

THE EVOLUTION OF UNDERGRADUATE RESEARCH AT GONZAGA UNIVERSITY: A 30-YEAR PARTNERSHIP WITH THE M. J. MURDOCK CHARITABLE TRUST



Shortly after graduation each year and through the summer months, college campuses are noticeably quieter than on typical days during the academic year. But if you happen to walk through the doors of Hughes Hall at Gonzaga University between May and August, you will find this science building abuzz with teams of undergraduate students and faculty mentors working together on research projects. It has not always been this way. In fact, three decades ago Hughes Hall was relatively deserted in the summer. There were only four faculty members each in Biology and Chemistry with minimal support staff. On-campus research opportunities for undergraduate students were scarce.

Then, in 1990, Dr. Neal Thorpe from the M. J. Murdock Charitable Trust, met with the Chair of Biology, Dr. Robert Prusch, to discuss a new initiative to support undergraduate research in the Pacific Northwest. The timing of this meeting could not have been better. Coinciding with the hiring of two research-active faculty members, one in Biology and the other in Chemistry, in 1987 the two departments that shared space in Hughes Hall became committed to identifying ways to improve the University's science programs. They were specifically motivated to pursue avenues for establishing on-campus research activities involving undergraduates and adding modern research equipment. At the urging of

Dr. Thorpe, Gonzaga submitted one of the first proposals to the new College Science Research Program of the M. J. Murdock Charitable Trust – and it was funded!

When speaking of the Trust's long standing support of Gonzaga, President Thayne McCulloh stated, "The Murdock Charitable Trust has been a leading partner with our institution, ensuring Gonzaga has had resources to advance our student and faculty research in the sciences. We appreciate their long standing commitment and belief in our mission. So much of their support in the early days, partnering with faculty members such as Dr. Thorpe, established the foundation for what is now a tradition of excellence at Gonzaga. The trust has inspired our students and faculty at Gonzaga, which has helped inform who we are today."

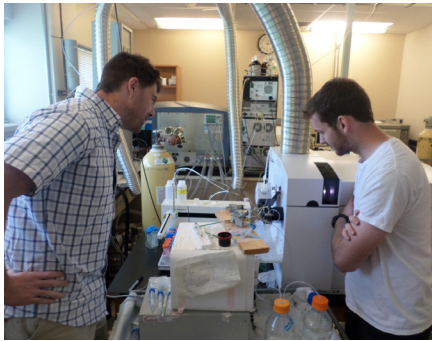
Thanks to the initial \$402,000 investment by The Trust with matching funds contributed by Gonzaga, we were able to hire an additional research-active faculty member in Biology, purchase several essential instruments that expanded the kinds of research questions that could be asked, support summer research projects involving undergraduates, and start making changes to the curriculum to support a more research oriented focus. Within just a few years of establishing the College Science Research Program

at Gonzaga, the impact of the initial investment and the momentum this generated for additional opportunities and support were already palpable. Between 1991 and 1994, a total of seven faculty were hired in Biology, Chemistry and Physics, all of whom shared in the vision of involving undergraduates in the research process. The number of students engaged in summer research increased dramatically, and more students than ever were interested in majoring in Biology and Chemistry.



Dr. Mia Bertagnolli (*pictured above helping a student*) made the decision to pursue graduate education in science and ultimately return to Gonzaga in 1993 to teach because of her research experience as an undergraduate student with Dr. Robert Prusch. Early in her career at Gonzaga she mentored Gerard Slobogean (*shown next page at a Murdock meeting in 2000*). Gerard knew he wanted to be an orthopedic surgeon, but his scientific curiosity drew him to her research lab where he was able to foster his critical thinking and scholarly inquiry skills while also obtaining financial support to help fund his education.

Even as an orthopedic surgeon today, Dr. Slobogean continues to pursue research questions and has received several competitive grants and published numerous scientific articles. To acknowledge the impact his undergraduate research experience had on his life, Gerard and his wife, Bronwyn, established the Slobogean Award at Gonzaga to provide annual research support for an undergraduate student and junior faculty mentor.



