

# EUGEN VĂRVĂRUCĂ

## CURRICULUM VITAE

### CONTACT INFORMATION

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### RESEARCH INTERESTS

Nonlinear Partial Differential Equations (Water Waves, Free Boundary Problems)  
Mathematical Analysis (Bifurcation Theory, Complex and Harmonic Analysis,  
Geometric Analysis)

### EDUCATION

- 2002–2005 University of Bath, UK  
PhD Mathematics, December 2005  
Thesis Title: “Singularities in Free Boundaries”  
Thesis Advisor: Professor John F. Toland FRS
- 2001–2003 “Al. I. Cuza” University, Iași, Romania  
MSc Mathematics, June 2003
- 1997–2001 “Al. I. Cuza” University, Iași, Romania  
BSc Mathematics, June 2001

### EMPLOYMENT

- October 2015 – present Associate Professor in Mathematics, Faculty of  
Mathematics, “Al. I. Cuza” University, Iași, Romania
- October 2012 – September 2015 Associate Professor in Mathematics,  
Department of Mathematics and Statistics,  
University of Reading, UK
- June 2010 – September 2012 Lecturer in Mathematics, Department of  
Mathematics and Statistics, University of Reading
- October 2008 – May 2010 Chapman Fellow, Department of Mathematics,  
Imperial College London, UK
- January 2006 – September 2008 Research Officer, Department of Mathematical  
Sciences, University of Bath, UK

### AWARDS AND PRIZES

- 2012 **Whitehead Prize of the London Mathematical Society**, the citation for  
which reads “*for ground-breaking analysis of free boundary problems for linear and nonlin-  
ear elliptic equations, with important applications, in arbitrary dimensions*”
- 1997 Silver Medal at the International Mathematical Olympiad (IMO), Argentina

## GRANTS

Participation as a researcher in the grant “Mathematical methods applied in the study of nonlinear mechanical systems”, PN-III-P1-1.1-TE-2016-2314, May 2018–April 2020, Principal Investigator: Dr. Ionel-Dumitrel Ghiba,  
<https://www.math.uaic.ro/~ghiba/TE-Ghiba2.html>

## PUBLICATIONS

- N. Katzourakis and E. Varvaruca, *An Illustrative Introduction to Modern Analysis*, CRC Press, Taylor and Francis Group, Boca Raton, 2017.
- A. Constantin, W. Strauss and E. Varvaruca, *Global bifurcation of steady gravity water waves with critical layers*, Acta Math. **217** (2016), 195–262.
- E. Varvaruca, *Recent progress on steady gravity water waves*. New trends in differential equations, control theory and optimization, 315–334, World Sci. Publ., Hackensack, NJ, 2016.
- M. Smit Vega Garcia, E. Varvaruca and G. S. Weiss, *Singularities in axisymmetric free boundaries for electrohydrodynamic equations*, Arch. Rational Mech. Anal. **222** (2016), 573–601.
- E. Varvaruca and G. S. Weiss, *Singularities of steady axisymmetric free surface flows with gravity*, Comm. Pure Appl. Math. **67** (2014), 1263–1306.
- E. Varvaruca and G. S. Weiss, *The Stokes conjecture for waves with vorticity*, Ann. Inst. H. Poincaré Anal. Non Linéaire **29** (2012), 861–885.
- E. Varvaruca and A. Zarnescu, *Equivalence of weak formulations of the steady water waves equations*, Phil. Trans. Roy. Soc. London **370** (2012), 1703–1719.
- E. Varvaruca and G. S. Weiss, *A geometric approach to generalized Stokes conjectures*, Acta Math. **206** (2011), 363–403.
- A. Constantin and E. Varvaruca, *Steady periodic water waves with constant vorticity: regularity and local bifurcation*, Arch. Rational Mech. Analysis **199** (2011), 33–67.
- E. Varvaruca, *On the existence of extreme waves and the Stokes conjecture with vorticity*, J. Differential Equations **246** (2009), 4043–4076.
- E. Varvaruca, *Bernoulli free-boundary problems in strip-like domains and a property of permanent waves on water of finite depth*, Proc. Roy. Soc. Edinburgh Sect. A **138** (2008), 1345–1362.
- E. Varvaruca, *On some properties of travelling water waves with vorticity*, SIAM J. Math. Anal. **39** (2008), 1686–1692.
- E. Varvaruca, *Some geometric and analytic properties of solutions of Bernoulli free-boundary problems*, Interfaces Free Bound. **9** (2007), 367–381.
- E. Varvaruca, *Singularities of Bernoulli free boundaries*, Comm. Partial Differential Equations **31** (2006), 1451–1477.
- E. Varvaruca, *Exact rates of convergence as  $t \rightarrow +\infty$  for solutions of nonlinear evolution equations*, J. Evol. Equ. **4** (2004), 543–565.
- E. Varvaruca, *Backward uniqueness and unique continuation for evolution inequalities governed by subdifferentials*, Nonlinear Funct. Anal. Appl. **7** (2002), 269–284.

