

# David T. Uminsky

---

## CONTACT INFORMATION

UCLA Mathematics Department  
Los Angeles, CA, USA 90095-1555  
Voice: (310) 825 - 9369

Fax: (310) 206 - 6673  
Email: [duminsky@math.ucla.edu](mailto:duminsky@math.ucla.edu)  
Website: <http://www.math.ucla.edu/~duminsky/>

## RESEARCH INTERESTS

Fluid dynamics, partial differential equations, dynamical systems, mathematical biology, mathematical physics, complex dynamics.

## EMPLOYMENT

<b>UCLA</b>	NSF Mathematical Sciences Research Postdoctoral Fellow	2011-Present
<b>UCLA</b>	University of California President's Postdoctoral Fellowship	2010-2011
<b>UCLA</b>	NSF Mathematical Sciences Research Postdoctoral Fellow	2009-2010

## EDUCATION

**Boston University**, Boston, Massachusetts USA

Ph.D., Mathematics, May 2009

- Dissertation: "The Viscous  $N$  Vortex Problem: A Generalized Helmholtz/Kirchhoff Approach"
- Advisor: C. Eugene Wayne

**Harvey Mudd College**, Claremont, California USA

B.S., Mathematics, May 2003

- Senior Thesis: "Generalized Spectral Analysis of Large Sets of Voting Data"
- Advisor: Michael Orrison

## GRANTS

1. NSF Mathematical Sciences Postdoctoral Research Fellowship, DMS-0902792. For the amount: \$135,000, 2009-2013.

## PAPERS & PUBLICATIONS

1. J. von Brecht and D. Uminsky. On soccer balls and linearized inverse statistical mechanics. Submitted.
2. G. Rousseaux, R. Levy, D. Uminsky. Cetacean flukeprints form dispersive white holes. Submitted.
3. D. Uminsky, C.E. Wayne, A. Barbaro. A multi-moment vortex method for 2D viscous fluids. To appear in *Journal of Computational Physics*, 2012.
4. H. Sun, D. Uminsky, A. Bertozzi. Generalized Birkhoff-Rott equation for 2D active scalar problems. To appear in *SIAM Journal on Applied Mathematics*, 2011.
5. J. von Brecht, D. Uminsky, T. Kolokolnikov, A. Bertozzi. Predicting pattern formation in particle interactions. To appear in *Mathematical Models & Methods in Applied Sciences*, 2011.
6. R. Levy, D. Uminsky. Formation of ocean surface patterns by cetacean fluke oscillations. To appear in *IMA Volume on Natural Locomotion in Fluids and on Surfaces: Swimming, Flying, and Sliding*, 2011.
7. T. Kolokolnikov, H. Sun, D. Uminsky, A. Bertozzi. Stability of ring patterns arising from two-dimensional particle interactions. *Physical Review E, Rapid Communications*, 84(1), 015203(R), 2011.
8. R. Levy, D. Uminsky, A. Park, J. Calambokidis. A theory for the hydrodynamic origins of whale flukeprints. *International Journal of Non-Linear Mechanics*, Volume 46, Issue 4, May 2011, Pages 616-626.

9. G. Van Baalen, D. Kreimer, D. Uminsky, K. Yeats. The QCD  $\beta$ -function from global solutions to Dyson-Schwinger equations. *Annals of Physics*, Volume 325, Issue 2, February 2010, Pages 300-324.
10. R. Nagem, G. Sandri, D. Uminsky, C.E. Wayne. Generalized Helmholtz/Kirchoff Model for Two-Dimensional Distributed Vortex Motion. *SIAM Journal on Applied Dynamical Systems*, **8**(1), 2009, 160-179.
11. G. Van Baalen, D. Kreimer, D. Uminsky, K. Yeats. The QED  $\beta$ -function from global solutions to Dyson-Schwinger equations. *Annals of Physics*, Volume 324, Issue 1, January 2009, Pages 205-219.
12. A. Gallegos, T. Plummer, D. Uminsky, C. Vega, C. Wickman, M. Zawoiski. A Mathematical Model of a Crocodilian Population Using Delay Differential Equations. *Journal of Mathematical Biology*. **57**(5), 2008, 737-754.
13. R. Devaney, M. Holzer, D. Look, M. Moreno Rocha, D. Uminsky. Singular Perturbations of  $z^n$ . In *Transcendental Dynamics and Complex Analysis*. eds. P. Rippon and G. Stallard. Cambridge University Press, 2008, 111-137.
14. R. Nagem, G. Sandri, D. Uminsky. Vorticity Dynamics and Sound Generation in Two Dimensional Incompressible Fluid Flow. *Journal of the Acoustical Society of America*, **122**(1), July 2007.
15. D. Uminsky, K. Yeats. Unbounded Regions of Infinitely Logconcave Sequences. *Electronic Journal of Combinatorics*, **14**(1), November 2007.
16. R. Devaney, M. Holzer, D. Uminsky. Blowup Points and Baby Mandelbrot Sets for Singularly Perturbed Families of Rational Maps. In *Complex Dynamics: Twenty-Five Years after the Appearance of the Mandelbrot Set*. Eds. R. Devaney and L. Keen. AMS, 2006, 51-62.
17. P. Blanchard, R. Devaney, D. Look, M. Moreno Rocha, P. Seal, S. Siegmund, D. Uminsky. Sierpinski Carpets and Gaskets As Julia Sets of Rational Maps. In *Dynamics on the Riemann Sphere: A Bodil Branner Festschrift*. Eds. P. Horth and C. Petersen. European Mathematical Society, 2006, 97-119.
18. B. Lawson, M. Orrison, D. Uminsky. Spectral Analysis of the Supreme Court. *Mathematics Magazine*, **79**(5), 2006, 340-346.
19. R. Devaney, D. Look, D. Uminsky. The Escape Trichotomy for Singularly Perturbed Rational Maps. *Indiana Journal of Mathematics*, **54**, 2005, 1621-1634.
20. E. Huerta-Sanchez, A. Lopez, D. Uminsky. Iteration of an Even-Odd Splitting Map Can Make Integration Easier. *The Pi Mu Epsilon Journal*, **11**(5), 2001, 241-250.

