

Zoe G. Cardon

Senior Scientist
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Education and Postdoctoral Training

Ph.D., Department of Biological Sciences, Stanford University, 1994. *Cellular and Physiological Investigations of Stomatal Regulation*, Joseph Berry advisor.
B.S. Biology, B.A. Spanish, Utah State University, 1988; College of Science valedictorian; graduation *Magna Cum Laude*.

Professional Positions

Senior Scientist, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA (Jan. 2008-)
Adjunct Associate Scientist, Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA (May 2006- Dec. 2007)
Associate Director, Center for Integrative Geosciences, University of Connecticut at Storrs (May 2005-Dec. 2007)
Graduate Program Director, Center for Integrative Geosciences, University of Connecticut at Storrs (March 2005-Dec. 2007)
Head, Biology Honors Program (Ecology and Evolutionary Biology, Physiology and Neurobiology, and Molecular and Cell Biology Departments, Univ. of CT, 2003-2005)
Dept. of Ecology and Evolutionary Biology, University of Connecticut at Storrs
Assistant Professor (August 1997-Summer 2003)
Associate Professor (Fall 2003-Dec. 2007)
Biology Dept., Bowdoin College, Brunswick, ME, Assistant Professor (1996-1997)
DOE Global Change Distinguished Postdoctoral fellow, UC Berkeley, F. S. Chapin III advisor (1994-1996)

Honors and Awards

Invited speaker, March 2011 Keystone Symposium, "Microbial Communities as Drivers of Ecosystem Complexity", Breckenridge, Colorado
Invited speaker, February 2011 American Academy of Microbiology colloquium "Incorporating microbes into climate models", Dallas, TX.
Invited member of Program Leaders Committee for NSF-funded SAMSI program emphasizing statistics for control of wireless sensing networks and analysis of data streams from those networks (2007-2008)
Invited member of nominating committee to establish the Board of Directors for the National iPlant Collaborative (<http://www.iplantcollaborative.org/>) (2008)
Visiting scientist, Ecosystems Center, Marine Biological Laboratory (Fall Semester, 2003)
Invited panelist, NSF "Frontiers in Belowground Carbon Cycling Research" workshop (2003)
Sarah Blaffer Hrdy Fellow in Conservation Biology, Organismic and Evolutionary Biology Department, Harvard University (Fall Semester, 2002)
Invited participant at Carey Conference IX, "Understanding Ecosystems: The Role of Quantitative Models in Observation, Synthesis, and Prediction", Institute of Ecosystem Studies (2001)
Invited member of international review panel for the National Phytotron at Duke (2001)
University of Connecticut University-wide Outstanding Faculty Advisor (1999)
Department of Energy Global Change Distinguished Postdoctoral Fellowship (1993-95)
National Defense Science and Engineering Graduate Fellowship (1990-93)
Morrison Institute for Population Studies, Stanford Univ., travel award (1991-92)
National Science Foundation Graduate Fellowship (1988-90)
Phi Kappa Phi James R. Slater Fellow, for excellence in plant sciences (1988-89)
Presidential Scholar (1983)
National Merit Scholar (1983-87)

Publications

Peer-reviewed Journals:

Skogen, K.A., Holsinger, K.E., and Cardon, Z.G. (2011) Nitrogen deposition and the decline of a regionally threatened legume, *Desmodium cuspidatum*. *Oecologia*. 165: 261-269.
Herron, P.M., Gage, D.J., and Cardon, Z.G. (2010) Micro-scale water potential gradients visualized in soil around plant root tips using microbiosensors. *Plant, Cell, and Environment*, 33:199-210.
Herron, P.M., Stark, J.M., Holt, C., Hooker, T., and Cardon, Z.G. (2009) Microbial growth efficiencies across a soil moisture gradient assessed using ¹³C-acetic acid vapor and ¹⁵N-ammonia gas. *Soil Biology and Biochemistry* 41:1262-1269.

