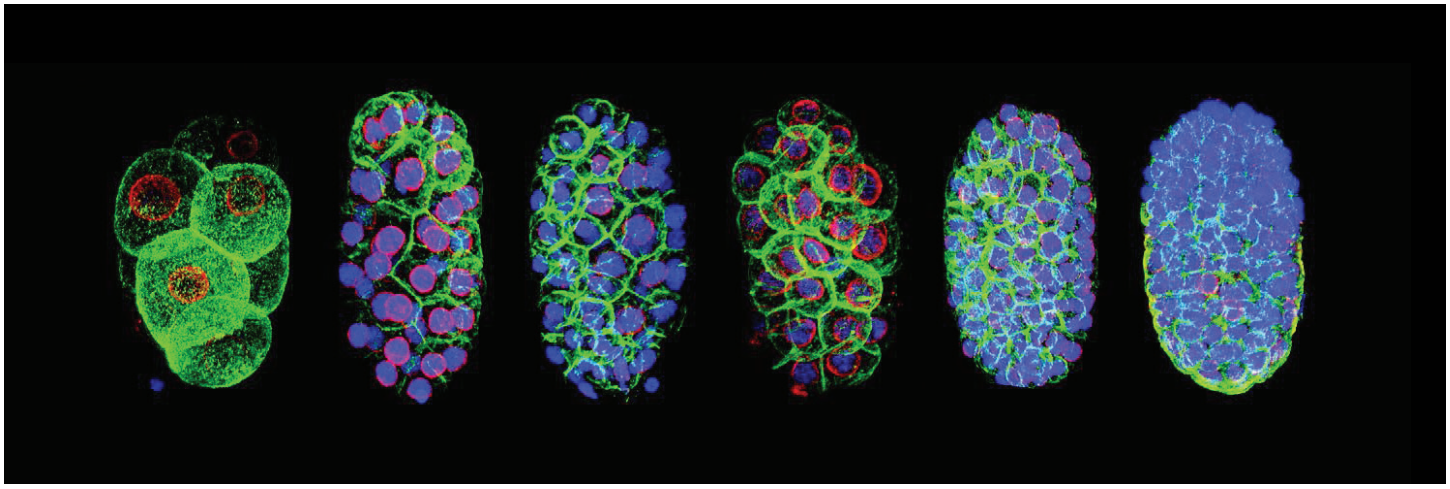
CONNECTIONS

Harvard Integrated Life Sciences



HARVARD INTEGRATED LIFE SCIENCES
PHD PROGRAMS

The Harvard Kenneth C. Griffin Graduate School of Arts and Sciences (Harvard Griffin GSAS) offers life sciences PhDs in 13 areas of study across three Harvard faculties—Harvard Faculty of Arts and Sciences, Harvard T. H. Chan School of Public Health, and Harvard Medical School. HILS programs offer students a diverse range of options to find the best fit in regards to subject area, program structure, and size. While there is a lot to choose from, the fact that each program has its own identity allows students and faculty to be integrated into supportive communities while also being able to take advantage of all that Harvard has to offer.

Visit **gsas.harvard.edu/programs/life-sciences** to learn more.

Harvard Life Sciences PhD Programs

Biological and Biomedical Sciences
Biological Sciences in Public Health
Biomedical Informatics
Biophysics
Chemical Biology
Chemistry and Chemical Biology
Immunology
Molecular and Cellular Biology
Neuroscience
Organismic and Evolutionary Biology
Speech and Hearing Bioscience and Technology
Systems, Synthetic, and Quantitative Biology
Virology

Studying the Life Sciences at Harvard

Harvard Griffin GSAS provides exceptional opportunities for study across the breadth and depth of the life sciences through the Harvard Integrated Life Sciences (HILS) alliance. Whether you are interested in conducting research on virus structures at the atomic level or on environmental impact in large ecosystems, you will find a good fit for your academic goals in one of HILS's 13 life sciences PhD programs.

What HILS Offers

As a HILS student, you will have access to University-wide training resources and facilities and more than 800 affiliated faculty. HILS offers flexibility including options to take courses, do laboratory rotations, and even choose a dissertation advisor from across HILS, subject to specific program requirements and lab availability. However you customize your training, HILS is with you every step of the way.

How to use the HILS Faculty Directory

1. Scan the QR code.
2. Type in words related to your research interests.
3. Browse HILS faculty, noting their research descriptions and PhD program affiliations.

