



Annual Report - 2014

Office of Undergraduate Research

Expanding understanding through undergraduate research

“Washington University’s mission is to discover and disseminate knowledge, and protect the freedom of inquiry through research, teaching, and learning.”

“The Office of Undergraduate Research supports the larger mission of Washington University in St. Louis to advance and protect the process of inquiry by facilitating and promoting faculty-mentored undergraduate research experiences in all schools and all disciplines.”

OUR History

Housed in the College of Arts & Sciences, The Office of Undergraduate Research (OUR) facilitates undergraduate research by maintaining a knowledge base of available opportunities, uniting students and mentors, and providing financial support. OUR promotes undergraduate research by providing forums for presentation and publication of research, assisting students in making effective presentations, and informing our community of these activities. OUR encourages broad and extensive participation so that all undergraduates from any university school or college can benefit from a research-rich environment and peer learning.

OUR came into being in 2005, thanks to a forward-thinking donor, Catherine F. Hoopes. Hoopes specified that her bequest enhance undergraduate education by “recognizing, promoting, honoring and rewarding excellence in the work of undergraduates” in faculty-mentored research in any discipline, based solely on merit. Additional funding comes from the generous support of our alums.

Shortly after OUR was founded, a report from the Association of American colleges and Universities (AACU) identified undergraduate research as a “high-impact practice.” The AACU report noted that studies found undergraduate research fosters deep learning, which emphasizes both acquiring information and understanding its underlying meaning, as well as improved student retention and engagement. In addition, these students pursue graduate education at a higher



rate than comparison groups and as alumni they retrospectively report higher gains than comparison groups in skills such as carrying out research, acquiring information, and speaking.

OUR Benefits

For our own Washington University students, data analysis from the 2014 Senior Survey showed students who participated in undergraduate research reported higher gains than those who didn't in a number of important skill areas including:

- Thinking critically, analytically and logically
- Synthesizing and integrating ideas and information
- Understanding and using quantitative reasoning and methods

In addition, participating in a research experience has a measurable effect on students' confidence level in their ability to make important decisions or carry out specific tasks, many of which provide benefits far beyond the research realm. For example, a comparison of 2014 summer research students' responses to pre- and post-research surveys showed significant increases in the percentages who felt very or somewhat confident in their ability to:

Skill Areas	Post-research response	Pre-research response
Consider the ethical implications of your actions	98%	78%
Plan and execute tasks independently to pursue research objectives	91%	64%
Adapt your research plan or objectives in response to new information or constraints	91%	70%



Furthermore, an undergraduate research experience gives students a competitive advantage when applying for graduate and professional schools. It also opens the door to publishing and conference experience as well as travel opportunities

Students engaged in faculty-mentored research experiences are making significant impact on their fields of study before they even graduate, contributing to the knowledge base of their disciplines, and in many cases, using this knowledge for the betterment of society at large.

Joshua Borgerding, a 2013 graduate, began researching stem cell biology the summer before his freshman year. He continued his research at Washington University and in the course of his undergraduate career he contributed to respected journals including Nature, The American Journal of Pathology, and Leukemia.

Borgerding's experience also shows that deep intellectual inquiry within any given discipline allows undergraduates to expand their own knowledge base and understanding of their topic and even themselves.

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“Undergraduate research undoubtedly shaped who I am as a human being and what I am going to do in the future,” Borgerding says.

In the summer of 2012, Borgerding received a Summer Undergraduate Research Award (SURA) to do archival work at Johns Hopkins. “Digging through 130-year-old letters written by William Welch, I was able to personally connect with a titan of American medicine when he was my age,” Borgerding says. “It was an intensely gratifying and intensely humbling experience, and one I could not have had without the OUR award.”

Today, this first-generation college student from rural Iowa is finishing a lab rotation at Mount Sinai School of Medicine as part of an M.D./Ph.D. program.

OUR funding has proved critical for many students like Borgerding. The 2014 survey found more than a third of students conducting summer research would not have been able to without OUR funding, while another 20 percent could have pursued research only part-time while working. For most undergraduates in the



natural sciences, social science and humanities, an OUR award is the only funding source for research experiences. This is especially true in the social science and humanities disciplines because faculty mentors often do not have money of their own to support undergraduates conducting research. OUR also contributes money to fund life sciences research through the Bio SURF Program.

