

Science Connection: Student Research Multiplying

The integration of student research with teaching is probably the most effective way to ignite a passion for the sciences. One of the recent strands of discussion on the e-mail listserv maintained by the Council on Undergraduate Research has concerned funding of research in the sciences at primarily undergraduate institutions. Reading those postings, it seems that undergraduate faculty at many institutions feel they must choose between maintaining a high level of productivity in their research program (preserving funding and opportunities for professional advancement) and serving the needs of their students to obtain significant research experience.

Students at Gonzaga are fortunate that faculty research programs have become an integral component of the curricula in the sciences. A dozen years ago, on-campus faculty-directed summer research for Gonzaga undergraduates consisted of two or three programs and allowed the participation of at most six or seven students each summer. Other Gonzaga science faculty were active in summer research, but mostly at other institutions.

In the late 1980s, to provide more opportunities for our undergraduates, the Biology and Chemistry departments made the establishment of on-campus research programs an important criterion in the hiring of new faculty. Research opportunities have also been enhanced by an increase in the number of science faculty. Since 1990 the number of faculty in Biology and Chemistry has increased from eight to 13. This year a new position was initiated in the Chemistry Department with the endowment of the Scholl Chair in Chemistry by the Scholl Foundation.

The nine current Biology and Chemistry faculty members hired since 1987 all maintain research programs that involve Gonzaga students. For each of the last several years more than 20 students in the sciences have participated in summer research with 10 or more different faculty members. In addition, about 25 students participate in research activities during each academic year.

Thus, in the last 10 to 15 years, the scope of undergraduate science research at Gonzaga has grown from a few positions for exceptional students to realistic opportunities for most interested and qualified science majors.

The major catalyst in this transformation was provided by the M.J. Murdock Charitable Trust. In 1990, the Trust solicited proposals from a number of private colleges and universities in the Northwest for funding of projects to improve opportunities for undergraduate research. The next year the Trust awarded a three-year, \$400,000 grant to initiate the Murdock College Science Research Program at Gonzaga. This program provides funds to support six faculty research projects each summer, including stipend support for twelve students. The Murdock grant also initiated a new tenure-track faculty position in Biology.

Another important aspect of Murdock's support for undergraduate research in the Northwest is its sponsorship of a premier conference each fall. These conferences, held on the campuses of sponsored institutions, draw hundreds of students who make oral and poster presentations. The most recent conference, held in November at Northwest

Nazarene College, included a Gonzaga contingent of nearly 30 students, faculty and administrators.

For our part, Gonzaga University committed to raising an endowment of \$1.5 million to provide for the continuing support of on-campus undergraduate science research. The University is now completing the last year of a second three-year grant, and more than half of the College Science Research Endowment has been raised.

While the Murdock grant was a catalyst for change, much of the continuing support for student research has come from individual extramural research grants obtained by science faculty. Funding for another faculty position, jointly held in Biology and Chemistry, was provided by a five year grant from the Luce Foundation. Faculty have received grants from the National Science Foundation, the National Institutes of Health, the American Chemical Society Petroleum Research Fund, the E.L. Wiegand Foundation, and Research Corp. to directly support research with students or to obtain necessary equipment.

In the last several years, students in Biology have also received generous support from Robert and Claire McDonald.

The real beneficiaries of the increased research activity are, of course, the students. Many of Gonzaga's science faculty have first-hand experience - they know the value of their own undergraduate research experiences. An example is Associate Professor Bill Ettinger.

"My exposure to undergraduate research began over 20 years ago when my biology professor asked me to help tackle a problem in plant reproduction," says Dr. Ettinger. "This was the first time that I had to integrate and use theories of ecology, botany and chemistry that I had learned in classes. The project required me to use all of my background to address and solve problems." "I can't imagine an undergraduate career that does not have research as a significant component."

Another example is Maria Herzog, now Dr. Maria Bertagnolli, Clare Booth Luce Professor of Biochemistry at Gonzaga. Initially a pre-medical student who received a B.S. in Biology with a minor in Chemistry, her career plans were transformed by her research experience in the late 1980s with Dr. Robert Prusch, long time Chair of the Gonzaga Biology Department.



"The research I did with Dr. Prusch provided me with the opportunity to experience the excitement associated with being an active participant in the process of scientific discovery," Bertagnolli says. "As my confidence in the lab grew, so did my interest in

pursuing a graduate degree in science and my desire to one day make a significant contribution to our understanding of biological systems."

Dr. Bertagnolli returned to teach at Gonzaga after receiving her Ph.D. from the University of Utah in 1993. The comments of these faculty are echoed by many recent Gonzaga students, for whom a research experience was important in defining their career plans. For some students research confirmed their long-held goals, but for others it provided the initial spark of passion necessary for success.

Lynsee Hudson, a Gonzaga senior who already has been accepted at several medical schools, cites her research experience as an important factor in her intellectual growth.

"The challenge of constructing and pursuing well-designed experiments has matured my analytical abilities and given me the confidence to undertake unanswered scientific and medical questions," Hudson says.

She also values the personal relationship that she was able to develop with her faculty mentor, Dr. Bertagnolli.

"In my experience, the time and intellectual commitment research requires makes this mentorship more influential than any other faculty-student relationship and a source of insight, direction, and motivation," she says. "Research has complemented the humanistic curriculum at Gonzaga and provided me with credentials substantial enough to be meaningful even after medical school."

But other students have perhaps received something more basic from their research experience. Chris Kaffer entered his senior year without a plan for what he would do after graduation.

"Participation in research was the single most important source for my continued interest in further education and the pursuit of academic excellence," Kaffer says.

Chris now plans to apply for graduate school and is getting further research experience. He received an NIH preIRTA Fellowship and now works at the National Institute of Child Health and Human Development.

Finally, the success of the science program at Gonzaga has been dependent on continuing funding for equipment and facilities renovation.

The science departments have received several NSF grants, matched by the University, to fund equipment used in both teaching laboratories and research programs.

Renovation of Hughes Hall, which houses the Chemistry and Biology departments, is nearing the end of a second phase with the completion of remodeling of student/faculty research space on the second floor. This phase was funded in part by a major grant (\$576,000) from the NSF Academic Research Infrastructure Program. The initial phase included replacement of the building HVAC system and renovation of space in the basement for introductory biology laboratories.