

Proposal for a 2012 Alliance to Advance Liberal Arts Colleges (AALAC) Workshop

Sponsor Institution: Wesleyan University

Primary Workshop Leader: Suzanne O’Connell, Associate Professor of Earth and Environmental Sciences and Director, Center for Service Learning

High Impact Educational Practices for Success in Science, Technology, Engineering, and Mathematics (STEM) Fields for First Generation and Under Represented Minority Students: Focus on Earth & Environmental Sciences

The geosciences, which include earth, environmental, atmospheric and ocean sciences have a dismal record of attracting and retaining Underrepresented Minority (URM) students. In the entire United States including Puerto Rico, the yearly average for URM geoscience bachelor degrees for the decade ending in 2008 is Hispanics 141, Blacks 66, and Native American/Native Alaskans 30 (National Science Foundation (NSF) data & terminology). How do select liberal arts colleges measure up?

The lack of URM participation in the geosciences has been the subject of considerable study. Among the multiple reasons are: lack of exposure in high school, negative images of the earth sciences and poor high school preparation for science (e.g. Journal of Geoscience Education v. 55,). This is despite excellent future projections for employment and employment with good starting salaries (AGI).

Many of the hurdles facing URMs in STEM are similar to those faced by First Generation/Low Income (FG) students. At Alliance to Advance Liberal Arts Colleges (AALAC) schools, most URM and FG students enter with strong math and science backgrounds. Yet few major in science. This situation has been studied at other institutions and specific practices have been identified to improve the academic performance of all students, especially URM and FG (Table 1).

First-Year Seminars and Experiences
Learning Communities
Writing Intensive Courses
Collaborative Assignments and Projects
Undergraduate Research
Service Learning/Community-Based Learning
Internships
Capstone Courses & Projects

Table 1. High-Impact Educational Practices (from Kuh et al, 2008)

We propose a workshop for geoscience faculty to create the information and infrastructure to submit a proposal to Opportunities for Enhancing Diversity in the NSF Geosciences (OEDG) Program (<http://www.nsf.gov/pubs/2010/nsf10599/nsf10599.htm>) for Fall 2012. This collaborative proposal will present data and plans from highly selective liberal arts colleges, including the AALAC, to increase the recruitment and retention of URM and FG

students in the geosciences. The focus will be on the first and second years and specifically address:

- 1) What is the status of the situation at AALAC schools? Look at admissions data, enrollment in first- and second-year **Science Technology, Engineering and Mathematics (STEM)** courses.
- 2) Educate department faculty about barriers faced by URM and FG students. Are faculty aware of barriers, stereotype threat, implicit bias, imposter syndrome, etc. What can be done to increase awareness among faculty?
- 3) Review what is being done at AALAC schools. Identify initiatives that are being or have been undertaken at participating schools to recruit and retain URM and FG students in Earth & Environmental Sciences and STEM This will include specific initiatives and outcomes including mentoring, summer enhancements and those listed in Table 1.
- 4) Identify synergies and possibilities for collaboration. Create outline and workplan for proposal.

We choose to focus on geoscience and earth and environmental science departments because they are small and a foundation for collaboration already exists through participation in fieldtrips, summer field camps and regional scientific meetings. If the interventions we propose and implement are successful, other STEM departments at AALACs could consider adopting similar measures.

Preliminary Schedule:

Day 1

12:00- 1:30: Registration, introductions, lunch,

1:30-3:00 – Data presentations from schools.

Break

3:15-4:30 – Information for faculty about URM and FG student barriers

Break

4:45 – 5:45- Discussion:, how to educate faculty about barriers? Participant experience with URM and FG student

6:30 – 8:30 Dinner

Day 2

8:30 – 9:00 – Breakfast

9:00-10:00 – What works? Successful programs at other schools, Barnard, Wesleyan, etc.

Break

10:15-11:30 – First to second year summer options, information needed for proposal

11:30-1:30- Lunch and brief field trip (East Berlin Formation, Triassic Lake Sequence?)

1:30-3:00 – Information needed for proposal

Break

3:15-4:30 – Assign tasks and deadlines

Outcome: NSF OEDG proposal submitted Fall 2012

Evaluation: Proposal reviewers and funding/no funding

Links

.Journal of Geoscience Education v. 55, <http://nagt.org/nagt/jge/abstracts/dec07.html>).
AGI -Geoscience Employment projections salaries
(<http://www.agiweb.org/workforce/reports/2009-EmploymentSectors.pdf>)
Opportunities for Enhancing Diversity in the National Science Foundation Geosciences
(OEDG) Program (<http://www.nsf.gov/pubs/2010/nsf10599/nsf10599.htm>)

Workshop Leaders

Contact: Suzanne OConnell (soconnell@wesleyan.edu), Wesleyan University, Associate Professor of Earth & Environmental Sciences