HILS Faculty Directory

HARVARD INTEGRATED LIFE SCIENCES

Biomedical Informatics (BMI)	BMI PhD students pursue one of two tracks: Bioinformatics and Integrative Genomics (BIG) or Artificial Intelligence in Medicine (AIM). The BIG track focuses on developing novel approaches and new technologies to address fundamental biomedical questions, whereas the AIM track focuses on harnessing real-world health data and AI methods to transform healthcare.
Biological and Biomedical Sciences (BBS)	BBS combines a broad choice of research topics and labs with the cohesiveness of special-interest communities: Biological Chemistry and Molecular Pharmacology; Cancer Biology; Cell Biology; Developmental and Regenerative Biology; Genetics; Human Biology and Translational Medicine; Microbiology and Immunobiology; Stem Cell and Regenerative Biology; and Therapeutics.
Biological Sciences in Public Health (BPH)	Rooted in the rich environment of the Harvard T.H. Chan School of Public Health, BPH trains students in individual fields of biological research with a focus on understanding, preventing, and treating human diseases affecting large populations. The program provides students with research training opportunities in a wide range of areas including the metabolic basis of health and disease, infectious diseases, gene-environment interactions, and immunology and inflammation.
Biophysics	The biophysics program prepares students with diverse scientific backgrounds for independent research careers in which the concepts and methods of physical science are applied to biological problems. Applicants should have sound preliminary training in a physical or quantitative science, especially chemistry, physics, computer science, or mathematics.
Chemical Biology (ChemBio)	ChemBio is a rapidly growing field that combines the rigor and quantitative aspects of traditional chemistry and biochemistry programs with the excitement and medical relevance of modern molecular, cellular, organismic, and human biology. The ChemBio program equips PhD candidates with the appropriate experimental and theoretical knowledge to use chemical tools—such as single-molecule measurements, single-cell imaging, and the use of exogenous molecules to modulate the activity of cellular components—to understand biological processes.
Chemistry and Chemical Biology (CCB)	CCB offers a PhD in chemistry at the frontiers of research in the chemical and life sciences. Research and training opportunities are offered in many subdisciplines of chemistry, including chemical biology, inorganic, organic, physical, and theoretical. Housed at Harvard's Cambridge campus, CCB admits students with a record of classroom and laboratory training in biological, organic, inorganic, and physical chemistry.
Immunology	The immunology program offers PhD students an education in basic biology, a sophisticated training in immunology, and exposure to the immunological and non-immunological problems of disease. The program offers multidisciplinary training that exposes students to traditional fields of medical biology as well as to all major areas in the expanding field of immunobiology including transplantation, neuro-immunology, autoimmunity, stem cell biology, infection and immunity, human translational immunology, tumor immunology, immunobiology, and mucosal immunity.

PHD PROGRAMS

Molecular and Cellular Biology (MCB)	MCB hosts the molecules, cells, and organisms (MCO) graduate program that trains future leaders of scientific research in all areas of modern biology. Research and teaching in the MCO graduate program is organized along four tracks: biochemistry, chemical, and structural biology (BCSB); cellular, neuro and developmental biology (CND); genetics, genomics and evolutionary biology (GGE); and systems and computational biology (SCB). MCB also hosts a program in engineering and physical biology (EPB).
Neuroscience (PiN)	The program in neuroscience (PiN) offers graduate students comprehensive training across the spectrum of neurosciences including from cellular and molecular processes at the foundation of neural development and function, integrative processing in the central nervous system, and mechanisms and treatment of human neurologic disease. PiN is an interdepartmental program, and students have access to neuroscientists across the entire University—including a large group of clinical and basic science faculty at Harvard Medical School, Harvard-affiliated hospitals and research centers, and the Faculty of Arts and Sciences.
Organismic and Evolutionary Biology (OEB)	The members of the department of OEB share a common interest in understanding the structure, function, and variation of biological systems. Research interests of OEB faculty include the flow of energy and material through ecosystems; the development and structure of communities and populations; the diversity of plant, animal, and microbial groups; and the mechanisms that have permitted diversity to evolve. There is representation in anatomy, behavior, biogeochemistry, development, functional morphology, physiology, paleontology, population genetics, molecular evolution, systematics, and the biology of global change.
Speech and Hearing Bioscience and Technology (SHBT)	SHBT provides multidisciplinary PhD research training in basic, clinical, and applied approaches to the study and treatment of all aspects of human communication and its disorders. SHBT seeks students who share an interest in speech and hearing in its broadest definition—the belief that progress in this area requires the coordinated effort of engineers, scientists, and clinicians, and the understanding that real-world applications require coupling the discoveries and the people behind them with appropriate industrial partners.
Systems, Synthetic, and Quantitative Biology (SSQB)	The SSQB program engages graduate students in explaining how the higher-level properties of complex biological systems arise from the interactions among their parts. This field requires a fusion of concepts from many disciplines, including biology, computer science, applied mathematics, physics, and engineering. Students with backgrounds in any of these disciplines are encouraged to apply.
Virology	Virology includes research on biochemical mechanisms of cell growth control, transformation, signal transduction, and transcriptional regulation; the molecular genetics, molecular biology and molecular pathogenesis of latent, persistent, or cytolytic virus infections; the characterization of virus-receptor interactions and the mechanisms of cell entry; structural studies of viruses and viral proteins; the use of viruses vectors for heterologous gene expression and for gene therapy; the interaction of viruses with cells involved in non-specific or specific immune responses; the pathogenesis of viral infection; and rational antiviral drug design.

