

# Research Experience for Undergraduates: Rewarding and Fun

Mary J. Granger (Moderator)  
George Washington University  
Washington, DC 20052  
1-202-994-7159  
granger@gwu.edu

Guy-Alain Amoussou  
California State University  
Arcata, CA 95521  
1-707-826-3380  
ga7001@humboldt.edu

Miguel A. Labrador  
University of South Florida  
Tampa, FL 33620  
1-813-974-3260  
labrador@csee.usf.edu

Sue Perry  
University of Southern California  
Los Angeles, CA 90089  
1-213-821-6340  
perry@caltech.edu

Kelly M. Van Busum  
DePauw University  
Greencastle, IN 46135  
1-765-658-5030  
kvanbusum@depauw.edu

## SUMMARY

The purpose of this panel is to explore ways to encourage and support undergraduate research in computer science and information technology. Specifically we will discuss ways that faculty members can fund and develop their own undergraduate research programs, as well as ways they can encourage their students to apply to existing programs. Research Experiences for Undergraduates (REUs) are programs established to promote and support undergraduate research and encourage students to continue their education and research after graduation. Perhaps the best known REU programs are those funded by the National Science Foundation. However we use the more general term REU to refer to any research experience for undergraduates regardless of funding source. It is anticipated that the panel focus will be on summer NSF REUs, but panelists will also discuss undergraduate research programs that may be sponsored by other agencies and/or on-going during the school year. The panel will seek input from the audience on their experiences with all forms of REUs.

## Categories and Subject Descriptors

K.3.2 [Computers and Education]: Computer and Information Science Education

## General Terms

Education, Research

## Keywords

Computer and Information Science Education Research

### 1. Mary J. Granger

I participated in an REU as a visiting professor and was amazed at the level of commitment and professionalism demonstrated by the students. They were eager to learn and research a topic of which they had no prior knowledge. Currently, they are expanding on their REU research and exploring graduate studies. Since that rewarding experience, I have encouraged students to participate in

REUs, and have obtained funding from the university to establish an on-going, semester-long REU program. Students are curious but not knowledgeable about research opportunities. My participation in this panel enables me to encourage other faculty members to work with undergraduates, to further undergraduates' participation in REUs and to learn about other opportunities.

### 2. Guy-Alain Amoussou

Humboldt State University (HSU) hosted the first year of a three year funded NSF-sponsored Research Experience for Undergraduates (REU) program during the summer of 2005 entitled "The Science of Design". This REU, organized for the first time, was a joint venture between four lead faculty from the Computing Science, Mathematics and the Environmental Resources Engineering Departments. Another emphasis of REU program is the recruitment of underrepresented students in the sciences. As a result of our effort, five of the eight students were women, four of the eight students were non-white, and three of the eight students were first-generation college students. All eight students expressed a sincere interest in continuing their education in the sciences in graduate school.

I designed the project concept for the grant and obtained funding. I was also responsible for recruiting the students and coordinating with faculty mentors. Along with mentoring two students, I managed and coordinated all aspects of the REU, including publishing the students' posters, papers and presentation, and the final NSF report.

### 3. Miguel A. Labrador

Current statistics and trends in graduation, enrollment and participation of minority groups in Science and Engineering (S&E) are not very promising. For example, according to NSF's Science and Engineering Indicators 2002, the enrollment in engineering has declined continuously from 1983 (441,000 students) to 1999 (361,000) by more than 20% [2]. Furthermore, the National Center for Educational Statistics (NCES) found in 2000 that, although 25-30% of students entering college intend to major in Science and Engineering, fewer than 50% completed

their degrees within a 5-year period [1]. The study also notes that approximately 20% of students dropped out of college and that the graduation rate of under-represented minority students is lower than that of other groups [1, 3].

One recommended reform included in the NSF Science and Engineering Indicators 2002 report to meet the challenges of S&E higher education is to increase undergraduate research [2]. The National Science Foundation, responding to this, established the Research Experiences for Undergraduates (REU) program. Under this program, REU Sites can be established to promote undergraduate research around a specific research topic during the summer. One of the main ideas of this program is to provide students with a research experience that is not available in their own institutions. This is a great program but, what if you want to continue the program during the academic calendar? What if you want to involve your own students? How do you get your own REU program started? How much support do you need?

