

## 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

Assistant Professor

Department of Mathematics

Georgia Institute of Technology, 2013-present

CAM Assistant Adjunct Professor

Department of Mathematics

UCLA, 2007-2013

## RESEARCH GRANTS

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

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

September 2011-2016, \$6.25M

Co-PI on NSF DMS-0968309

FRG: Mathematics of large scale urban crime

September 2010-2013, \$1M

## RESEARCH INTERESTS

- Interdisciplinary micro- to macro-scale modeling, including sociological phenomena, criminal behavior, social networks, biological locomotion, swarming and crowd dynamics, and foraging behavior
- Nonlinear dynamical systems
- PDEs, especially those exhibiting spatial and/or temporal pattern formation

## JOURNAL PUBLICATIONS, BOOK CHAPTERS, AND REFEREED CONFERENCE PROCEEDINGS

C. Zhang, *et al.*, "Opportunistic security game: An initial report", *AAMAS OPTMAS-DCR Workshop* (2014)

C. Zhang, *et al.*, "Modeling crime diffusion and crime suppression on transportation networks: An initial report", *AAAI Symposium on Social Networks and Social Contagion* (2013)

M.R. D'Orsogna, *et al.*, "Criminal defectors lead to the emergence of cooperation in an experimental, adversarial game", *PLOS ONE* (2013)

S.G. McCalla, P.J. Brantingham, and M.B. Short, "The effects of sacred value networks within an evolutionary, adversarial game", *Journal of Statistical Physics* **151** (2013)

D.S. Hermina Martinez, *et al.*, "An Economical Testbed for Cooperative Control and Sensing Strategies of Robotic Micro-vehicles", in *Informatics in Control, Automation and Robotics, Lecture Notes in Electrical Engineering*, Volume 174, Springer-Verlag (2013)

M.B. Short, *et al.*, "Gang rivalry dynamics via coupled point process networks", accepted in *Discrete and Continuous Dynamical Systems* (2013)

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", *European Journal of Applied Mathematics* **24** (2013)

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**PUBLICATIONS,  
CONTINUED**

- P.J. Brantingham, *et al.*, "The ecology of gang territorial boundaries", *Criminology* **50** (2012)
- G.O. Mohler & M.B. Short, "Geographic profiling from kinetic models of criminal behavior", *SIAM Journal on Applied Mathematics* **72** (2012)
- A. Stomahkin, M.B. Short, & A.L. Bertozzi, "Reconstruction of missing data in social networks based on temporal patterns of interactions", *Inverse Problems* **27** (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", *Journal of the American Statistical Association* **106** (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** (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** (2010)
- M.B. Short, *et al.*, "Nonlinear patterns in urban crime: Hotspots, bifurcations, and suppression", *SIAM Journal on Applied Dynamical Systems* **9** (2010)
- W. Liu, *et al.*, "Multi-scale collaborative searching through swarming", *International Conference on Informatics in Control, Automation, and Robotics* (2010)
- 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** (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** (2006)
- M.B. Short, J.C. Baygents, & R.E. Goldstein, "Stalactite growth as a free-boundary problem", *Physics of Fluids* **17** (2005)
- M.B. Short, *et al.*, "Stalactite growth as a free-boundary problem: A geometric law and its platonic ideal", *Physical Review Letters* **94** (2005)
- Preprints available at <http://www.math.gatech.edu/~mshort9/publications.shtml>
- C. Zhang, *et al.*, "Defending against opportunistic criminals: New game-theoretic frameworks and algorithms", (2014)
- A.L. Bertozzi, *et al.*, "Contagion shocks in one dimension", (2014)
- E.W. Fox, *et al.*, "Modeling e-mail networks and inferring leadership using self-exciting point processes", (2013)

**PUBLICATIONS,  
CONTINUED**

J.R. Zipkin, M.B. Short, and A.L. Bertozzi, "Cops on the dots in a mathematical model of urban crime and police response", (2013)

M. McBride, *et al.*, "Crime, punishment, and evolution in an adversarial game", (2013)

**TEACHING AND  
MENTORING**COURSES TAUGHT OR SCHEDULED

- Math 4581, Math Methods in Engineering (2014, GA Tech)
- Math 1501, Calculus I (2013, GA Tech)
- Math 285J, Graduate Applied Math Seminar (2010 and 2013, 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 and 2013, UCLA)
- Physics 513, Topics in Advanced Mechanics (2005, UofA)
- Physics Laboratories (2001-2004, UofA)

STUDENT MENTORING

- Summer 2012, mentored four undergraduates through the international IPAM RIPS program working on predicting crime trends with LAPD
- 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

**SELECTED TALKS  
AND COLLOQUIA**

April 2014, invited speaker at AMS Western Sectional meeting, special session on modeling complex social processes

October 2013, Applied Mathematics Colloquium, Temple University

September 2013, invited speaker at Santa Fe Institute workshop on big data issues in cities

May 2013, invited speaker at SIAM Snowbird, minisymposium on urban dynamics

October 2012, Applied Mathematics Colloquium, Georgia Tech

September 2012, invited speaker at PIMS Hot Topic Workshop on Computational Criminology

August 2012, Special Colloquium, University of Surrey, UK

July 2012, invited speaker at AIMS Conference on Dynamical Systems, Differential Equations and Applications, special session on social systems

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**SELECTED TALKS  
AND COLLOQUIA,  
CONTINUED**

June 2012, invited speaker at SIAM Conference on Nonlinear Waves and Coherent Structures, minisymposium on social modeling

January 2012, Special Colloquium, Olin College

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 Modeling of Complex Social Systems Symposium, IRMACS center, SFU, Vancouver

April 2010, Special Colloquium, Arizona State University

July 2009, invited speaker at the Kinetic and mean-field models in the socio-economic sciences workshop at the ICMS, Edinburgh, Scotland

February 2009, invited public lecture on the "Mathematics of collective behavior: from swarming to crime", CosmoCaixa science museum, Barcelona, Spain

**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