**Integrated Water Atmosphere and Ecosystem Education and Research**

NSF Integrated Graduate Education, Research, and Training

2011 – 2015

Intellectual Merit

WATER-IGERT will apply three dimensions of integration to scientific solutions of water–based environmental problems. Integration of disciplines, scales, and problem–sheds will occur through a new problem–focused approach to education and research. Problem–shed integration is necessary because of barriers between the scientific world and the world of action where water–based problems are confronted. The program will lead to the discovery of new, scientific mechanisms for integration of scales and disciplines and to learn how to apply them in the world of action where political, legal, economic, and social forces dominate. The WATER-IGERT program will provide a new generation of Ph.D. students with capabilities to work across disciplines and problem-sheds. The WATER-IGERT program will be based on integrated approach to hydrologic and water resource science and engineering, land-surface- atmosphere interactions, ecosystems science, vulnerability analysis, water management and policy. Students will learn to evaluate and analyze complex non-linear systems interactions, environmental variability, and climate change to develop and apply integrative solutions to pressing current problems.

The program’s uniqueness arises because, while many studies have been conducted on the hydrologic cycle, aquatic ecosystems, and harnessing water for human uses, few studies have addressed the persistent influences of human activities on water resources and fluxes. Far fewer have addressed the biospheric feedbacks in the climate system and the hydrologic cycle, and fewer still have addressed the vulnerabilities of hydrologic, ecologic and socio-economic systems to environmental variability and climate change that occur while pressing problems demand action and solutions. The interfaces between human activities and aquatic ecosystems (especially in the arid West) comprise the most critical and least studied issues in the field of water science, issues that are exacerbated by water scarcity.

Broader Impacts

Strengths and uniqueness of our IGERT program are derived from 1) the combination of a large and rich cadre of internationally renowned faculty and scientists in the subject areas, 2) world class research facilities including the Natural Resource Ecology Laboratory, the Graduate Degree Program in Ecology, the Center for Multi-scale Modeling of Atmospheric Processes, the Cooperative Institute for Research in the Atmosphere, the CSU-CHILL National Radar Facility, the Engineering Research Center, the Colorado Climate Center, the Water Center, and the School of Global Environmental Sustainability, 3) the unique methods that we intend to use to integrate the sciences and to give students experience in applying scientific advances to real-world problem-solving, including the development of new multidisciplinary courses in the above fields, 4) the importance and relevance of the major multi- disciplinary focus areas, and, particularly, 5) the strength of the currently existing multi-disciplinary academic and research programs in water engineering and science, atmospheric sciences, ecology, social sciences, and resource management at CSU, 6) our WATER-IGERT team has an exemplary record of providing interdisciplinary education, such as through our WATER-REU Program in Water Research at CSU, the Hydrology Days Conference, the Student Water Symposium, and the Front Range Student Ecology Symposium. Collaboration with federal research agencies and European universities will offer internship. None of the currently funded IGERT programs either address the same research emphasis or possess such potential in multi-disciplinary research in WATER issues.

To increase diversity among recipients of Ph.D. degrees in these fields, a key aspect of WATER- IGERT is collaboration with the Graduate Center for Diversity and Access of the Graduate School, and with its programs including the Louis Stokes Alliance for Minority Participation Bridges to the Doctorate, Alliance for Graduate Education to the Professoriate, Fast Track to Work, McNair Scholars and The Colorado Alliance for Minority Participation (CO-AMP), a state-wide consortium of higher education institutions in Colorado and the Four Corners Region sponsored by the NSF for the purpose of attracting and preparing students for careers in Science, Mathematics, Engineering and Technology (SMET).

Image

Full Proposal

Annual Report 2012

Publications

Students