In the original 1991 proposal to the Trust, we envisioned a “substantial change in the climate and capability for research” as a result of Murdock support. That is exactly what happened. Within the first three year period covered by this award the atmosphere in Hughes Hall was noticeably different. Students doing research were more numerous, visible and active, equipment holdings improved substantially, and we became competitive in our ability to recruit and retain faculty members committed to doing research with undergraduates. Overall, publication

and funding records were steadily growing and we started to be recognized for our commitment to providing quality undergraduate research experiences in the sciences.

The catalytic effect of the support we received from the M. J. Murdock Charitable Trust is still noticeable. Since the initial grant in 1991, we have benefited from a 30-year partnership with The Trust that includes numerous contributions to support undergraduate research at Gonzaga.

Gonzaga President, Dr. Thayne McCulloh stated, “I am so appreciative of the relationship we have had with the Murdock Charitable Trust over the past 30 years. To have a partner such as this allows an institution to be bolder and better in what they do. The Trust’s support has ensured that Gonzaga faculty and students have contemporary opportunities to advance the sciences through research and learning. This helps set the Gonzaga experience apart.”

In 1996, we received a \$140,000 Undergraduate Research Enhancement award that expanded research opportunities into the academic year and sustained programs that were developed through our initial award. Further, a \$1 million contribution in 2003 allowed us to renovate Hughes Hall, expanding research space and creating a facility

that reflected the state-of-the-art scientific research that was taking place. Funding to support start-up costs for new faculty positions in Biology and Chemistry, as well as Murdock College Research Program awards that provide critical resources for ongoing faculty research projects have enabled us to recruit highly competitive colleagues and set them up for success as they developed their research agendas and mentored undergraduate students in their labs. We also have received funding to support the professional development of science teachers through the Partners in Science Program and a recent grant that will help local K-12 teachers incorporate inquiry-based approaches in their science courses. The Trust has also generously supported capital projects in the School of Engineering and Applied Sciences. In total, we have received \$3.2M from the M.J. Murdock Charitable Trust for the sciences and engineering at Gonzaga, and the Gonzaga Science Research Program Endowment has reached nearly \$2.5M!



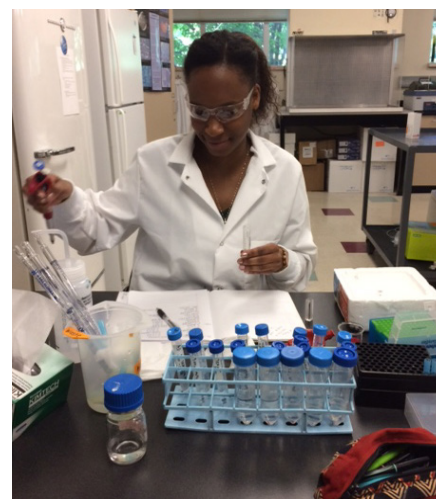


The success of individual faculty and the science departments at Gonzaga in obtaining additional funding from NSF, NIH, HHMI, Research Corporation, the E. L. Wiegand Foundation, the W. M. Keck Foundation, the Henry Luce Foundation, and many other external funding agencies over the years to grow our research programs, improve our infrastructure, and be able to stay competitive in recruiting faculty and students is a direct result of our productive relationship with the M. J. Murdock Charitable Trust. Faculty who have been supported by grants from The Trust have secured over \$4.5 Million of additional research funds and made significant contributions to their field of science. Two of our exemplary teacher scholars, Dr. Jennifer Shepherd, Professor of Chemistry & Biochemistry, and Dr. Brook Swanson, Professor of Biology, are highlighted in the Spotlight Boxes below. Development of the SEA-Phages program has allowed us to introduce real research activity in our first semester Biology lab. Course-based research experiences have been integrated into several other teaching

labs as well. In striking contrast to the early 1990's, we now have a teaching and research environment that gives our students a realistic perspective on how modern science is conducted and makes them competitive in their applications for professional and graduate schools. A notable example is Dr. Greg Hermann (*pictured at left*), a former Biology major whose research experience at Gonzaga inspired him to pursue graduate education. Today Dr. Hermann is a successful Professor of Biology with an active undergraduate research program at Lewis & Clark College, another Murdock-supported school.

