One of two prizes awarded to the most outstanding student works in natural sciences at Charles University in Prague.

2003 **Main prize of the Austrian Society of Physicists**, *presented for the high-school graduation project.*

2003 **First prize of the Austrian Society for Astronomy and Astrophysics**, *presented for the high-school graduation project.*

Invitations to present at conferences/workshops (since 2014)

Non-interpenetration in thin-film models, PDE 2019: Partial Differential Equations in Fluids and Solids (Berlin, September 9 - 13, 2019) - keynote lecture

Non-interpenetration in thin-film models, Workshop on Regularity theory for elliptic and parabolic systems and problems in continuum mechanics 2018 (Telč, May 2 - 5, 2018)

A model for polycrystalline shape-memory alloys derived from microscopically motivated assumptions, Polycrystals: microstructure and effective properties (Oxford, March 26-28, 2018)

The concept of gradient polyconvexity and applications in elasticity, Conference on Recent Advances in PDEs and the Calculus of Variations (Venice, July 3-6, 2017)

Injectivity in magnetoelasticity Oberwolfach Miniworkshop on "Mathematics of Magnetoelastic Materials" (Oberwolfach, October 30 - November 5, 2016)

Flow of micromagnetic complex fluids, GAMM Workshop on Partial Differential Equations (Kassel, September 30 - October 2, 2015)-one of the principal speakers

Characterization of Young measures generated by homeomorphisms, Workshop on Relaxation, homogenization and dimensional reduction in hyperelasticity (Paris, March 25, 2014)

Invited seminars (since 2014)

Flow of micromagnetic complex fluids (Nečas Seminar in Prague, April 22, 2016)

Non-interpenetration conditions in elasticity (University of Bonn, May 21, 2015 & University of Vienna, December 16, 2015)

Open problems in elasticity (Penn State University, March 23, 2015)

Quasiconvexity conditions when minimizing over homeomorphisms in the plane (Nečas Seminar in Prague, March, 17, 2014 & MPI Leipzig, April 10, 2014 & University of Würzburg, May 20, 2014)

Teaching experience

2018-now **Lectures**, *Applied Mathematics*, Charles University, Prague.

2018-now **Exercises**, *Mathematical Analysis for Economists*, Charles University, Prague.

2014-2017 **Exercises**, *Analysis I, II, Complex Analysis, Mathematics for Physicists and Engineers*, University of Würzburg.

2013-2014 **Exercises**, *Higher Mathematics III, IV*, RWTH Aachen University.
Higher dimensional calculus and theory of complex functions for students of electrical engineering and physics

2012 **Series of Lectures**, *Seminar on Young measures*, RWTH Aachen University.

2012 **Lecturer**, *Mathematical Methods in Solid State Continuum Mechanics 2*, Charles University in Prague.
alterning with Martin Kružík

2009-2011 **Exercises**, *Introduction to Calculus*, Czech Technical University in Prague.

2006 **Exercises**, *Continuum mechanics*, Charles University in Prague.

Skills

Languages German, Slovak (bilingual native), Czech, English (very good), French (beginner)

Programming C++, Mathematica, Matlab

Service/Organisation

2016 **Guest editor**, *of a special issue in* Discrete Continuous Dynamical Systems - S.
Together with M. Kružík.

2019 **Co-Organizer**, *of the workshop "Mathematics for Mechanics"*, October 29 - November 1, 2019.
Together with M. Friedrich and M. Kružík.

2016 **Co-organizer**, *of the "Winterschool on Calculus of Variations in Physics and Materials Science"*, February 14–19, 2016.
Together with A. Schlömerkemper.

2014-now **Reviewer for the following journals:**.

SIAM J. Math. Anal., IMA Journal on Numerical Analysis, Nonlinear Analysis: Real World Applications, Communications in Mathematical Sciences, Meccanica, International Journal of Solids and Structures, Discrete and Continuous Dynamical Systems-S

2011-2012 **President**, *Charles University in Prague Chapter of SIAM* .

A student initiative supported by SIAM (Society of Industrial and Applied Mathematics) to promote applied mathematics and mathematics in interdisciplinary collaboration.
Responsible for organizing the events of the Chapter including invited talks by experts from outside academia, a graduate student seminar and a workshop.