

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 a promising approach to fundamental problems."

Miller Fellow Focus: Steve Poe

Miller Fellow Steve Poe evaluates methods for reconstructing evolutionary history, develops statistical tests for use in evolutionary biology, and studies the relationships of *Anolis* lizards. He is hosted by Professors Marvalee Wake and David Wake in the Department of Integrative Biology.

Phylogenetic biology is focused on the reconstruction of evolutionary history, or phylogeny. Phylogeneticists may choose between several quantitative methods for reconstructing phylogeny, including *parsimony* methods that minimize the number of evolutionary changes among species, *statistical* methods that explicitly model the evolutionary process, and *distance* methods that optimize the amount of evolutionary similarity between species. Steve and collaborator Kevin de Queiroz of the Smithsonian Institution identified the general approaches researchers use to evaluate these methods. One of these approaches asks whether a given method is compatible with some preferred philosophy of science, such as Karl Popper's system of corroboration. Kevin and Steve

showed that both statistical and parsimony methods are compatible with Popper's philosophy, in contrast to researchers who have suggested that Popper's approach is compatible with only the parsimony method. In addition to this philosophical approach, phylogeneticists use computer simulations of evolutionary data, well-supported relationships, and laboratory-generated viral phylogenies to test the performance of methods. Steve and collaborator David Swofford, also of the Smithsonian Institution used computer simulations to overturn the idea that adding more species to an analysis always tends to be beneficial for reconstructing relationships accurately. Steve has also used computer simulations, viral phylogenies, and meta-analyses of several phylogenetic data sets to demonstrate the potentially extreme sensitivity of all phylogenetic methods to the inclusion or exclusion of key species in an analysis.

Besides evaluating phylogenetic methods, Steve works on developing statistical tests for phylogenetic biology and evolutionary developmental biology. While at Berkeley he has developed a statistical power approach to determine how much data is needed for tests of rapid



Miller Fellow Steve Poe

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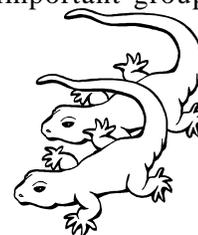
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evolutionary radiations.

Steve and Berkeley graduate student Allison Chubb collaborated on an application of this test that demonstrated that evolutionary lineages of modern birds underwent an explosive radiation in the distant past. Marvalee Wake and Steve are collaborating on statistical tests of general theories of the evolution of development. Their work has shown that existing models for the evolution of development are not good descriptions of real data, and a new explanatory model may be required for at least some organisms.

The remainder of Steve's work at Berkeley focuses on the relationships of the Neotropical lizards called *Anolis*. These lizards are popular study organisms for evolutionary biologists because several

species of this group are able to share habitat in a single area by occupying different ecological niches. Elucidation of the phylogeny of this group is critical for understanding how these lizards came to coexist. Steve has traveled to Puerto Rico, the Dominican Republic, and Cuba during his Miller tenure to collect lizards for this research. He has collected and preserved over 900 specimens of 120 species of reptiles and amphibians during these trips, including over 70 species of *Anolis*. Thus far this research has unearthed one new species of lizard and copious phylogenetic information for this important group.



Next Steps



Miller Fellow Tamas Hausel has been appointed as Assistant Professor in the Department of Mathematics at the University of Texas, Austin beginning September 2002.

Miller Fellow Ray Jayawardhana has been appointed as Assistant Professor in the Department of Astronomy at the University of Michigan, Ann Arbor beginning September 2002.

Miller Fellow Thomas Juenger has been appointed as Assistant Professor in the Section of Integrative Biology at the University of Texas, Austin beginning Fall 2002.

Miller Fellow Steven Poe has been appointed as Assistant Professor in the Department of Biology at the University of New Mexico beginning Septmeber 2002.

Miller Fellow Philip Starks has been appointed as Assistant Professor in the Department of Biology at Tufts University beginning September 2002.



Recent Miller Institute Awards



Visiting Miller Professorships

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 2002-2003 academic year.

<i>Astronomy</i>	Prof. Alexander Tielens, University of Groningen, Netherlands
<i>Chemistry</i>	Prof. Majed Chergui, Universite de Lausanne, Switzerland Prof. Marsha Lester, University of Pennsylvania
<i>Earth and Planetary Science</i>	Prof. Kenneth Farley, California Institute of Technology
<i>EECS</i>	Prof. Noam Nisan, Hebrew University of Jerusalem, Israel
<i>Integrative Biology</i>	Prof. Simon Levin, Princeton University
<i>Mathematics</i>	Prof. Gaven Martin, University of Auckland, New Zealand
<i>Mechanical Engineering</i>	Prof. Friedrich Busse, Universitaet Bayreuth, Germany
<i>Physics</i>	Prof. Patrick Lee, Massachusetts Institute of Technology

Awards & Honors

Former Miller Professor Anil Chopra ('90-'91) was awarded the George W. Housner Medal which is the highest honor of the Earthquake Engineering Research Institute. Professor Chopra was honored for his contributions to structural dynamics and to the earthquake response of structures.

Former Visiting Miller Professor ('71-'72) and Miller Professor ('82-'83) Alexandre Chorin was awarded the prestigious title of University Professor which is reserved for scholars of international distinction who also are recognized and respected as exceptional teachers.

Former Visiting Miller Professor (Spring '97) Brian Hall was awarded the Medal of Alexander Kowalevsky in recognition as one of the most distinguished scientist of the twentieth century in the field of comparative zoology and evolutionary embryology.

Former Miller Professor ('91-'92) Clayton Heathcock was honored with the Herbert C. Brown award for Creative Research in Synthetic Methods for his contributions to synthetic organic chemistry.

Former Miller Fellow ('78-'79) Christos Papadimitriou was elected to the National Academy of Engineering. This is one of the highest professional honors for an American engineer. Professor Papadimitriou also won the Donald E. Knuth prize for outstanding contributions to the foundations of computer science.



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Recent Publications



Former Miller Fellow Emily Brodsky ('01) published one paper during her term with the Miller Institute: "The elastohydrodynamic lubrication of faults," with H. Kanamori, *J. Geophys. Res.*, 106, 16, 357-16, 374, 2001.

Former Miller Fellow Philip Kim ('99-'02) completed one paper during his Miller term: "Thermal Transport Measurements of Individual Multiwalled Nanotubes," with L. Shi, A. Majumdar and P. McEuen, *Phys. Rev. Lett.* 87, 215502, 2001.

Miller Professor Mimi Koehl ('00-'01) had a prolific term publishing three papers: "Sniffing by a silkworm moth: Wing fanning enhances air penetration through and pheromone interception by antennae," with C. Loudon, *J. Exp. Biol.* 203: 2977-2990, 2000, "Stomatopod antennule design: The asymmetry, sampling efficiency, and ontogeny of olfactory flicking," with K. S. Mead, *J. Exp. Biol.* 203: 3795-3808, 2000, and "Fluid dynamic design of lobster olfactory organs: High-speed kinematic analysis of antennule flicking by *Panulirus argus*," with J. A. Goldman, *Chemical Senses* 26: 385-398, 2001.