SCIENCE RESEARCH OPPORTUNITIES FOR UNDERGRADUATES: HOW TO GET STARTED

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October 9, 2019
October 23, 2019

Workshop Outline: Undergraduate research

- Science research: what, why, who, and where?
- How to find a research group
- HUROS: preparing strategy
- Interviews
- Funding for research



Science Research: what?

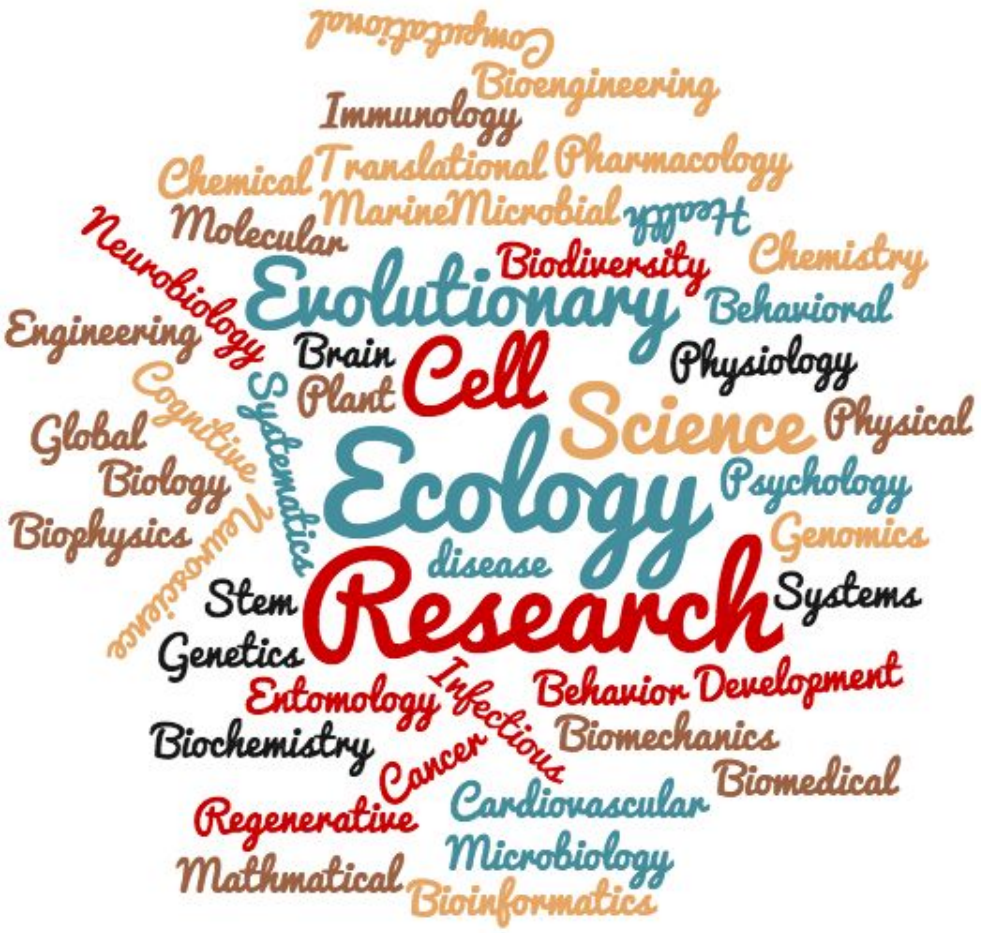
Basic, Translational, & Clinical research







Science Research: what?



- Boundaries between disciplines have dissolved
- Focus on a scientific question or problem rather than a subject
- Interdisciplinary research & teamwork is standard

Science Research: why?

