

# Ewelina Zatorska

## Curriculum Vitae

Department of Mathematics,  
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### Personal information

Date of Birth 17.12.1985.  
Place of Birth Nowa Dęba, Poland.  
Nationality Polish.

### Employment

since 9/2017 **Lecturer in Applied Mathematics**, Department of Mathematics, University College London.

10/2015–9/2017 **Chapman Fellow**, Department of Mathematics, Imperial College London.

10/2015–9/2017 **Associate Professor**, Institute of Applied Mathematics and Mechanics, University of Warsaw.

10/2013–9/2015 **Assistant Professor**, Institute of Applied Mathematics and Mechanics, University of Warsaw.

10/2014–9/2015 **Research associate**, Institute of Mathematics of Polish Academy of Sciences.

10/2013–09/2014 **Postdoc**, Centre de Mathématiques Appliquées, École Polytechnique.

2006–2008 **Science Entertainer**, Copernicus Science Centre in Warsaw.

### Education

09/2013 **Ph.D. in Mathematics (with distinction)**, University of Warsaw, Ph.D. Programme: Mathematical Methods in Natural Sciences.

Title of thesis Fundamental problems to equations of compressible chemically reacting flows.  
Supervisors prof. Piotr Mucha & Doc. Mgr. Milan Pokorný, Ph.D.

09/2009 **Master's Degree in Mathematics**, University of Warsaw, College of Inter-faculty Individual Studies in Mathematics and Natural Sciences.

Title of thesis Analysis of nonlocal models of compressible fluid: existence, asymptotic behaviour, structure of solutions.  
Supervisor prof. Piotr Mucha.

### Longer research visits

07/2018 **Scientific visit at Nanjing University**, China, 2 weeks, visiting Yongzhong Sun.

- 04/2018 **Scientific visit at Gran Sasso Scientific Institute, L'Aquila, Italy**, 1 week, visiting Pierangelo Marcati and Donatella Donatelli.
- 03/2018 **Charles University, Prague, Czech Republic**, 1 week, collaboration with Milan Pokorný and Antonin Novotný.
- 02/2018 **Claude Bernard University Lyon 1, Lyon, France**, 1 week, collaboration with Francesco Fanelli.
- 09/2017 **University of Warsaw, Poland**, 1 week, collaboration with Piotr Mucha.
- 08/2017 **University Savoie Mont Blanc, Chambéry, France**, 1 week, collaboration with Didier Bresch.
- 04/2017 **Pierre and Marie Curie University, Paris, France**, 1 week, collaboration with Nicolas Vauchelet.
- 09/2016 **Institut Mittag-Leffler, Djursholm, Sweden**, 1 month, member of the program *Interactions between Partial Differential Equations & Functional Inequalities*.
- 04/2016 **KAUST, Saudi Arabia**, 1 week, collaboration with Athanasios Tzavaras and José A. Carrillo.
- 03/2015 **Universite du Sud Toulon-Var, France**, 1 week, collaboration with Eduard Feireisl, Rupert Klein and Antonin Novotný.
- 02/2015 **Waseda University in Tokyo, Japan**, 1 month, collaboration with Yoshihiro Shibata.
- 01/2015 **Universite Paris Dauphine, France**, 1 month, visiting professor.
- 11/2014 **Charles University in Prague, Czech Republic**, 1 week, visiting Milan Pokorný.
- 2013–2014 **Université de Savoie, France**, 5 weeks, visiting Didier Bresch and Charlotte Perrin.
- 07/2013 **Technische Universität Berlin, Germany**, 2 weeks, visiting Etienne Emmrich.
- 2011–2013 **Charles University in Prague, Czech Republic**, 24 months, visiting Milan Pokorný.
- 04/2013 **Ecole Polytechnique, France**, 1 week, visiting Vincent Giovangigli.
- 06/2011 **Universität Bielefeld & Universität Duisburg-Essen, Germany**, 1 week, visiting Etienne Emmrich & Perta Wittbold.
- 2008–2009 **Universitat Autònoma de Barcelona, Spain**, 6 months, Erasmus exchange.

