

## Melanie E. Moses, Ph. D.

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### ACADEMIC POSITIONS

January 2007

to present Assistant Professor, Department of Computer Science, University of New Mexico.

August 2008

to present Joint appointment, Department of Biology, University of New Mexico

2005 - 2006

Postdoctoral Researcher, Departments of Computer Science (under Professor Stephanie Forrest) and Biology (under Distinguished Professor James H. Brown). Research in the scaling properties of biological, social and information networks.

2000 - 2005

Ph.D. awarded August 2005. Dissertation title: Metabolic Scaling in Individuals and Societies. Department of Biology, University of New Mexico. Major Advisor: Dr. Bruce T. Milne. Advanced to candidacy with Distinction, November 2002.

1989 – 1993

Stanford University, B.S. Symbolic Systems. Coursework in computer science, artificial intelligence, cognitive science, mathematics and philosophy of mind.

### PUBLICATIONS

Banerjee, S.\* and **Moses, M.E.** (2009) "A Hybrid Agent Based and Differential Equation Model of Body Size Effects on Pathogen Replication and Immune System Response" Proceedings of the 8TH INTERNATIONAL CONFERENCE ON ARTIFICIAL IMMUNE SYSTEMS (ICARIS 2009), YORK, ENGLAND (ACCEPTED).

Arora, T.\* and **Moses, M.E.** (2009) "Ant Colony Optimization for Power Efficient Routing in Manhattan and Non-Manhattan VLSI Architectures" Proceedings of the 2009 IEEE Swarm Intelligence Symposium, Nashville TN.

**Moses, M. E.** (2009) "Essay Series on Being Human, Engineering: World Wide Ebb" *Nature* 457:660-661. DOI:10.1038/457660a.

Arora, T.\* and **M. E. Moses** (2008) "Using Ant Colony Optimization for Routing in VLSI chips, Proceedings of the workshop on Bio Inspired Computational Methods Used in Difficult Problem Solving (BICS 2008), pp 37-49, Tg.Mures, Romania.

Hou, C, W. Zuo, **M. E. Moses**, J.H. Brown and G. B. West (2008) "Energy Uptake and Allocation During Ontogeny." *Science* 332(5902):736-739. DOI:10.1126/science.1162302

**Moses, M.E.**, S. Forrest, A.L. Davis, M. Loder and J.H. Brown (2008) "Scaling Theory for Information Networks" *Journal of the Royal Society's Interface* (early online May 2008). DOI 10.1098/rsif.2008.0091

**Moses, M.E.**, C. Hou, W.H. Woodruff, G.B. West, J.C. Nekola, W. Zuo, and J.H. Brown (2008) "Revisiting a Model of Ontogenetic Growth: Estimating Model Parameters from Theory and Data." *The American Naturalist* 171(5):632.

Samaniego, H.\* and **M.E. Moses** (2008) "Cities as Organisms: Allometric Scaling of Urban Road Networks in the USA." *Journal of Transport and Land Use* 1(1).

Samaniego, H.\* and **M.E. Moses** (2007) "Cities as Organisms: Allometric Scaling as an Optimization Model to Assess Road Networks in the USA." Proceedings of Access to Destinations II, Minneapolis, MN, August 2007.

Charnov, E.L., R. Warne, and **M.E. Moses** (2007) "Lifetime reproductive effort in mammals and lizards." *The American Naturalist* 170: E129-E142. DOI: 10.1086/522840.

Decker, E.D., A.J. Kerkhoff and **M.E. Moses** (2007) "Global Patterns of City Size Distributions and Their Fundamental Drivers." *PLoS ONE* 2(9):e934. DOI:10.1371/journal.pone.0000934

Cable, J.M., B.J. Enquist and **M.E. Moses** (2007) "The Allometry of Host-Pathogen Interactions." *PLoS ONE* 2(11): e1130. DOI:10.1371/journal.pone.0001130.

Savage, V., E. White, **M.E. Moses**, S. Ernest, B.J. Enquist and E. L. Charnov (2006) "Technical Comment on the Illusion of Life History Invariants." *Science* 312, 5771: 198. DOI: 10.1126/science.1123679.