- Intellectual engagement
- It's fun!
- Other motivations for doing research





SURE STUDY
(Survey of Undergraduate Research Experiences)

Top 5 learning gains:

① Understanding the research process

② Readiness for more demanding research

③ Understanding of how scientists work on problems

④ Learning lab techniques

⑤ Tolerance for obstacles

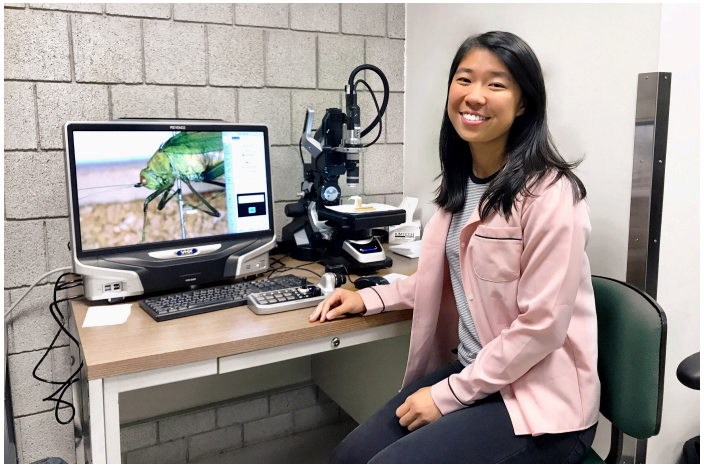
Lopatto, D. (2007). "Undergraduate research experiences support science career decisions and active learning." CBE Life Sci Educ **6**(4): 297-306.

Research shows that undergraduate research benefits students

Stanford, J. S., et al. (2017). "Early undergraduate research experiences lead to similar learning gains for STEM and Non-STEM undergraduates." Studies in Higher Education **42**(1): 115-129.

Carpi, A., et al. (2017). "Cultivating minority scientists: Undergraduate research increases self-efficacy and career ambitions for underrepresented students in STEM." Journal of Research in Science Teaching **54**(2): 169-194.





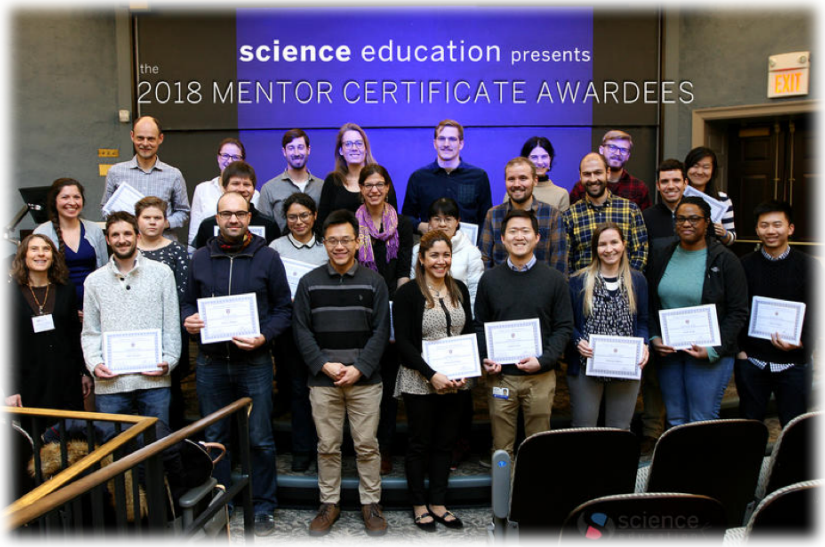
Finding a Lab/Research group that Fits

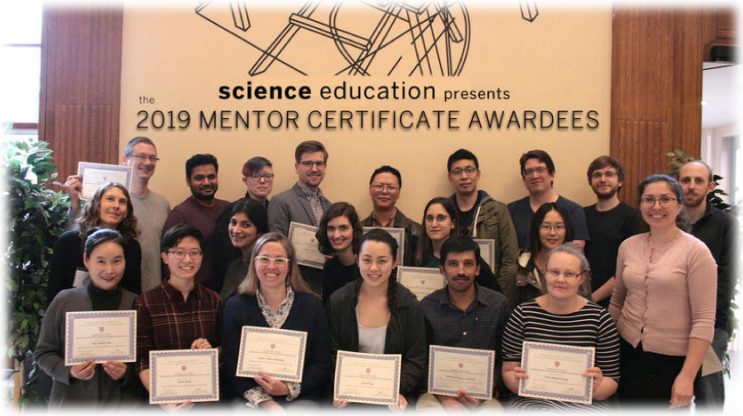


What is a mentor?