## Awards

- 2018 Junior Leader position of **PDEs/SPDEs & Functional Inequalities Simons Semester**, Banach Center Warsaw, Poland.
- 2016 Fellowship of **Institut Mittag-Leffler**, Djursholm, Sweden.
- 2015 **Chapman Fellowship**, Imperial College London.
- 2015 **Invited professor grant**, Universite Paris Dauphine.
- 2014 **Special research position** of Warsaw Center of Mathematics and Computer Science.
- 2014 Nomination to the **International Stefan Banach Prize** for a Doctoral Dissertation in the Mathematical Sciences.
- 2014 Fellowship **START** of the Foundation for Polish Science for outstanding young scientists.
- 2013 **Postdoc position of DRE** (Direction des Relations Extérieures) at CMAP, Ecole Polytechnique.

- 2012 The prize of the **Polish Ministry of Science and Higher Education** for outstanding scientific achievements.
- 2011 Fellowship **Modern University** for the best doctoral students of the University of Warsaw.
- 2010–2013 Scholarship for the best Ph.D. students of the University of Warsaw.
- 2009 Fellowship of the Foundation for Polish Science.
- 2008 Scholarship within the Erasmus Programme.
- 2006 Scholarship of the Director of the College of Inter-faculty Individual Studies in Mathematics and Natural Sciences for the best students.

## Grants and research funding

- 2019 **Research in Pairs Grant of the London Mathematical Society**, (£ 1100).
- 2016–2019 **Polish Ministry of Science Grant "Iuventus Plus"**, *Reduced models for complex flows*, Principal Investigator, 158 400 PLN (£ 28 514).
- 07/2016 **London Mathematical Society**, *Travel grant*, (£ 510).
- 06/2016 **Polish Ministry of Science (DUN), Banach Center, and Warsaw Center of Mathematics and Computer Science**, *Funding for organization of the conference: X Forum of PDEs, Bedlewo 2016*, 93 600 PLN (£ 16 838).
- 05/2016 **KI-Net: Center for Scientific Computation and Mathematical Modelling**, *Travel Grant*, (\$ 1500).
- 2015–2018 **National Science Centre grant "Harmonia"**, *Basic systems of fluid mechanics. Regularity, stability, structure of solutions*, Co-investigator, 468 000 PLN (£ 84 244).
- 2013–2015 **Alexander von Humboldt Foundation grant for research group linkage**, *Nonlinear differential equations: analysis, discretization methods, and applications*, Junior investigator, (54 905 EUR).
- 2011–2014 **National Science Centre grant "Preludium"**, *Compressible, chemically reacting fluids mixtures*, Principal Investigator, 97 300 PLN (£ 17 515).
- 2010–2013 **MS Grant Nr N N201 547438**, *Mathematical aspects of the fluid mechanics and related topics*, Co-investigator, 400 000 PLN (£ 72 000).
- 2011–2014 **Programme IDEAS PLUS ID 2011 0006 61**, *Physical systems in the mathematical setting*, Co-investigator, 1113 800 PLN (£ 200 495).

## Publications in peer-reviewed journals

1. D. Bresch, P. B. Mucha, E. Zatorska: Finite-Energy Solutions for Compressible Two-Fluid Stokes System. *Arch. Rational Mech. Anal.* <https://doi.org/10.1007/s00205-018-01337-6> (2018).
2. J.A. Carrillo, A. Wróblewska-Kamińska, E. Zatorska: On long-time asymptotic for viscous hydrodynamic models of collective behaviour with damping and nonlocal interactions. *Math. Models Methods Appl. Sci.* Vol. 29, No. 1, 31–63 (2019).
3. P. Degond, P. Minakowski, E. Zatorska: Transport of congestion in two-phase compressible/incompressible flows. *Nonlinear Analysis Real World Applicatios*, Vol. 42, 485–510 (2018).
4. P. Degond, P. Minakowski, L. Navoret, E. Zatorska: Finite Volume approximations of the Euler system with variable congestion. *Computers & Fluids*, Vol. 169, 23–39 (2018).

