

### LEVERAGING UNDERGRADUATE RESEARCH

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The University of California at Berkeley proposes a panel discussion at the NAMEPA/WEPAN Joint Conference on the topic of "Leveraging Undergraduate Research". The panel will be composed of both academic staff and student presenters from summer research programs which target underrepresented students: UC Berkeley's NSF Research Experiences for Undergraduates SUPERB Program; Stanford's NSF REU SURF Program (Dean Noe Lozano); MIT Lincoln Laboratory's Summer Internship Program for Minority Students in Engineering; and the Computer Research Association's Distributed Mentor Program.

Presenters will address ways in which summer research programs can be effectively leveraged, both on behalf of the student participants' academic goals and for the participating host institutions. We will explore the role of industry in promoting and enhancing summer research experiences, especially in the context of current competition for undergraduates to work in non-research positions in industry. We will try to "push the envelope" in discussing how to leverage targeted undergraduate research programs most effectively to advance our common goals.

Some of the themes to be addressed by this panel are:

- Enhancing summer research through industry collaboration
- Linking summer research more closely to the graduate admissions process
- Longitudinal evaluation of summer research: feasibility and use of results
- Gauging the effects of summer research programs on institutional culture
- Measuring the effectiveness of summer research as compared with *other* outreach programs for diversity

Berkeley panelists will discuss models for **the enrichment by industry** of the Summer Undergraduate Research Program in Engineering Research-Information Technology (SUPERB-IT) through collaboration with both Intel and IBM Almaden Research Corporation, San Jose, CA. To complement students' university-based laboratory experience, both corporations created on-site laboratory tours of their research and development facilities for our summer students. The industrial component of the program demonstrates to students that research occurs in industry as well as on campuses, and providing introductions to working industrial research role models. Aspects of the

industrial visit include information on the independence a research career affords and the similarities to and differences from an academic career. At IBM Almaden, a Berkeley faculty member accompanied the students and gave a talk to the IBM summer minority students about graduate school. One consequence of this collaboration is the creation by Almaden of a new summer research internship program focussing on women students. This new program may be compared with the established Lucent Summer Research Program for Women and Minorities, and the Lincoln Laboratories Summer Research Program for Minority Students.

**Linking summer undergraduate research to the graduate admissions process** is another focus of this workshop. First, experiencing exciting research is a powerful motivational tool to help for women students, which lets them know they can participate in the world of research. It is becoming increasingly crucial for successful graduate applicants to demonstrate research *accomplishment* as well as research *potential*. At Berkeley, for example, last year 100% of the U.S. women admitted to the graduate program in electrical engineering and computer sciences has participated in undergraduate research during the academic year or in a summer program. The National Science Foundation has increased its allocation to the Research Experiences for Undergraduates (REU) Program, thereby multiplying the number of summer options for engineering undergraduates.

**Longitudinal evaluation of summer research programs** is a stated goal of the NSF REU and other undergraduate research programs. However, evaluation is never a line item for REU Budgets. Reasonable inquiries as to the outcome of summer programs, and any evidence of longer range effects are encouraged. Such long term follow-up surveys of past participants present certain problems: Rarely is an external evaluation included in the budget. Then, there is the difficulty of reaching a mobile undergraduate population. Finally, institutional commitment to the evaluation endeavor requires staff effort and time. In the panel discussion, we shall reflect on longitudinal evaluation models, referencing various NSF REU programs such as Stanford's SURF Program, and the Computer Research Association's evaluation of the Distributed Mentor Program. The CRA evaluation was conducted by professional evaluators, with excellent results.

## **Undergraduate Research Discussion**

Summer research programs sometimes have unintended side effects on institutional culture. One way to gauge these effects is by investigating the responses of the students' graduate mentors. In the case of SUPERB-IT, a survey has been conducted for several years of the graduate student mentors who provide day-to-day guidance of the undergraduate researchers. Valuable lessons can be learned from the mentors closest to the daily activities of the students. These graduate students in turn can coach the students in their graduate applications, and take the role of internal advocates in the graduate admissions process.

Finally, how do we ascertain whether summer research is more or less effective than other diversity outreach programs, such as fellowships, recruitment trips, conferences for prospective students, internet-mediated programs, etc? We do not expect to answer this question definitively, but to clarify the value of undergraduate research in the context of graduate pipeline development.