Amherst College

Tekla Harms, Professor of Geology, (taharms@amherst.edu)
Anna Martini, Chair and Associate Professor of Geology (ammartini@amherst.edu)

Barnard College

Stephanie Pfirman (Co-Chair and Martin Hirschorn Professor of Environmental and Applied Sciences), Barnard College, Department of Environmental Science

Bryn Mawr College

Pedro Marengo, Assistant Professor of Geology (pmarengo@brynmawr.edu)
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Carlton College

Ellen Iverson, Director of Evaluation Science Education Resource Center
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Macalester College

Kelly MacGregor, Chair and Associate Professor of Geology (macgregor@macalester.edu)

Middlebury College

Peter Crowley Ryan, Chair Department of Geology (pryan@middlebury.edu)
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Oberlin College

Steven Wojtal, Chair and Professor of Geology (steven.wojtal@oberlin.edu)

Vassar College

Jill S. Schneiderman, Professor of Earth Science (schneiderman@vassar.edu)

Williams College

Mea Cook, Assistant Professor of Geology, (Mea.S.Cook@williams.edu)

Wendy Raymond, Professor of Biology (Wendy.E.Raymond@williams.edu)

Preliminary Budget

Item	Travel	Hotel	Food	\$/Participant	#/Participants	Total
Driving distance schools	\$200	\$150	\$200	\$550	20	\$11,000
Long-distance schools	\$500	\$150	\$200	\$850	10	\$8,500
Workshop management						\$1,000
					Total	\$20,500

CURRICULUM VITAE

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Education

A.B. Oberlin College - 1973 (Majors: biology and geology)
M.Sc. State University of New York at Albany - 1979 (geology)
Thesis: Geology of the Mafic/Ultramafic Transition, Table Mt, Western Newfoundland
Ph.D. Columbia University - 1986 (marine geology)
Dissertation: Anatomy of Modern Submarine Depositional and Distributary Systems

Professional Experience

2007- present, Director Service Learning Program, Wesleyan University
2003-2005, Chair Dept. of Earth and Environmental Science, Wesleyan University
2000-2002, Director, Interdisciplinary Science Center, Trinity College, Hartford, CT 06106
1996 - present, Associate Professor, Depart. of Earth & Environmental Sciences, Wesleyan University
1996 - 1997, Visiting Professor, Dept. of Earth, Atmospheric, & Planetary Science, MIT, Cambridge, MA
1989 - 1996, Assistant Professor, Department of Earth and Environmental Sciences, Wesleyan University
1991 - 1992, Program Coordinator, JOI/USSAC Summer Research Program for Undergraduates
1991 - present, Adjunct Associate Research Scientist, Lamont-Doherty Earth Observatory
1991, 1992 (summers) NASA/ASEE, Faculty Fellow, Goddard Institute for Space Studies, New York, New York
1989 - 1991, Visiting Scientist, Lunar and Planetary Institute, Houston, TX
1987 - 1990, Adj. Asst. Professor, Grad. Faculty, Dept. Oceanography, Texas A&M University
1985 - 1989, Staff Scientist - Ocean Drilling Program, Texas A&M University
1978 - 1980, Science Coordinator, Joint Oceanographic Institutions for Deep Earth Sampling, Woods Hole, MA

Honors and Awards

2001 Outstanding Educator: Association for Women Geoscientists
1996-1997 Distinguish Lecturer: U.S. Science Advisory Comm. (USSAC) to Joint Oceanographic Inst. (JOI)
1996-1997 NSF Fellowship: Visiting Professorship for Women at MIT
1991, 1992 (summers) NASA/ASEE, Faculty Fellow, Goddard Institute for Space Studies, New York, New York

Oceanographic Experience - Participant in 17 research cruises, representing twenty months of sea time.

Editorial board - Environmental Geology 2000-2009

Publications

O'Connell, S. and Holmes, M.A., 2011. Obstacles to the Recruitment of Minorities in the Geosciences: A Call to Action, GSA Today, V. 21, Doi: 10.1130/G105gw.1
Holmes, M.A., O'Connell, S., Frey, C. and Ongley, L., 2008. Gender imbalance in US geoscience academia, Nature Geoscience 1, 79 - 82. doi:10.1038/ngeo113
O'Connell, S. and Holmes, M.A., 2004. Where are the Women Geoscience Professors?, Assoc for Women in Science Magazine, v. 33, 11-16.
O'Connell, S. and Holmes, M.A., 2005, Women of the Academy and the Sea, Oceanography, 18, 12 - 24.
O'Connell, S., Ortiz, J., D., and Morrison, J., 2004. Connecting urban students with their rivers generates interest and skills in the geosciences, Journal of Geoscience Education, 54, 462-471

Publications (general)

Ortiz, J.D., O'Connell, S., DelViscio, J., Dean, W., Carriquiry, J., Marchitto, T., Zheng, Y., and A. van Geen, 2004. Enhanced marine productivity off western North America during warm climate intervals of the past 52 kyr, Geology, v. 32, 521-524.
Ortiz, J., Mix, A., Harris, S., O'Connell, S., 1999. Diffuse spectral reflectance as a proxy for percent carbonate content in North Atlantic sediments, Paleoceanography, 14, 171-186.
O'Connell, S., 1997. Communicating science in general education science courses with popular-science books., Jour. of Geoscience Education, 45, 354-358.

