

EDUCATION

Ph.D. in Physics, The University of Arizona, 2006

M.S. in Physics, The University of Arizona, 2004

B.S. in Engineering Physics, The University of Arizona, 2001

ACADEMIC POSITIONS

CAM Assistant Adjunct Professor

Department of Mathematics

UCLA, 2007-present

RESEARCH GRANTS

Co-PI on NSF DMS-0968309

FRG: Mathematics of large scale urban crime

September 2010-2013

Co-PI on ARO MURI W911NF-11-1-0332

Scalable, stochastic, and spatiotemporal game theory for real-world human adversarial behavior

September 2011-2016

RESEARCH INTERESTS

- Interdisciplinary micro- to macro-scale modeling, including criminal behavior, social networks, biological locomotion, biological and robotic swarming, and foraging behavior
- Modeling complex systems, especially those exhibiting spatial and/or temporal pattern formation
- Nonlinear dynamical systems

PUBLICATIONS

G.O. Mohler & M.B. Short, "Geographic profiling from kinetic models of criminal behavior", accepted in *SIAM Journal on Applied Mathematics* (2011).

A. Stomahkin, M.B. Short, & A.L. Bertozzi, "Reconstruction of missing data in social networks based on temporal patterns of interactions", accepted in *Inverse Problems* (2011).

P.J. Brantingham & M.B. Short, "Crime emergence", in *When Crime Appears: the Role of Emergence*, edited by J.M. McGloin, C. Sullivan, & L.W. Kennedy, New York: Routledge (2011).

M. Gonzalez, *et al.*, "A third generation micro-vehicle testbed for cooperative control and sensing strategies", *International Conference on Informatics in Control, Automation, and Robotics* (2011).

G.O. Mohler, *et al.*, "Self-exciting point process modeling of crime", accepted in *Journal of the American Statistical Association* (2011).

M.B. Short, P.J. Brantingham, & M.R. D'Orsogna, "Cooperation and punishment in an adversarial game: How defectors pave the way to a peaceful society", *Physical Review E* **82**, 066114 (2010).

M.B. Short, *et al.*, "Dissipation and displacement of hotspots in reaction-diffusion models of crime", cover feature in *Proceedings of the National Academy of Science (USA)* **107**, 3961-3965 (2010).

M.B. Short, *et al.*, "Nonlinear patterns in urban crime: Hotspots, bifurcations, and suppression", *SIAM Journal on Applied Dynamical Systems* **9**, 462-483 (2010).

W. Liu, *et al.*, "Multi-scale collaborative searching through swarming", *International Conference on Informatics in Control, Automation, and Robotics* (2010).

**PUBLICATIONS,
CONTINUED**

M.B. Short, *et al.*, "Measuring and modeling repeat and near-repeat burglary effects", *Journal of Quantitative Criminology* **25** (2009).

M.B. Short, *et al.*, "A statistical Model of criminal behavior", *Mathematical Methods and Modeling in Applied Sciences* **18** (2008).

M.B. Short, *et al.*, "Flows driven by flagella of multicellular organisms enhance long-range molecular transport", *Proceedings of the National Academy of Science (USA)* **103**, 8315 (2006).

M.B. Short, J.C. Baygents, & R.E. Goldstein, "A free-boundary theory for the shape of the ideal dripping icicle", *Physics of Fluids* **18**, 083101 (2006).

M.B. Short, J.C. Baygents, & R.E. Goldstein, "Stalactite growth as a free-boundary problem", *Physics of Fluids* **17**, 083101 (2005).

M.B. Short, *et al.*, "Stalactite growth as a free-boundary problem: A geometric law and its platonic ideal", *Physical Review Letters* **94**, 018501 (2005).

Preprints available at <http://www.math.ucla.edu/~mbshort/publications.shtml>

M.B. Short, A.B. Pitcher, & M.R. D'Orsogna, "External conversions of player strategy in an evolutionary game: a cost-benefit analysis through optimal control", submitted (2011).

P.J. Brantingham, *et al.*, "The social ecology of gang territorial boundaries", submitted (2011).

M.B. Short, *et al.*, "Gang rivalry dynamics via coupled point process networks", submitted (2011).

**TEACHING AND
MENTORING**COURSES TAUGHT OR SCHEDULED

- Math 285J, Graduate Applied Math Seminar (2010, UCLA)
- Math 134, Dynamical System (2008-2010, UCLA)
- Math 167, Mathematical Game Theory (2011, UCLA)
- Math 151B, Applied Numerical Methods (2012, UCLA)
- Math 31B, Integration and Infinite Series (2009 and 2010, UCLA)
- Math 3B, Calculus for Life Sciences (2011, UCLA)
- Physics 513, Topics in Advanced Mechanics (2005, UofA)
- Physics Laboratories (2001-2004, UofA)

STUDENT MENTORING

- Summer 2011, mentored three undergraduates performing a UCLA summer REU on evolutionary game theory on networks; a paper based on this research is in preparation
- Summer 2010, mentored three undergraduates performing a UCLA summer REU on robotic swarming; their work has led to a published conference paper
- Summer 2009, mentored four undergraduates through the international IPAM RIPS program working on geographic profiling; their final software is in use by the LAPD
- Summer 2008, mentored six undergraduates performing a UCLA summer REU entitled "Disaster LA"; their final work was presented to the Army Research Office, helping to secure additional funding
- Summer 2007, mentored four undergraduates performing a UCLA summer REU on crime modeling and data analysis

INVITED SEMINARS AND COLLOQUIA

February 2011, Special Colloquium, University of California - Merced
February 2011, Applied Mathematics Colloquium, University of Utah
February 2011, Applied Mathematics Colloquium, Caltech
January 2011, Special Colloquium, North Carolina State University
September 2010, speaker at the third annual "Modelling of Complex Social Systems Symposium", IRMACS center, SFU, Vancouver
April 2010, Special Colloquium, Arizona State University
July 2009, speaker at the "Kinetic and mean-field models in the socio-economic sciences" workshop at the ICMS, Edinburgh, Scotland
February 2009, public lecture on the "Mathematics of collective behavior: from swarming to crime", CosmoCaixa science museum, Barcelona, Spain
October 2007, Applied Mathematics Colloquium, California State University at Northridge
March 2007, geophysical pattern formation symposium at the APS March meeting
January 2007, Applied Mathematics Colloquium, MIT
November 2006, Applied Mathematics Colloquium, UCLA
March 2006, colloquium speaker at the CNLS at Los Alamos National Labs

AWARDS AND HONORS

- Graduated Summa Cum Laude with 4.0 GPA, University of Arizona
- Outstanding Senior Project Award
- Glenn C. Purviance Scholarship in Physics
- George Gregson Science Scholarship
- Galileo Circle Scholarship