

Facilities & Other Resources

Research Facilities Available to Faculty

Wellesley College houses exceptional facilities for research and teaching in its integrated 277,000 square foot Science Center. The Science Center was built in 1977 and has undergone major additions and renovations in 1991 and 2008, however, as a priority of the current capital campaign for campus renewal, Wellesley has begun a renovation of this facility that is expected to cost over \$150m in the next four years. The building houses the natural and physical sciences, computer science, mathematics, psychology, and cognitive and linguistic sciences departments, as well as the laboratory infrastructure to support research in these fields. By design, all science departments are co-located in one building with many collaborative spaces at Wellesley College, to encourage faculty and students to collaborate across disciplines and share resources.

Wellesley College faculty benefit from the in-house IRB and the fully accredited animal care facilities, both available for faculty research without fees. The College also provides two full-time Advanced Instrumentation Specialists and one Instrument Technician who maintain all major equipment for the Science Center, train both faculty and students on technical equipment, and troubleshoot technical problems. There are no user fees charged for any of the major pieces of instrumentation, such as the Leica Confocal Microscopes, Asylum Atomic Force Microscope, or the Bruker Avance small-bore MRI and 500 MHz NMR spectrometers. The College provides financial support for all instrumentation, including repair contracts and salary for instrumentation specialists. Instructional Support manages all the technical computing needs of the faculty, providing both training and trouble-shooting support as needed.

Administrative assistants are provided to assist faculty with financial administration of federal grants. These staff members provide other invaluable resources, such as the production of brochures on student research opportunities, management of College funds for scholarly activities, and general support for faculty endeavors. The Science Center at Wellesley College also has strong central administrative support to address faculty space and equipment needs, general building management, as well as administration of the robust Science Center Summer Research Program for undergraduate students. The College's Office of Environmental Health and Safety provides training and record keeping for all staff and undergraduate research students with regard to laboratory safety, chemical safety, and biological safety. They also oversee the proper handling and disposal of all biohazard waste and other hazardous waste.

Instrumentation Rooms: The departments occupying the Science Center at Wellesley College have collaborated to equip and maintain centralized instrumentation rooms that contain shared-use facilities. Multiple centrifuges, ultracentrifuges, a Bio-Rad gel doc imager, temperature-controlled rooms, rooms for cell and tissue culture, a GC-Mass Spec, MALDI-TOF Mass Spec, DNA sequencer, microarray scanners, spectrophotometers, etc. are housed in or adjacent to two instrumentation rooms. These include:

- **Imaging Facilities:** A 4-room suite is equipped with two Leica confocal microscopes and a Nikon 80i upright dual bright field/fluorescent microscope with a real-time image analysis system, a Leica fluorescence macrocope, and an Asylum atomic force microscope combined with a Nikon inverted fluorescence microscope.
- **NMR facility:** One room is devoted to a small-bore MRI spectrometer and a 500 mHZ NMR machine.
- **Morphology/Histology:** Standard histological equipment are available, including a vibratome, freezing microtome, 2 cryostats, fume hoods and two -80° storage freezers.
- **Engineering:** A machine shop and electronics shop are available and staffed within the Science Center free of charge.

Library: The Science Library is staffed within the Science Center to support faculty and students. The library holds many subscriptions to biomedical journals. PDFs of articles are also available through Inter Library Loan agreements.

Diversity of the Faculty

Wellesley College's exceptional and diverse faculty members are proven scholars and outstanding teachers. The College values and celebrates the diversity of its faculty. Fifty-seven percent of faculty members are

women overall, and 43% of faculty in the sciences are women. Nineteen percent of faculty in the sciences are minorities.

Potential for Increasing the Level of Externally-Sponsored Research Projects

One of the greatest strengths and unique attributes of Wellesley College is the high expectation for research on the part of the administration and the commitment of the faculty to scholarship in the form of high-caliber, original research and the engagement of students in their research. The strong emphasis on research sets Wellesley apart from many peer undergraduate liberal arts institutions. Although the College has a truly outstanding group of biomedical faculty, administrative support for sponsored research is in short supply, and this has limited the ability of the current faculty to obtain research funding. With the Office of Sponsored Research recently staffed with two full-time employees, the office is beginning to make progress toward enhancing services with an overall goal of increasing the level of externally-sponsored research.