Merriam Webster dictionary definition:
a trusted counselor or guide

Who are the science mentors at Harvard?







Characteristics of an effective mentor

- Enthusiasm
- Sensitivity
- Ability to appreciate mentee‘s individual differences
- Respect
- Unselfishness
- Availability
- Ability to inspire and create optimism
- Provide support without micromanaging
- Ask insightful questions while being a patient listener
- Be widely read and open-minded
- Help to identify the right initial project
- Rewarding success

https://www.nature.com/naturejobs/science/career_toolkit/mentoring

Mentor-student matching

- Several models
  - Students are matched with a mentor who has interest and time
  - Students express interest in a specific research area or project, and a mentor with expertise in that area is selected

- Be sure to meet your potential mentor before committing to a lab or research group

- In some cases, students can choose between several projects and mentors

Questions you can ask prospective mentors

- What projects are available for undergraduates? Have you mentored undergraduate researchers?
- What skills, techniques or programs will I learn? How will I learn (individual instruction, self-study, group training?)
- What time commitment and schedule are required for conducting this research?
- Are our schedules compatible (e.g. Will your mentor be available in the lab when you are there?)
- How and how often will we meet? How often will I or we meet with the P.I.?
- When are the group meetings/journal clubs? Do you encourage undergraduates to attend?

A Mentor's Roles

"The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires." -William Arthur Ward

(accessed from http://www.nea.org/grants/55158.htm on 10/08/2019)

A mentor may even become a lifelong mentor and potential collaborator

A mentor may also act as a sponsor who can:

- Alert you to scholarship, fellowship, & career opportunities
- Encourage you to present your research at conferences
- Connect you with their scientific network
- Introduce you to experts in the field



Science Research: where?

- >2,000 research groups
- FAS
- SEAS
- HMS/HSDM
- HSPH
- Harvard-affiliated hospitals: MGH, Boston Children's, McLean, BWH

  Research Institutes: Wyss, Rowland, Broad

IDENTIFY YOUR RESEARCH INTEREST:
courses, conversations, direct search

Undergraduate Research at Harvard

Type:

- Volunteer
- Course-credit
- Fellowships

Time commitment:

- Term-time
  - First year/Soph 6-10hrs/week
  - Junior/Senior 15-20hrs/week (course credit/senior thesis)
- Summer
  - 40 hrs/week
  - 8-12 weeks



How can I find a lab?



- Open Research Positions https://lifesciences.fas.harvard.edu/undergraduates-open-research-positions-projects
- HUROS research fair https://lifesciences.fas.harvard.edu/huros
- Contact faculty (cold email/see Research Advisor for help: Anna Babakhanyan abababkhanyan@fas.harvard.edu

Open Research Positions

Undergraduates: Open Research Positions & Projects

Students: contact Dr. Anna Babakhanyan, Science Undergraduate Research advisor, to help identify research laboratories.
Faculty: if you are interested in posting your open research position, please contact Dr. Anna Babakhanyan.

