

Curriculum Vitae

CG Farmer
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Research Interests: 1) Evolutionary physiology; I primarily focus on studies of metabolism associated with the following physiological states: exercise, basal (standard), and postprandial. 2) Applied evolution.

Professional preparation

Ph.D. 1998, Brown University, Providence, RI. Physiology, Donald Jackson, advisor
B.A. 1987, University of Idaho, Moscow, ID. Physics

Professional positions:

2007-present Assistant Professor, Dept. of Biology, University of Utah, SLC, UT, USA
2006-present Vice President for Comparative Cardiopulmonary Research, Utah Artificial Heart Institute, Salt Lake City, Utah, USA
2004-2006 NSF Advance Fellow, Dept. of Biology, University of Utah, Salt Lake City, Utah, USA
2002-2003 Visiting Professor, Université Catholique Louvain, Louvain-la-Neuve, Belgium
2001-2006 Research Assistant Professor, Dept. of Biology, University of Utah, Salt Lake City, Utah, USA
1998-2001 Postdoctoral fellow: Individual National Research Service Award, National Institute of Health. Dept. of Ecology and Evolutionary Biology, University of California Irvine, Irvine, California, USA. James Hicks, advisor.
1993-1998 Teaching Fellow, Division of Biology, Brown University, Providence, Rhode Island, USA
1991-1993 Biomedical Scientist: University of California Berkeley, Lawrence Livermore National Lab, Livermore, California, USA
1987-1991 Engineer, Westinghouse Corporation, Livermore, California, USA

Grants:

- 2008-2012 "Cardiopulmonary Function in Archosaurs During Hypoxic Exercise" National Science Foundation (IOS-0818973). (PI)
- 2002-2007 "The Significance of the Crocodylian Cardiopulmonary System" National Science Foundation (PI). Start date postponed to 2003 due to research in Europe.
- 1998-2001 "The Importance of Thoracic and Abdominal Pressures to Venous Return" National Institute of Health, Individual National Research Service Award. (PI)
- 1995-1997 "Did Lungs and the Intracardiac Shunt Evolve to Oxygenate the Heart?" National Science Foundation. Dissertation Improvement Grant.

Awards

- 2002 National Science Foundation Advance Fellowship
- 1997 Best Student Poster, Society for Integrative and Comparative Biology, Chicago, Illinois
- 1996 Best Student Poster, Honorable Mention, The Integrative Biology of Exercise, American Physiological Society (Intersociety Meeting), Vancouver, British Columbia, Canada
- 1995 Brown University Fellowship for Graduate Research, Providence, Rhode Island
- 1985 Halland Physics Scholarship, University of Idaho, Moscow, Idaho

Publications:

- 26) Uriona, T.J., Lyon, M., **Farmer, C.G.** The importance of the diaphragmaticus to dive-time in the American alligator (*Alligator mississippiensis*). *Zoology*. In press
- 25) Uriona, T.J., and **C.G Farmer**. 2008. Recruitment of the *diaphragmaticus*, *ischipubis*, and other respiratory muscles to control pitch and roll in the American alligator (*Alligator mississippiensis*). *Journal of Experimental Biology* 211(7):1141-1147 (cover).
- 24) **Farmer, C.G.**, T.J Uriona, M. Steenblik, D. Olsen, K. Sanders. 2008. The right-to-left shunt of crocodylians serves digestion. *Physiological and Biochemical Zoology* 81(2):125-137, (cover).
- 23) Chan, B.K., Peterson, A.L., **C.G Farmer**. 2007. Predation of *Dendrobates auratus* larvae by *Phelsuma laticauda*. *Herpetological Review* 38(3): 321-322.
- 22) Uriona, T.J. and **C.G Farmer**. 2006. Contribution of the diaphragmaticus muscle to vital capacity in postprandial American alligators (*Alligator mississippiensis*). *Journal of Experimental Biology* 209(21): 4313-4318.
- 21) **Farmer, C.G.** 2006. On the Origin of Avian Air Sacs. *Respiration Physiology and Neurobiology* 154:89-106.
- 20) T.J. Uriona, **C.G. Farmer**, J. Dazely, F. Clayton, J. Moore. 2005. Structure and function of the esophagus of the American alligator (*Alligator mississippiensis*). *Journal of Experimental Biology* 208:3047-3053.
- 19) **Farmer, C.G.** 2003. Reproduction: the adaptive significance of endothermy. *American Naturalist* 162(6):826-840.