## PREPRINTS

- A. Constantin, W. Strauss and E. Varvaruca, *Large-amplitude steady downstream water waves*, submitted December 2018 to Acta Mathematica  
<https://arxiv.org/abs/1811.10353>

## INVITED PARTICIPATION IN LONG TERM RESEARCH PROGRAMMES

- “Mathematics of Sea Ice Phenomena”, Isaac Newton Institute, Cambridge, UK, August–October 2017
- “Nonlinear Water Waves”, Isaac Newton Institute, Cambridge, UK, August 2017
- “Theory of Water Waves”, Isaac Newton Institute, Cambridge, UK, July–August 2014
- “Free Boundary Problems and Related Topics”, Isaac Newton Institute, Cambridge, UK, January–July 2014
- “Nonlinear Water Waves”, Erwin Schrödinger Institute, Vienna, Austria, April–June 2011
- “Wave Motion”, Mittag-Leffler Institute, Stockholm, Sweden, September–December 2005

## INVITED CONFERENCE/WORKSHOP TALKS

- Workshop “Partial Differential Equations”, Institute of Mathematics of the Romanian Academy, Bucharest, Romania, December 2018
- 14th Franco-Romanian Conference on Applied Mathematics, University of Bordeaux, France, August 2018
- Workshop “Fluid Dynamics and Dispersive Equations”, University of Lund, Sweden, June 2018
- Workshop “Analysis, Nonlinear Analysis and Control of Continuous Media”, University of Bucharest, Romania, May 2018
- Workshop “Nonlinear Water Waves – an Interdisciplinary Interface”, Erwin Schrödinger Institute, Vienna, Austria, December 2017
- Workshop “Nonlinear Water Waves”, Isaac Newton Institute, Cambridge, UK, August 2017
- “Equadiff 2015” Conference, University Claude Bernard, Lyon, France, July 2015
- Eighth Congress of Romanian Mathematicians, “Al. I. Cuza” University of Iași, Romania, June 2015
- Workshop “Mathematical Theory of Water Waves”, MFO Oberwolfach, Germany, April 2015
- Spitalfields Day “Advances in the Mathematics of Water Waves”, Isaac Newton Institute, Cambridge, UK, July 2014
- Workshop “Recent Developments and Challenges in Interface and Free Boundary Problems”, University of Warwick, UK, March 2014
- Workshop “Recent Advances in Nonlinear PDE and Calculus of Variations”, University of Reading, UK, February 2014
- Introductory School to the Programme “Free Boundary Problems and Related Topics” (4 hour lecture course on “Geometric Approaches to Water Waves and Free Surface Flows”), Isaac Newton Institute, Cambridge, UK, January 2014
- LMS–EPSRC Short Instructional Course “Modern Nonlinear PDE Methods in Fluid Dynamics” (2 hour lecture course on “Bifurcation Theory in the context of Steady Water Waves”), University of Reading, UK, July 2013
- Joint International Meeting of the AMS and the Romanian Mathematical Society, “1 Decembrie 1918” University of Alba Iulia, Romania, June 2013
- Workshop “Riemann–Hilbert Problems and their Applications”, University of Reading, UK, May 2013
- Workshop “Nonlinear Analysis of Water Waves”, University College, Cork, Ireland, April 2013
- Workshop “Nonlinear Waves and Interface Problems”, Lund, Sweden, June 2012
- Conference “Free Boundary Problems”, Frauenchiemsee, Germany, June 2012
- Workshop “Mathematical Aspects of Water Waves”, King’s College, London, UK, March 2012
- “Equadiff 2011” Conference, Loughborough University, UK, August 2011
- Erwin Schrödinger Institute Workshop on Surface Water Waves, Vienna, Austria, June 2011