I will describe the experience of the College of Engineering at the University of South Florida in establishing an internally-funded REU program [4]. Our experience has been that with very little monetary support from your Department or College, you can establish an internal REU program with an enormous potential to grow. The organization, information, procedures, funding strategies other key aspects needed to run and grow this program successfully will be described.

I have been the coordinator for my department in the College of Engineering's REU program since its inception in the spring 2002. In addition, I am the PI of an NSF-funded REU Site in Computer Science and Engineering and member of the USF's Undergraduate Research Advisory Board.

#### **4. Sue Perry**

I run a large, interdisciplinary, team-based internship program, the Southern California Earthquake Center/Undergraduate Studies in Earthquake Information Technology (SCEC/UseIT), where students conduct IT research to benefit earthquake science and outreach. A UseIT internship stresses collaboration, and working in teams comprising varied interests, skills, and backgrounds. We encourage our interns to try something they would not otherwise have tried. I am responsible for all aspects of the program, including recruitment, applicant review, project creation, training, special events, mentoring, human resources, and career counseling. Like all REU sites, UseIT is committed to attracting top students to research careers, and to building a more diverse scientific community, and we have solid successes on both fronts.

UseIT began in summer, 2002, with seed money from SCEC, and internships for twelve students at University of Southern California (USC). We now fill 22 summer internships from over 100 applications, and maintain a handful of year-round positions

for USC students only. We have been established as a NSF REU Site, jointly funded by the CISE and Geo directorates, and also receive funding from entities within USC. UseIT welcomes all majors and class standings, although the majority of our students are in upper classes and in computer science or engineering. Almost without exception, our interns have been terrific, and give us much hope for the future.

By all measures, our program is successful, but I believe we can do better. I have an increasingly nagging sense that REU Sites remain unknown to the students we most wish to attract, those with an aptitude for research who have never considered it as an option. Moreover, however successful a summer internship, it turns out to be just the beginning of a process of support and encouragement that extends for years and would best include professors and advisors back at the student's home institution.

#### **5. Kelly M. Van Busum**

I strongly believe in the benefits of a research experience for undergraduates (REU). I participated in an REU program as a student, and now as a faculty member I work with undergraduate researchers. As an undergraduate at a school with no graduate students, I had only a dim idea of what it meant to go to graduate school. One of the highlights of my REU was visiting a graduate school and learning about current research projects. This helped contribute to my decision to attend graduate school. After I became a faculty member, I wanted to participate as a faculty sponsor for our REU program. It was fun to see students struggle with research problems, find creative solutions to these problems, and gain confidence in their abilities.

#### **6. REFERENCES**

- [1] National Center for Education Statistics (NCES) U.S. Department of Education. "Entry and Persistence of Women and Minorities in College Science and Engineering Education" (<http://www.nces.ed.gov/pubsearch/>). Washington, DC: Office of Educational Research and Improvement, 2000.
- [2] *Science and Engineering Indicators 2002*. National Science Board, <http://www.nsf.gov/sbe/srs/seind02/start.htm>, 2002.
- [3] *Science and Engineering Indicators 2002. Higher Education in Science and Engineering*. National Science Board, <http://www.nsf.gov/sbe/srs/seind02/c2/c2h.htm>, 2002.
- [4] M. A. Labrador, J. Wolan, G. Centeno, A. Kumar, G. Mullins, and R. Schlaf. A Research Initiative to Close the Gap between Undergraduate and Graduate School in Engineering. In *Proceedings of Frontiers in Education*, October 2004.

\*Rationale for 5 panelists: Each of the panelists has played a different role in an REU. As mentioned above, one was a visiting faculty, one was a student participant and is currently a faculty mentor, one has obtained non-NSF agency REU funding, one has experience with an ongoing/school year REU and one is a principle investigator. They will provide different views of an REU: limiting each panelist to 10 minutes provides ample time for audience participation.