**Moses, M.E.** and J.H. Brown (2003) "Allometry of Human Fertility and Energy Use." *Ecology Letters* 6: 295-300. (Reviewed in *Nature News* "Food and Fertility Hand in Hand" April 7, 2003).

\* Students and Postdocs

**GRADUATE STUDENTS and POST DOCS**

Dr. Horacio Samaniego, postdoc January 2007 – March 2008

Soumya Banerjee, Ph.D. student August 2007-present

Matthew Fricke, Ph.D student August 2007-present

Tamanna Arora, Masters student August 2007 – present

Kenneth Letendre, Masters student May 2008-present

Josh Hecker, Ph.D. student August 2008 - present

**FUNDING**

NIH award # P20 RR018754, \$310,000 for award period 7/1/2006 - 06/30/2009. Modeling viral dynamics and immune response in vertebrates: A subproject of the COBRE Center for Evolutionary and Theoretical Immunology.

Microsoft Research New Faculty Fellowship awarded 8/2008. Distributed Computation in Ant Pheromone Networks.

Sandia National Labs, LDRD award 09-1292 \$75,000, 2008 – 2010. An agent based approach to understanding cooperative foraging in ant colonies.

**ACADEMIC DISTINCTIONS**

2008 Microsoft New Faculty Fellowship Finalist

2004-2005 Ford Foundation Dissertation Fellow

2003-2004 NSF Biocomplexity Fellow

2003-2004 Sevilleta Long Term Ecological Research Site Summer Grantee

2000-2003 Environmental Protection Agency STAR Fellow

2003 New Mexico Graduate Research and Development Grantee

2002-2005 New Mexico Alliance for Graduate Education and the Professoriate Fellow

2000 NSF Pre-doctoral Fellowship awarded (declined to accept EPA STAR Fellowship)

1989-1993 Undergraduate Training Program Scholar, National Security Agency

1989 National Merit Finalist, National Achievement Scholar

**Selected Invited PRESENTATIONS**

November 2008 "Networks: how exchanges of energy and information shape the evolution of organisms & societies." as the New Mexico Academy of Sciences 2008 Distinguished Lecturer

April 2008 "Scaling in Natural and Human Engineered Networks." Presentation for the Microsoft New Faculty Fellowship, Redmond, WA.

- November 2007* “Network Scaling in Societies” at the Metabolic Scaling Science Cafe. New Mexico Museum of Natural History and Science.
- September 2007* “Applications of Metabolic Scaling Theory in Immunology and Epidemiology” at the COBRE Center for Evolutionary and Theoretical Immunology (CETI) Seminar, University of New Mexico.
- September 2007* “Network Scaling in Complex Systems: What happens when organisms, cities & computer chips get bigger?” Department of Computer Science Colloquium, University of New Mexico.
- July 2007* “Scaling of Distribution Networks in Organisms, Societies and Information Systems” invited talk at the Scaling in Biological and Social Networks Workshop at the Santa Fe Institute, NM.
- February 2007* “Metabolic Scaling in Social and Information Networks” presentation in the AAAS Annual Meeting, Symposium on Universal Laws Governing Biological Systems, San Francisco, CA
- January 2007* “Metabolic Scaling in Social & Information Networks” invited presentation to the Seminar in Interdisciplinary Biomedical and Biological Science, University of New Mexico
- December 2006* “Conceptual Foundations of the Metabolic Theory of Ecology” invited presentation to the National Research Council’s Conceptual Basis of Biology Workshop, Washington D.C.
- October 2006* “A tale of two societies: network scaling in human and ants” invited seminar to the Ecology and Evolutionary Biology Department at the University of Arizona.
- January 2006* “Scaling in Ant Foraging Networks” invited presentation to the Biologically Inspired Investigations Mini-Workshop of the Consortium of the Americas, Albuquerque, NM.
- November 2005* “Energy and Information in Social Systems” invited presentation to the UNM Technology of Nature, Nature of Technology Workshop, Albuquerque, NM.
- September 2005* “Metabolic Scaling from Individuals to Societies” presented at the Conference of Ford Fellows, National Academy of Sciences, Washington D.C.
- January 2005* “The effect of colony size on energy acquisition rates in *Pogonomyrmex*” oral presentation at the Sevilleta LTER Annual Symposium, New Mexico.
- July 2004* “The Allometry of Human Energy Consumption and Reproduction: Implications for Sustainability” invited presentation at the Gordon Conference on the Metabolic Theory of Ecology, Bates College, Maine.
- April 2003* “Human Energy Consumption and Reproduction: The Geometry of Resource Networks” oral presentation at the US-International Association of Landscape Ecologists, Banff, Canada.
- April 2003* “Human Energy Consumption and Reproduction” oral presentation at the UCLA Human Complex Systems Conference, Lake Arrowhead, CA.