- NSF/CBMS Conference “Nonlinear Water Waves with Applications to Wave-Current Interactions and Tsunamis”, University of Texas–PanAmerican, Edinburg TX, USA, May 2010
- Workshop “Partial Differential Equations”, MFO Oberwolfach, Germany, August 2009
- Workshop “Wave Motion”, MFO Oberwolfach, Germany, February 2009
- Workshop “Large Amplitude Internal Waves”, International Centre for Mathematical Sciences, Edinburgh, UK, December 2008
- AIMS Conference on Dynamical Systems and Differential Equations, Arlington TX, USA, May 2008
- Mathematics 2005, BMC & BAMC, University of Liverpool, UK, April 2005

#### INVITED SEMINAR TALKS

- “Mathematics of Sea Ice Phenomena” Seminar, Isaac Newton Institute, Cambridge, UK, September 2017
- Paris–London Analysis Seminar, Paris, France, June 2014
- Analysis Seminar, University of Warwick, February 2013
- Partial Differential Equations Seminar, University of Bath, February 2013
- London Analysis Seminar, Imperial College, London, January 2012
- Analysis Seminar, Heriot–Watt University, Edinburgh, November 2011
- Analysis Seminar, University of Birmingham, October 2011
- Analysis Seminar, Cardiff University, November 2010
- Mathematics and Applications Seminar, University of Sussex, Brighton, November 2010
- Applied Mathematics Seminar, University of East Anglia, Norwich, November 2010
- Analysis Seminar, University of Warwick, February 2010
- Analysis Seminar, EPFL, Lausanne, Switzerland, November 2009
- Erwin Schrödinger Institute Seminar, Vienna, Austria, October 2009
- Nonlinear Mathematics Seminar, University of Surrey, Guildford, May 2009
- Applied Mathematics and Mathematical Physics Colloquium, Imperial College, London, December 2008
- Partial Differential Equations Seminar, University of Oxford, December 2008
- Partial Differential Equations Seminar, Massachusetts Institute of Technology, Cambridge MA, USA, May 2008
- Partial Differential Equations Seminar, Brown University, Providence RI, USA, May 2008
- Partial Differential Equations Seminar, Trinity College, Dublin, Ireland, November 2007
- Mittag-Leffler Institute Seminar, Stockholm, Sweden, October 2005
- London Analysis Seminar, King’s College, London, October 2004

#### SUPERVISION OF PHD STUDENTS

- Peter de Boeck: 2010–2014, University of Reading, UK, PhD degree awarded December 2014, thesis title “Steady Capillary-Gravity Water Waves with Constant Vorticity”
- Razvan Ceuca: 2018 – present, joint supervision with Arghir Zarnescu, Basque Center for Applied Mathematics, Bilbao, Spain

## TEACHING-RELATED ACTIVITIES

2015–present Faculty of Mathematics, “Al. I. Cuza” University of Iași:

- **lectures and problem classes/lab sessions** in
  - *Elements of Numerical Simulation* (taught five times);
  - *Special Chapters of Mathematical Analysis* (taught three times);
  - *Introduction to Partial Differential Equations* (taught twice);
  - *Numerical Methods in Linear Algebra and Multidimensional Analysis*;
- problem classes in *Logic and Set Theory*;

2010–2015 Department of Mathematics and Statistics, University of Reading:

- **lectures and problem classes** in
  - MA3TLA *Topology and Linear Analysis* (taught three times);
  - MA37L *Analysis and Topology* (taught twice);
  - MA4XD *Modern Analysis*;
  - MA3FA1 *Functional Analysis I*;
  - MA4FA1 *Functional Analysis I (reading course)*;
  - MA2VAD *Vector Analysis and Differential Equations* (only the second half of the module, devoted to the theory of Ordinary Differential Equations);
- problem classes for various modules in Analysis, Calculus, Differential Equations, Linear Algebra;

2008–2010 Department of Mathematics, Imperial College London:

- **lectures and problem classes** in M3P7/M4P7 *Functional Analysis* (twice);
- problem classes for various modules in Calculus, Differential Equations;

2002–2008 Department of Mathematics, University of Bath: problem classes for various modules in Analysis, Calculus, Differential Equations, and Algebra.

## OTHER PROFESSIONAL ACTIVITIES

- referee for *Bulletin of the American Mathematical Society*, *Communications on Pure and Applied Mathematics*, *Archive for Rational Mechanics and Analysis*, *SIAM Journal on Mathematical Analysis*, *SIAM Journal on Applied Mathematics*, *Journal of Fluid Mechanics*, *European Journal of Applied Mathematics*, *IMA Journal of Applied Mathematics*;
- reviewer for *Mathematical Reviews*.