CURRICULUM VITAE

JOSHUA BALLEW

1. PERSONAL INFORMATION

Joshua Ballew
Address: Department of Mathematics, Carnegie Mellon University
E-mail address: jballew@andrew.cmu.edu
Website: `http://www.math.cmu.edu/~jballew`
Citizenship Status: U.S. Citizen

a. Educational background

• **University of Maryland College Park**

Ph. D. *in Applied Mathematics: May 2014*
Dissertation Title: Mathematical Topics in Fluid-Particle Interaction
Adviser: Dr. Konstantina Trivisa

• **St. Mary's College of Maryland**

B. A. *in Mathematics and Physics, Summa cum Laude: May 2007*
Senior Project: Mathematically Modeling Tsunamis
Adviser: Dr. Katherine Socha

b. Employment background

• **Carnegie Mellon University** *NSF Postdoctoral Associate* (Fall 2014-Summer 2017)
Supervising Scientist: Dr. Robert Pego

• **University of Maryland at College Park**
Graduate Research and Teaching Assistant (Fall 2008-Spring 2014)

• **St. Mary's College of Maryland**
Teaching Assistant (Fall 2005–Spring 2007)

c. Research Interests

- Nonlinear Partial Differential Equations, Hyperbolic Conservation Laws, Applied Mathematics
- Compressible and Incompressible Fluids, Models for Complex Fluids

2. RESEARCH, SCHOLARLY, AND CREATIVE ACTIVITIES

a. Published research articles

(1) J. Ballew, G. Iyer, and R. Pego. Bose-Einstein condensation in a hyperbolic model for the Kompaneets equation. *SIAM J. Math. Anal.*, 48-6 (2016), 3840-3859.
(2) J. Ballew. Low Mach number limits to the Navier-Stokes-Smoluchowski system. *Hyperbolic Problems: Theory, Numerics, Applications.* Proceedings of the 14th International Conference on Hyperbolic Problems (HYP2012) held in Padova, June 25–29, 2012. Edited by Fabio Ancona, Alberto Bressan, Pierangelo Marcati, and Andrea Marson. AIMS Series on Applied Mathematics, Vol. 8 (2014), 301-308.

(3) J. Ballew and K. Trivisa. Viscous and inviscid models in fluid-particle interaction. *Commun. Inf. Syst.* 13 (2013), no. 1, 45-78.
(4) J. Ballew and K. Trivisa. Weakly dissipative solutions and weak-strong uniqueness for the Navier-Stokes-Smoluchowski system. *Nonlinear Anal.* 91 (2013), 1-19.
(5) J. Ballew and K. Trivisa. Suitable weak solutions and low stratification singular limit for a fluid particle interaction model. *Quart. Appl. Math.* 70 (2012), no. 3, 469-494.

b. Preprints and articles in preparation

(1) J. Ballew. A hyperbolic Kompaneets model and Bose-Einstein condensation in photon scattering. (2016). To appear in *Proceedings of HYP 2016 Conference*.
(2) J. Ballew. Vanishing viscosity solutions for the Navier-Stokes-Smoluchowski system for particles in a compressible fluid. (2016). Submitted to *J. Dynam. Differential Equations*.
(3) J. Ballew and K. Trivisa. Multiple solutions for a simplified Euler-Smoluchowski system for particles in a compressible fluid.
(4) J. Ballew, G. Iyer, and R. Pego. Global dynamics of photon scattering for the Kompaneets equation.

c. Talks, Abstracts, and Other Professional Papers Presented

Contributed and Minisymposium Talks

- *Well-Posedness for Systems of Fluid-Particle Interaction.* Joint Mathematics Meetings, January 2017.
- *Bose-Einstein Condensation in a Hyperbolic Model for the Kompaneets Equation.* Sixteenth International Conference on Hyperbolic Problems: Theory, Numerics, Applications, August 2016.
- *We Started a Directed Reading Program–And So Can You.* With S. Balady, R. Black, and E. Fleming. Joint Mathematics Meetings, January 2014.
- *Weak-Strong Uniqueness of the Navier-Stokes-Smoluchowski System.* SIAM Conference on Analysis of Partial Differential Equations, December 2013.
- *Low Mach Number Limits to the Navier-Stokes-Smoluchowski System.* Fourteenth International Conference on Hyperbolic Problems: Theory, Numerics, Applications, June 2012.

Invited Talks

- *Weak-Strong Uniqueness for a Fluid-Particle System.* University of Pittsburgh: PDE and Analysis Seminar, January 2014.