This funding is critical to an ever-increasing number of students. A sea change has occurred since OUR first opened in 2005, when many students were not aware that participating in research as an undergraduate was a possibility or the benefits of doing so. Undergraduates now expect and demand opportunities for research.

The percentage of undergraduate students participating in faculty-mentored research at Washington University has increased steadily from 32 percent in 2002 to 41 percent in 2014, according to the Senior Survey. There has been an eight-fold increase in the number of students presenting posters at the two undergraduate research symposia sponsored by OUR each year, from 51 in the 2005-2006

academic year to more than 400 this past year (*see graph 1*).

Visits to the OUR web site jumped 50 percent from 13,000 in the 2012-2013 academic year to more than 20,000 visits in 2013-2014

OUR has kept pace with students' burgeoning interest by constantly assessing student needs, seeking feedback from students and mentors, and adjusting and adding programs to keep up with the changing landscape of undergraduate research.

For example, OUR has worked hard to make our web site our "front door," an important and accessible starting point for students interested in undergraduate research.

In 2013, OUR initiated student surveys and a focus group to evaluate how the OUR website could better help students get started in undergraduate research. As a result, OUR made significant changes to the web site to provide students with more information and resources about the earliest stages of the research process, from deciding what discipline sparks their interest, to finding a mentor, to securing funding.



After these changes and with the growing interest in undergraduate research opportunities, the number of visits to the OUR web site jumped 50 percent from 13,000 in the 2012-2013 academic year to more than 20,000 visits in 2013-2014.

Other surveys helped OUR refine the weekly summer workshops and we regularly seek feedback from participants of OUR programs such as the twice-yearly symposia and Mentor Connections events to make them more useful to students.

OUR advances the process of inquiry by :

- ◇ Helping students discern their own research paths by offering events geared to different populations within the student body to help them identify their intellectual spark and begin planning their research path, including:

- New student orientation events and resource fairs
- Two days of drop-in advising during each semester, in addition to appointments scheduled throughout the year
- Mentor Connection events, which help students connect with researchers in many fields while students are in the very earliest stages of considering research options. These events help students envision what undergraduate research looks like, investigate a wide variety of subject areas and meet potential mentors, all in one place.
- The OUR web site, which provides detailed information and links to help students research their areas of interest
- ScholarBridge, a new online database, the introduction of which OUR recently helped facilitate, to connect students looking for mentors with faculty and research opportunities,

- ◇ Providing students with financial support to pursue research:

- In the past year, OUR has funded directly or facilitated research funding for 85 undergraduate students from more than 20 disciplines, more than four times the number of students funded in 2008 (*see graph 2*), the first

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year the awards were given. OUR's flagship program is the Summer Undergraduate Research Awards (SURA), designed to support excellence in undergraduate research. Faculty mentors nominate outstanding students for the award that will enable them to pursue a summer research project. Research awards of up to \$4,000 allow a student to engage in original, groundbreaking research with significant and meaningful results.

- ◇ Facilitating presentation and publication of student research, which allows students to disseminate their research to a wider audience, while learning presentation skills by providing:

- Conference travel awards
- Twice-yearly symposia
- Publication of two journals of student work

In 2014, research abstracts from 165 students from nearly 30 disciplines were published in the annual Washington University Senior Honors Thesis Abstracts (WUSHTA).

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OUR actively works to broaden faculty and undergraduate participation in research across all disciplines by:

- Working with humanities faculty to create models of undergraduate research that benefit student engagement and learning as well as faculty research agendas
- Partnering within academic departments to seek ways to make undergraduate research experiences a regular part of the curriculum
- Seeking new sources of support for research awards and stipends to meet the increased demand for undergraduate research experiences

In addition, OUR pursues partnerships and seeks collaborations with departments throughout the university to promote excellence, enrich the research experience and publicize the many resources available to students on campus.