- O'Connell, S., Chandler, M.A., and Ruedy, R., 1996. Implications for the creation of warm saline deep water: L. Paleocene reconstructions and global climate model simulations, *Geol. Soc. of Am. Bull.*, v.108, 270-284.
- O'Connell, S. McHugh, C., and Ryan, W.B.F., 1995. Unique fan morphology in an entrenched thalweg channel on the Rhone Fan, in K.T. Pickering, R.N. Hiscott, N.H. Kenyon, F. Ricci Lucci, and R.D.A. Smith (eds.), *Atlas of Deep Water Environments: Architectural style in turbidite systems*, Chapman & Hall, London, 80-83.

Synergistic Activities

American Geological Institute (AGI). In addition to the formal associations listed, I thought it was important for undergraduate earth science majors to have a firsthand exposure to the workings of our federal government. The then Director of Government Affairs Program (Dr. Craig Schiffries) and I started the program using a Wesleyan fund for off-campus professional development and Wesleyan students. After two years, AGI was able to find outside funding and the program thrives. Member Society Council (1992-1995), Nominations Committee (1993, 1995), Government Affairs Committee (1995-1997), Executive Committee (1997- 2000), Environmental Affairs Committee (1999-present), Strategic Planning Committee (2002-2004)

Program to Increase Mastery of Math and Science (PIMMS) is a Wesleyan-based program to educate Connecticut teachers in the sciences. I am on the Earth Sciences Committee and help to teach two workshops/year. As part of this effort, I am also available to give lectures at local middle and high schools, provide tours of Wesleyan science facilities, and judge school science fairs. In June, as part of PIMMS, I co-taught (with a certified middle school science teacher) a weeklong "Environmental Science" workshop to middle school teachers in the Hartford Elementary Science Professional Development Project. A quarter of the teachers had been in previous workshops I taught and were anxious to explore science subjects with me.

Association for Women Geoscientists. Through this organization I have worked to promote women in the geosciences, by participating in and/or leading activities such as workshops (e.g. "Getting a Job and Getting Tenure" at the 2001 Annual Geological Society of America meeting), helping women geoscience professors be recognized for their achievements through the Outstanding Educator Award (chaired for 5 years), and talking and giving demonstrations at local middle and high school career nights. The Foundation itself awards funds to run Earth Science Week programs, and weekend and summer programs to interest girls in the earth sciences, e.g. Nebraska Rocks and San Francisco Rocks. As a board member I tried to encourage people to submit requests for funds that would support girls in the earth sciences.

Director of General Science Education, Wesleyan University, (2002-2006) I worked with science departments to develop general education courses for non-science students. Wesleyan does not have a science requirement and we need to offer courses that will attract science-phobic students. I organized a public lecture series, in which science topics were presented at a general level. I was responsible for selecting the speakers and publicity.

Director of Service Learning, Wesleyan University, (2007- present) In this position I am responsible for identifying community needs that could be aligned with courses or courses that needed outside of the university. This resulted in an architecture course that built an observing station at an Audubon Sanctuary, and an oral history or the Portland (CT) Brownstone quarries and the development of a Science Pedagogy Course. During my time as director, service-learning course offerings doubled. I also chaired the committee that developed a program in Civic Engagement that provided academic and experiential program for students interested in exploring their relationship to civic engagement.

Collaborators and Co-Editors

Heming, Sidney, Lamont Doherty Earth Observatory, Columbia University
Holmes, Mary Anne, University of Nebraska, Lincoln
Ku, Tim, Dept. of Earth & Environmental Sciences, Wesleyan University
Pierce, Elizabeth, Lamont Doherty Earth Observatory, Columbia University
Resor, Philip, Dept. of Earth & Environmental Sciences, Wesleyan University

Graduate Advisor

William B.F. Ryan, Lamont Doherty Earth Observatory, Columbia University.
No Post-doc

Graduate Advisor (M.S.)

Caryn Smith (1988, Texas A&M Univ.), Claudia Veneer (1999, Wesleyan), Tracy Kruger (2005, Wesleyan).
Rosemary Ostfeld (2011, Wesleyan), Stephen Schwarz (2011, Wesleyan)