- 18) **Farmer, C.G.** and J.W. Hicks. 2002. The intracardiac shunt as a source of myocardial oxygen in a turtle, *Trachemys scripta*. *Integrative and Comparative Biology* 42(2):208-215.
- 17) **Farmer, C.G.** 2001. Parental care: A new perspective on the origin of endothermy. Pp. 389-412, In J.A. Gauthier and L.F. Gall, eds., *New Perspectives on the Origin and Early Evolution of Birds: Proceedings of the International Symposium in Honor of John H. Ostrom*. Peabody Museum of Natural History, Yale University.
- 16) Carrier, D.R. and **C.G. Farmer**. 2000. The evolution of pelvic aspiration in archosaurs. *Paleobiology* 26(2):271-293.
- 15) Carrier, D.R. and **C.G. Farmer**. 2000. The integration of ventilation and locomotion in archosaurs. *American Zoologist* 40(1):87-100.
- 14) **Farmer, C.G.** 2000. Parental Care: The key to understanding endothermy and other convergent features in birds and mammal. *American Naturalist* 155 (3): 326-334.
- 13) **Farmer, C.G.** and D.R. Carrier. 2000. Pelvic aspiration in the American alligator (*Alligator mississippiensis*). *Journal of Experimental Biology* 203:1671-1678.
- 12) **Farmer, C.G.** and D.R. Carrier. 2000. Respiration and gas exchange during recovery in alligators. *Respiration Physiology* 120(1):81-87.
- 11) **Farmer, C.G.** and D.R. Carrier. 2000. Ventilation and gas exchange during treadmill-locomotion in the American alligator (*Alligator mississippiensis*). *Journal of Experimental Biology* 203:1679-1687.
- 10) **Farmer, C.G.** and J.W. Hicks. 2000. Circulatory impairment induced by exercise in the lizard *Iguana iguana*. *Journal of Experimental Biology* 203: 2691-2697.
- 9) **Farmer, C.G.** 1999. The evolution of the vertebrate cardio-pulmonary system. *Annual Review of Physiology* 61:573-592
- 8) Hicks, J.W. and **C.G. Farmer**. 1999. Gas exchange potential in reptilian lungs: implications for the dinosaur-avian connection. *Respiration Physiology* 117(2-3): 73-83
- 7) Janis, C.M. and **C.G. Farmer**. 1999. Proposed habitats of early tetrapods: Were all Devonian forms aquatic? *Zoological Journal of the Linnean Society* 126 (1):117-126
- 6) Owerkowicz, T., **C.G. Farmer**, J.W. Hicks, and E.L. Brainerd. 1999. Contribution of the gular pump to ventilation. *Science* 284:1661-1663
- 5) **Farmer, C.G.** and D.C. Jackson. 1998. Air-breathing during activity in the fishes *Amia calva* and *Lepisosteus oculatus*. *Journal of Experimental Biology* 201:943-948.
- 4) Hicks, J.W. and **C.G. Farmer**. 1998. Lung ventilation and gas exchange in theropod dinosaurs. *Science* 281:45-46
- 3) **Farmer, C.** 1997. Did lungs and the intracardiac shunt evolve to oxygenate the heart in vertebrates? *Paleobiology* 23(3):358-72
- 2) Simons, A.D., D.R. Carrier, **C. Farmer**, and C. Gregerson. 1997. Lack of locomotor-cardiac coupling in trotting dogs. *American Journal of Physiology* 273(4 part 2):R1352-R60
- 1) ven den Engh, G. and **C. Farmer**. 1992. Photo-bleaching and photon saturation in flow cytometry. *Cytometry* 13:669-77

Publications under review:

- 1) **Farmer, C.G.** Unidirectional flow in the lungs of archosaurs. *Physiological and Biochemical*

Zoology. In review.

