Spring 2003

MILLER INSTITUTE NEWS

The Miller Institute is "dedicated to the encouragement of creative thought and the conduct of research and investigation in the field of pure science and investigation in the field of applied science in so far as such research and investigation are deemed by the Advisory Board to offer promising approach to fundamental problems."

Miller Fellow Focus: Andrew Suarez

Second year Miller Fellow Andrew Suarez combines comparative and experimental approaches to integrate the study of ecology, behavior and evolution into the fields of conservation biology and invasion biology. Most recently, his research has focused on 1) the impacts and mechanisms of success in ant invasions, and 2) patterns and mechanisms of nestmate recognition in social insects. He is hosted by Dr. George Roderick in the Department of Environmental Science, Policy and Management.

Identifying the direct and indirect impacts of invaders is essential for prioritizing conservation efforts. One species that is particularly damaging (and quite familiar to home owners in California) is the Argentine ant (Linepithema humile). In addition to being widespread urban and agricultural pests, Argentine ants eliminate most native ants in areas they invade. Andy has quantified this loss of native ant species and has started to unravel the cascading, community-wide effects of ant invasions in natural systems. For example, in collaboration with Ted Case (UC San Diego) and Robert Fisher (U.S. Geological Survey), Andy determined that there is a striking lack of spatial overlap between coastal horned lizards (Phrynosoma coronatum) and Argentine ants. Through an examination of horned lizard diet in the field, coupled with laboratory prey preference and growth rate experiments, Andy was able to measure the indirect effects of Argentine ants on horned lizard populations through changes in prey availability. Presently, he is finishing a four-year radio-telemetry project on horned lizards to further examine the mechanisms responsible for their decline.

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DEADLINES TO NOTE

MILLER PROFESSORSHIPS
Monday, September 22, 2003

VISITING MILLER PROFESSORSHIPS
Monday, September 29, 2003 (Fall)
Monday, February 9, 2004 (Spring)

MILLER RESEARCH FELLOWSHIPS
Thursday, October 2, 2003

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Miller Fellow Focus: Andrew Suarez

A major challenge of invasion biology lies in the development of a predictive understanding of invasion processes. Attempts to identify the proximate causes of invasion success or to predict rates of spread seldom emphasize behavioral characteristics. Recent work, however, illustrates that insights into the proximate causes of animal invasions often hinge upon a careful assessment of behavioral mechanisms. In addition, invasions can provide an opportunity to test the factors that influence the maintenance of specific behavioral repertoires. In collaboration with Neil Tsutsui (UC Davis) and David Holway (UC San Diego), Andy is investigating how behavioral attributes, specifically a loss of territorial behavior associated with reduced intraspecific aggression, may contribute to the success of Argentine ants as invaders. Ant colonies typically have well-defined territorial boundaries, a condition referred to as multicoloniality. Multicolonial ants defend their territories aggressively, particularly against conspecifics. Such territorial behavior is thought to limit population density in ants, and for animals generally, because territorial defense can increase mortality and expends resources, time, and energy that could otherwise be allocated to growth, maintenance and reproduction. However, many invasive ant species exhibit a colony structure known as unicoloniality where levels of intraspecific aggression are reduced, colony boundaries are weak to non-existent, and supercolonies composed of networks of interconnected nests are the norm. Worker populations of unicolonial ants often attain higher densities than those of multicolonial ants, perhaps because unicolonial species are exempt from the costs of defending territories against conspecifics. The breakdown in nestmate recognition typical of many species of invasive ants has lead to Andy's current interest in the mechanisms of nestmate discrimination in social insects.

Miller Fellow Andrew Suarez

In social insects, systems for nestmate recognition are often well developed, allowing colony boundaries to be maintained with high fidelity. Because social insect colonies are typically comprised of related individuals, non-reproductives gain inclusive fitness by preferentially helping nestmates. Cues used to distinguish nestmates from non-nestmates may be environmentally derived, innate (genetically based), or a combination of both. In collaboration with Neil Tsutsui, Rick Grosberg (UC Irvine), Dangsheng Liang and George Roderick (UC Berkeley), Andy is using genetic and biochemical approaches to investigate the mechanisms underlying nestmate recognition in Argentine ants. Cuticular hydrocarbons are recognized as the most likely label used to distinguish nestmates from non-nestmates in ants. However, experiments that examine the relative contributions of genetic versus environmental factors to hydrocarbon variation are lacking. Argentine ants provide a powerful system for exploring the genetic and biochemical basis of social behavior because they are easily collected and maintained in the lab, and can therefore be used for controlled and replicated experiments. Moreover, Argentine ants (like many invasive ants) exhibit remarkable variability in colony structure both within their native range and between native and introduced populations, allowing for comparative studies within species.

Andy will be leaving the Miller Institute to join the faculty in the School of Integrative Biology at the University of Illinois, Urbana, in August.

A coastal horned lizard wearing a radio-transmitter. Andy radio-tracked horned lizards in order to see how individuals were responding to the invasion of Argentine ants in southern California.

Recent Publications

Miller Fellow Marius Crainic (‘01-‘03) published one paper during his term: “Integrability of Lie brackets, Annals of Mathematics, March, 2003,” with R.L. Fernandes. Dr. Crainic also submitted one paper, has three preprints and had two papers in preparation at the end of this term.

Miller Fellow Taylor Feild (‘01-‘03) published one paper during his Miller term: “Acclimation of leaf anatomy, photosynthetic light-use, and xylem hydraulics to light in Amborella trichopoda (Amborellaceae),” with Brodribb T, Jaffré T, and Holbrook NM, International Journal of Plant Sciences 162: 999-1008. Dr. Feild also had three papers in press, two manuscripts in review and one manuscript in preparation at the time he left Berkeley.

