

Peter R. Girguis

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Positions

- 2005-present Assistant Professor, Department of Organismic and Evolutionary Biology
Harvard University
- 2005-present Adjunct Research Scientist, Research and Development
Monterey Bay Aquarium Research Institute
- 2003-2005 Associate Research Scientist, Research and Development
Monterey Bay Aquarium Research Institute

Education

- 2001-2003 Postdoctoral Research Fellow, Monterey Bay Aquarium Research Institute
Research Advisor, Dr. Edward F. DeLong
- 1995-2000 Ph.D. in Marine Biology, University of California Santa Barbara (U.C. Santa Barbara)
Dissertation Advisor, Dr. James J. Childress
- 1989-1994 B.Sc. in Biological Sciences, University of California Los Angeles (U.C.L.A.)
Undergraduate Dissertation Advisors, Drs. William Hamner & David Chapman

Honors and Awards

- 2008 Buckminster Fuller Innovations in Science Award, Honorable Mention
- 2007 Lindbergh Foundation Award for Science and Sustainability
- 2006 Elected Distinguished Lecturer, National Science Foundation, for NSF-RIDGE 2000
- 2006 Elected Chair, National Academy of Sciences Frontiers of Science Program
- 2006 Merck Co. Innovative Research Award
- 2002 Department of Energy's E.C.-U.S. Biotechnology Fellowship
- 2000-2002 Monterey Bay Aquarium Research Institute Postdoctoral Fellowship
- 2000 U.C. Regents Fellowship, UC Santa Barbara
- 2000 U.C. Graduate Division Affiliates Fellowship for outstanding teaching and research
- 1999 U.C. Santa Barbara Graduate Division Fellowship
- 1997-1998 U.C. Academic Senate Distinguished Teaching Assistant Award

Research Interests

My efforts are aimed at better understanding the physiology of *uncultivated* microbes that govern major geochemical cycles in the deep oceans, the largest biome on Earth. In particular, to aim to couple microbial phylogenetic identity with gene/protein expression and – ultimately – metabolic activity, I develop and employ interdisciplinary approaches that enable me to study microbial processes *in situ* and in lab simulations that mimic environmental conditions. Such interdisciplinary approaches are arguably the only means by which we can interrogate uncultivated microbes, and their role in mediating planetary processes.

- Microbial physiology and ecology of endolithic bacteria at hydrothermal vents
- Carbon and nitrogen metabolism of hydrocarbon seep archaea
- Energy metabolism of deep subsurface archaea and bacteria
- Contribution of chemoautotrophic bacterial symbionts to host metabolism; primary productivity

Professional Service

- 2007-present Deep Ecosystem Biosphere Institute, steering committee
2005-2008 NSF-RIDGE steering committee
2003-2006 National Academy of Sciences, New Frontiers symposium steering committee

University Affiliations and Professional Memberships

- 2008-present Harvard Systems Biology Program, Faculty Affiliate.
2008-present Molecule, Cells, and Organisms Program, Faculty Affiliate.
2007-present Harvard Origins Initiative, Faculty Affiliate.
2005-present Harvard Microbial Science Initiative, Faculty Affiliate.
2000-present American Association for the Advancement of Science
2000-present American Society for Microbiology
1999-present American Geophysical Union
1994-present American Society for Limnology and Oceanography
1994-2007 Society for Integrative and Comparative Biology

Teaching Experience

I am currently supervising four postdoctoral fellows, three graduate students, and four undergraduates in my laboratory. I have also served on twelve graduate student committees (nine OEB, three EPS)

- 2005-present Instructor, courses developed at Harvard University
OEB 191: Physiological and Biochemical Adaptation
OEB 119: Deep Sea Biology
- Co-Instructor, courses developed at Harvard University
OEB 279: Microbial Metabolic Systems
- 2007-2008 Lecturer, courses at Harvard University
LS 190r: Diverse Microbial Strategies for Metabolism, Pathogenesis, and Chemical Signaling
- 2000 Co-Instructor
Upper Division Ecological Physiology Course, U.C. Santa Barbara
- 1997-2000 Lead Teaching Assistant
Ecological Physiology Laboratory Course, U.C. Santa Barbara
- 1994 Teaching Assistant
Introductory Biology for majors, U.C. Santa Barbara
- 1994 Teaching Assistant
Introduction to the Oceans for non-majors. U.C.L.A

