

# David T. Uminsky

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## CONTACT INFORMATION

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## RESEARCH INTERESTS

Fluid dynamics, partial differential equations, mathematical modeling, mathematical biology, mathematical physics, complex dynamics.

## EMPLOYMENT

<b>UCLA</b>	NSF Mathematical Sciences Research Postdoctoral Fellow	2011-2013
<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

## PAPERS & PUBLICATIONS

1. A. Barbaro, D. Uminsky, C.E. Wayne. Shear-diffusion and tripole relaxation for 2D vorticity: a new computational approach. In preparation.
2. R. Levy, D. Uminsky, A. Park, J. Calambokidis. A theory for the hydrodynamic origins of whale flukeprints. Submitted.
3. 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.
4. R. Nagem, G. Sandri, D. Uminsky, C.E. Wayne. Generalized Helmholtz/Kirchhoff Model for Two-Dimensional Distributed Vortex Motion. *SIAM Journal on Applied Dynamical Systems*, **8**(1), 2009, 160-179.
5. 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.
6. 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.
7. 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.
8. R. Nagem, G. Sandri, D. Uminsky. Vorticity Dynamics and Sound Generation in Two Dimensional Incompressible Fluid Flow. *J. Acoust. Soc. Am.* **122**(1), July 2007.
9. D. Uminsky, K. Yeats. Unbounded Regions of Infinitely Logconcave Sequences. *Electronic Journal of Combinatorics*, **14**(1), November 2007.

10. 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. American Mathematical Society, 2006, 51-62.
11. 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.
12. B. Lawson, M. Orrison, D. Uminsky. Spectral Analysis of the Supreme Court. *Mathematics Magazine*, **79**(5), 2006, 340-346.
13. R. Devaney, D. Look, D. Uminsky. The Escape Trichotomy for Singularly Perturbed Rational Maps. *Indiana Journal of Mathematics*, **54**, 2005, 1621-1634.
14. 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.
15. D. Uminsky. Senior Thesis: Generalized Spectral Analysis of Large Sets of Voting Data, 2003.

HONORS &  
AWARDS

- NSF Mathematical Sciences Postdoctoral Research Fellowship, UCLA, 2009 - Present.
- University of California President's Postdoctoral Fellowship, UCLA, 2009 (deferred till 2010).
- 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.

TEACHING  
EXPERIENCE

**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.

**UCLA**, Los Angeles, California USA

*Instructor for*

- MA 3A: Calculus I for Biology Students **Winter 2010**
- MA 146: Methods of Applied Mathematics **Spring 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.

**California State University, Bakersfield, Bakersfield, California USA**

*High School Summer Mathematics Teacher*

**Summer 1999**

*Teaching Assistant for MA222: Calculus Lab*

**March 1999 - June 1999**

PROFESSIONAL  
EXPERIENCE

**Vertex Pharmaceuticals, Boston, Massachusetts USA**

*Mathematical Consultant*

**July 2005 - 2009**

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

SELECTED  
CONFERENCE  
TALKS

*The hydrodynamic origin of whale flukeprints.* Invited speaker, SS: Biofluids and Computational Fluids, SIAM Annual Meeting in Pittsburg, PA. **July 2010**

*Tripole evolution for 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

*Spectral analysis of the supreme court.* UC Irvine Social Network Theory Seminar. **May 2010**

*Noncommutative harmonic analysis of approval voting.* UCLA 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**

Senior thesis defense: *Generalized Spectral Analysis of Large Sets of Voting Data.* Presentation Days at Harvey Mudd College. **May 2003**

*Iteration of an Even-Odd Splitting Map Can Make Integration Easier.* Presentation Days at Harvey Mudd College. **May 2001**

POSTER  
PRESENTATIONS

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

R. Nagem, G. Sandri, D. Uminsky. *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 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**

Invited Panelist for the Promoting Undergraduate Research in Mathematics (PURM) Conference **September 2006**

- I was invited to speak on the Panel: *Perspective from students*, where I spoke about the effect of attending an REU and doing research as an undergraduate on attending graduate school.

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

ACADEMIC SERVICE Member in good standing of the **January 2002 - Present**

- American Mathematics Society (AMS)
- Society for Industrial and Applied Mathematics (SIAM)
- Society for Advancement of Chicanos and Native Americans in Science (SACNAS)

Referee for

- SIAM Journal of Mathematical Analysis
- SIAM Journal of Applied Dynamical Systems

**Boston University**, Boston, Massachusetts USA

*Co-Organizer of the BU Student Dynamics Seminar* **September 2005 - May 2008**

*BU Center for BioDynamics* **September 2005 - May 2009**  
Active researcher and member of the BU Center for BioDynamics.

*BU Complex Dynamics Group* **September 2003 - 2005**  
Active researcher and attendee of weekly BU complex dynamics group.

Grader for

- MA561: Methods of Applied Mathematics **September 2007 - December 2007**
- MA225: Multivariate Calculus **September 2003 - December 2003**

**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.

*Facilitator for Academic Excellence* **January 2003 - May 2003**  
Ran weekly problem-solving seminars for the Core Mathematics Program at Harvey Mudd College.

Mathematics Tutor and Grader for

- Math 182: Partial Differential Equations **January 2003 - May 2003**
- Math 188: Social Choice and Decision Making **January 2003 - May 2003**

## REFERENCES

1. Professor C. Eugene Wayne, Boston University, cew@math.bu.edu (Ph.D. advisor)
2. Professor Andrea L. Bertozzi, UCLA, bertozzi@math.ucla.edu (postdoctoral advisor)
3. Professor Tasso Kaper, Boston University, tasso@bu.edu (research)
4. Associate Professor Richard Hall, Boston University, rockford@bu.edu (teaching)
5. Assistant Professor Angela Gallegos, Occidental College, angela@oxy.edu (teaching & research)
6. Professor Dirk Kreimer, Boston University, dkreimer@bu.edu (research)
7. Professor Robert Devaney, Boston University, bob@bu.edu (research)