5. J. Barré, J. A. Carrillo, P. Degond, D. Peurichard, E. Zatorska: Particle interactions mediated by dynamical networks: assessment of macroscopic descriptions. *Journal of Nonlinear Science*, Vol. 28, Issue 1, 235–268 (2018).
6. N. Vauchelet, E. Zatorska: Incompressible limit of the Navier-Stokes model with growth term. *Nonlinear Analysis*, Vol. 163, 34–59 (2017).
7. J. Barré, P. Degond, E. Zatorska: Kinetic theory of particle interactions mediated by dynamical networks. *Multiscale Model. Simul. (SIAM)*, 15(3), 1294–1323, (2017).
8. J. A. Carrillo, Y-P. Choi, E. Zatorska: On the pressureless damped Euler-Poisson equations with non-local forces: Critical thresholds and large-time behavior. *Math. Models Methods Appl. Sci.* Vol. 26, No. 12, 2311–2340 (2016).
9. D. Maltese, M. Michalek, P. B. Mucha, A. Novotný, M. Pokorný, E. Zatorska: Existence of weak solutions for compressible Navier-Stokes equations with entropy transport. *J. Differential Equations*, Vol. 261, no. 8, 4448–4485 (2016).
10. E. Feireisl, R. Klein, A. Novotný, E. Zatorska: On singular limits arising in the scale analysis of stratified fluid flows. *Math. Models Methods Appl. Sci.* Vol. 26, No. 3, 419–443 (2016).
11. B. Haspot, E. Zatorska: From the highly compressible Navier-Stokes equations to the Porous Medium equation - rate of convergence. *DCDS-A* Vol. 36, No. 6, 3107–3123 (2016).
12. P. B. Mucha, M. Pokorný, E. Zatorska: Heat-conducting, compressible mixtures with multicomponent diffusion: construction of a weak solution. *SIMA*, Vol. 47, No. 5, 3747–3797 (2015).
13. E. Zatorska: Mixtures: sequential stability of variational entropy weak solutions. *J. Math. Fluid Mech.* Vol. 17, No. 3, 437–461 (2015).
14. V. Giovangigli, M. Pokorný, E. Zatorska: On the steady flow of reactive gaseous mixture. *Analysis (Berlin)* Vol. 35, No. 4, 319–341 (2015).
15. D. Bresch, B. Desjardins, E. Zatorska: Two-velocity hydrodynamics in Fluid Mechanics, Part II: Existence of global  $\kappa$ -entropy solutions to compressible Navier-Stokes system with degenerate viscosities. *J. Math. Pures Appl.* Vol. 104, No. 4, 801–836 (2015).
16. D. Bresch, V. Giovangigli, E. Zatorska: Two-velocity hydrodynamics in Fluid Mechanics, Part I: Well posedness for zero Mach number systems. *J. Math. Pures Appl.*, Vol. 104, No. 4, 762–800 (2015).
17. C. Perrin, E. Zatorska: Free/Congested Two-Phase Model from Weak Solutions to Multi-Dimensional Compressible Navier–Stokes Equations. *Commun. PDEs*, 40: 1558–1589 (2015).
18. P. B. Mucha, E. Zatorska: Multicomponent Mixture Model. The Issue of Existence via Time Discretization. *Commun. Math. Sci.*, Vol. 13, No. 8, 1975–2003 (2015).
19. D. Bresch, C. Perrin, E. Zatorska: Singular limit of a Navier–Stokes system leading to a free/congested zones two-phase model. *C. R. Math. Acad. Sci. Paris* 352, No. 9, 685–690 (2014).
20. P. B. Mucha, M. Pokorný, E. Zatorska: Approximate solutions to a model of two-component reactive flow. *Discrete Contin. Dyn. Syst. Ser. S*, 7(5): 1079–1099 (2014).
21. P. B. Mucha, M. Pokorný, E. Zatorska: Chemically reacting mixtures in terms of degenerated parabolic setting. *J. Math. Phys.*, 54, 071501 (2013).
22. E. Zatorska: On the flow of chemically reacting gaseous mixture. *J. Differential Equations*, 253, 3471–3500 (2012).