ENRICHMENT AND CERTIFICATE PROGRAMS

Students in Harvard Integrated Life Sciences (HILS) PhD programs can also join optional, interdisciplinary concentration programs. These programs allow students to become a member of more specialized communities that come together through shared intellectual interests. The rigor and commitment of these concentrations vary considerably, from no formal requirements whatsoever to an additional application process with course requirements that yield a certificate. Students may join one or more concentrations or none at all. Some are open to all HILS students, others are restricted to those in specific PhD programs.

Developmental and Regenerative Biology

The **Developmental and Regenerative Biology** program (DRB) provides a rigorous and innovative training experience in stem cell, developmental and regenerative biology for Harvard graduate students. The DRB program also offers professional development opportunities, including a Student-Faculty Seminar series, mentoring meetups, and an annual student-organized retreat. Students meet for data club and happy hour once a month and the broader DRB community also gathers quarterly for a variety of fun social activities.
For more information, visit **drb.hms.harvard.edu**.

Graduate Program in Bacteriology

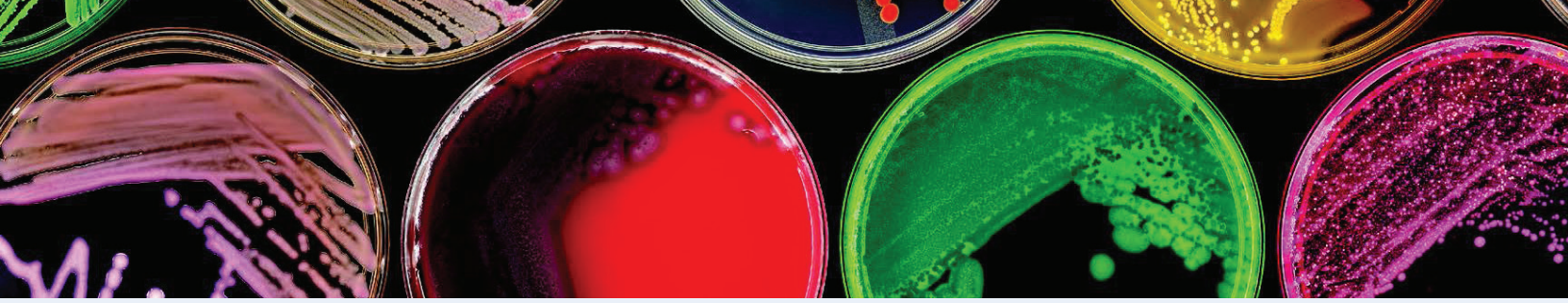
The **Graduate Program in Bacteriology** (GPiB) is a graduate concentration that aims to create community, collaboration, and career development support for students working on diverse aspects of bacteriology at Harvard. The program includes courses and also provides students with opportunities to engage with each other in data clubs, journal clubs, social hours, peer mentoring events, and more. In addition, the program provides supplementary advising and hosts career chats with alumni and other events to help prepare students for their next steps after graduation. For more information, please visit **bacteriology.hms.harvard.edu**.

Infectious Diseases Consortium

The **Infectious Diseases Consortium** (IDC) is made up of students, fellows, and faculty from the Harvard community who share an interest in understanding infectious diseases and their effects on people and societies. IDC activities include a J-term “Intro to Infectious Diseases” boot camp course, seminars, mentoring events with infectious disease professionals in diverse careers, social activities, data clubs, peer mentoring, and an annual retreat. For more information, visit **idc.hms.harvard.edu**.