OUR staff includes the director, two full-time staff, and one part-time publications/assessments/website specialist. The director and one of the full-time staff members also split time between OUR and the College of Arts and Sciences.

Staff are responsible for planning and executing all of the OUR major programs.

These programs include:

- Summer Undergraduate Research Awards, Travel Awards and Conference Awards
- Weekly workshops for summer researchers on practical topics such as applying to graduate school, writing abstracts and techniques for organizing and documenting research in conjunction with the Olin Library, Writing Center and Career Center
- Workshops throughout the year on research ethics and on preparing oral and poster presentations
- Mentor Connections events that allow students to explore research topics, practice networking and meet faculty mentors
- Fun summer activities with other students doing research on campus
- Bi-annual research symposia to practice presentation skills, showcase research, provide opportunities for peer networking and cross-disciplinary conversations
- Publication of the Washington University Undergraduate Research Digest (WUURD) and WUSTHA
- Peer review board experience
- Poster printing services
- A website (<http://undergradresearch.wustl.edu>) which publicizes the many available opportunities to conduct original research
- Informal gatherings with faculty mentors targeted at freshmen and sophomores in various departments
- Open walk-in hours to answer student questions and concerns



In the end, it is the extraordinary and diverse students and the research they conduct that provides the “why” of OUR’s existence.

In an anonymous 2014 post-summer-research survey, students identified the most memorable experiences of their summer: stepping outside their comfort zones, learning from and being motivated by failure, achieving success with an independent project, sharing their results with others, understanding their place in the larger world, and the excitement of realizing research is the right path for them.

Students’ most memorable experiences from SURA 2014 post-research survey:

- *It was exciting when I finally began gathering and analyzing the results from my project and realizing that it was successful.*
- *Living in an island village and conducting interviews with local people about how their lives are changing, having a family in a different country, learning about the world and my place in the world.*
- *Having the women I interviewed tell me they were so honored to have me come into their homes and interview them - and the joy on their faces when they held the pen and signed their name!*
- *The best moment was when I did the second trial of the big final experiment completely by myself and I didn't make a single mistake - I handled the radioactivity safely and precisely and everything worked the way it was supposed to.*
- *The best moment was when I pushed myself outside of my comfort zone to do independent field research in a remote town in China.*
- *When I realized that my design had flaws and I had to change things completely. Initially, it was dejecting but later it motivated me to work even harder.*
- *Presenting in front of the neuroimaging labs - I felt a sense of accomplishment for my work and was glad that I could share my results with other labs*

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- *My mentor was telling me about an idea he had for a new project he wanted me to work on. When I found myself getting really excited about the project, I really knew research was the right path for me.*
- *I have been able to cultivate a great relationship with Professor Kastor over the summer and many of my most memorable experiences involve moments when he would take time out of his day to explain to me in layman's terms the purpose of this project, my role in helping him, and the implications for today.*
- *There was a moment where we actually got to see the tomography of a quantum state, just as we expected, which was incredibly cool.*

OUR Student Research

Marie Draper

Senior Marie Draper has an uncanny ability to see connections in what many people think of as disparate topics. For example, Draper can make associations between the literary analysis she did in her comparative literature classes and the scientific method she uses in physics.

Draper originally thought she would major in comparative literature, but once she got into the lab she was hooked.

“I came into college not really thinking I wanted to do research” Draper says.

“Without OUR, I certainly would not have had this kind of opportunity. I would have been less sure or less committed to physics as a career. I certainly wouldn’t have had as much confidence.

“The opportunity to actually get inside a lab was really empowering to me to see if this is something I really want to do for the next 6 years. Astrophysics is really cool.”

She was able to get a summer research award from OUR, a physics summer fellowship and funding from her mentor in both 2013 and 2014, that allowed her to work on three different projects.



The first project, in 2013, involved nothing less than writing a computer program that would help detect the position of incoming x-rays in space as part of a NASA-funded project called X-Calibur. This past summer Draper helped build and test x-ray detectors like those used in X-Calibur, which will help scientists gain new insights into black holes, neutron stars and gamma ray bursts, or as Draper puts it, understanding how the world works.