Undergraduate Research opportunity, Dr. LeBoff's Lab/ Skeletal Health, Osteoporosis Center, and Bone Density Unit, Brigham and Women's Hospital, Posted September 28, 2018

Undergraduate Research Opportunity, Sleep Disorders Clinical Research Program, MGH, Posted September 28, 2018

Undergraduate research positions, Mackenzie Mathis' lab, Posted September 28, 2018

Research Assistant Positions in Developmental Cognitive Neuroscience – Fall Term 2018, Boston Children's Hospital, Posted September 28, 2018

Undergraduate Research Opportunity, Kwon Lab, Ragon Institute of MGH, MIT and Harvard, Posted September 28, 2018

Hookstra Laboratory | Undergraduate opportunities, Posted September 28, 2018

RESEARCH
Harvard-affiliated Labs
Research Opportunities and Funding
Undergraduates: Open Research Positions & Projects
Harvard Wintersession & Winter Recess
Summer Programs Away
Underrepresented Minority Fellowships
Post-Bac Job Listings
Post-Bac Resources
Transportation for Researchers
HUROS poster event
Undergraduate Research Spotlight

Undergraduate Research Opportunity, Joslin Diabetes Center

PI: Dr. Christian Rask-Madsen, Vascular Biology and Complications, Joslin Diabetes Center
One Joslin Place, Boston, MA 02215, Email: christian.rask-madsen@joslin.harvard.edu
Lab website: https://joslinresearch.org/investigators/Christian-Rask-Madsen

The aim of the research will be to characterize the regulation of the intestinal stem cell niche by vascular endothelial cells. Our hypothesis is that vascular endothelial dysfunction in type 2 diabetes changes the vascular niche for intestinal stem cells and causes expansion of the stem cell population. This increases the risk for oncogenic mutations and contribute to the increased risk for colorectal cancer in people with type 2 diabetes. The student research will use culture of mouse intestinal stem cells and co-culture with vascular endothelial cells. The project may also involve mice with expression of a fluorescent reporter in intestinal stem cells combined with genetic mutations in endothelial cells.

Learning outcomes: The student researcher will learn 3D-culture techniques, analysis of RNA and protein expression, and manipulation of gene expression in cell culture. The student will be involved in data analysis and planning of experiments. The goal will be that the student will experience the creativity of experimental research by designing and interpreting experiments independently with input from the mentor as needed. The student will also have opportunities for presentation at lab meetings at Joslin and at national or international meetings, depending on the data which will be acquired. The student can expect to be an author on manuscripts based on the results.

Time Commitment: The student researcher will be expected to work in the lab about 20 hours per week. However, this commitment is flexible and will accommodate periods with increased time demands in the school curriculum. The project will be planned for the duration of the academic year but can be extended depending on results and interest.

Mentoring: The PI will mentor the student daily and be involved or available in planning all experiments. We are a small lab where the advantage is close supervision and daily availability of the PI.

Funding: The laboratory does not provide a stipend for this project. Students are encouraged to apply to the HCRP and other fellowships (please contact Dr. Babakhanyan at ababakhanyan@fas.harvard.edu for more info) or register for a research course credit.