Landry Cancer Biology Consortium

The **Landry Cancer Biology Consortium** (LCBC) was created in order to bring students and faculty from across the Harvard community together through a shared interest in all of the multidisciplinary aspects of cancer biology research. Community events include annual symposia that highlight cutting edge cancer research, student-driven data clubs, student-faculty happy hours, career and networking events, and more. To find out more, visit our website at **landrycancer.hms.harvard.edu**.



Leder Human Biology and Translational Medicine

The **Leder Human Biology and Translational Medicine** Program (LHBTM) is a 1.5-year program that provides PhD students with a working knowledge of the fundamentals of human biology and disease through a series of courses designed to enrich their training in translational science. The program aims to demystify the culture and practice of medicine, facilitating future collaborations between clinicians and basic scientists. Students who successfully complete the LHB Program will receive a certificate in Human Biology and Translational Medicine with their PhD. More information: **lhbtm.squarespace.com**

iMolecular Mechanistic Biology

Molecular Mechanistic Biology (MMB) is an interdisciplinary community whose members are driven by the molecular-level study of biochemical, biophysical, and cellular mechanisms. The goals of MMB are (1) to extend students' breadth of knowledge beyond their coursework and thesis laboratories and (2) to expand their professional networks beyond their individual departments and graduate programs. Opportunities including the annual symposium and monthly work-in-progress talks enable students to hear about each other's work and to receive feedback from peers and faculty mentors throughout the HMS community. MMB is sponsored by the departments of Biological Chemistry and Molecular Pharmacology (BCMP) and Cell Biology under the MCD2 training grant.
More information: **mmb.hms.harvard.edu**

Therapeutics Graduate Program

The **Therapeutics Graduate Program** (TGP) provides students with the scientific, laboratory, computational, and professional skills needed to excel in academic and biopharmaceutical careers. TGP offers rigorous multidisciplinary training in the sciences relevant to therapeutics discovery, development, and applications to improve the treatment of disease. We provide students with hands-on experiences and networking opportunities that will open fulfilling careers and leadership trajectories in the field of therapeutics. More information: **tgp.hms.harvard.edu**

Program in Genetics and Genomics

The **Program in Genetics and Genomics** (PGG) offers many opportunities to meet students, fellows, and faculty from across multiple HMS departments who share an interest in genetics and genomics. Membership is open to all Harvard BBS students. In addition to being exposed to a wide variety of cutting-edge research, students receive individualized research mentoring and develop effective communication skills. Many PGG events are student-run, so events directly meet student needs. There is no formal application process for admittance. For more information, please visit the website at **projects.iq.harvard.edu/pgg**.

STUDENT NAME:
Brandon Campbell

PROGRAM:
Chemistry and Chemical Biology

ACTIVE IN:
2025 Harvard Horizons Scholar

A CHEAPER WAY TO MAKE DRUGS

The cost of prescription drugs is high—particularly in the US where consumers pay nearly three times more than those in 33 other nations in the Organization for Economic Cooperation and Development.

One factor in prices is fluorination, which plays a crucial role in the production of many widely-used pharmaceuticals. Driven by the high cost of reagents needed for the trifluoromethyl (CF^3) group, the process is expensive—and hard on the natural environment. If there was a way to make fluorination more accessible, sustainable, and affordable—it could reshape how we approach drug synthesis—and much else in chemistry.

Chemist and Harvard Griffin GSAS PhD candidate Brandon Campbell has developed an innovative method of fluorination that could do just that. Using silver and visible light, Campbell's pioneering approach promises a cost-effective and eco-friendly alternative to traditional synthetic methods.

Central to Campbell's research is the use of silver (Ag^2) as a novel photocatalyst. Unlike traditional outer-sphere photocatalysts, which are unable to activate trifluoroacetate with visible light, silver offers the unique capability to oxidize this substrate efficiently through inner-sphere mechanisms. Through a process called ligand-to-metal charge transfer, silver can capture and utilize light energy to cleave bonds between itself and trifluoroacetate, generating reactive radicals that facilitate the desired chemical transformations.

Ultimately, Brandon Campbell's research is poised to impact not only the pharmaceutical industry by reducing costs and improving sustainability but also a wide array of chemical processes. His innovative work with silver photocatalysts and visible light sets a foundation for future exploration in photochemistry, potentially transforming how chemists think about molecular synthesis and energy use.

Are Harvard Life Sciences Right for You?

