

**Contact Information**

Department of Mathematics, Rice University, P. O. Box 1892, Houston, TX 77251

Telephone: (770)-298-0281

Email: ryham@rice.edu

Website: <http://www.owlnet.rice.edu/~rjr1>

**Personal Data**

Date of Birth: May 15, 1980

Place of Birth: Cambridge, Ontario, Canada

Nationality: Canada and Sweden

Visa Status: Permanent Resident

**Current Position**

Postdoctoral Research Associate, Department of Chemical and Biomolecular Engineering & Complimentary Visiting Scholar, Department of Mathematics, Rice University.

**Research Interests** Partial differential equations, computational modeling and geometric measure theory.

**Education**

- **The Pennsylvania State University**, University Park, Pennsylvania

PhD Mathematics, August 2006

Dissertation: *An energetic variational approach to the mathematical modeling of charged fluids: charge phases, simulation and well posedness.*

Advisers: Chun Liu and Ludmil Zikatanov

- **University of Georgia**, Athens, Georgia

BS Mathematics, magna cum lauda, May 2001

**Research Publications**

1. *On the Small Mass Limit of the Debye-Hückel System*, In preparation.
2. *On Linear Growth Variational Problems Without the Convex Hull Property*, In preparation.
3. *Existence, Uniqueness, Regularity and Long-term Behavior for Dissipative Systems Modeling Electro-hydrodynamics*. In preparation.
4. (with Qiang Du, Chun Liu and Xiaoqiang Wang) *Energetic variational approaches in modeling vesicle and fluid interactions*. Phys. D 238 (2009), no. 9-10, 923–930.

5. (with Chun Liu and Ludmil Zikatanov) *Mathematical models for the deformation of electrolyte droplets. Discrete Continuous Dynamical Systems B.* 8 (2007), no. 3, 649–661.
6. (with Qiang Du, Chun Liu and Xiaoqiang Wang) *Diffuse interface energies capturing the Euler number: relaxation and renormalization. Communications in Mathematical Sciences.* 5 (2007), no. 1, 233–242.
7. (with Chun Liu and Zhi-Qiang Wang) *On electro-kinetic fluids: one dimensional configurations. Discrete Continuous Dynamical Systems B.* 6 (2006), no. 2, 357–371.
8. (with Qiang Du, Chun Liu and Xiaoqiang Wang) *Modeling the spontaneous curvature effects in static cell membrane deformations by a phase field formulation. Communications in Pure Applied Analysis.* 4 (2005), no. 3, 537–548.
9. (with Qiang Du, Chun Liu and Xiaoqiang Wang) *A phase field formulation of the Willmore problem. Nonlinearity* 18 (2005), no. 3, 1249–1267.

## Teaching Experience

1. Math 310, Mathematics of Music, Spring 2010
2. CHBE 692, Numerical Methods for Diff. Eqn's in Engineering and Biology (graduate), Fall 2009 (co-taught)
3. CHBE 401, Transport Phenomena I, Fall 2009 (co-taught)
4. Math 424, Partial Differential Equations II (graduate), Spring 2009
5. Math 468, Continuum Mechanics (graduate), Fall 2008
6. Math 211, Ordinary Differential Equations, Spring 2008
7. Math 425, Integration Theory (graduate), Fall 2007
8. Math 211, Ordinary Differential Equations, Spring 2007
9. Math 213, Mathematical Biology, Fall 2006
10. Math 699, Varifolds and Elliptic Variational Problems (graduate), Fall 2008 - Spring 2009 (seminar)
11. Math 499, Michell Trusses, Spring 2008 - Spring 2009
12. Math 499, Stochastic Differential Equations (graduate), Summer 2008 (seminar)
13. Math 699, Curvature Measures (graduate), Spring 2008
14. Math 699, The Willmore Functional (graduate), Fall 2007

15. Math 699, Phase-Field Methods (graduate), Spring 2007
16. Math 499, Curve Shortening, Spring 2007 - Fall 2007
17. Math 699, Level Set Methods (graduate), Fall 2006 (seminar)
18. Multivariable Calculus, College Algebra I and II and Elementary Linear Algebra, 2001-2006 (at Penn State)

## Talks

1. "Dissipative Systems modeling Electro-Hydrodynamics", Séminaire du GIREF, Université Laval, Québec, October, 2009.
2. "Global Existence and Long Term Behavior for Dissipative Systems in Electro-Hydrodynamics", IMACS World Congress, Athens Georgia, 2009.
3. "Long Term Behavior for Drift-Diffusion Equations" Seminar on Partial Differential Equations, University of Houston, March 2009
4. "Long Term Behavior for Drift-Diffusion Equations" Seminar in Applied Analysis, Universität Stuttgart, March 2009
5. "Long Term Behavior for Drift-Diffusion Equations" Geometry-Analysis Seminar, Rice University, January 2009
6. "Analysis in Electrohydrodynamics." PDE Seminar, Purdue University, March 2008
7. "Solving Electrolyte Equations." AMS Fall Sectional, Albuquerque, NM 2007
8. "Singular limit of a nonlocal semi-elliptic PDE." Geometry-Analysis Seminar, Rice University, August 2007
9. "Diffuse Interface Approximations of the Euler Number." A Conference on Applied Analysis on the Occasion of the 65th Birthday of David Kinderlehrer, Carnegie Mellon University, October 2006
10. "Electrolyte Droplets." CAAM Colloquium, Rice University, September 2006
11. "Diffuse Barrier Potential in Electrolyte Models." Geometry-Analysis Seminar, Rice University, August 2006
12. "Deformation of Charge Selective Vesicles." 15th U.S. National Congress on Theoretical and Applied Mechanics, Boulder, Colorado, June 2006
13. "Deformation of Charge Selective Drops." Interfacial Dynamics in Complex Fluids, Banff, Canada, May 2006