HUROS: Harvard Undergraduate Research Opportunities in Science Fair

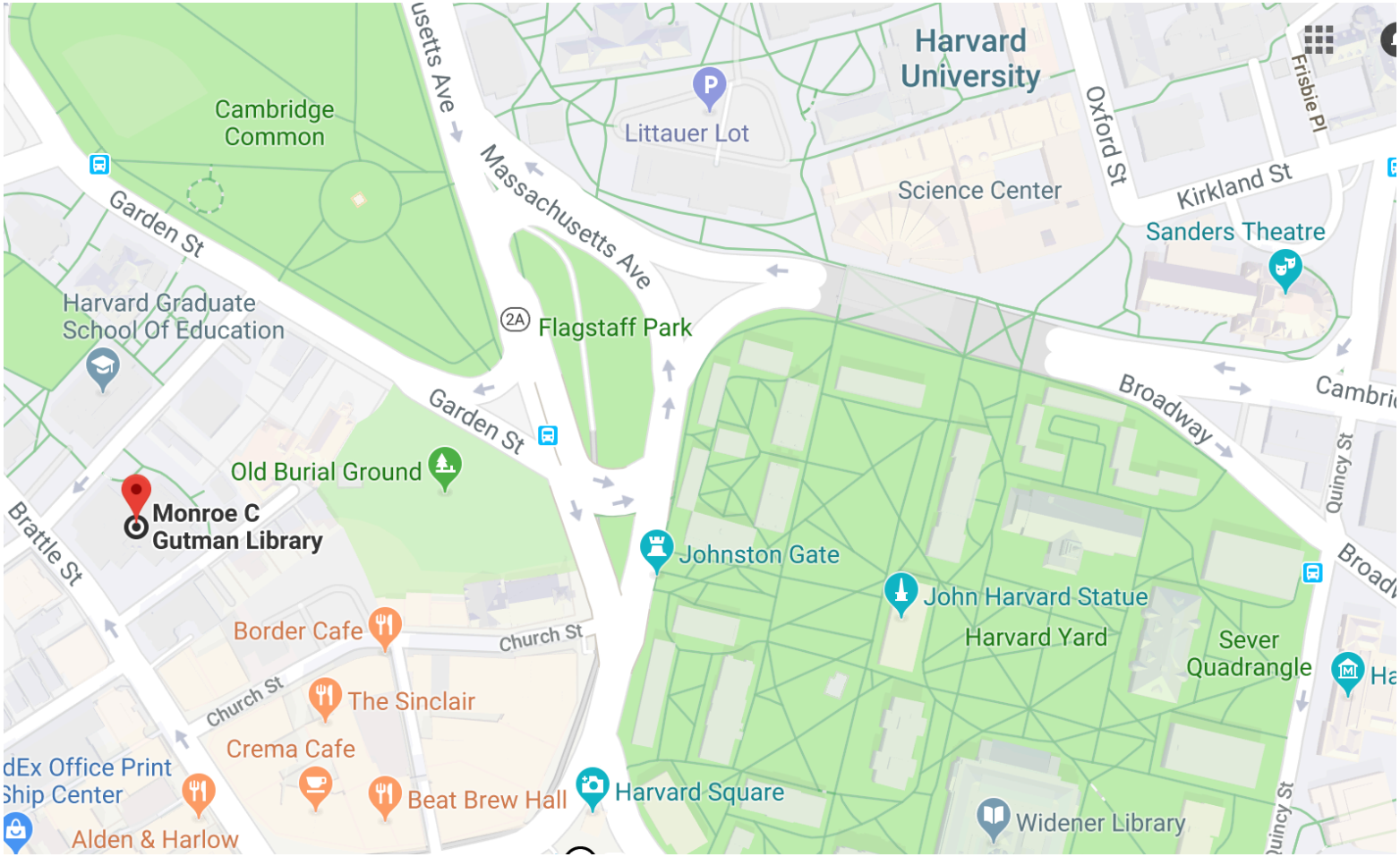
November 14, 2019 3:00 - 5:00PM Gutman Conference Center

Register Online: https://lifesciences.fas.harvard.edu/huros



HUROS

November 14, 2019 3:00 - 5:00PM Gutman Conference Center



HUROS Strategy



- Come to the event!
- Bring your friends and classmates
- If you have a scheduled class or section, speak to your instructor and let them know of your interest in attending (but class comes first!)
- Find the list of participating research groups at https://lifesciences.fas.harvard.edu/huros
- Browse through the list of attending researchers and check lab websites
- Make a list of abstract titles/professors who you are interested in (abstract book is arranged by PI last name, as are the posters at the event)
- Visit the refreshments table!

HUROS Strategy



- Prepare list of questions (bring a digital or print list with you)
  - Potential research projects they have for undergraduates
  - Spring/Summer project
  - Length of the project, hrs/week
  - Experience required (does it match your research skillset?)
  - Who could be your day to day mentor?
  - Opportunities for medical shadowing (if it is a hospital-based research lab)
  - What are the next steps to follow up on this position?

