

Undergraduate Research at the University of Arizona

Description of the Institution

The University of Arizona (UA) is a Research I, Land Grant Institution established in 1885.

UA offers 334 fields of study at the bachelor's, masters, doctoral, and first professional level.

There are 18 colleges and 12 schools located on a 378-acre campus.

2006 enrollment: 36,805 students (roughly 28,000 undergraduates)

University awards roughly 7,000 degrees annually including more than 1,200 masters degrees and almost 700 doctoral degrees.

Faculty and alumni have won 10 Nobel and Pulitzer Prizes; 50 faculty members have been elected to the National Academies of Science and Engineering, the American Academy of Arts and Sciences, the Institute of Medicine, the Royal Netherlands Academy of Science, and Britain's Royal Society.

UA is ranked 14th among public universities in research expenditures.

Faculty members are enthusiastic about including undergraduates in their research and about supervising undergraduate research projects. As a Research I institution, faculty are expected to have active research programs. Faculty who are used to teaching large lecture courses find that working with an undergraduate doing research is a satisfying way to teach. Moreover, postdocs and graduate students are often involved in the supervision of the undergraduate researchers in their groups which provides them with valuable teaching and mentoring experience.

UA was one of ten institutions nationally recognized in 1997 by NSF for the Integration of Research and Education (received a RAIRE grant: 500K over three years to disseminate what we do and how we do it).

Definition of Undergraduate (UG) Research

The University does not have an official definition of undergraduate research; definitions vary by discipline.

Undergraduate research in the sciences and engineering tends to be hypothesis driven, requires collection and analysis of data, at a minimum;

Undergraduate research in the arts, humanities, and social sciences involves new ways of seeing things, and involves development of the analytical tools to provide deeper insights into questions of interest. Much of the work in these areas is interdisciplinary which means breaking down the traditional barriers between fields.

In all cases, the proposed undergraduate research project should push the edge of discovery and knowledge, not just serve as a new experience for the research (which might be defined as an internship instead).

Organization of UG Research on Our Campus

Undergraduate researchers are an important part of the UA scientific community, but Undergraduate Research at UA is decentralized.

It is difficult to say exactly how much is actually going on because no one is collecting this information centrally (no indication on students' transcript that s/he has had a research experience).

Numerous programs have developed over past 18 years to get undergraduates, particularly in the biological sciences, (broadly defined), into research. These include numerous NSF REU programs, a McNair Achievement Program, the Undergraduate Biology Research Program, a MARC Program, and more. The Honors College has an undergraduate research grants program that covers all disciplines.

Undergraduate research can be done for credit or for pay and many students volunteer their time in research groups.

Sixty percent of students in College of Science are involved in independent research by the time they graduate.

Faculty in sciences, engineering, pharmacy, social and behavioral sciences, medicine, are very supportive of undergraduate research and many students are paid for the time they spend doing research.

Faculty in arts and humanities also are supportive of undergraduate research but students involved in research in these areas are more likely to be doing the work for credit or volunteering.

Examples of UG Research Projects in Different Disciplines

Legacies of the "Lost Boys" of Sudan: PTSD and Children of War (Nursing Major)

A Comparison of Satirical and Fear Appeal Anti-Smoking Advertisements: Effects on Attitudes, Beliefs, and Intentions Regarding Smoking Cigarettes (Sociology & English Major)

The Nakashi Art of Fresco Painting (Studio Art and Chemistry Major)

Exploring the Roots of the Spanish Concert Guitar: The Legacy of Andres Segovia (Guitar Performance Major)

Tutorials, Terms, and Specialization – Does the British Model of Higher Education Have Us Beat? (History Major)

Behaviors of Consumer and Sommelier in Restaurant Wines (Economics and Mathematics Major)

The Effects of a Democratically Elected National Government on Educational Opportunities for Young Girls in Niger (French and English Major)

The Role of Polyamines in the Stability of COX-2 mRNA (Biochemistry and Molecular Biophysics Major)

Flow Rate and Intimal Thickening of a Small-Diameter Blood Vessel Mimic (Chemical Engineering Major)

The History and Fate of the Mariachi Harp (Music Education Major)

Challenges

Simply collecting baseline data on amount of UG research taking place at UA is difficult which is why no one has done it yet. There are pockets of good data, but nothing comprehensive or centralized

Support for UG research is nearly all externally funded, so even though undergraduate research is being done all over campus and a significant number of students are involved, it is not at this point a permanent part of what we offer at UA (unlike other institutions that have endowments). However, the research community counts on the undergraduate researchers so it is unlikely that undergraduate research would ever entirely disappear from our campus if we failed to get our grants renewed.

If UA ever moves to a model where all students are required to do independent undergraduate research we would have difficulty providing all students with a good experience. We would need to make extensive and creative use of graduate students, postdocs and individuals off campus who are doing research and could supervise such experiences. This would require setting up some training for such individuals and institutional resources would be required to coordinate the placement and evaluation of the students' experiences.

Undergraduate Research Programs at the University of Arizona
(not a comprehensive list)

Although course work is an essential part of undergraduate education, the faculty adhere to the principle that **the best way to learn is by doing research**. To that end, a multitude of organized programs exist at the University of Arizona to get undergraduates involved in research. It is important to note that many students are involved in research on our campus independent of an organized program.