We are looking for creative people from a variety of backgrounds who are passionate about the life sciences, have enjoyed a previous research experience, and are ready to dedicate time to identifying and investigating new ideas. If this describes you, we encourage you to explore the cutting-edge science and training opportunities in the HILS programs and apply.

A Welcoming Community

Different points of view are critical to life sciences research in which advancing knowledge often requires bringing a new perspective or approach to a problem. At Harvard Griffin GSAS, we strive to create a welcoming community where all students can thrive and grow academically and personally. The School is proud of its vibrant and inclusive community, where individuals bring a wide range of perspectives, experiences, and backgrounds that enrich the learning environment and welcomes applications from individuals from all backgrounds.

Visit **gsas.harvard.edu/culture-community-and-engagement** to learn more or contact the Harvard Griffin GSAS Office of Culture, Community, and Engagement at gsas_recruitment@fas.harvard.edu.

STUDENT NAME:
Anita Reddy

PROGRAM:
Biological and Biomedical Sciences

ACTIVE IN:
Minority Biomedical Scientists Association of Harvard Griffin GSAS

"I feel incredibly supported by the people in my lab."

SIGNAL OF STRENGTH

Let's say you go to the gym and lift weights. The strain creates microtears in muscles that signal to a wide variety of cell types—including immune cells, motor neurons, and satellite cells—that play a role in muscle regeneration. But what are those signals? Where do they come from? And what is their vehicle? Those are some of the questions that Anita Reddy, PhD '24, and her colleagues in the lab of Harvard Medical School Assistant Professor Edward Chouchani wanted to investigate.

"We found that during exercise, the metabolite succinate is selectively released from exercising muscles," Reddy says. "It signals to non-muscle cells—specifically stromal cells—that play an important role in muscle repair. When succinate is released, there is an increase in the muscle motor neurons and the strength of mice in our experiments. That's really important because increased muscle innervation leads to increased strength—and increased strength helps with the prevention of arthritis and bone fractures."

The daughter of Indian immigrants, Reddy says she chose Harvard Griffin GSAS because she wanted to work with brilliant people at facilities as good as any in higher education. As a student of color, she also wanted to be part of a community in which she felt she belonged. Fortunately, Reddy says she's found both at Harvard Griffin GSAS.

"We can run some experiments in a day that might take a month at other institutions," she says. "And as a member of the Minority Biomedical Scientists Association of Harvard Griffin GSAS group, I've found people that I can really look up to and confide in as well even about non-lab-related things."

Why Choose Harvard?

Harvard and Harvard Griffin GSAS Support Your Academic and Scholarly Goals

PhD students are offered full financial support including stipends and grants for tuition and health insurance. In addition, Harvard Griffin GSAS provides resources to support your growth as a scholar and a scientist. These include:

- exceptional breadth of cutting-edge research, access to state-of-the-art facilities, and the opportunity to learn from and work with faculty at the forefront of their fields;
- professional development assistance for enhancing writing, research, and teaching skills and for planning academic and nonacademic career paths;
- access to a large, vibrant, and broad alumni network for mentorship, career exploration, and social, cultural, and intellectual engagement;
- connection to Boston's scientific hub, where students in HILS programs are well positioned to network with colleagues at other local institutions such as MIT and interact with scientists at any of the more than 1,000 life sciences and biotech companies based in the Greater Boston area.

STUDENT NAME:
Sydney Stanley

PROGRAM:
Biological Sciences in Public Health

ACTIVE IN:
Recipient of the 2023 Edgar Haber Award for outstanding achievement in the biological sciences

"It was a wonderful experience working with such amazing scientists who happen to be even better people."

TACKLING TB

Sydney Stanley, PhD '23, is fascinated by the way small organisms can have a big impact on public health. As a student at Harvard Griffin GSAS, Stanley explored the evolutionary genetics of the bacteria that cause tuberculosis (TB). She says her work is motivated by a desire to mitigate global health disparities.

"TB therapy includes multiple antibiotics that have to be taken over a course of several months, and infection is difficult to detect," she says. "The shortcomings of these tools are compounded in resource-limited settings—which contributes to the spread and ultimately the mortality of the disease."

Stanley studied a family of TB strains from Southeast Asia whose mutations rendered them more susceptible to newly developed drugs. She and her colleagues collaborated with a research group in Vietnam to sequence the bacterial genomes, analyze their mutations, and assess their fitness in the face of different challenges that simulate infection.

"Studying these mutations can enable the design of better diagnostics and drug combinations to detect and treat infections," Stanley explains. "TB can be genetically distinct in different regions of the world, so we should tailor diagnostics and antibiotics accordingly."