The sciences are thriving at Gonzaga today with 47 long-term faculty members in Biology, Chemistry & Biochemistry and Physics. During the summer of 2019 alone, 70 of our undergraduates participated in original research projects, too many to fit in a Hughes Hall classroom for the weekly pizza and seminar series. The Chemistry program has expanded to include Biochemistry, and faculty from both the Department of Biology and the Department of Chemistry

and Biochemistry helped establish the Environmental Studies major, and a proposal has been submitted to create an Environmental Science major. The Regional Health Partnership that has formed with the University of Washington School of Medicine also would not have occurred without the development of the undergraduate sciences. And if you look out the south window of Hughes Hall, you can see the new Integrated Science and Engineering facility emerge, which will physically and programmatically connect the Life Sciences, the Natural Sciences, Engineering, Math and Computer Science.



As we look to current and future opportunities to be leaders and innovators in the STEM disciplines and to provide the educational experience our students need to excel in their pursuits, we are thankful for our history with the M. J. Murdock Charitable Trust and excited about new aims that will be realized because of our ongoing partnership.



Dr. Brook Swanson

In 2006, Dr Swanson began his career at Gonzaga as an Assistant Professor of Biology with a \$40K Murdock Start-Up Research Package grant. This allowed him to hit the ground running, developing his research program and applying for external funding. The startup funds from The Trust put him in a place to be very successful in writing instrumentation, curriculum and research grants. Over the last 14 years he has been either the PI or Co-PI on grants totaling over \$3.7 Million from the National Science Foundation, the Howard Hughes Medical Institute, and the Air Force Office of Scientific Research. He has published 16 peer-reviewed papers with 17 different undergraduate student authors, and made his research accessible to the public through a BBC and NOVA documentary, a TED Talk, an appearance on the Discovery channel, and in a traveling performance featuring his findings on fiddler crabs as depicted through dance. Dr.

Swanson has established collaborations with leading scientists in his field and has traveled across the world to pursue his research questions and present his findings on the evolution of weapons in crabs and beetles and high performance biomaterials like spider silk.



Dr. Jennifer Shepherd

The \$14,000 grant that Dr. Shepherd received through the Murdock Partners in Science Program 19 years ago as a young Assistant Professor of Chemistry at Gonzaga allowed her to bring a high school teacher into her lab for two summers. The success of this experience sparked her idea to develop an outreach program as part of the NSF CAREER Award proposal she submitted, which was originally funded in the amount of \$355,000 with a supplemental award of \$4289. With these funds she was able to recruit two different high school teachers and three different students from the Wellpinit School

District on the Spokane Indian Reservation to participate in summer research projects in her lab. While her research and large instrumentation purchases totaling over \$1.3 Million have been externally funded for much of her career by organizations such as Research Corp, NSF, NIH and NFRF, she has been the recipient of internal GSRP funds to support student stipends and has benefited from renovations to research and teaching laboratory spaces that were made possible through our partnership with The Trust. The 15 peer-reviewed papers she has published since 1999 have included 41 undergraduate student co-authors, and another student co-author contributing to one of the two additional papers she has submitted this year. Her research on developing new treatments for parasitic infections by targeting rhodoquinone, a molecule in energy metabolism that is not used in humans, has gained international attention and resulted in collaborations with scientists in Canada, Uruguay as well as California and Florida. One of Dr. Shepherd's former research students, Helen Xun, was recently in the news as the co-founder of a biotech startup company that is using 3D printing to make medical devices. Helen graduated in 2015 with a B.S. in Biochemistry, and is currently taking time off from her medical studies at Johns Hopkins School of Medicine to focus on this innovative and research based work.