Draper eventually decided to double major in physics and French. It was her study abroad experience in France, where she often had to search for the right word, that helped shape her current research.

“The way we speak is so ingrained in how we think and how we communicate and develop a relationship with people,” Draper says. “It really hit home thinking about how we communicate with professors.”

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Draper thinks there may be a disconnect between how instructors think they’re communicating with students and what they’re actually saying, and vice versa.

“I think that the way language is used in scientific communities may correlate with the low numbers of women and minorities in science, particularly physics,” says Draper, who is one of just two female physics

students in her graduating class.

So Draper is developing a questionnaire for physics instructors to measure how they express their perceptions and biases about student success in their interactions with students and how their use of language may be linked to their ideas about subjectivity and objectivity.

Her research experiences have helped Draper decide to pursue a graduate degree in astrophysics and eventually, she hopes, teach. She credits OUR and her faculty mentors for providing the support to get her started. “OUR does a really good job of showing you how to put your foot in the door,” Draper says. “Once you’re there I’ve found faculty really willing to open the door.”



Lauren Henley

Lauren Henley came to Washington University in 2011 to prepare for law school in the pre-law program, with a goal of becoming an international corporate lawyer. Three years later, she is double majoring in history and African-American studies with a minor in Spanish. She has won multiple awards, fellowships and scholarships for her research on early 20th century reformatory schools for African-American girls.

Henley credits the Office of Undergraduate Research and her inspirational mentor, Dr. Sowande Mustakeem, for opening her eyes to the possibility of doing undergraduate research in the humanities and supporting her along the way.

It all started with a bit of bad luck. A glitch at the start of her freshman year forced her to register late for classes and by then, all the pre-law classes were full. She landed in Dr. Mustakeem's freshman seminar, African-American Women's History: Sexuality, Violence, And The Love Of Hip-Hop, and was hooked.

She learned about undergraduate research at an OUR presentation for Ervin scholars. Still, she didn't think *she* could do research. "Freshman research, sure," Henley thought. "Me, no. I thought it was all science. I wasn't sure what humanities research looked like. I didn't know archives existed."

She turned to OUR to learn more. "Dean Kiefer was really welcoming," Henley remembers. "She let me know I could do my research in different areas. To (be able to) apply for funding to not only do research but to learn how to do research says a lot."

The second semester of freshman year, Henley changed her major to history. "I just kinda took a leap," Henley says. "I told my parents and they were kind of upset. My parents didn't understand the concept of getting grants for research."

Henley has focused her research on African-American girls in reformatory schools in Virginia, North Carolina and Missouri. "I've always been interested in young

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black women, particularly those who fall between children and the young adult state,” Henley says.

Girls as young as 7 and as old as 22 were sentenced for “delinquency,” coded language for sexual deviancy, Henley said. “They weren’t necessarily doing anything wrong – it was just against the social norms of the times – going to a movie theater unattended, having a boyfriend, skipping school, getting married without their parents’ permission.”

As a sophomore, she was selected to write a feature article for the OUR publication Washington University Undergraduate Research Digest about the creation and structure of the reformatory schools. Now in her senior year, Henley is researching the girls’ individual stories for her senior thesis.

“I thought history was objective, just facts, but it’s not,” Henley says.

Her ultimate goal is to become a history professor, which will please her parents. “They can see it wasn’t all for nothing.”

Nick Okafor

Receiving a Summer Undergraduate Research Award from OUR the summer after his freshman year is still paying dividends for Nick Okafor as he is poised to begin his junior year. Okafor is pursuing a double major in mechanical engineering and sustainable development, which he is carefully integrating with his interest in public health. Okafor says that engineering gives him the tools to make a difference in the community while sustainable development gives him the cultural context to apply his solutions.

Okafor used his summer award to conduct research at two shelters in St. Louis, one for homeless youth, the other for adults with HIV. He looked at factors affecting their health, including access to stable housing. After completing data collection over the summer, Okafor continued his research in the fall with an independent study project looking at the literature on the subject and data he collected.