- Gage, D.J., Herron, P.M., Arango Pinedo, C., and Cardon, Z.G. (2008) Live reports from the soil grain – the promise and challenge of microbiosensors. *Functional Ecology* 22: 983-989.
- Cardon, Z.G., Gray, D.W., and Lewis, L. A. (2008) The green algal underground – evolutionary secrets of desert cells. *Bioscience* 58(2): 114-122.
- Gray, D.W., Lewis, L.A., and Cardon, Z.G. (2007) Photosynthetic recovery following desiccation of desert green algae (Chlorophyta) and their aquatic relatives. *Plant, Cell, and Environment*, 30:1240-1255. (Journal cover image is from our work.)
- Gartner, T.L. and Cardon, Z.G. (2006) Site of leaf origin affects how mixed litter decomposes. *Soil Biology and Biochemistry*, 38: 2307-2317.
- Cardon, Z.G. and Gage, D.J. (2006) Resource exchange in the rhizosphere – molecular tools and the microbial perspective. *Annual Review of Ecology, Evolution, and Systematics*, 37: 459-88.
- Gray, D.W., Cardon, Z.G., and Lewis, L. A. (2006) Simultaneous collection of rapid chlorophyll fluorescence induction kinetics, fluorescence quenching parameters, and environmental data using an automated PAM-2000/CR10X data logging system. *Photosynthesis Research*, 87:295-301.
- Zanne, A.E., Lower, S.S., Cardon, Z.G., and Orians, C.M. (2006) ¹⁵N fertilization of tomatoes: vascular constraints vs. tissue demand. *Functional Plant Biology* 33:457-64.
- Venterea, R.T., Rolston, D.E., and Cardon, Z.G. (2005) Effects of soil moisture, physical, and chemical characteristics on abiotic nitric oxide production. *Nutrient Cycling in Agroecosystems* 72:27-40.
- Hooker, B.A., Morris, T. F., Peters, R., and Cardon, Z.G. (2005) Long-term effects of tillage and corn stalk return on soil carbon dynamics. *Soil Science Society of America Journal*, 69 (1) : 188-196.
- Johnston, C. A., Groffman, P., Breshears, D. D., Cardon, Z. G., Currie, W., Emanuel, W., Gaudinski, J., Jackson, R. B., Lajtha, K., Nadelhoffer, K., Nelson Jr., D., Post, W. M., Retalack, G., and Wielopolski, L. (2004) Carbon cycling in soil. *Frontiers in Ecology and the Environment*, 2(10): 522-528.
- Gartner, T. B. and Cardon, Z. G. (2004) Decomposition dynamics in mixed-species leaf litter — a review. *Oikos* 104: 230-246.
- Jones, C.S, Cardon, Z.G., and Czaja, A.D. (2003) A phylogenetic view of low level CAM in *Pelargonium* (Geraniaceae). *American Journal of Botany*, 90:135-142.
- Cardon, Z. G., Czaja, A. D., Funk, J. L., and Vitt, P. L. (2002) Periodic carbon flushing to roots of *Quercus rubra* saplings affects soil respiration and rhizosphere microbial biomass. *Oecologia*, 133: 215-223.
- Hooper, D. U., Cardon, Z. G., Chapin III, F. S., and Durant, M. (2002) Corrected calculations for whole ecosystem measurements of CO₂ flux using the LI-COR 6200 portable photosynthesis system. *Oecologia*, 132: 1-11.
- Bringham, R. M., Cardon, Z. G., and Gage, D. J. (2001) Galactosides in the rhizosphere: utilization by *Sinorhizobium meliloti* and development of a biosensor. *Proceedings of the National Academy of Sciences*, 98(8): 4540-4545.
- Cardon, Z. G., Hungate, B. A., Cambardella, C. A., Chapin III, F. S., Field, C. B., Holland, E. A., and Mooney, H. A. (2001) Contrasting effects of elevated CO₂ on old and new soil carbon pools. *Soil Biology and Biochemistry*, 33: 365-373.
- Lodding, C. C., Behling, J., and Cardon, Z. G. (2000) Water relations of *Betula cordifolia* and *Betula allegheniensis* rooted together on landslides in Franconia Notch, NH. *American Midland Naturalist*, 143:321-329.
- Tsionsky, M., Cardon, Z.G., Bard, A.J., and Jackson, R.B. (1997) Photosynthetic electron transport in single guard cells as measured by scanning electrochemical microscopy. *Plant Physiology*. 113(3):895-901
- Cardon, Z.G. (1996) Effects of root exudation and rhizodeposition on ecosystem carbon storage under elevated CO₂. *Plant and Soil*. 87(2):277-288.
- Cardon, Z.G., Berry, J.A., and Woodrow, I.E. (1995). Fluctuating [CO₂] drives species-specific changes in water use efficiency. *Journal of Biogeography* 22:203-208.
- Jackson, R.B., Luo, Y., Cardon, Z.G., Chiariello, N.R., Sala, O.E., Field, C.B., and Mooney, H. A. (1995). Photosynthesis, growth, and density for the dominant species in a CO₂-enriched grassland. *Journal of Biogeography*. 22:221-225.
- Cardon, Z.G., Berry, J.A., and Woodrow, I.E. (1994a). Dependence of the extent and direction of average stomatal response in *Zea mays* and *Phaseolus vulgaris* on the frequency of fluctuations in environmental stimuli. *Plant Physiology* 105:1007-1013.
- Cardon, Z.G., Mott, K.A., and Berry, J.A. (1994b) Dynamics of patchy stomatal movements, and their contribution to steady-state and oscillating stomatal conductance calculated with gas-exchange techniques. *Plant, Cell, and Environment*. 17:995-1007.
- Mott, K.A., Cardon, Z.G., and Berry, J.A. (1993). Asymmetric patchy stomatal closure for the two surfaces of *Xanthium strumarium* L. leaves at low humidity. *Plant, Cell, and Environment*. 16:25-34.
- Cardon, Z.G., and Berry, J.A. (1992). Effects of O₂ and CO₂ concentration on the steady-state fluorescence yield of single guard cell pairs in intact leaf discs of *Tradescantia albiflora*. Evidence for Rubisco-mediated CO₂ fixation and photorespiration in guard cells. *Plant Physiology* 99:1238-1244.
- Cardon, Z.G., and Mott, K.A. (1989). Evidence that ribulose 1,5-bisphosphate (RuBP) binds to inactive sites of RuBP carboxylase *in vivo* and an estimate of the rate constant for dissociation. *Plant Physiology* 89:1253-1257.