#### HONORS & AWARDS

- Convocation Speaker. Harvey Mudd College, August 2010.
- University of California President's Postdoctoral Fellowship, UCLA, 2010-2011.
- SIAM Student Travel Award, SIAM conference on Nonlinear Waves, July 2008.
- Dept. of Education GAANN Fellowship, Boston University, 2003 - 2005.
- Honorable Mention, National Science Foundation Graduate Research Fellowship, 2003.
- First Place, Poster Award Session, Southern California regional MAA conference, Spring 2003.
- Meritorious Award, Mathematical Competition in Modeling (MCM), 2002.
- Richard V. Andree Award, *The Pi Mu Epsilon Journal*, for the article: Iteration of an Even-Odd Splitting Map Can Make Integration Easier, 2001.
- Dean's List, Harvey Mudd College, 1999 - 2003.
- Achievement of Excellence, Chicano/Latino Student Affairs organization, 1999 - 2003.
- National Hispanic Scholar, 1997.

TEACHING  
EXPERIENCE

**UCLA**, Los Angeles, California USA

*Instructor* for

- MA272b: Mathematical Aspects of Fluid Mechanics **Spring 2011**
- MA 33a: Linear Algebra w/ Applications **Fall 2010**
- MA 146: Methods of Applied Mathematics **Spring 2010**
- MA 3a: Calculus I for Biology Students **Winter 2010**

**Boston University**, Boston, Massachusetts USA

*Instructor* for

- MA 225: Multivariate Calculus **Summer I 2009**
- MA121: Calculus I for Life and Social Science **Summer II 2006**
- MA226: Differential Equations **Summer II 2004**

*Teaching Assistant* for

- MA124: Calculus II **Fall 2006**
- MA120: Applied Math for Soc. and Mgt. Sciences **Spring 2006**
- MA123: Calculus I **Fall 2005**

**Harvey Mudd College**, Claremont, California USA

*High School Chemistry Teacher for Upward Bound*

**Summer 2001**

Taught three classes of eighteen students each, students came from low-income high schools with poor college acceptance rates. Covered what would be expected in the first semester of a typical high school chemistry course. I was responsible for the curriculum and syllabus for the class.

**CSU Bakersfield**, Bakersfield, California USA

*Teaching Assistant* for

- MA222: Calculus Lab **Spring 1999**

*Co-instructor* for

- Remedial Mathematics for high school students **Summer 1999**

ACADEMIC  
OUTREACH

*Graduate Mentor* for the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) **2003 - Present**

*Undergraduate Mentor* for the National Alliance **2009 - Present**

My role as a mentor for both these organizations involves providing scholastic tools and information for both undergraduate and graduate students from backgrounds that are typically underrepresented in the mathematical sciences with the explicit goal of encouraging and supporting these students in their pursuit of graduate studies in mathematics.

**Harvey Mudd College**, Claremont, California USA

*Upward Bound High School Mentor and Tutor*

**September 1999 - May 2003**

Worked weekly with high school students from severely under-performing high schools in the surrounding communities. Covered chemistry, Spanish, history, and calculus and SAT preparation with students.