First Year Miller Fellow Alison Galvani recently published: “Ecological and immunological determinants of influenza evolution,” with Neil M. Ferguson and Robin M. Bush, Nature vol 422, 27 March 2003, page 428.

We previously noted three publications for Miller Professor Martin Head-Gordon (AY ‘01-‘02). Based on work during his Miller term, Professor Head-Gordon published a total of 17 papers with another 15 papers in progress. For more information regarding these papers, refer to http://www.cchem.berkeley.edu/mhggrp/bibliography.html.

Miller Fellow Jun Korenaga (‘01-‘03) published six papers during his term: “Mantle thermal structure and melting processes during continental breakup in the North Atlantic,” with Holbrook, W. S., H. C. Larsen, T. Dahl-Jensen, I. D. Reid, P. B. Kelemen, J. R. Hopper, G. M. Kent, D. Lizarralde, S. Bernstein, and R. S. Detrick, Earth Planet. Sci. Lett., 190, 251-266, 2001, “Effects of vertical boundaries on infinite Prandtl number thermal convection,” with T. H. Jordan, Geophys. J. Int., 147, 639-659, 2001, “On the state of sublithospheric upper mantle beneath a supercontinent,” with T. H. Jordan, Geophys. J. Int., 149, 179-189, 2002a, “Methods for resolving the origin of large igneous provinces from crustal seismology,” with P. B. Kelemen, and W. S. Holbrook, J. Geophys. Res., 107(B9), 2178, doi:10.1029/2001JB001030, 2002, “Onset of convection with temperature- and depth-dependent viscosity,” with T. H. Jordan, Geophys. Res. Lett., 29(19), 1923 doi:10.1029/2002GL015672, 2002b, and “On ‘steady-state’ heat flow and the rheology of oceanic mantle,” with T. H. Jordan, Geophys. Res. Lett., 29(22), 2056, doi:10.1029/2002GL016085, 2002c. Dr Korenaga also submitted two papers and two papers were in preparation.

Miller Professor Terry Machen (Fall ‘02) published one paper during his term: “Modulation of cytosolic Ca^{2+} concentration in airway epithelial cells by Pseudomonas aeruginosa,” with Jacob T., and Lee J. Engel, Infection and Immunity 70: 6399-6408. Professor Machen also has one paper in preparation and two abstracts in press.

Miller Fellowship Awards
2003-2006

Twelve Miller Fellowships were awarded for a three-year term, generally beginning August 1, 2003.

Astronomy	**Eric Ford,** (Princeton University) will be hosted by Professors Geoff Marcy and Eugene Chiang **Alice Shapley,** (California Institute of Technology) will be hosted by Professor Chung-Pei Ma
Chemistry	**Yi Cui**, (Harvard University) will be hosted by Professor Paul Alivisatos **Munira Khalil,** (Massachusetts Institute of Technology) will be hosted by Professor Charles Shank
Earth & Planetary Science	**Sergio Speziale,** (Princeton University) will be hosted by Professors Raymond Jeanloz and Jill Banfield
Electrical Engineering & Computer Science	**Irit Dinur**, (Tel-Aviv University) will be hosted by Professor Luca Trevisan
Espm	**Alex Thompson**, (York University, Toronto) will be hosted by Professor Ron Amundson
Mathematics	**Ioana Dumitriu,** (Massachusetts Institute of Technology) will be hosted by Professor James Demmel **Ovidiu Savin,** (University of Austin) will be hosted by Professor Craig Evans
Molecular and Cell Biology	**Anat Herskovits,** (Weizmann Institute of Science, Israel) will be hosted by Professor Daniel Portnoy
Physics	**Subhadeep Gupta,** (Massachusetts Institute of Technol ogy) will be hosted by Professor Dan Stamper-Kurn **Taizan Watari,** (University of Toyko, Japan) will be hosted by Professors Lawrence Hall and Hitoshi Murayama

For information on the Miller Fellows' research interest please refer to our website at: http://socrates.berkeley.edu/~4mibrs.

Visiting Miller Professorship Program Spring Awards

The Executive Committee and Advisory Board of the Miller Institute have granted awards to the following Visiting Miller Professors. Their terms range from thirty days to one semester during the 2003-2004 academic year.

Astronomy	**Professor Eli Waxman,** The Weizmann Institute of Science, Israel
Chemistry	**Professor Roderick MacKinnon**, Rockefeller University **Professor Hongkun Park**, Harvard University **Professor Gregory Voth,** University of Utah
Eecs / Statistics	**Professor Shmuel Safra**, Tel Aviv University, Israel
Earth & Planetary Science	**Professor Jerry Mitrovica,** University of Toronto, Canada
Espm / Civil & Environmental Engineering	**Ignacio Rodriguez-Iturbe,** Princeton University
Mathematics	**Professor Max Karoubi,** Université Paris, France

Awards and Honors

Visiting Miller Professor Simon Levin (Spring '03) has been awarded the Distinguished Landscape Ecologist Award by the US Chapter of the International Association of Landscape Ecologists. This award is a prestigious honor given to recognize distinguished scientific contributions to the field of landscape ecology. Professor Levin joins an impressive list of scientists, whose work has helped to shape the field of landscape ecology.

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Check our website for upcoming program deadlines

The Stork Club

The Miller Institute would like to congratulate Miller Fellow Jun Korenga and his wife Tomoko on the birth of their son Riku Maximilian Korenaga. Riku was born on March 7, 2003.