- You can also prepare a science resume and bring copies to the HUROS: https://lifesciences.fas.harvard.edu/resume-proposal-tips

- If you don't have a resume the day of the event, come anyways—it's not required!

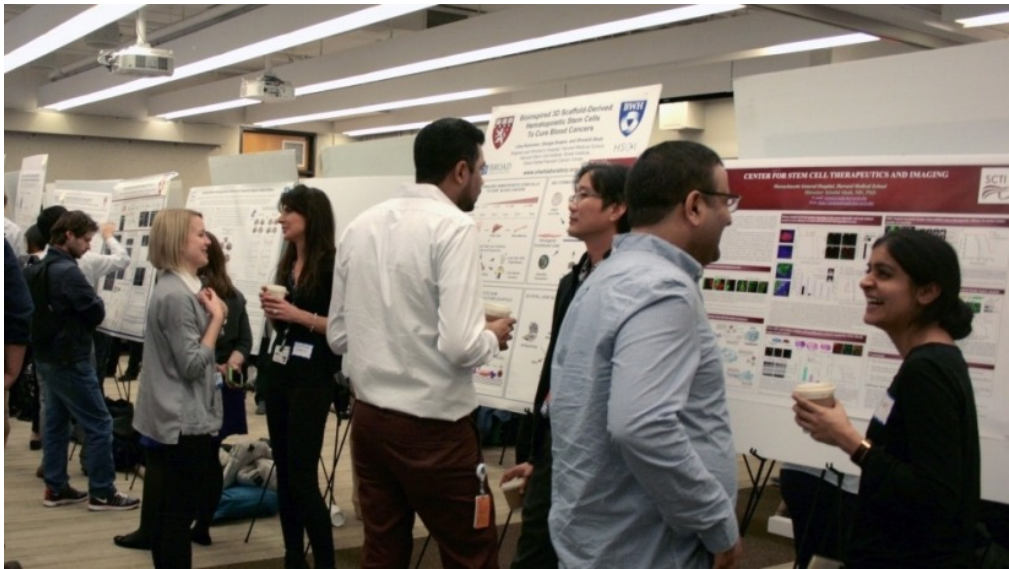
HUROS the day of



- Dress for an academic event
- Bring a list of your questions and resume (if you have it), as well as a pen and notepad or phone to take notes
- The day of the event check the printed abstract booklet to find abstract numbers for the posters you are interested in and make sure you stop by their poster
- As you approach a poster:
  - Introduce yourself—the presenters are here to meet you!
  - Clarify to whom you are talking (graduate student, postdoctoral fellow, professor)
  - Ask them to present their poster to you, take notes as needed
  - Ask specific questions regarding research projects and logistics
- Thank them at the end of the conversation
- Before moving to the next poster, ask the presenter for their business card or contact information (may be on the poster as well)
- Follow up within a few days of the HUROS with a short email expressing your interest if you wish to visit their lab
- Stop by Summer Research Program & Funding tables

After HUROS

- Follow up with all the professors whose research interests you
- Mention that you met them or their group's researcher at the HUROS.
- Send them a copy of your science resume
- Prepare for your interview



Interviewing

- Prepare:
  - Read faculty website and manuscript
  - Print specific questions
  - Dress professionally
- Meet the P.I. (Principal Investigator) & potential direct research mentors
- Mentor's expectations & your availability
- Ask for a lab tour
- Follow up – thank you note



Funding & Fellowships

Term-time:

- Harvard College Research Program (HCRP)
- Faculty Aide Program

Summer:

- General: PRISE, HCRP, Herchel-Smith, Harvard-Amgen
- Specific: Harvard Stem Cell Institute, Planetary Health, and many more
- International

https://lifesciences.fas.harvard.edu/research-opportunities

Science Education Funding & Resources

- Science Education **Undergraduate Researcher Transportation Program** https://lifesciences.fas.harvard.edu/research-transportation
- Science Education **Conference Presentation Grant Program** https://lifesciences.fas.harvard.edu/conference-presentation-grants
- **Mentor Training certificate workshop series** for research mentors of undergraduates
- **Contact me**: what additional programs or resources do you need for a successful research experience?



