

CONTACT INFORMATION Program in Applied Mathematics *Office:* (520) 621-1163
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 Tucson, AZ 85721 USA

CITIZENSHIP USA

RESEARCH INTERESTS Applications of evolutionary game theory, dynamical systems, and graph theory to the study of the changes in outcomes of species interactions and their effects on large scale ecosystem structures through time.

EDUCATION **The University of Arizona**, Tucson, Arizona USA

Ph.D., Interdisciplinary Program in Applied Mathematics, Expected graduation date: May 2009

- Dissertation Title: An evolutionary game theory approach to population dynamics, with applications.
- Advisors: J. M. Cushing, Professor of Mathematics, University of Arizona;
T. L. Vincent, Professor Emeritus of Aerospace and Mechanical Engineering, University of Arizona
- Areas of Study: Dynamical Systems, Evolutionary Game Theory, Ecological Modeling.

M.S., Interdisciplinary Program in Applied Mathematics, December 2005

Western New Mexico University, Silver City, New Mexico USA

B.S., Mathematics, Botany, Zoology, May 2003

- Cumulative GPA: 4.0
- Summa cum laude

EMPLOYMENT/
PROFESSIONAL
EXPERIENCE

TEACHING AND RESEARCH

Graduate Teaching Assistant, Fall 2008, Fall 2006-Spring 2007

University of Arizona, Department of Mathematics, Tucson, AZ

Taught College Algebra and Precalculus courses. Prepared course materials and presented all course lectures, held regular office hours, and assigned student grades.

Graduate Research Assistant, Summers 2004 - present

Pacific Ecoinformatics and Computation Ecology Lab & Rocky Mountain Biological Lab, Gothic, CO

Used differential equation models and graph theory to research effects of species extinction on food web structure and ecosystem function. Developed model for evolution of food webs.

Undergraduate Research Assistant, Summers 2002, 2003

Los Alamos National Laboratory, Los Alamos, NM

Used differential equation models to study the effects of contraction on graph properties with application to epidemiology (2002), and the role of network topology in influenza epidemics (2003). Presented work in seminars and poster presentations.

SUMMER SCHOOLS

Complex Systems Summer School, June 2004

Santa Fe Institute and St. John's College, Santa Fe, NM

Explored the effects of the topological structure of food webs on robustness with regard to extinction. Presented work at colloquium.

Mathematical and Theoretical Biology Institute, Summers 2001, 2003
Cornell University, Ithaca, NY; and Los Alamos National Laboratory, Los Alamos, NM

Modeled the evolution of pesticide resistance in the European corn borer (2001), and the effects of network topology on influenza epidemics (2003). Presented research at colloquia, and posters at national conferences.

PUBLICATIONS *Effects of extinctions on food webs*, with B. Starzomski. Proceedings of the Complex Systems Summer School, 2004.

Evolution of corn oil sensitivity in the flour beetle, with T. L. Vincent, R. F. Costantino, and J. M. Cushing. Annals of the International Society of Dynamic Games, vol. 9: Advances in Dynamic Game Theory. Birkhäuser, 2007.

Modeling the influence of polls on elections: A population dynamics approach, with J. M. Restrepo and J. M. Hyman. (accepted at Public Choice).

Using stage-structured evolutionary game theory to model experimentally observed evolution of a genetic polymorphism, with R. F. Costantino, J. M. Cushing, and T. L. Vincent. (in review at Evolutionary Ecology Research).

*Competitive outcomes changed by evolution**, with T. L. Vincent, R. F. Costantino, and J. M. Cushing. (in preparation for submission to Nature).

* work covered in Science News web edition article: *Mathematicians show how beetles can share a niche*, by Patrick Barry, Jan. 6, 2009.

AWARDS AND
FELLOWSHIPS

The University of Arizona

- NSF Graduate Research Fellowship, 2003-2008
- NSF IGERT Fellowship, Fall 2003-Spring 2004
- NSF VIGRE Fellowship, Summer 2004, Summer 2007
- NetSci International Workshop and Conference on Network Science Travel Award, Spring 2006
- Herbert E. Carter Travel Award, Spring 2008
- Univ. of Arizona Graduate and Professional Student Council Travel Grant, Summer 2008
- AWM Sonya Kovalevsky Day Grant (co-PI for a grant of \$1000 to fund an all-day mathematics workshop for high school girls and their teachers), Spring 2008
- SACNAS National Conference Outstanding Graduate Oral Presentation in Mathematics Award (\$500), Fall 2008

Western New Mexico University

- Alliance for Minority Participation Scholarship, 2002-2003
- Cardinal Key National Honor Society, 2000-2003
- Highest GPA Award, Graduating class 2003
- WNMU Academic Achievement Award, 2003

SELECTED TALKS INVITED

Summer 2008: *Evolution Reverses Competitive Outcomes*

Thirteenth International Symposium on Dynamic Games and Applications, Wroclaw, Poland.