- 2) **Farmer, C.G.**, On the evolution of the sauropsid cardiovascular system. *Journal of Morphology*. In review.
- 3) Chan, B.K. and **C.G. Farmer**. Bacterial Transformation Yields Potential Preventive Treatment of Chytridiomycosis. *Physiological and Biochemical Zoology*. In review.
- 4) Chan, B.K., Peterson, A.L., **Farmer, C.G.** Post depositional paternal care in the green and black poison frog, *Dendrobates auratus*. *Behavioral Ecology*. In review.

Dissemination to the lay community:

My research has been profiled and disseminated to the public through the following venues:

- 1) 1997 News and views article in *Nature* 389:229-230
- 2) 1998 Radio interview with the BBC
- 3) 1998 *At the Water's Edge: Macroevolution and the Transformation of Life* (1998, Simon and Schuster, London)
- 4) 2000 radio interviews with Earth and Sky, Blair Feulner of KCPW, and Quirks and Quarks
- 5) 2000 *Natural History Magazine* (April)
- 6) 2005 *Bioscience* 55(6):470-475.
- 7) 2006 *Science News* 170(17): 260-261.
- 8) 2008 Coverage of Farmer *et al* 2008 (PBZ 81(2):125–137) in the following: *Science* (February 6, 2008), *Nature*; *ScienceNow* (Feb 6); *NewScientist*. Also Featured on the Discovery News Channel, February 6, 2008. Featured in MSNBC.com, February 5, 2008, and other news media.
- 9) 2008 Coverage of *Uriona* and Farmer 2008 (JEB 211(7):1141-1147) in the following: *ScienceNews* (March 15, 2008; Vol. 173 #11), *ScienceNow* 14 March 2008, MSNBC, LA Times, *Smithsonian Magazine* (May 2008), *Scientific American*, *National Geographic*, *Christian Science Monitor*, NSF website (July 2008), *Nature* (www.nature.com/news), Reuters (worldwide), *Cosmos magazine* (March 4, 2008, Australia), *Raptor's nest* (May 7, 2008) and other news media.

Symposia Chaired:

- 1999 Yale University. Symposium entitled, "New Perspectives on the Origin and Early Evolution of Birds" in Honor of John H. Ostrom. New Haven, Connecticut, USA
- 2000 Society for Experimental Biology. Symposium entitled, "Cardiovascular Shunts in Vertebrates: New Insights into Function, Regulation and Mechanism." Cambridge, England.

Invited Seminars:

- 2008 University of California, Irvine, Department of Ecology and Evolutionary Biology, Irvine CA, USA
- 2008 Wright State University, Department of Biology, Dayton, Ohio, USA
- 2008 University of Utah, Department of Chemistry, Salt Lake City, UT, USA
- 2008 University of Utah, Department of Mathematics, Salt Lake City, UT, USA
- 2007 8th International Congress of Vertebrate Morphology. Symposium entitled: "Respiratory evolution in Sauropsids: progress and new approaches. Paris, France
- 2007 8th International Congress of Vertebrate Morphology. Symposium entitled: Functional morphology of the Reptilian Five Chambered Heart. Paris, France
- 2007 Brown University, Department of Physiology, Pharmacology and Biotechnology. Providence RI, USA
- 2006 American Physiological Society Intersociety Conference. Comparative Physiology 2006. Symposium entitled: "Integrating Diversity." Virginia Beach, Virginia, USA.
- 2006 University of Otago, Department of Physiology, Medical School, Dunedin, New Zealand
- 2006 University of Massey, Department of Ecology, Palmerston North, New Zealand
- 2006 University of Utah, Department of Biology, Salt Lake City, Utah, USA
- 2006 University of Utah, Keynote Speaker for the Access Organization, Salt Lake City, Utah, USA
- 2006 University of South Florida, Department of Biology, Tampa, Florida, USA
- 2006 Utah Artificial Heart Institute, Salt Lake City, UT
- 2005 University of Montana, Department of Biology, Missoula, Montana, USA
- 2005 Colorado State University, School of Veterinary Medicine, Fort Collins, Colorado, USA
- 2003 Sixth International Congress of Comparative Physiology and Biochemistry. Symposium entitled "Energetics and locomotion, do we have all the answers? Mt. Buller, Australia.
- 2003 Sixth International Congress of Comparative Physiology and Biochemistry. Symposium entitled, "Dinosaur Physiology." Mt. Buller, Australia.
- 2002 Université Catholique Louvain, Louvain-la-Neuve, Belgium.
- 2001 Creighton University Medical School, Omaha, Nebraska, USA
- 2001 Society for Integrative and Comparative Biology. Symposium entitled: "Molecules, Muscles, and Macroevolution: Integrative Functional Morphology". Chicago, Illinois, USA.
- 2000 Society for Experimental Biology. Symposium entitled: "Cardiovascular Shunts in Vertebrates: New Insights into Function, Regulation and Mechanism." Cambridge, England.
- 2000 Experimental Biology. Symposium entitled: "The Metabolic Status of Theropod Dinosaurs: Insights from Comparative Physiology." San Diego, California, USA.
- 1999 University of Nevada, Department of Biology, Reno, Nevada, USA
- 1999 Yale University: Symposium entitled: "New Perspectives on the Origin and Early Evolution of Birds" in Honor of John H. Ostrom. New Haven, Connecticut, USA
- 1999 Harvard University, Concord Field Station, Boston, Massachusetts, USA
- 1999 University of California, Irvine. Department of Biology, Irvine, California, USA
- 1998 University of California, Los Angeles. Department of Biology, Los Angeles, California, USA

- 1998 University of California, San Bernardino. Department of Biology, San Bernardino, California, USA
1997 Roger Williams Hospital, Pulmonary Research Division, Providence, Rhode Island, USA

Teaching:

- Comparative Morphology*, Lecturer of undergraduate course at the University of Utah (90 students)
Human Physiology, Lecturer of undergraduate course at the University of Utah (65 students)
Evolution of Endothermy, Lecturer of graduate course, University of Utah
Comparative Physiology, Guest lecturer at University of Utah
General Physiology, Guest lecturer at University of Southern Florida
World of Insects, Guest lecturer at University of Utah
General Biology, Guest lecturer at Westminster College, Utah
Biological Sciences 100L, Guest Lecturer, University of Irvine, Irvine California
Supercourse in Environmental Biology, postdoctoral teaching assistant. The course was held at the White Mountain Field Station. Supercourses are those in which students enroll from all University of California Campuses
Human Physiology, graduate teaching assistant in the Medical School at Brown University
Developmental Biology, graduate teaching assistant for an undergraduate course at Brown University
Inorganic Chemistry, Undergraduate laboratory teaching assistant, Department of Chemistry at the University of Idaho
Electricity and Magnetism, Undergraduate teaching assistant in the Department of Physics at the University of Idaho
Astronomy, Undergraduate teaching assistant in the Department of Physics at the University of Idaho

National Service:

2000 National Science Foundation Panel Member

Ad hoc reviewer for the following journals and organizations: *Behavioral Ecology*, *Bulletin of Mathematical Biology*; *Cells, Tissues, Organs*; *Comparative Biochemistry and Physiology*; *Ecology Letters*; *Evolution*; *Journal of Experimental Biology*; *Journal of Morphology*; *National Science Foundation*; *Netherlands Journal of Zoology*; *Physiological and Biochemical Zoology*; *Reviews in Fish Biology and Fisheries*; *Vertebrate Paleontology*; *Zoology*

University Service:

- 2008-present Advisor for Integrative Graduate Education Research Traineeship Program in Math Biology (NSF-IGERT Award)
2004-2007 Member of institutional animal care and use committee (IACUC)
2004 Member of the Access Selection Committee. The Access program is a College of Science initiative at the University of Utah. Service includes reviewing approximately 100 fellowship applications and attending a selection event.
2004 Member of the University of Utah Advance Committee

Departmental Service:

2008-present Member of the following committees:

Department of Biology Search Committee for an Environmental Biologist
Graduate Admissions Committee
Animal Care and Use Committee
Aquatic Facilities Committee

2007-2008 Member of the Curriculum Committee

Graduate committees:

Ms. Roxana Arauco (Ph.D), Ms. Jennifer Araneo-Yowell (MS), Mr. Ryan Bixenmann (PhD), Mr. Benjamin Chan (PhD), Ms. Elizabeth Jarrell (PhD), Ms. Jessamyn Markley (PhD), Mr. Martin Moyano (PhD), Dr. Shannon O'Grady (PhS), Mr. TJ Uriona (PhD).

Member of the University of Utah Advance Committee

Assisted with writing the following two graduate student training grant proposals for the department of biology:

- 1) A proposal submitted to the NSF K-12 initiative entitled, "Think Globally, Learn Locally: Neighborhood ecology in a global perspective." Proposal was funded \$3,000,000.
- 2) A proposal submitted to the U.S. Department of Education for Graduate Assistance in Areas of National Need. The proposal was not funded.

Publications (not previously listed), presentations, and honors of graduate (bold) and undergraduate (italics) students relating to work done in my laboratory:

Uriona, TJ and Farmer, C.G. 2008. Examining the role of the diaphragm muscle in American alligators (*Alligator mississippiensis*) and African clawed frog (*Xenopus laevis*) in aquatic locomotion. TJ Uriona gave an oral presentation at the annual meeting for the Society for Integrative and Comparative Biology.

Uriona, TJ, M. Lyon, and Farmer, C.G. 2008. The importance of the diaphragm muscle to dive time in American alligators (*Alligator mississippiensis*). M. Lyon presented a poster at the annual meeting for the Society for Integrative and Comparative Biology.

Uriona, TJ and Farmer, C.G. 2006. Contribution of the diaphragmaticus muscle to vital capacity in postprandial American alligators (*Alligator mississippiensis*). Honorable Mention at the First International Congress of Respiratory Biology, Bonn, Germany. Pg. 99.

Broderick, M. and Farmer, CG. 2006. An Investigation of Growth Strategies Utilizing American Alligator Growth Rate Data. 20th National Conference on Undergraduate Research 6: 119.

Faisal A., Jones, C.R., Chillson, M., Farmer, CG. 2006. Thermoregulation in the American alligator (*Alligator mississippiensis*). 20th National Conference on Undergraduate Research 6: 7-8.

Uriona, TJ. 2005. Deutscher Akademischer Austausch Dienst (DAAD) fellowship to study pulmonary morphology of archosaurs in Bonn, Germany.

Baxter, N.B., Dazley, J.S., Savage, C., Farmer, C.G. 2003. Apparent Assimilation Efficiency of Various Diets of Juvenile American Alligators, *Alligator mississippiensis*. *Integrative and Comparative Biology*: 43:P2.112.

Dazley, J. 2003. The structure and function of the esophagus of the American alligator. 17th National Conference on Undergraduate Research: P216.

Dazley, J.S., C. Farmer, J. Moore, F. Clayton. 2003. Structure and Function of the Esophagus in the American alligator. University of Utah Undergraduate Research. UROP 3: 31.

Dazley, J.S., Farmer, C.G., Moore, J, Clayton, F. 2003. Esophageal Structure and Function in the American alligator. *Integrative and Comparative Biology*: 43:P2.80.

Uriona, T.J. 2003. Effect of Blood Flow on the Drive to Breathe during Exercise. 17th National Conference on Undergraduate Research: P234.

Graduate Students

Dr. Ben Chan Ph.D. 2008. The selective advantages of parental care in poison arrow frogs. After graduating Dr. Chan accepted a position as a research scientist at Omnilytics, Inc.

Dr. TJ Uriona Ph.D. 2008 The evolution and functional significance of the crocodilian diaphragmaticus muscle. After graduating Dr. Uriona accepted a position as a research Scientist at Ross Southern Labs.

Ms. Jennifer Araneo-Yowell. 3rd yr graduate student (Masters).