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Science Research Advising Resources

- Finding a lab that fits
- Help finding lab with specific research interest
- Resumes, cover letters & interviews
- Help with research fellowships
- Feedback on research proposals for funding

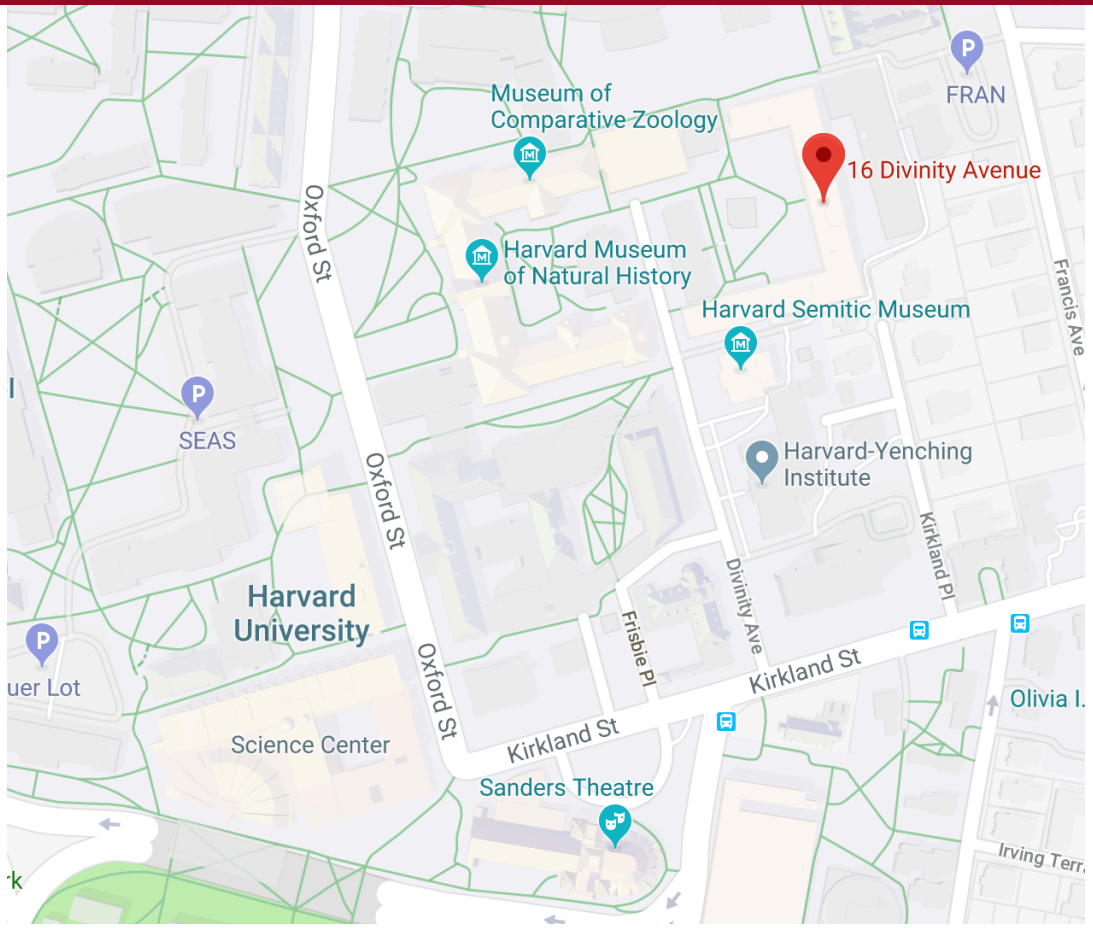


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Science Education
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THANK
YOU!