Another factor affecting the potential for increasing sponsored research projects is the current influx of early-career faculty. Increasing baby boomer retirements have opened up numerous faculty positions in STEM departments, and Wellesley is carefully recruiting early-career faculty who are highly motivated to seek research funding. The College invests significantly in the success of early-career faculty research projects. The start-up package at Wellesley consists of laboratory space dedicated to the P.I.'s research, access to shared laboratory spaces and major equipment as well as generous start-up funds. An additional \$3,000 per year ("Faculty Award") may be competitively awarded for equipment, travel to maintain collaborations or conference attendance. The dedication of Wellesley College to early-career faculty is evident in its policy for re-appointment and tenure, which includes a full year of pre-tenure leave for research with no teaching or service obligations. After 6 semesters of teaching (three academic years) and a positive review in the spring of the third year, the 4th year is an 'Early Leave' year (research sabbatical).

In addition to the talented and motivated early-career faculty, Wellesley is home to world-class senior faculty in STEM departments with well-established research programs. Senior faculty dedicate time to the College's formalized mentorship programs in place to support early-career faculty. Senior faculty offer substantial and clear advice in areas such as grant writing, expectations for undergraduate research students, and how to effectively grow a new laboratory. Because of Wellesley's emphasis on research as an important aspect of faculty careers, all faculty benefit from a 2-2 teaching load which allows ample time for research and a very generous sabbatical policy (one semester every three years or a full year every six years). Full salary support is available during research sabbaticals (including the Early Leave year) with the condition that the individual applying for leave has made a strenuous effort to obtain external grant support.

Approach to and Potential for Increasing Student Exposure to Biomedical and Behavioral Research

As a diverse women's college, Wellesley is perfectly positioned to tangibly support an increase in the proportion of women and URM students participating in research in the STEM fields. Wellesley students are extremely bright and motivated undergraduates, many of whom already work in the lab during the academic year and full time during the summer. Multiple pathways have been put in place to encourage students to get involved early in scientific research, such as the Sophomore Early Research Program, which emphasizes participation by underrepresented minority students in conducting research as work-study. As part of this program, a selected group of sophomore students with interest in science are placed in faculty research laboratories during the academic year. The program also includes career seminars, workshops on how to succeed in science courses, and presentations by students to their peers. During Wintersession, Wellesley offers an intensive, introductory biochemistry lab research program for students. The primary goal of this program is attracting first- and second-year students who have expressed an interest in science and who belong to a group that has traditionally been underrepresented among science majors at Wellesley (URM, first generation, and/or low income backgrounds). Students are not required to have any laboratory background, and those coming from high schools with poor or no experimental labs are encouraged to apply. This program has been incredibly successful; 95% of program participants end up majoring in a biomedical science.

Wellesley faculty have found that some URM students are hesitant to seek out or ask to participate in research. To address this issue, Wellesley's Associate Provost and Academic Director of Diversity & Inclusion, Robbin Chapman, Ph.D., created an invitation program in which faculty members specifically invite URM students to participate in research. This program has significantly increased participation rates. In summer

2015, Wellesley achieved a 36% URM student participation rate in science summer research (up from a previous high of 14% in 2011) as a result of faculty encouraging students to apply.

Other examples of activities taking place across campus include:

- Two Mathematics faculty members offer the Wellesley Emerging Scholars Initiative that provides student workshops in which students tackle challenging calculus problems, emphasizing a problem-based approach to high-level work application of calculus rather than remediation and theory. This approach is based on research into the learning habits of URM students, which reveals that URM students learn best in cooperative vs. competitive environments and that they are “field dependent” learners (i.e., they prefer student-centered learning, small-group activities, and like to see concepts related back to their life experiences).
- Dr. Chapman provides hands-on workshops and individual coaching for STEM faculty on cross-cultural communication and creating inclusive learning spaces. She acts as a resource and mentor, providing guidance and advice to STEM faculty to support them in promoting self-development for their URM students.
- In summer 2016, Biological Sciences faculty members participated in a Scientific Teaching workshop sponsored by the National Academies of Sciences and HHMI. This group is now working with others in the Biological Sciences department to focus on implementing scientific teaching in their curriculum, which will increase retention of all students with interests in science.

These programs combined with the College’s career services and other URM student support services (described below) provide the essential infrastructure to support increased student participation biomedical research.