23. E. Zatorska: Analysis of semidiscretization of the compressible Navier–Stokes equations. *J. Math. Anal. Appl.*, 386, 559–580 (2012).
24. E. Zatorska: On the steady flow of multicomponent, compressible, chemically reacting gas. *Nonlinearity*, 24, 3267–3278 (2011).
25. E. Zatorska: Analysis of nonlocal model of compressible fluid in 1-D. *Math. Methods Appl. Sci. Sciences*, 34, 198–212 (2011).

## Book chapters

1. M. Pokorný, P. B. Mucha, E. Zatorska: Existence Of Stationary Weak Solutions For The Heat Conducting Flows. *Handbook of Mathematical Analysis in Mechanics of Viscous Fluids*, pages 1–68 (2016).
2. P. Minakowski, P. B. Mucha, J. Peszek, E. Zatorska: Singular Cucker-Smale Dynamics. *arxiv:1807.08617*.

## Preprints

1. T. Piasecki, Y. Shibata, E. Zatorska: On strong dynamics of compressible two-component mixture flow. *arXiv:1709.09722*.
2. Y. Li and Y. Sun, E. Zatorska: Large time behavior for a compressible two-fluid model with algebraic pressure closure and large initial data. *arXiv:1811.05833*.

## Outreach

E. Zatorska: Dynamical Networks, De Morgan Newsletter 2017 UCL.

## Selected Seminar Talks

- 18/10/2018 CDT PDE Lunchtime seminar, Oxford, UK.
- 29/08/2018 Math-Bio Seminar Series, Heriot-Watt University Edinburgh, UK.
- 18/07/2018 PDEs Seminar Nanjing University, Nanjing, China.
- 29/05/2018 Seminar of the Program PDEs/SPDEs & Functional Inequalities, Warsaw, Poland.
- 12/04/2018 GSSI Mathematics Seminar, L'Aquila Italy.
- 14/03/2018 Applied Maths Seminar Series, School of Mathematics, University of Manchester, UK.
- 12/02/2018 Mathematical Finance and Stochastic Analysis Seminar, University of York, UK.
- 06/02/2018 Séminaire EDP-Analyse, Université Claude Bernard - Lyon 1, France.
- 14/12/2017 Analysis Seminar, University of Bath, UK.
- 10/10/2017 Applied Mathematics Seminar, UCL, UK.
- 15/06/2017 PDE Seminar Oxford, UK.
- 22/09/2016 Institut Mittag-Leffler, Sweden.
- 25/04/2016 Applied Mathematics Seminar, University of York.
- 13/04/2016 AMCS Seminar, KAUST, Saudi Arabia.
- 13/11/2015 Pure Analysis and PDE's working group seminar, Imperial College London.
- 3/11/2015 Applied PDEs Seminar, Imperial College London.
- 29/10/2015 Analysis seminar, King's College London

- 04/02/2015 PDE seminar, Waseda University Tokyo.
- 24/11/2014 Necas Seminar on Continuum Mechanics, Charles University in Prague.
- 17/11/2014 PDE seminar, IMPAN Warsaw.
- 10/04/2014 Seminaire Groupe de Travail EDP, Université Paris XII - Val de Marne, Creteil.
- 18/02/2014 Seminaire d'EDPs et Applications, Institut Élie Cartan, Université de Lorraine, Nancy.
- 14/02/2014 Seminar of team EDPs, LAMA, Université de Savoie, Chambéry.
- 04/02/2014 Séminaire du CEREMADE Analyse-Probabilités, Université Paris Duphine.
- 17/12/2013 Séminaire du CMAP, École Polytechnique.
- 20/02/2013 Compact Seminar: Renormalized and entropy solutions to partial differential equations, IWR, University of Heidelberg.
- 11/12/2012 Seminar on PDEs of the Mathematical Institute of the Academy of Sciences of the Czech Republic.
- 09/12/2011 Seminar of the project: Modelling of gasification and combustion of the produced gas. Institute of Geophysics, University of Warsaw.
- 22/06/2011 Seminar on PDEs, Universität Duisburg-Essen.
- 20/06/2011 Numerical Analysis Seminar, Universität Bielefeld.
- 12/04/2010 Necas Seminar on Continuum Mechanics, Charles University in Prague.