Education and Outreach Activities

- 2008 Harvard iGEM faculty mentor 2008, Microbial Fuel Cells.
- 2008 New England Aquarium's Evening Seminar Series, Invited Speaker.
- 2006-present Cambridge-Rindge Latin School - Harvard Student Intern Program, Founder.
A program that I developed to host high school students in the Girguis lab during the summers (four high school students to date)
- 2006, 2007 HHMI-TRIP program, summer mentor.
A program in which I host high school teachers in the Girguis lab during the summers (as well as on research expeditions).
- 2006-present Harvard Microbial Sciences Initiative Summer Undergraduate Program. Host.
Five students to date (A. Roque, I. Figueroa, A. Weingarden, D. Stolper, S. Sharma, T. Moorosi)
- 2005-present Harvard Program for Research in Science and Engineering. Host.
Four undergraduates to date (A. Roque, I. Figueroa, A. Weingarden, D. Stolper, S. Sharma)

Publications

- Girguis, P.R.**, Nielsen, M. and Reimers, C.E. 2009. Fundamentals of sediment-hosted microbial fuel cells. In *Bioelectrochemical systems, First Edition* (Ed. K. Raebey). Springer Verlag Press. In Print.
- White, H.K., Reimers, C.E., Cordes, E.E., Dilly, G.F., and **Girguis, P.R.** 2009. Quantitative population dynamics of microbial communities in plankton-fed microbial fuel cells: examining the relationship between power production, geochemistry and microbial ecology. *International Society for Microbial Ecology (ISME: a Nature Journal)*. In print.
- Nielsen, M.E., Reimers, C.E., White, H.K., Sharma, S. and **Girguis, P.R.** 2008. Sustainable energy from deep ocean cold seeps. 2008. *Energy and Environmental Science*, 1 (5): 584-593.
- Nyholm, S. V., J. Robidart, and **Girguis, P.R.** 2008. Coupling metabolite flux to transcriptomics: Insights into the molecular mechanisms underlying primary productivity by the hydrothermal vent tubeworm *Ridgeia piscesae*. *Biol. Bull.* 214: 255-265.
- Reimers, C.E., Stecher III, H.A., Westall, J.C., Alleau, Y., Howell, K.A., Soule, L., White, H.K. and **Girguis, P.R.** 2007. Substrate degradation kinetics, microbial diversity and the current efficiency of microbial fuel cells supplied with marine plankton. *Applied and Environmental Microbiology* 73(21):7029-7040.
- Fisher, C. R. and **Girguis, P.R.** 2007. A proteomic snapshot of life at a vent. *Science* 315: 198-199 (Perspectives).
- Girguis, P.R.***, McBride, L. R.*, and Reimers, C.E. 2006. Power storage and conversion from an ocean microbial energy source. *Proceedings of the Marine Technology Society / Institute of Electrical and Electronics Engineers*. (* = authors contributed equally).
- Girguis, P.R.** and Childress, J.J. 2006. Metabolite uptake, stoichiometry and chemoautotrophic function of the hydrothermal vent tubeworm *Riftia pachyptila*: Responses to environmental variations in substrate concentrations and temperature. *Journal of Experimental Biology* 209 (18): 3516-28.
- Girguis, P.R.** and Lee, R.W. 2006. Thermal tolerance and preference of alvinellids. *Science*. 312(5771): 231.