When he saw an opportunity to continue his field research over winter break, Okafor came to OUR, which was able to extend his research award to allow him to



work at a shelter in Dallas. There, he took what he had learned the previous summer and helped the shelter develop a job training program for the youth it served. “It was great to see my research going somewhere,” Okafor says.

That spring, Okafor traveled to Salvadore, Brazil, funded through a study abroad program. He selected a program that worked in the favelas to rebuild the dangerous and unsanitary housing stock. His research looked at how community participation affected the development and sustainability of slum upgrading. Okafor’s OUR-funded research the previous summer paid off in Brazil in several ways, he says.

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“Having the experience the previous summer showed me how to do hands-on human interaction research. I was going to areas I had never been before and had to interview people.”

The failure of some of his questions during his shelter projects in the U.S. helped Okafor ask the right questions in Brazil. “Understanding what questions to ask based on the information you are trying to uncover – It helped me develop my questions for Brazil. It helped me execute my research.”

“I feel without the OUR project I would not have been prepared to conduct my research in Brazil,” Okafor says. “I would have wasted a lot of time figuring it out. I was able to have a more focused, effective experience, making the most of my time there.”

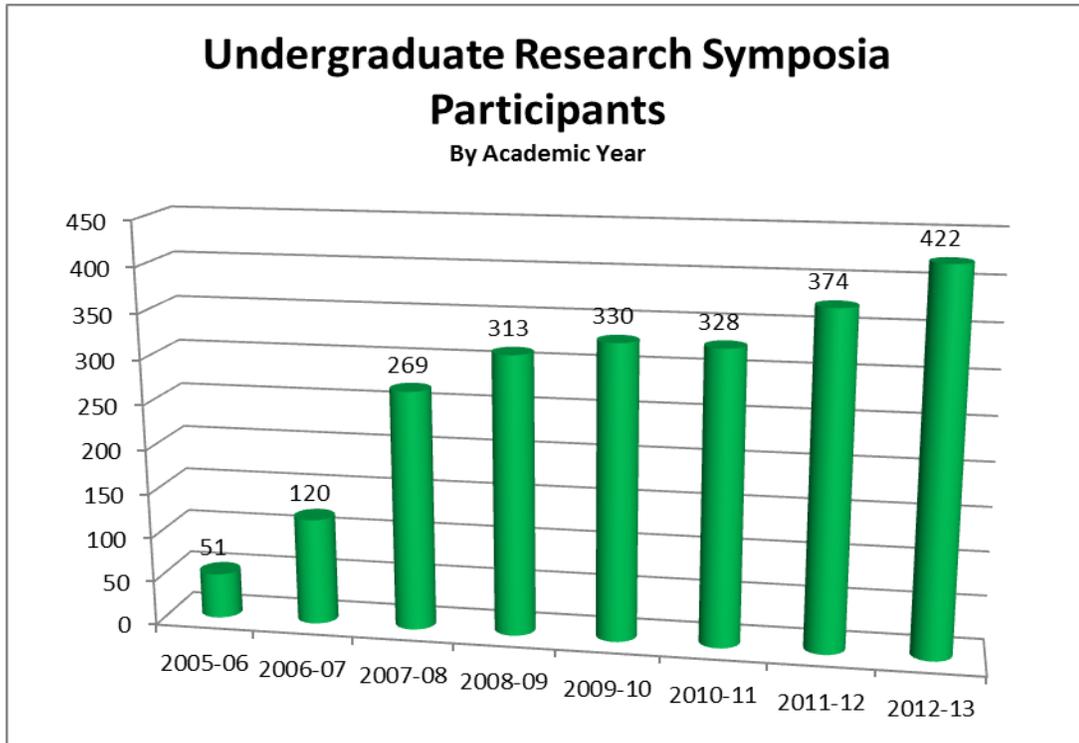
For his senior thesis, Okafor plans to use his research findings to compare how two countries approach stabilizing housing for transient populations and how it ultimately affects their health. In the US, programs in St. Louis and Dallas offered services, resources and tools to help the homeless find their own stability, while the program in Brazil focused on rebuilding the homes of the favela-dwellers.

Two countries, two solutions.



OUR Numbers

Graph 1



Graph 2