Volumes Edited, and Peer-Reviewed Contributions to Edited Volumes:

- Cardon, Z.G. and Whitbeck, J.L. (eds) (2007) *The Rhizosphere: an Ecological Perspective*. Elsevier.
- Whitbeck, J.L. and Cardon, Z.G. Introduction. (2007) IN: *The Rhizosphere: an Ecological Perspective*. Cardon, Z.G. and Whitbeck, J.L. (eds). Elsevier, San Diego. Pp. xv-xix.
- Cardon, Z. G., and Herron, P. M. Sweeping water, oozing carbon: long distance transport and patterns of rhizosphere resource exchange. (2005) IN: *Vascular Transport in Plants*. Holbrook, N.M. and Zwieniecki, M.A. (eds). Academic Press, San Diego. Pp. 257-276.
- Cottingham, K. L., Cardon, Z. G., D'Antonio, C. M., Dent, C. L., Findlay, S. E. G., Lauenroth, W. K., LoGiudice, K. M., Stelzer, R. S., Strayer, D. L. (2003) Increasing modeling savvy: strategies to advance quantitative modeling skills for professionals within ecology. In: *Models in Ecosystem Science*. 9th Cary Conference volume, Canham, C., Cole, J. and Lauenroth, W., eds. pp. 428-436.