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## Main Conference Talks

- 21/11/2018 Particle Systems and PDE's VII, Palermo, Italy.
- 08/07/2018 AIMS, 12th Conference on Dynamical Systems, Differential Equations and Applications, Taipei, Taiwan.
- 26/06/2018 Workshop "Complex fluids and granular flow", Université d'Aix-Marseille, France.
- 27/04/2018 Workshop on PDEs/SPDEs and Functional Inequalities I, Bedlewo, Poland.
- 21/02/2018 Young Researchers Workshop: Kinetic models in biology and social sciences, Arizona State University, USA, 2018.
- 22/01/2018 Transport Phenomena in Mathematical Biology, Polish Academy of Sciences, Warsaw, Poland.
- 18/12/2017 Prague Compressible Meeting (In honour of the 60th birthday of Professor Eduard Feireisl), Prague, Czech Republic.
- 03/10/2017 Analysis and Control of Fluid-Structure Interaction Systems, Bordeaux, France.
- 28/06/2017 Analysis/Stochastic Analysis workshop, Imperial College London, UK.
- 19/06/2017 Workshop on PDEs: Modelling, Analysis and Numerical Simulation, Granada, Spain.
- 16/05/2017 EPSRC Symposium: Emerging PDE models in Socio-Economic Sciences, Warwick, UK.
- 02/12/2016 The International Research Training Group on 'Mathematical Fluid Dynamics' meeting, Darmstadt, Germany.
- 20/07/2016 7ECM, Berlin, Germany.
- 20/06/2016 X Forum of PDEs, Bedlewo, Poland.
- 25/05/2016 Mixing and Mixtures in Geo- and Biophysical Flows: A Focus on Mathematical Theory and Numerical Methods, CSCAMM, University of Maryland, College Park, USA.

- 08/12/2015 SIAM PDEs meeting, Scottsdale, Arizona USA.
- 17/09/2015 Mathflows 2015, Porquerolles, France.
- 30/08/2015 Mathematical Fluid Mechanics: Old Problems, New Trends - A week for Wojciech Zajączkowski, Będlewo, Poland.
- 06/07/2015 Equadiff 2015, Lyon, France.
- 29/10/2014 Autumn School and Workshop: Mathematical Fluid Dynamics, Bad Boll, Germany.
- 01/10/2014 ECI2014- Electrochemical Interfaces: Recent Topics and Open Questions, WIAS Berlin.
- 11/07/2014 10th AIMS Conference on Dynamical Systems Differential Equations and Applications, Madrid, Spain.
- 16/04/2014 8es Journées Scientifiques de l'UTLN, Workshop Mathématiques en Mécanique de Fluides, Toulon, France.
- 01/04/2014 Workshop: Maxwell-Stefan meets Navier-Stokes, Halle (Saale), Germany.
- 28/01/2014 Winter Seminar and Klausurtagung "Fluids and Snow", La Clusaz, France.
- 10/12/2013 SIAM Conference on Analysis of Partial Differential Equations, Orlando, Florida, USA.
- 29/08/2013 Equadiff13, Prague, Czech Republic.
- 12/07/2013 SIAM Annual Meeting, San Diego, California, USA.
- 25/05/2013 13th School: Mathematical Theory in Fluid Mechanics, Kacov, Czech Republic.
- 08/04/2013 ITN-Springschool Optimization in Partial Differential Equations, Reaction-Diffusion Systems and Phase-Field Models, Frejus, France.
- 23/10/2012 Mathflows 2012, Porquerolles, France.
- 04/09/2012 Parabolic and Navier-Stokes equations, Będlewo, Poland.
- 04/07/2012 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida, USA.
- 01/11/2011 Recent Trends in Differential Equations: Analysis and Discretisation Methods, Bielefeld, Germany.
- 05/06/2011 12th School: Mathematical Theory in Fluid Mechanics, Kacov, Czech Republic.
- 06/09/2010 Regularity aspects of PDEs a week for Wojciech Zajączkowski, Będlewo, Poland.
- 01/07/2010 International Summer School on Mathematical Fluid Dynamics, Levico Terme (Trento), Italy.
- 30/03/2010 2nd Spring School: Analytical and Numerical Aspects of Evolution Equations, Berlin, Germany.