*Invited panelist* for 2011 NSF CISE and OCI REU sites PI meeting

Panel Member: “The Impact of REUs on Enhancing Diversity” **March 2011**

*Invited panelist* at 2011 HMC Mathematics Conference on Broadening Participation in the Mathematical Sciences

Panel Member: “How can one work toward broadening participation in mathematics at all levels of one’s career?” **Feb 2011**

*Invited panelist* for the Promoting Undergraduate Research in Mathematics (PURM) Conference  
Panel Member: “Perspective from students” **September 2006**

**Harvey Mudd College**, Claremont, California USA

*Upward Bound High School Mentor and Tutor* **September 1999 - May 2003**

Worked weekly with high school students from surrounding communities. Covered chemistry, Spanish, history, and calculus and SAT preparation with students.

REU &  
MENTORING  
EXPERIENCE

**California Research Training Program in Computational and Applied Mathematics at UCLA**, Los Angeles, California USA

*Co-Advisor for REU Project*, **June 2011 - August 2011**

Worked as a research advisor for CRTPCAM at UCLA, an eight-week undergraduate summer research program in applied mathematics for advanced students. I co-advised three students working on a project in the area of game theory, crime modeling, and network structures.

**Applied Mathematical Sciences Summer Institute**, Los Angeles, California USA

*Research Assistant Advisor for REU* **June 2007 - August 2007**

Worked as a research advisor for AMSSI, an intensive seven-week undergraduate summer research program in applied mathematics for students that largely came from underrepresented minorities. I co-advised eight students working on two projects involving mathematical modeling. My responsibilities included giving lectures, mentoring, running computer lab sessions, working closely with students, and establishing research direction for the projects. I have continued to mentor my students after the completion of the program.

PROFESSIONAL  
EXPERIENCE

**Vertex Pharmaceuticals**, Boston, Massachusetts USA

*Mathematical Consultant* **July 2005 - 2009**

Research includes modeling of chemical kinetics, dissolution/crystallization controlled reactions.

PLENARY TALKS

*Deforming vortex methods for 2D viscous fluids*. The 11th Bluenose Computational and Applied Math Day, Saint Mary’s University, Halifax. **June 2011**

SELECTED  
CONFERENCE  
TALKS

*Stability and the Inverse Statistical Mechanics Problem for Aggregating Particles*. Invited speaker, MS55: Mathematical Models of Biological Aggregations, SIAM conference in PDEs in San Diego, CA. **November 2011**

*Dynamical systems and vortex methods*. Invited speaker, Dynamical systems techniques for fluids. Equadiff 2011, Loughborough, England. **August 2011**

*Multi-moment Vortex Methods for 2D Viscous Fluids*. Invited speaker and co-organizer, MS141 Vortex Dynamics: Analysis and Simulation. 2011 SIAM Conference on Dynamical Systems, Snowbird, UT. **May 2011**

*A theory of complex patterns arising from 2D particle interactions*. AMS Special Session on Self-Organization in Human, Biological, and Artificial Systems, II. Joint Mathematics Meetings in New Orleans, LA. **January 2011**

*A Multi-moment vortex method for 2D viscous fluids.* Session AN: Vortex Dynamics and Vortex Flows I, 63rd Annual Meeting of the APS Division of Fluid Dynamics in Long Beach, CA.

**November 2010**

*Simulating 2D fluids using higher order vortex particle methods.* 2010 UC President's Postdoctoral Fellows Retreat in Lake Arrowhead, CA.

**October 2010**

*A multi-moment vortex method for 2D viscous fluids.* Invited speaker and co-organizer, SS15: Non-linear Phenomena - Applications of PDEs to Fluid Flows, Swarming, and Aggregation, AMS Western Section Meeting in Los Angeles, CA.

**October 2010**

*The hydrodynamic origin of whale flukeprints.* Invited speaker, MS49: Biofluids and Computational Fluids Session (WCD), SIAM Annual Meeting in Pittsburgh, PA.

**July 2010**

*Capturing metastability of the viscous tripole in 2D fluids.* Invited speaker and co-organizer, MS 27: Fluid dynamics: coherent structures and asymptotic behavior, SIAM Emerging Topics in Dynamical Systems and PDEs in Barcelona, Spain.

**June 2010**

*A delay differential equations model for a crocodilian population.* Invited speaker, SS 45: Evolution Equations and Mathematical Biology, The 8th AIMS Conference on Dynamical Systems, Differential Equations and Application in Dresden, Germany.

**May, 2010**

*A moment model approach to tripole dynamics in viscous fluids.* Invited speaker, Mathematics of the New Generation, National SACNAS Conference in Dallas, Tx.

**October 2009**

*Generalized Helmholtz-Kirchhoff model for two dimensional distributed vortex motion.* Invited speaker, MS 63: Interaction of Coherent Structures, SIAM Nonlinear Waves and Coherent Structures in Rome, Italy.

**July 2008**

*Invariant manifolds and asymptotic solutions to the Navier-Stokes equations.* Invited speaker, National SACNAS Conference in Denver, CO.