Undergraduate Biology Research Program (UBRP)

<http://ubrp.arizona.edu/>

This nationally recognized program provides for paid research experience for undergraduates. Students can choose from over 240 faculty in 43 departments across campus. Students work full-time during the summer and can continue part-time during the academic year.

The application deadline is February 1 of each year.

Sources of funding: HHMI, NSF, NIH, ASPET, Beckman Foundation, Faculty mentors' research grants, Bio 5 Institute

Biomedical Research Abroad: Vistas Open (BRAVO!)

<http://ubrp.arizona.edu/bravo/>

BRAVO! provides research experienced UA undergraduates with the opportunity to travel to work with a foreign collaborator of his/her UA faculty mentor. The application requires a five page proposal and letters of endorsement from the UA and the foreign mentor.

Sources of funding: HHMI, NIH, NSF

Minority Access to Research Careers (MARC) Program

<http://www.biochem.arizona.edu/marc/>

This is a unique research, mentoring, financial and academic opportunity for underrepresented minority students who have interest and potential to pursue careers in biomedical research.

Source of funding: NIH

Ronald E. McNair Achievement Program

<http://grad.admin.arizona.edu/mcnair/program.htm>

This program provides low-income, first generation, and underrepresented students with opportunities and activities to develop the skills necessary for them to be admitted to and excel in academic studies at the graduate level.

Source of funding: Dept. of Education

UA/NASA Space Grant

<http://spacegrant.arizona.edu/>

The UA/NASA Space Grant Program employs full-time undergraduate students in various research programs. Application information is available on their website.

Source of funding: NASA

The Summer Research Institute at the UA

<http://grad.admin.arizona.edu/multi/sri/index.php>

The Summer Research Institute's mission is to provide outstanding underrepresented students with the skills, information, and encouragement that will enable them to compete successfully for entrance into graduate programs at the U of A and other prestigious institutions throughout the country.

Source of funding: Internal sources at UA

UA Honors College Research Opportunities Database and Honors Research Grants

<http://www.honors.arizona.edu/HonorsStudents/research.htm>

The Honors College maintains an in-house listing of faculty members who are willing to have Honors students assist with their projects. Students participate as volunteers, paid research assistants, and as interns earning academic credit. To access this database, students must have updated Honors standing. An annual competition is held for students wishing to secure funding for research and creative activities. Grants of up to \$1800 can be made in any discipline.

Source of funding: UA Vice President for Research

NSF REU in Chemical Sciences

<http://www.chem.arizona.edu/REU/>

This program provides support primarily for women and minority students from institutions in the Western US to do summer research on the University of Arizona campus in chemistry.

Source of funding: NSF

The Nyanza Project

<http://www.geo.arizona.edu/nyanza/>

This is an international NSF REU site in Tanzania for students interested in limnology. The program recruits undergraduates from all over the country who then travel together to Africa for a six week summer research experience.

Source of funding: NSF

NSF REU in Advanced Materials Processing and Analysis

<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0243847>

This project supports undergraduates and teachers in a summer research experience in Thailand.

Source of funding: NSF

NSF REU in Physics/Summer Bridge Program

<http://www.physics.arizona.edu/~thews/reu/reugen.html>

The summer REU program in the Department of Physics at the University of Arizona provides opportunities for undergraduates to participate in forefront research activities lead by distinguished faculty members. The program includes access to physics research programs based in several other departments of the university, including Atmospheric Sciences, Astronomy, Geosciences, Lunar and Planetary Studies, Optical Sciences, Applied Mathematics, and some Engineering departments.

This program is aimed at local community college students who plan to transfer to our department for the B.S. degree. The program includes introductory lectures, remedial individual work where necessary, and provide graduate student mentors to assist in both the academic and research work.

The Ambos Nogales Revegetation Project

<http://aran.bara.arizona.edu/>

The Ambos Nogales Revegetation Project, classified as "community based participatory research" is a successful multidisciplinary collaboration among the University of Arizona, Instituto Tecnológico de Nogales, and various schools, state and city agencies, and nongovernmental organizations on the Arizona-Sonora border, focusing on Nogales, Sonora. The Project was designed to explore ways to increase the planting and maintenance of native vegetation on hillsides and in local gardens in Nogales, Sonora, Mexico as a means of reducing air pollution. There were three phases to the project: the first phase of the project was to assemble existing information on native vegetation and sustainable community forestry and gardening in Ambos Nogales, it included interviews within the pilot schools and neighborhoods to explore the residents' histories and concerns, attitudes and practices regarding planting and gardening, and to inform residents of the demonstration projects; the second phase was to prepare the demonstration sites and begin planting and to include demonstration workshops on organic gardening, composting, water harvesting and plant/tree selection and maintenance; and the third phase included the production of guides and presentations on native vegetation, sustainable community forestry and gardening, a booklet organized as a "Community Tour" of the pilot demonstration sites, and the creation of a bilingual website describing the project.

Sources of funding: EPA, Hewlett and Ford Foundations (through Border Pact), NSF, internal funds