Wellesley is already a strong producer of STEM professionals. In a survey of science and engineering doctoral recipients in U.S. institutions graduating between 2002-2011 conducted by the National Center for Science and Engineering Statistics, Wellesley was ranked 34th by the among the top 50 producers of students who went on to receive science and engineering doctorates, averaging 6.5 Ph.D.s per 100 undergraduate degrees conferred. This survey included both large research universities and small liberal arts colleges.

Service Provided by the Office of Sponsored Research

The Wellesley College Office of Sponsored Research (OSR) is a small, high-volume office that provides support to the College’s 350 faculty as well as its library and museum. The office’s two full-time staff members manage the submission of approximately 100 grant applications annually, and that number is increasing annually. The demand for research administration services has outpaced growth of the OSR. In 2015 the OSR staff was increased from 1 FTE to 2 FTE; however, with a grant application submission volume significantly higher than industry average, there is little time for the OSR to support faculty research development. An additional strain on resources is the current lack of technology infrastructure to support the OSR. The OSR’s current tools for managing data and files include Excel, Google Drive, and paper files. To streamline OSR workflow, the College’s Library and Technology Services office has agreed to develop a home-grown, pre-award research administration software application; however, managing this project will further stretch the OSR’s limited resources.

The OSR currently provides basic services, including reviewing proposals for compliance with sponsor guidelines; routing proposals for pre-submission approval; limited funding searches; drafting budgets; compliance checks; management and enforcement of the college’s Responsible Conduct of Research program; and assistance with non-financial post-award matters and monitoring of post-award financial activity. The new half-time grants coordinator proposed in this application combined with streamlined infrastructure will allow OSR staff to devote time to providing enhanced services, including in-depth proposal review; creation of boilerplate resources for non-science portions of grant applications (e.g., facilities & resources sections, data management plans); robust funding searches; workshops tailored to faculty needs; and enhanced communication and celebration of faculty research accomplishments.

Faculty Participation in Research and Level of External Research Support

College records show that there is great potential to increase the level of external research support for STEM faculty. In FY16, of the 82 principal-investigator-eligible faculty in STEM departments, only 39% had active research grants, and 39% applied for new research grants. Additionally, STEM faculty had 51 active awards, six of which were NIH grants (5 awarded directly to Wellesley College and 1 passed through from Northeastern University). There was a total of 110 grant submissions from all departments processed through the Office of Sponsored Research; of those, 49% were submitted by STEM faculty. We believe that with enhanced OSR services, the number of grant submissions from STEM faculty will increase, therefore increasing research opportunities for students.

Many research-active Wellesley faculty are specifically interested in external funding for initiatives to increase the participation of URM students in STEM majors. Recently, Wellesley received two awards from the Sherman Fairchild Foundation to support these efforts. These grants have enabled the College to provide increased support to students from groups with historically lower participation rates in STEM (first-generation students, low-income students, and students from underrepresented minority groups), as well as for faculty to work with these students.

Dr. Chapman leads many research and other programs for URM students in STEM majors. Dr. Chapman earned her S.M and her Ph.D. degrees in Electrical Engineering and Computer Science from Massachusetts Institute of Technology where she conducted research at the MIT Artificial Intelligence Laboratory and the MIT Media Laboratory. Her research interests include design and use of computational tools for learning in public spaces, and examining equity issues as they relate to learning technologies and culturally-responsive pedagogy. In 2016 she was invited to participate in the Symposium on the Science of Broadening Participation, a workshop funded by the National Science Foundation's Science of Science and Innovation Policy Program. The workshop focused on the need for a scientific approach to broadening participation in the STEM workforce. About 100 researchers were invited to participate; half of those were from large research institutions, only two primarily undergraduate liberal arts colleges were invited to participate, and Wellesley was the only invited women's college. Workshop themes included frameworks for informing assessment of underrepresentation relative to employment, education, and policy processes and outcomes; how the U.S. workforce has been affected by underrepresentation of minorities, women, and people with disabilities; and evidence-based pathways to broadening participation in STEM fields within and across academia, industry, and government.