14. “Modeling of Selectively Permeable Vesicle Membranes in Electrolytes: An Energetic Variational Formulation.” APS March Meeting 2006
15. “Analysis of a Nonlocal, Semilinear Equation from Electrokinetics.” Mathematical Biology Seminar, University of Utah, February 2006
16. “Nonlocal Poisson-Boltzmann Equation.” Applied Math Seminar, University of Colorado, Boulder, February 2006
17. “Electrokinetics and the Stationary Debye Huekel Model.” AMS Sectional Meeting, Univ. of Nebraska, October 2005.
18. “Algorithm for Optimal Choice of Prolongation Operator.” Lawrence Livermore National Lab, 2004.
19. “On the convergence of Matching Based Multilevel Method.” Univ. of Pittsburgh, Finite Element Circus, 2004.
20. “Two Level Convergence and Choice of Optimal Coarse Subspace.” Cornell Univ., Finite Element Circus, 2003.

## Research Experience

- **Department of Chemical and Biomolecular Engineering, Rice University**, 2009-present  
Houston, Texas  
Postdoctoral Research Associate. Supervisor: Matteo Pasquali.
- **Department of Mathematics, Rice University**, 2006-2009  
Houston, Texas  
VIGRE Lovett Instructor. Performed independent research and co-organized the department’s undergraduate research program. Supervisor: Robert Hardt.
- **Department of Mathematics, Pennsylvania State University**, 2003-2006  
University Park, Pennsylvania  
VIGRE Graduate Research Assistant
- **Institute for Mathematics and its Applications**, 2004-2005  
Minneapolis, Minnesota  
Long term graduate visitor for thematic year on Mathematics of Materials and Macromolecules.
- **Lawrence Livermore National Lab**, Summer, 2003 and 2004  
Center for Applied Scientific Computing  
Livermore, California  
Worked in Linear Solvers group on multigrid prolongation algorithms.

- **Department of Mathematics, University of Utah**, May 28 - June 8, 2002  
Salt Lake City, Utah  
VIGRE Minicourse on Variational Methods and Nonlinear PDE

## Honors and Awards

- Outstanding Faculty Associate, from the Lovett College, Rice University, 2008.
- Pritchard Lab Dissertation Fellowship from the Department of Mathematics, Fall 2005.
- Undergraduate Teaching Award from the Department of Mathematics, December 2005.

## Web-Published Materials

- Michell Trusses PFUG (Research group for Postdocs, Faculty, Undergraduates and Graduates)  
<http://cnx.org/content/m19065/latest/>

## Other Professional Experiences & Skills

- Chair, Current Math Seminar, Rice University 2008-2009. Seminar centered around introductory talks given by graduate students in preparation for department colloquia.
- Lovett Undergraduate Research Symposium 12 undergraduates presented their research in humanities and sciences to peers and faculty panel, April 2008 and 2009
- Faculty address, Rice University High School Math Competition, *Holditch's theorem*, 2008
- Faculty lecture, Rice Undergraduate Conference in Mathematical Physics, *Can you hear the shape of a drum?* 2008
- Co-organizer for Rice Undergraduate Conference on Math Physics, brought 13 students from around the country to hear 6 lectures from Rice faculty and participate in two labs, March 2008.
- Co-organizer, Colloquium Committee, Rice University 2007-2008
- Lecture for International Baccalaureate Workshop, *The Intermediate Value Theorem*, 2007
- Lecture for Rice Academy of Continuing Education, *Area and Volume*, 2007
- Chair, Colloquium Committee, Rice University 2006-2007
- Co-examiner, advanced exam for Ph.D. candidate Zhi Zhang, Rice University
- Fluent in German and proficient in spoken French
- Expertise in Matlab, FORTRAN, FORTRAN-95 and C-programming.

## References

### **Chun Liu**

Dept. of Mathematics  
Penn State University  
University Park, PA 16802  
liu@math.psu.edu  
(814) 865-3611

### **Ludmil Zikatanov**

Dept. of Mathematics  
Penn State University  
University Park, PA 16802  
ltz@math.psu.edu  
(814) 863-9682

### **William Veech**

Dept. of Mathematics  
Rice University  
P. O. Box 1892  
Houston, TX 77251  
veech@rice.edu  
(713) 348-4881

### **Frank Jones**

(Teaching Reference)  
Dept. of Mathematics  
Rice University  
P. O. Box 1892  
Houston, TX 77251  
fjones@math.rice.edu  
(713) 348-5266

### **Tim Cochran**

(Teaching Reference)  
Dept. of Mathematics  
Rice University  
P. O. Box 1892  
Houston, TX 77251  
cochran@math.rice.edu  
(713) 348-5265

### **Bernard Aresu**

(University Reference)  
French Studies Department  
Rice University  
P. O. Box 1892  
Houston, TX 77251  
bca@rice.edu  
(713) 348-4857

### **Robert Hardt**

(Postdoctoral Supervisor)  
Dept. of Mathematics  
Rice University  
P. O. Box 1892  
Houston, TX 77251  
hardt@math.rice.edu  
(713) 348-3280