University Seminars and Colloquia

- *From a Mesoscopic to Macroscopic Description of Fluid-Particle Interaction.* Carnegie Mellon University: Center for Nonlinear Analysis Seminar, October 2016.
- *Relative Entropy and the Navier-Stokes-Smoluchowski System for Compressible Fluids.* Carnegie Mellon University: Center for Nonlinear Analysis Seminar, October 2014.
- *Local and Global Existence of Solutions for the Compressible Euler-Smoluchowski Model.* University of Maryland College Park: AMSC Student Seminar, December 2013.
- *Weak-Strong Uniqueness of the Navier-Stokes-Smoluchowski System.* University of Maryland College Park: Applied PDE Seminar, March 2013.
- *Fluid-Particle Interaction and the Navier-Stokes-Smoluchowski Model.* University of Maryland College Park: Applied Mathematics and Statistics, and Scientific Computation Student Seminar, November 2012.

- *Entropy and Relative Entropy for Hyperbolic PDEs.* University of Maryland College Park: Student PDE Seminar, October 2012.
- *Low Mach Number Limits to the Navier-Stokes-Smoluchowski System.* University of Maryland College Park: Applied PDE Seminar, April 2012.
- *Singular Limits to the Navier-Stokes-Smoluchowski System.* University of Maryland College Park: Applied Mathematics and Statistics, and Scientific Computation Student Seminar, November 2011.
- *Weak-Strong Uniqueness of Solutions to the Navier-Stokes-Smoluchowski System.* University of Maryland College Park: Applied Mathematics and Statistics, and Scientific Computation Student Seminar, April 2011.
- *Singular Limits in Hydrodynamics.* University of Maryland College Park: Applied PDE Seminar, November 2010.

d. Grants

- **NSF Grant DMS-1401732** *(Principal Investigator)*
  Mathematical Sciences Postdoctoral Fellowship
  Amount: $150,000
  Duration: September 1, 2014-July 31, 2017

e. Fellowships and Awards

University of Maryland, College Park

- *Ann G. Wylie Dissertation Fellowship*, Fall 2012
- *John Osborn Memorial Fellowship,* Summer 2011
- *VIGRE Fellowship,* Fall 2008-Spring 2009

St. Mary's College of Maryland

- *Induction to Phi Beta Kappa,* 2007
- *Departmental Award in Mathematics,* 2007
- *Departmental Award in Physics,* 2007
- *Jeanne Brocavich Scholarship,* 2006

Travel Grants and Awards

- *Travel Grant to Sixteenth International Conference on Hyperbolic Problems: Theory, Numerics, Applications*, August 2016
- *Travel Grant to Fourteenth International Conference on Hyperbolic Problems: Theory, Numerics, Applications*, June 2012
- *Jacob K. Goldhaber Travel Award*, June 2012
- *Travel Grant to Incompressible Fluids, Turbulence and Mixing Conference at Carnegie Mellon University,* Fall 2011

Other Awards

- *Catoctin High School Distinguished Graduate Award*, 2016

e. Editorial and Reviewing Activities

- Reviewing Activities for Journals: *SIAM J. on Math. Analysis*, *Journal of Mathematical Analysis and Applications*, *Journal de Mathematiques Pures et Appliquees (JMPA)*, *Journal of Differential Equations*, *Nonlinear Analysis*

3. TEACHING, MENTORING, AND ADVISING

a. Courses taught

Carnegie Mellon University

- *21-241: Matrices and Linear Transformations,* Spring 2017
- *21-355: Principles of Real Analysis I,* Fall 2016
- *21-124: Calculus II for Biologists and Chemists,* Spring 2016
- *21-241: Matrices and Linear Transformations,* Fall 2015

University of Maryland, College Park

- *MATH 115: Precalculus,* Spring 2014
- *MATH 220: Elementary Calculus I,* Spring 2011
- *MATH 141: Calculus II,* Fall 2009
- *MATH 112: College Algebra with Applications and Trigonometry,* Spring 2009
- *MATH 221: Elementary Calculus II,* Fall 2008

St. Mary's College of Maryland

- *MATH 352: Analysis II,* Spring 2007
- *MATH 351: Analysis I,* Fall 2006
- *MATH 281: Foundations of Mathematics I,* Fall 2005

b. Mentoring

Carnegie Mellon University

- Yuanyuan Feng–Under the direction of G. Iyer.
- Adam Williams–Under the direction of R. Pego, Masters thesis: *A Variational Formula for Conservation Laws Arising from Discrete Systems of Sticky Particles*, Spring 2015.

4. SERVICE AND SYNERGISTIC ACTIVITIES

a. Campus

Departmental–University of Maryland College Park

- Judge for Spotlight on Student Research Talks, Spring 2014
- Organizer for the Student PDE Seminar, Fall 2012
- Directed Reading Program: pairing undergraduate students with graduate student mentors for semester-long independent study projects, Fall 2011-Spring 2014
- Orientation Committee, 2010-2013
- New Student Visiting Days, 2010-2014

Departmental–St. Mary's College of Maryland

- Student Hiring Committee, Physics Department, Spring 2007
- Student Hiring Committee, Mathematics Department, Spring 2006

b. Community, State, and National

- Author of mathematics questions for the Academic Tournament for Frederick County Public Schools, Maryland, Winter 2010-Winter 2014

c. Affiliations

- American Mathematical Society
- Society for Industrial and Applied Mathematics