Invited Departmental Talks, past 5 yearsDepartmental or Series Seminars:

- University of Vermont, April 2011
- Michigan State University, graduate student invitee for MCB department, April 2010
- Boston University, Biology Department, Boston University, February 2010
- Brown University, Dept. of Geological Sciences, April 2009
- Bowdoin College, Biology Dept., November 2008
- The Ecosystems Center, Marine Biological Laboratory, July, 2007
- UMass Boston, Boston, MA, Department of Biology, April 2007
- MIT, ESI (Earth System Initiative) seminar series, March 2006
- Michigan State University, East Lansing, MI, Department of Plant Biology, Oct. 2005

Symposia:

- 2011 Keystone Symposium on "Microbial Communities as Drivers of Ecosystem Complexity", Breckenridge, Colorado, invited speaker March 2011
- 2011 American Academy of Microbiology colloquium "Incorporating microbes into climate models", Dallas, TX. February 2011
- Ecological Society of America meetings, August 2009, organized oral session "Missing Links in the Root-Soil Organic Matter Continuum"
- Soil Science Society of America meetings, November 2006, symposium "Towards a Predictive Understanding of Belowground Ecosystem Responses to Global Change"
- Ecological Society of America (ESA) meetings, August 2006, organized oral session "Rhizosphere Functioning in Carbon and Nitrogen Cycles"
- ESA meetings, August 2005, organized oral session "Sensors and Sensor Networks"
- Soil Ecology Society Meeting "Resource Exchange in the Rhizosphere", keynote, May, 2005

Service on National Committees, Editorial Boards, and Institutional Boards

- Editorial Board, *Oecologia* (2004-ongoing)
- President (elected), Physiological Ecology Section, Ecological Society of America (1/2009 - 12/2010)
- Program Leaders group, SAMSI Sensor Networks, Forests, and Global Change Program, <http://www.samsi.info/programs/2007sensornetprogram.shtml> (2008)
- National Science Foundation panel member, multiple panels: IGERT, Doctoral Dissertation Improvement Grants, Ecology, Ecology and Evolutionary Physiology, Ecosystems, and TECO panels (from 1996 to 2010)
- Secretary (elected), Physiological Ecology Section, Ecological Society of America (1/2002 – 12/2003)
- Invited member of international panel to review the National Phytotron at Duke (2001)
- Co-organizer of symposium "The Rhizosphere", sponsored by the Soil Ecology Section of ESA at annual national meetings of the Ecological Society of America (2000)
- U.S. DOE panel, Alexander Hollaender Postdoctoral Fellowships
- Ad hoc reviewer for grant proposals from NSF, NASA, NERC, University of Connecticut, USDA, Utah State University
- Reviewer for *American Naturalist*, *Biogeochemistry*, *Ecological Applications*, *Ecology*, *Global Change Biology*, *Journal of Ecology*, *Journal of Environmental Quality*, *New Phytologist*, *Oecologia*, *Physiologia Plantarum*, *Plant and Soil*, *Plant Cell and Environment*, *Science*, *Soil Biology and Biochemistry*, *Wetlands*

TeachingFormal teaching at MBL-Brown:

- New NSF IGERT, "Reverse Ecology: Computational Integration of Genomes, Organisms and Environments", David Rand PI, Zoe Cardon, Mitch Sogin, Annie Schmitt, Sorin Istrail co-Is

Informal courses at MBL:

Participant in graduate Phenology seminar, EEB Department, Brown Univ., fall 2009.

Maintaining the web page for, and organizing with Julie Huber, the weekly meetings for the "MicroEco" discussion group at MBL, a cross-Center group exploring links between microbial activity&diversity and ecosystem function (spring 2008 - current)

Organized weekly meetings for a "Chlorophyll Fluorescence" discussion group at MBL and WHOI, a cross-institution group examining what information chlorophyll fluorescence signatures (detected directly from samples or remotely at distance) can give about photosynthetic activity (June 2009 – May 2010)

Regularly taught at UConn:

Introductory Biology (~300 first year students);

General Ecology "W" (~70-100 sophomores/juniors, writing intensive);

Organisms and Ecosystems (~10-20 seniors, graduate students);

Soil Degradation and Conservation (~10-15 seniors/graduate students)

Integrative Earth System Science (~6-10 graduate students, proposal-writing intensive core course for first-year students in the Center for Integrative Geosciences)