Stanley says the support she received from Professor Sarah Fortune, her mentor and principal investigator, enabled her to develop as a researcher. "I appreciate how she entrusted me with compelling projects while also encouraging me to explore my scientific interests and creativity," she says. The postdoctoral fellows and colleagues in Fortune's lab were also instrumental to Stanley's success. "It was a wonderful experience working with such amazing scientists who happen to be even better people."

Why Choose Harvard?

Harvard and Harvard Griffin GSAS Support Your Personal Growth and Well-Being

In addition to providing you access to unparalleled facilities, faculty, and academic resources at Harvard, Harvard Griffin GSAS supports your physical, social, and mental well-being through:

- health and wellness services such as comprehensive health care and a range of resources promoting physical and mental wellness;
- a supportive and inclusive community fostered by Harvard Griffin GSAS and supported in part by Harvard Griffin GSAS Office of Culture, Community, and Engagement and the Disability Access Office;
- opportunities to connect with a community of students who share common interests and goals through graduate student groups such as United Scholars in Neuroscience, Harvard Griffin GSAS Women in Science and Engineering Group, and LGBTQ@GSAS, and more;
- The Student Center at Harvard Griffin GSAS, where students and faculty from multiple disciplines interact with one another and participate in activities such as dinners, discussion groups, language tables, dances, concerts, ski trips, and other outings.

How to Apply

Interested students should visit **gsas.harvard.edu/programs/life-sciences** to identify the program that best suits their interests and research experience and to learn more about the application process and requirements. Some factors to consider to find the best fit include: subject area, curriculum, program size, learning environment, and affiliated faculty. You can visit the individual program websites and compare each program's offerings and requirements.

One of the benefits of applying to study at Harvard is the ability to truly explore the scope of the life sciences by expressing interest in more than one area. Applicants may apply to up to three programs but must pay a separate application fee for each program. You may submit a maximum of three applications to Harvard Griffin GSAS during the course of your academic career.

While each program has its own admissions requirements and committee, all HILS programs take an integrated look at each application, holistically evaluating all aspects of the application rather than relying on any single factor to determine admission. Visit **gsas.harvard.edu/apply** to apply.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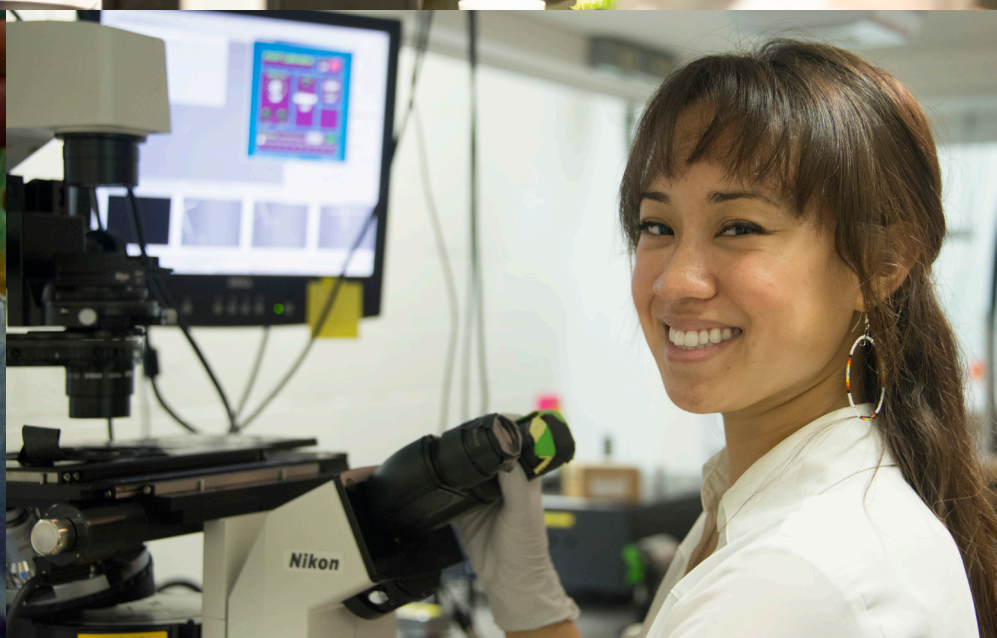
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HILS

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Nicole Santorella, HILS Coordinator

HARVARD Kenneth C. Griffin
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Express Your Interest in HILS