**October 2005**

*Generalized spectral analysis of large sets of voting data.* contributed speaker, AMS Session on Applications of Mathematics, Joint Mathematics Meetings in Baltimore, MD.

**January 2003**

INVITED SEMINAR  
TALKS

*From Soccer Balls, to Vortices and Whale Flukeprints: Applications of Nonlocal PDEs.* UCLA Applied Math Seminar.

**November 2011**

*A theory of complex patterns arising from non-local particle interactions.* CSU Northridge Applied Mathematics Seminar.

**December 2010**

*Spectral analysis of the supreme court.* UC Irvine Social Network Theory Seminar.

**May 2010**

*Noncommutative harmonic analysis of approval voting.* UCLA Applied Math Crime Modeling Seminar.

**April 2010**

*A Hermite deformable vortex method for the 2D Navier-Stokes equations.* UCLA Applied Math Seminar.

**December 2009**

*Tripole evolution: A new computational and analytic approach to the viscous  $N$  vortex problem.* USC AME Research Seminar.

**October 2009**

*Modeling the 2D Viscous  $N$  Vortex Problem.* CSU Los Angeles Maths Seminar.

**January 2008**

*A Generalization of the Helmholtz-Kirchoff Model of Vortex Motion.* Tulane Center for Computational Science Seminar. **December 2008**

*A Mathematical Model of a Crocodilian Population Using Delay Differential Equations.* Boston University Dynamics Seminar. **November 2007**

POSTER  
PRESENTATIONS

*Generalized Birkhoff-Rott equation for 2D active scalar problems* (w/ Hui Sun). FAN 2010: A conference in honor of J. Thomas Beale at Duke University, NC. **June 2010**

*The Viscous N Vortex Problem: A Generalization of the Helmholtz-Kirchoff Model of Vortex Motion.* IMA Hot Topics Workshop in Minneapolis, MN. **March 2009**

*Vorticity Dynamics and Sound Generation in Two-Dimensional Incompressible Fluid Flow.* SIAM Conference on Application of Dynamical System in Snowbird, UT. **May 2007**

*Generalized Spectral Analysis on Large Sets of Approval Voting Data.* Southern California Regional MAA Conference in Claremont, CA. **March 2003**

*Generalized Spectral Analysis on Large Sets of Approval Voting Data.* National SACNAS Conference in Anaheim, CA. **October 2002**

*Iteration of an Even-Odd Splitting Map Can Make Integration Easier.* Joint Mathematics Meetings in New Orleans, LA. **January 2001**

*Iteration of an Even-Odd Splitting Map Can Make Integration Easier.* National SACNAS Conference in Atlanta, GA. **October 2000**

WORKSHOPS

Invited attendee of the Academic Retreat for UC President Postdoctoral Fellows **October 2010**

Invited attendee of the National Center of Atmospheric Research (NCAR) workshop: Mathematics of Interacting Climate Processes **February 2010**

Invited attendee of the IMA Hot Topics workshop: Higher Order Geometric Evolution Equations: Theory and Applications from Microfluidics to Image Understanding **April 2009**

Attendee of the 2008 Multidimensional Localized Structures held at Università di Roma, Rome, Italy. **July 2008**

Attendee of the 2006 Stability and instability of nonlinear waves workshop held at the University of Washington. **September 2006**

ACADEMIC SERVICE Professional Memberships:

- American Mathematics Society (AMS)
- Society for Industrial and Applied Mathematics (SIAM)
- Society for Advancement of Chicanos and Native Americans in Science (SACNAS)
- American Physical Society, Division of Fluid Dynamics (APS-DFD)

Referee for

*SIAM Journal of Mathematical Analysis, SIAM Journal of Applied Dynamical Systems, Physics of Fluids, Journal of Nonlinear Science, Nonlinearity, Proceedings of the Royal Society A and Elsevier*

book proposal reviewer

**Boston University**, Boston, Massachusetts USA

*Co-Organizer of the BU Student Dynamics Seminar*

**September 2005 - May 2008**

REFERENCES

1. Professor Andrea L. Bertozzi, UCLA, bertozzi@math.ucla.edu (postdoctoral advisor)
2. Professor C. Eugene Wayne, Boston University, cew@math.bu.edu (Ph.D. advisor)
3. Professor Paul Newton, USC, newton@usc.edu (research)
4. Professor Robert Brown, UCLA, rfb@math.ucla.edu (teaching)
5. Professor Robert Devaney, Boston University, bob@bu.edu (research)
6. Professor Dirk Kreimer, Humboldt University Berlin, kreimer@math.hu-berlin.de (research)
7. Associate Professor Angela Gallegos, Loyola Marymount, angela.gallegos@lmu.edu (Mentoring)