- Reimers, C.*, **Girguis, P.R.***, Stecher, H., Westall, J. 2006. Geochemical and genomic insights into microbial fuel cell energy from ocean cold seeps. *Geobiology* 4: 123-136.
- Girguis, P.R.**, Cozen, A., DeLong, E.E. 2005. Growth rates of methane-oxidizing archaeal-bacterial consortia in deep-sea marine sediments: insights into the physiology of microbially-mediated anaerobic methane oxidation. *Applied and Environmental Microbiology* 71: 3725-3733.
- Childress J.J., Fisher C.R., Felbeck, H., and **Girguis, P.R.** 2003. On the edge of a deep biosphere: true animals in extreme environments. In *The Seafloor Biosphere at Mid-Ocean Ridges*, (eds. W.D. Wilcock, D.S. Kelley, J.A. Baross, E. DeLong, C. Cary), *American Geophysical Union Monographs*. Volume 144, pages 41-49.
- Girguis, P.R.**, Orphan, V.J., Hallam, S.J., DeLong, E.F. 2003. Growth and methane oxidation rates of anaerobic methanotrophic archaea in a continuous flow bioreactor. *Applied and Environmental Microbiology* 69: 5472-5482.
- Hallam, S.J., **Girguis, P.R.**, Preston, C.M., Richardson, P.M., DeLong, E.F. 2003. Identification of methyl coenzyme m reductase A (mcrA) genes in methane oxidizing archaea. *Applied and Environmental Microbiology* 69: 5492-5502.
- Girguis, P.R.**, Childress, J.J., Freytag, J.A., Klose, K.A., and Stuber, R. 2002. Effects of metabolite uptake on proton-equivalent elimination by two species of deep-sea vestimentiferan tubeworm, *Riftia pachyptila* and *Lamellibrachia cf. luymeri*. *Journal of Exp. Biology* 205: 3055-3066.
- Freytag, J.K., **Girguis, P.R.**, Birquist, D.A., Fisher, C.R., and Childress, J.J. 2001. A paradox resolved: Sulfide acquisition by roots of seep tubeworms sustains net chemoautotrophy. *Proceedings of the National Academies of Science* 98 (23): 13408–13413.
- Girguis, P.R.** 2000. Metabolite flux of the hydrothermal vent tubeworm *Riftia pachyptila*: Stoichiometric balance of the chemoautotrophic symbiosis and the potential rates of primary production. U.C. Santa Barbara. Dissertation.
- Girguis, P.R.**, Lee, R.W., Childress, J.J., Pospesel, M., Desaulniers, N.T., Zal, F., Felbeck, H. 2000. Fate of nitrate acquired by the hydrothermal vent tubeworm *Riftia pachyptila*. *Applied and Environmental Microbiology* 66(7): 2783-27909.
- Goffredi, S.K., **Girguis, P.R.**, Childress, J.J., Desaulniers, N.T. 1999. Physiological functioning of carbonic anhydrase in the hydrothermal vent tubeworm *Riftia pachyptila*. *Biological Bulletin* 196:257-264.
- Girguis, P.R.**, Childress, J.J. 1998. Proton equivalent elimination rates by the vestimentiferan tubeworm *Riftia pachyptila*: Ramifications for metabolite flux. *Cahiers de Marine Biologie* 39:285-296.

Popular Science Articles

- 2006 Batteries Not Included - Circuits Of Slime. *Nature* 441, 277-279. (by Schubert, C.)
- 2006 Living Batteries. July 1, 2006. *The Scientist*.
- 2006 Symbionts' body buffers. *Journal of Experimental Biology*. 209: 3481.
- 2006 Into Hot Water: Lab test shows that worms seek heat. *Science News* 169(15): 228.
- 2002 Deep Sea Tubeworms are Champion Proton Pumpers. *Journal of Experimental Biology*. 205:1902.
- 2002 Primary productivity in the deep oceans. *New Scientist*.

- 1998 Random Samples (tubeworm farming). *Science*. 279(5351):663.
1998 Bringing tubeworms back alive. *Discover magazine*, p. 22.
1996 Meeting briefs (Proton elimination rates). *Science*. 275(5315):305.

Invited Conferences

- 2008 American Geophysical Union General Meeting
Geological Society of America / Soil Society of America Annual Meeting
First Annual Microbial Fuel Cell Symposium
- 2007 American Geophysical Union General Meeting
- 2006 RIDGE Theoretical Institute
American Society of Microbiology
- 2004 National Academy of Sciences, New Frontiers Symposium on methane cycling.
Gordon Research Conference, Bio-inorganic Chemistry.
AAAS General Meeting
- 2003 National Academy of Sciences, Workshop on global climate change.
- 2002 National Academy of Sciences, New Frontiers Symposium on carbon sequestration.
Gordon Research Conference: Molecular basis of microbial one-carbon metabolism.