Diversity of Student Enrollment in the Biomedical, Behavioral, Social, and Clinical Sciences or STEM Areas

Ranked as the number four liberal arts college in the U.S. (Best Colleges, U.S. News and World Report), Wellesley College's student body of approximately 2,300 women is geographically, culturally, and economically diverse. The College is listed among the top ten colleges for diversity among liberal arts colleges by U.S. News & World Report. Overall, 45% of students identify as minorities, and 12% are international students. Five percent of full-time students identify themselves as African American, 1% as Native American, 21% as Asian American, 12% as Latina, and 6% as multi-racial. In 2015, 13% of STEM majors identified themselves as members of underrepresented minority groups. First-generation college students make up 12% of the student body as a whole; the percentage of first-generation STEM majors is slightly higher than that at 13%. Students come from a wide variety of economic backgrounds, which is heavily supported by the College's need-blind admissions policy. In 2015, 63% of students enrolled in the College received financial aid. Also in 2015, 16% of graduating STEM majors were low-income.

At Wellesley, diversity and inclusion are a way of life. The College devotes substantial resources to ensuring both access and the success of all of its students. Our current programs include:

Harambee House – Support and Community for Students of African Descent: Harambee House provides academic, social, and emotional support to students of African descent at Wellesley College. Additionally, Harambee House provides enlightening cultural activities for the Wellesley College community, as well as educational, cultural and social activities for students, faculty and staff of African descent. Named after the Swahili term for "working together," Harambee has been serving the Wellesley community of African descent and the College since 1970. Harambee House provides advising for all student organizations whose primary

purpose is to serve students of African descent. Harambee House staff serve on College committees including the Black Task Force, the Diversity and Inclusion Initiative Committee, the Committee for Lectures and Cultural Events, the Cultural Advising Network, and the Academic Excellence Committee.

Latina Student Advising: The College's Latina Advisor advocates for and supports the needs of Latina students on campus. She provides resources and advising for Latina Students to address a variety of personal, social, academic and community concerns. She also provides leadership consultation, referrals, and information on internships and scholarships. The office promotes appreciation and understanding of Latin American cultures and offers programs and training that focus on the many facets of multicultural development. She works with the entire campus community to raise awareness of the benefits and challenges of living in a pluralistic community. The Advisor develops initiatives and programs that support the social, personal and educational experiences of Latina Students. The Advisor offers advice to Latina student organizations and works very closely with the Latina leaders in this campus. There are four Latinas groups at Wellesley: Mezcla, the largest organization on campus mainly composed of US Latinas; Alianza, a Latina organization whose members mainly are Latina International students; Cielito Lindo, a Latin dance group organization; and Familia, dedicated to the support of LGBTQ students of Latina descent.

Asian Student Advising: The goals of the Asian Student Advising Office are to provide resources and advising for Asian/Asian American students to address a variety of personal, social, academic, and community concerns; to foster the personal, ethnic/racial identity and leadership development of Asian and Asian American students to provide opportunities for growth; to increase awareness of issues affecting Asian/Asian American students at Wellesley and to advocate on behalf of students of Asian descent; to empower and educate students to advocate for themselves; and to promote appreciation and understanding of Asian cultures and the experiences of Asians/Asian Americans in the United States.

Wellesley College First Generation Network: The goals of Wellesley College's First Generation Network are to connect first generation students to one another, and by so doing build a network of peer resources; to connect first generation students to faculty and staff and by so doing build a network of mentors and mentees; to extend the network into first generation Wellesley alumnae and to seek their assistance in addressing the concerns of employment and further education after Wellesley; and to connect first generation student experiences to the diversity/inclusion goals of the College, as issues of class, ethnicity, gender, and citizenship not only intersect with but also provide integrative focus for the curricular and co-curricular aspects of a Wellesley College education.

Center for Work and Service: The Center for Work and Service (CWS) is the College's career services office. CWS is currently recruiting a career advisor specifically for STEM professions. The advisor will be responsible for ensuring that the College is reaching and serving all students in its career advising, which includes particular focus on underrepresented populations. CWS received a large gift in 2015 which will provide the funding to enhance these resources.

Initiative for Diversity and Inclusion for Students (IDIS): The goal of this College initiative is to engage members of the Wellesley community in collectively casting a concrete vision of how Wellesley will enhance its efforts to support diversity and inclusion for all students over the coming years. One key outcome of this process thus far, is the creation of the Office of Intercultural Education which is responsible for preparing students for national and global citizenship through an integrated co-curricular program of intercultural education that equips students with the awareness, knowledge and skills they will need for leadership and life in a diverse and interdependent world.