Summer 2008: *Emergence of Coexistence from Competition in an Evolutionary Game*

SIAM Annual Meeting, San Diego, CA.

Fall 2007: *Evolutionary Games in Flour Beetle Populations*

Department of Mathematics and Statistics Graduate Student Research Seminar, Arizona State University, Tempe, AZ.

Fall 2007: *Evolution Reverses Competitive Outcomes*

Mathematical Modeling and Analysis of Populations in Biological Systems Conference, Univ. of Arizona, Tucson, AZ.

Summer 2006: *Evolution of Competitive Coexistence Among Flour Beetles*

Twelfth International Symposium on Dynamic Games and Applications, Sophia-Antipolis, France.

Fall 2004: *Evolution of Corn Oil Sensitivity in Tribolium castaneum*
Eleventh International Symposium on Dynamic Games and Applications, Tucson, AZ,

CONTRIBUTED

Fall 2008: *Coexistence Emerges Through Evolution*
SACNAS National Conference, Salt Lake City, UT.

Spring 2008: *Who Eats Whom? Ecological Structure and the Effects of Extinction on Food Webs*

Program in Applied Mathematics Graduate Student Colloquium, Univ. of Arizona; Tucson, AZ.

Spring 2007: *From Flour Beetles to Food Webs: Applications of Evolutionary Game Theory*
Applied Mathematics Graduate Student Recruitment Workshop, Univ. of Arizona, Tucson, AZ.

Fall 2006: *Introduction to Evolutionary Game Theory and Its Application to Flour Beetles*
Program in Applied Mathematics Graduate Student Colloquium, Univ. of Arizona, Tucson, AZ.

POSTER
PRESENTATIONS

- UA Graduate Interdisciplinary Department Programs Showcase, 2006
- NetSci International Workshop and Conference on Network Science, 2006
- MGE@MSA/WAESO Annual Conference, 2003
- SACNAS National Conferences, 2001, 2002
- AMS/MAA Joint Meeting, 2001

OUTREACH
EXPERIENCE

Sonya Kovalevsky High School Mathematics Day, Spring 2008

Co-organized the event. Contributed to event scheduling, student and teacher recruitment, and purchasing supplies. Conducted a workshop on modeling in population genetics with a group of students and teachers on the university campus.

Mathematical Modeling Class Group Mentor, Spring 2008

Mentored a group of undergraduate students conducting a research project on chaos in a dynamical system model of flour beetle populations.

High School Workshop, Fall, 2007

Conducted a workshop for high school students on modeling ecosystem interactions.

PROFESSIONAL
AFFILIATIONS

SIAM (Society for Industrial and Applied Mathematics) Student Chapter; LAGSES (Latino/a Association of Graduate Students in Engineering and Science), webmaster; SACNAS (Society for the Advancement of Chicanos and Native Americans in Science); ESA (Ecological Society of America); ISDG (International Society for Dynamic Games); PEaCE Lab (Pacific Ecoinformatics and Computational Ecology Lab), Berkeley, CA; RMBL (Rocky Mountain Biological Lab), Gothic, CO.

COMPUTER SKILLS

Operating systems

- Linux
- Windows
- Mac OS

Software and Programming Languages

Matlab \LaTeX MS Powerpoint
Maple HTML MS Excel
Mathematica
Scientific Workplace

REFERENCES

Dr. Jim Cushing	cushing@math.arizona.edu	Dissertation Advisor
Dr. Tom Vincent	vincent@email.arizona.edu	Research Advisor
Dr. Juan Restrepo	restrepo@physics.arizona.edu	Professor and Research Collaborator
Dr. Neo Martinez	neo@peacelab.net	Research Supervisor
Chris Mikel	mikel@math.arizona.edu	Teaching Supervisor