## Teaching/supervising experience

- 2018 Supervision of the MSc project of Mr. Bede Frank, University College London.
- 2017/2018 Lecturing of the course: *Multivariable Analysis*, University College London.
- and
- 2018/2019
- 2016 Co-supervision of the MS project of Mr. Barry Cavin, Imperial College London.
- 2016/2017 Lecturing of M3,4,5/M3 course: *Introduction to Partial Differential Equations*, Imperial College London.

- 2016 Lecturing of summer course: *The basis of the mathematical theory of compressible, chemically reacting mixtures* at CNRS-PAN Mathematics Summer Institute, Cracow 27 June - 2 July, 2016, Poland.
- 2016 Supervision of the second year students group project: *Game Theory and Game of Hex*, Imperial College London.
- 2016 Co-supervision of the MS project of Mr. Nicolas Brigouleix, Imperial College London.
- 2015/2016 Personal tutoring for the 1st, 2nd and 3rd year students of Mathematics, Imperial College London.
- 2015/2016 TCC course: The basis of the mathematical theory of compressible viscous flows, Imperial College London, University of Bath, University of Oxford, University of Warwick.
- 07/2015 Co-supervision of the PhD project of MS Joanna Skonieczna, University of Warsaw.
- 2014/2015 1 semester of practice classes for the lecture Mathematics A, Faculty of Chemistry, University of Warsaw.
- 2009/2010 1 semester of practice classes for the lecture Elements of Mathematical Analysis, Faculty of Economic Sciences, University of Warsaw.
- 2011/2012 1 semester of practice classes for the lecture Functional Analysis I, Faculty of Mathematics, Informatics and Mechanics, University of Warsaw.

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## Organizational Activity

- 09/2018 Minisymposium: Advances in Kinetic Theory at Joint Polish-Italian Meeting UMI-SIMAI-PTM 2018, Wrocław, Poland.
- 03/2018 Minisymposium: Agent-based, Kinetic and Multi-scale modelling in Mathematical Biology at 60th British Applied Mathematics Colloquium, University of St Andrews.
- 01/2017 Workshop Mathflows 2017, Będlewo, Poland.
- 06/2016 Conference: X Forum of Differential Equations, Będlewo, Poland.
- 12/2015 Minisymposium: Equations of 3D flows at SIAM PDEs meeting, Scottsdale, Arizona, USA.
- 10/2015-09/2017 Applied PDEs Seminar, Imperial College London.
- 03/2014 Conference: Compflows 2014, Będlewo, Poland.
- 10/2013 Workshop: Engaging Flows, Institute of Mathematics of the Polish Academy of Sciences, Warsaw.
- 04/2013 The doctoral session at ITN-Springschool: Optimization in Partial Differential Equations, Reaction-Diffusion Systems and Phase-Field Models, Frejus, France.
- 01/2011 International Winter School: Mathematical analysis in fluid mechanics 2011, Białka Tatrzańska, Poland.
- 06/2010 Conference: VII Forum of Differential Equations, Będlewo, Poland.
- 02-06/2010 Joint PDEs Seminar of Mathematical Institutes of University of Warsaw, Technical University of Warsaw and Polish Academy of Sciences, Warsaw, Poland.