Level of Student Participation in Research

Wellesley College has a strong history of exposing its students to research as a part of their overall education. In a student survey conducted in 2015, 47% of seniors reported that they had conducted research with a faculty member at some time during their education at Wellesley. All science majors are encouraged to engage in independent research during their undergraduate career, and the chemistry major includes a research requirement. Many more students carry out independent research and senior theses in the sciences than in other disciplines at the College. For example, in the 2015-2016 academic year, 30% of all senior honors theses were performed by students majoring in biological sciences, biochemistry, chemistry, or neuroscience. Sixty-

two students are currently receiving support to conduct research with Wellesley biological sciences, chemistry, and neuroscience faculty members through the 2016 Science Center Summer Research Program. Throughout the year, the College commits significant financial support for students to present their research at national professional meetings. Attendees at these meetings are often impressed by the caliber of the students' research projects and their strong oral communication skills.

Many of our alumnae credit their research experience at Wellesley as the most significant factor in shaping their choice of a scientific or medical career. In a 2005 survey of 183 graduates from the classes of 1997 through 2001 who had participated in undergraduate science research (with a 52% response rate), nearly half participated in two or three different projects, and more than two-thirds participated both in the summer and academic year research programs. Only 8% have left science; 49% are in pure or applied science; and 43% are in medicine or an allied field. Two-thirds were currently in graduate training, and another 9% planned to enter graduate programs in the near future.

Overall Research Environment and Institutional Support for the BRAD Program

Strategic Vision for Research: Wellesley College provides a wonderful local environment and is unusual for a small college for its high level of commitment to faculty scholarship. The College's administration has recognized that a significant barrier to increasing sponsored research at Wellesley is the lack of research administration and development support for faculty. The administration has recently taken steps toward addressing this issue. In 2014, the Provost's Office undertook a comprehensive review of support for faculty research, prompted by survey results indicating a high level of faculty dissatisfaction with the College's level of research administration support. Based on open meetings and conversations with faculty and staff, and on consultation with others at peer institutions, the College identified a list of best practices elsewhere and areas in greatest need of improvement at Wellesley. From this effort a "Roadmap for Support of Sponsored Research" was developed, which outlined a series of practical steps to reorganize, invigorate, and greatly improve support for faculty research at Wellesley.

Wellesley College is committed to providing the infrastructure, space, and time necessary to accomplish the aims of this proposal (see also: Letters of Support). As noted above, the College began the process of strengthening research administration services in 2014, and this led to the hiring of EA Demski as Director of Sponsored Research in 2014, and the hiring of the Co-I Parmet as Associate Director of Sponsored Research in 2015. Also in 2014, the administration moved the OSR space into the main administration building, allowing for enhanced communication and collaboration with faculty and other administrative offices. The College has committed to dedicating resources from its Library and Technology Services office for the development of the home-grown, pre-award research administration software application.

Support of the President: In July 2016, Paula Johnson, MD, MPH, Wellesley College's first African-American president, took office. Dr. Johnson enthusiastically supports and encourages the activities of this proposal as described in her letter of support. She is an internationally renowned researcher and leader and she is passionate about improving Wellesley's biomedical research environment as well as increasing opportunities for participation of URM students in research. In her role at Wellesley, she will create a new strategic plan for the College, a plan in which strengthening the research environment will be involved.

Before taking the helm at Wellesley, Dr. Johnson was most recently a professor and faculty member at Harvard Medical School and the Harvard T.H. Chan School of Public Health, and she served as chief of the Division of Women's Health at Harvard Medical School and Boston's Brigham and Women's Hospital where she founded and was executive director of the Connors Center for Women's Health and Gender Biology. She is recognized internationally as an innovator, bringing her broad range of experience as a researcher, educator, and expert in health care, public health, and health policy to bear in the effort to transform the health of women.

Research in Support of Teaching and Community Service at Wellesley: Strengthening Wellesley's research culture directly supports its teaching and service mission to "provide an excellent liberal arts education for women who will make a difference in the world" by providing opportunities for faculty to challenge students to explore widely, try on new ideas, try out new courses of action, and interact authentically with others whose beliefs or choices challenge their own. The young women who come to Wellesley are outstanding students and

directed individuals. A core Wellesley College value is “knowing how to serve as a key element of effective leadership.” The Wellesley College faculty and administration understand the important lessons that participation in biomedical research can impart by giving students the opportunity to participate in solving real-world problems that relate to the health and well being of national and global populations.