

CONTACT INFORMATION	Pacific Ecoinformatics and Computational Ecology Lab 1604 McGee Ave. Berkeley, CA 94703	Office: (510) 848-9850 Mobile: (520) 289-1950 Email: rrael@umich.edu URL: http://math.arizona.edu/~rrael
CITIZENSHIP	USA	
RESEARCH INTERESTS	Applications of evolutionary game theory, ordinary differential equations, difference equations, and graph theory to the study of the changes in outcomes of species interactions, such as competition, and their effects on large scale community and ecosystem structures through time.	
EDUCATION	<p>The University of Arizona, Tucson, Arizona USA</p> <p>Ph.D., Interdisciplinary Program in Applied Mathematics, May 2009</p> <ul style="list-style-type: none"> • Dissertation Title: Comparing Theory and Data on Multi-Species Interactions Using Evolutionary Game Theory. • Advisors: J. M. Cushing, Professor of Mathematics, University of Arizona; T. L. Vincent, Professor Emeritus of Aerospace and Mechanical Engineering, University of Arizona <p>M.S., Interdisciplinary Program in Applied Mathematics, December 2005</p> <p>Western New Mexico University, Silver City, New Mexico USA</p> <p>B.S., Mathematics, Botany, Zoology, May 2003</p> <ul style="list-style-type: none"> • Cumulative GPA: 4.0 • Summa cum laude 	
EMPLOYMENT/ PROFESSIONAL EXPERIENCE	<p><u>RESEARCH</u></p> <p>Ford Postdoctoral Fellow <i>Pacific Ecoinformatics and Computational Ecology Lab</i> Modelling the evolution of food webs and exploring the effects of adaptive traits on ecosystem structure and stability.</p> <p>Alliance for Graduate Education and the Professoriate Postdoctoral Fellow <i>University of Michigan, Department of Ecology and Evolutionary Biology</i> Developing models at the interface of ecology and evolution to explore the effects of competition on the structure of niche and neutral communities.</p> <p>NSF Graduate Research Fellow <i>University of Arizona, Department of Mathematics, Tucson, AZ</i> Developed dissertation research on the evolution of competition amongst flour beetles using evolutionary game theory.</p> <p>Graduate Research Assistant <i>Pacific Ecoinformatics and Computation Ecology Lab & Rocky Mtn. Biological Lab, Gothic, CO</i> 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.</p> <p>Undergraduate Research Assistant <i>Los Alamos National Laboratory, Los Alamos, NM</i> Modeled the effects of contraction on graph properties with application to epidemiology (2002), and the role of network topology in influenza epidemics (2003).</p>	<p>Summer 2011 - present</p> <p>Fall 2009 - Summer 2011</p> <p>Fall 2004 - Spring 2006, Fall 2007 - Spring 2008</p> <p>Summers 2004 - 2008</p> <p>Summers 2002, 2003</p>

TEACHING

Postdoctoral Short Course on College Teaching in Science and Engineering

Spring 2010

University of Michigan, Ann Arbor, MI

Discussed teaching strategies, technology, curriculum design, and diversity. Prepared a syllabus for a future class in mathematical biology and a lesson plan for an inquiry-based lab.

Graduate Teaching Assistant

Fall 2008 - Spring 2009, 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.

SUMMER SCHOOLS

Complex Systems Summer School,

June 2004

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

Completed a project on the effects of the topological structure of food webs on robustness with regard to extinction.

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).

PUBLICATIONS

Rael, R. C., Ostling, A. O., and D'Andrea, R., Bedford, T. Scaling of species abundance patterns in niche and neutral communities. (In preparation).

Rael, R. C., Vincent, T. L., and Cushing, J. M. Competitive outcomes changed by evolution. *Journal of Biological Dynamics*. 5: 3, 227-252, 2011. (work announced in: Barry, P. Mathematicians show how beetles can share a niche. *Science News*. 175(3):14).

Rael, R. C., Costantino, R. F., Cushing, J. M., and Vincent, T. L. Using stage-structured evolutionary game theory to model experimentally observed evolution of a genetic polymorphism. *Evolutionary Ecology Research*. 11:141-151, 2009.