## **TEACHING**

- Spring 2008,09* Complex Adaptive Systems, CS 591
- Fall 2007,08* Developed and taught CS 151, Computer Programming Fundamentals for Biologists  
CS 591, Biological Computation Graduate Seminar
- Spring 2007* CS 691, Network Scaling Graduate Seminar
- Fall 2003* Teaching Assistant for the Introductory Biology Lab
- Spring 2003-  
Summer 2005* Teacher of the Biology Minority Access to Research Careers (MARC) GRE preparatory course
- Summer 2002* Teaching assistant for Biology department course in Ethnobotany

### **ATTENDED WORKSHOPS and SHORT COURSES**

- August 2003* "The Ant Course," species identification, behavior and ecology of southwestern ants, sponsored by the California Academy of Science in Portal, AZ
- May 2002* "Modeling Complexity Across Levels: Social Insect Societies as Multilevel Integrated Systems," workshop of the Santa Fe Institute, NM
- June 2001* Complex Systems Summer School, 4 week course exploring complex dynamics in physics, biology, economics and mathematics at the Santa Fe Institute.
- November 2000* Fractals in Biology: Developing Underlying Mechanistic Principles, Santa Fe Institute Workshop

### **EMPLOYMENT HISTORY**

- 1999* Research Intern in the Forest Canopy Lab of the Smithsonian Environmental Research Center. Measure morphological and optical properties of leaves from the forest canopy and incorporate results into a computer model of light attenuation.
- 1997 to 1999* Network Security Manager and Technology Risk Specialist, Fannie Mae: Manage the network security team, assess corporate computer network security, develop and enforce corporate information security policy, and conduct computer security analysis for electronic commerce initiatives.
- 1993-1997* Computer Scientist, Information Security Group, Department of Defense: Research, design, install, and evaluate hardware and software systems for secure government computer communications; projects include encryption and key management, network security and intrusion detection systems. Assist in drafting the list of research initiatives required to address computer network vulnerabilities for the first National Information Infrastructure Risk Assessment.

### **SERVICE**

- 2008* Vice Co-chair for the 2010 Gordon Research Conference on the Metabolic Theory of Ecology, Co-chair for the 2012 Gordon Research Conference on the Metabolic Theory of Ecology
- 2007-2008* Departmental Service: Faculty Search Committee, Incoming Graduate Student Advising Committee, Master's Curriculum Re-design Committee, co-organized annual graduate student recruiting event, co-organized annual graduate student orientation
- 2003-present* Reviewer for *Ecology Letters*, *Ecology and Society*, *Bulletin for Mathematical Biology*, *Proceedings of the Royal Society B*, *Biotropica*, *Proceedings of the National Academy of Sciences*, *Physica A*, *Oecologia*, *Functional Ecology*, *Networks and Spatial Economics*, *PLoS ONE*, *Journal of the Royal Society Interface* and *Nature*
- 2001-2004* Active member of Young Women United, a nonprofit organization which links teenagers and women to reduce violence against young women of color in Albuquerque
- 1996-2000* Volunteer with Habitat for Humanity, Fannie Mae Help the Homeless Campaign, Whitman Walker crisis counseling in Washington D.C., Water for People at the I'jatz Permaculture Farm in the Guatemalan highlands, International Brigade builder following Hurrigan Mitch in Esteli, Nicaragua.