Taught irregularly at UConn:

Introduction to Undergraduate Research (~25-60 students)

Professional Development Seminar (~15 graduate students)

Seminars on The Rhizosphere, on Plant Evolution, on Plant Ecology, and on Plant Water Relations (~10-15 graduate students each)

Multiple independent study courses one-on-one with undergraduate and graduate students

Students and PostdocsGraduate Major Advisor at Univ. of Connecticut:

Patrick Herron (NSF DDIG recipient and EPA STAR fellow, examining water flow in the rhizosphere and its effects on nutrient cycling, PhD 2007, now postdoc at Harvard)

Bethanie Hooker (EPA STAR fellow and PEO Scholar, studying soil carbon storage in agroecosystems, PhD 2005, now at Mt Holyoke)

Tracy Gartner (NSF graduate research fellow, focused on decomposition of mixed-species leaf litter; PhD 2003. Now assistant professor at Carthage College, Wisconsin.)

Graduate Major Co-Advisor at Univ. of Connecticut:

David Hoover (Geosciences program, MS 2008, now PhD student at Colorado State)

Graduate Committee Member, Various Institutions:

Bo Pietraszkiwicz (University of Connecticut, Storrs, PhD 2010)

Kristina Catanese (University of Connecticut, MS 2009)

Shirley Micallef (University of Massachusetts, Boston, PhD 2008)

Krissa Skogen (University of Connecticut, PhD 2008)

Lindsay Bowerman (University of Connecticut, MS 2007)

Krista Fisk (University of Connecticut, MS 2007)

Courtney Hamler (University of Connecticut, MS 2007)

Robin Kodner (Harvard University, PhD 2007)

Sarina Lambert (University of Connecticut, MS 2007)

Corie Cann (University of Connecticut, MS 2006)

Stacey Leicht (University of Connecticut, PhD 2006)

Nava Tabak (University of Connecticut, MS 2005)

Robert Dunn (University of Connecticut, PhD 2003)

Michael Gavin (University of Connecticut, PhD 2003)

Nancy Ryan (University of Connecticut, MS 2003)

David Bryant (University of New Hampshire, PhD 2002)

Undergraduates at Univ. of Connecticut and Bowdoin College:

Jed Rasmussen (REU through UConn, graduate of Utah State University 2008)

Kristina Catanese, honors thesis spring 2008

Christine Quartararo – fall 2006

David Hoover, undergraduate researcher and post-graduate research assistant

Naomi Avery, honors

Corie Cann, graduated from UConn BS/MS program in Conservation Biology

Andrew Czaja, honors (NSF and NDSEG graduate fellow, astrobiology program, UCLA; PhD 2006)

Jeremy Draghi (now grad. student at Yale; NSF graduate fellowship honorable mention);

Matthew Dunn, honors

Jennifer Funk (UC Berkeley undergraduate, technician in my lab at UConn, NSF and EPA graduate fellow, Ecology

and Evolution program, SUNY Stonybrook; National Parks Postdoc, Stanford University; now assistant professor at Chapman College)
Laura Pustell (researcher at Harvard Forest, MA; now pursuing a career in education)
Kristen Riley (now dietician counselor in Florida)
Multiple other undergraduate advisees through the honors program and the EEB dept. at UConn.
At Bowdoin: Cynthia Lodding (senior research published in *American Midland Naturalist*)

Postdoctoral:

Rebecca Neumann (Harvard, hydraulic redistribution of water by plant root systems), co-advisor with N.M. Holbrook and P. Moorcroft.
Claire Lurch (MBL, diversity and photophysiology in desert green algae), current
Patrick Herron (MBL, microbial sensors, microbial growth efficiency), 2008
Dennis Gray (UConn, photosynthesis in green algae from desert crusts), 2005-2007
Catalina Arango (UConn, developing genetically engineered microbial sensors for soil), 2007
Pati Vitt (UConn, now Conservation Botanist at the Chicago Botanic Garden), 1998-99
Jon Behling (Bowdoin College, now organic farmer in Wisconsin), 1996-97