Restrepo, J. M., Rael, R. C., and Hyman, J. M. Modeling the influence of polls on elections: A population dynamics approach. *Public Choice*. 140:389-420, 2009.

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

Rael, R. C., and Starzomski, B. Effects of extinctions on food webs. *Proceedings of the Complex Systems Summer School*. 2004.

Rael, R. C., and Wickland, T. Effects of contractions on graph properties with application to epidemiology. *Los Alamos National Laboratory Theoretical Division Technical Report*. 2002.

AWARDS AND FELLOWSHIPS

GRADUATE AND POST-GRADUATE

- Ford Postdoctoral Fellowship, 2011-present
- Alliance for Graduate Education and the Professoriate Postdoctoral Fellowship, 2009 - 2011
- SACNAS Nat.Conference Outstanding Graduate Oral Presentation in Math (\$500), Fall 2008
- AWM Sonya Kovalevsky Day Grant (\$1000), Spring 2008
- Univ. of Arizona Graduate and Professional Student Council Travel Grant, Summer 2008
- Herbert E. Carter Travel Award, Spring 2008
- NSF Graduate Research Fellowship, 2003-2008
- NSF VIGRE Fellowship, Summer 2004, Summer 2007
- NetSci International Workshop and Conference on Network Science Travel Award, Spring 2006
- NSF IGERT Fellowship, Fall 2003-Spring 2004

UNDERGRADUATE

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

SELECTED TALKS INVITED

Fall 2011: *Species Abundance Patterns and Competition in a Stochastic Niche Model*
Center for Computational Science Seminar, Tulane University, New Orleans, LA.

Fall 2011: *Species Abundance Distributions in a Stochastic Competition Model*
The Third International Conference On Math Modeling & Analysis of Populations in Biological Systems (ICMA III), San Antonio, TX.

Spring 2011: *Evolutionary Game Theory in Trophic Interactions*
AMS/MAA Joint Meetings, New Orleans, LA.

Summer 2010: *Body Size Evolution in Food Webs*
Fourteenth International Symposium on Dynamic Games and Applications, Banff, AB, CAN.

Spring 2010: *Evolution Reverses Competitive Outcomes: An Evolutionary Game Theory Approach to Population Dynamics*
Department of Mathematics Colloquium, University of Wisconsin, Whitewater.

Fall 2009: *Evolutionary Changes in Competitive Outcomes*
The Second International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems, Huntsville, AL.

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

Summer 2011: *Species Abundance Distribution and Its Scaling in Trait Space in a Stochastic Niche Model*
Ecological Society of America Annual Meeting, Austin, TX.

Fall 2010: *Evolution of Body Size in Food Webs*
Workshop for Young Researchers in Mathematical Biology, Math. Bio.Institute, Columbus, OH.

Fall 2010: *Scaling of abundance patterns across a niche axis*
Theory Group Meeting, Ecol. and Evolutionary Bio. Dept., Univ. of Michigan; Ann Arbor, MI.

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

Spring 2008: *Who Eats Whom? Ecological Structure & 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
- Blackwell-Tapia Conference, Mathematical Biology Institute, Fall 2010
 - 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
- WISE GISE Science and Engineering Summer Program**, Summer 2011
 Contributed to the organization and running of a population dynamics workshop for 7th and 8th grade girls.
- 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)
 - SACNAS (Society for the Advancement of Chicanos and Native Americans in Science)
 - ESA (Ecological Society of America)
 - ISDG (International Society for Dynamic Games)
- COMPUTER SKILLS
- Operating systems
- Linux • Windows • Mac OS
- Software and Programming Languages
- | | | |
|----------------------|---------------------------------|---------------|
| Matlab | L ^A T _E X | MS Powerpoint |
| Maple | HTML | MS Excel |
| Mathematica | | |
| Scientific Workplace | | |
- REFERENCES
- | | | |
|---------------------|--------------------------|-------------------------|
| Dr. Neo Martinez | neo@peacelab.net | Postdoctoral Supervisor |
| Dr. Annette Ostling | aostling@umich.edu | Postdoctoral Supervisor |
| Dr. Jim Cushing | cushing@math.arizona.edu | Dissertation Advisor |
| Deirdre Smith | dsmith@math.arizona.edu | Teaching Supervisor |