Invited Seminars

- 2007 Oregon State University
University of California, Irvine
New England Biolabs, Inc. (Ipswich, MA)
- 2006 Pennsylvania State University
RIDGE 2000 Distinguished Lecture, Skidmore College.
University of Massachusetts, Boston
RIDGE 2000 Distinguished Lecture, Berea College
RIDGE 2000 Distinguished Lecture, Boston University
- 2005 University of South Florida
Stanford University
University of California, Irvine
- 2004 University of Washington
Harvard University
Georgia Institute of Technology
- 2002 University of Washington
- 2000 U.C.L.A.
- 1999 Monterey Bay Aquarium Research Institute

Presentations (Contributed Talks and Posters)

- 2008 Society of Integrative and Comparative Biology Annual Meeting
American Geophysical Union General Meeting
9th International Conference on Gas in Marine Sediments.
The European Society for Comparative Physiology and Biochemistry Annual Meeting
American Society for Microbiology

	Ocean Sciences Annual Meeting
2007	American Geophysical Union General Meeting American Chemical Society Annual Meeting American Society of Microbiology General Meeting
2006	American Geophysical Union General Meeting
2005	Goldschmidt Conference, Oxidation-Reduction Reactions in Marine Sediments American Chemical Society Meeting American Society of Limnology & Oceanography Meeting
2004	American Geophysical Union General Meeting American Society of Microbiology General Meeting Gordon Conference on C1 metabolism
2003	American Society of Microbiology General Meeting
2002	American Society of Microbiology General Meeting American Geophysical Union General Meeting
2001	American Society of Limnology & Oceanography Meeting American Society of Microbiology General Meeting
2000	American Geophysical Union General Meeting
1999	American Society of Limnology & Oceanography Meeting
1997	Deep Sea Biology Symposium

Research Expeditions

Thermal Bio 2008. Co-chief Scientist. 7-4-08 to 7-23-08. Juan de Fuca ridge expedition via R/V *Atlantis* and DSV *ALVIN*.

Thermal Bio 2007. Co-chief Scientist. 8-26-07 to 9-6-07. Juan de Fuca ridge expedition via R/V *Atlantis* and DSV *ALVIN*.

HOT VENTS 2006. 8-25-06 to 9-11-06. Juan de Fuca ridge via R/V *Atlantis* and DSV *ALVIN*.

VISIONS 2005. 10-1-05 to 11-4-05. Juan de Fuca ridge via R/V *Thompson* and ROV *JASON*.

Virtual Lost City 2005. 9-15-05 to 9-25-05. Lost City hydrothermal field via R/V *Ronald H. Brown* and the Institute for Exploration's ROV *Argus* and *Hercules*.

MBARI-KECK 2004. Chief Scientist. 8-16-04 to 8-29-04. Juan de Fuca ridge via R/V *Western Flyer* and ROV *Tiburon*.

Monterey Bay Hydrocarbon seep cruises. Chief Scientist of over 30 expeditions, visiting various seep sites in the Monterey canyon via the R/V *Point Lobos* and the ROV *Ventana*. Various dates between 1-00 and 5-05.

Research expedition, 7-5-09 to 7-9-09. Santa Barbara channel. Bioluminescence studies

LARVE '98. 9-16-98 to 12-6-98. 9 Degrees North, East Pacific Rise. R/V *New Horizon*, R/V *Atlantis/ALVIN*.

HOT '97. 9-21-97 to 12-26-97. 9 degrees North, East Pacific Rise. R/V *New Horizon*, R/V *Atlantis/ALVIN*.

HOT '96. 2-10-96 to 3-25-96. 9 and 13 degrees North, East Pacific Rise. R/V *New Horizon*, R/V *Nadir/Nautila*.

Santa Barbara/Hyperion sewage outfall cruise, 6-15-1995 to 6-17-95. *Solemya* and *Lucinoma* dredging. R/V *Sproul*.

Midwater trawl, San Clemente basin, 3-20-95 to 3-27-95. R/V *New Horizon*.

EPR '94 cruise. 11-1-94 to 12-5-94. 9 and 13 degrees North, East Pacific Rise. R/V *New Horizon*, R/V *Atlantis II/ALVIN*.

Louisiana slope cold seep cruise, 11-94. Louisiana slope and escarpment. Brine pool. R/V *Edwin Link/Johnson Sea-Link*.

Juan de Fuca vent cruise, 7-10-94 to 7-31-94. Juan de Fuca and Explorer Ridge sites. R/V *Atlantis II/ALVIN*.