FOOTHILL COLLEGE
SCIENCE LEARNING INSTITUTE

SLI STEM Micro-Internships Winter 2023: Project Catalog

Updated 10/19 – added project #14

The following are the possible internship projects you will be working on this winter if selected. In your application, you will be asked to mark all that you are interested in. You may select no more than 5 to apply to.

There are two parts of this catalog:
- **Quick Links Table of Contents** – contains key information about each project. Click on the hyperlink to go to the full description below.
- **Project Full Descriptions** – read each project's full description to make sure this is a project you are interested in. In your application, you will want to explain your interest in each of your selected projects.

You will see that some projects are listed multiple times because they are interdisciplinary or cross disciplinary. Click here to see a complete Project List.

Read through each description carefully to see if
1) You have the skills that the mentor/ supervisor is asking for.
2) You have an interest in the project.
3) The modality works for you – several of these are in-person, either fully or partially. You will need to provide your own transportation to the institution and some have parking fees.
4) Use this as a guide as you fill out the application. READ IN FULL DETAIL!

All internships start on Monday, 1/9/23 with an orientation before the end of fall quarter and a training during week 1 of winter quarter. All internships run for the entire winter quarter, ending Friday, 3/24/22. You will be making a commitment of 6 – 7 hours per week.

If you have any questions, please reach out to the SLI Director, Sophia Kim at kimsophia@fhda.edu or Marissa Yañez at yanezmarissa@fhda.edu. We are happy to provide support with the application process. Find out more at the website: https://foothill.edu/sli/internships/schoolyear.html

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QUICK LINKS TABLE OF CONTENTS
BE SURE TO REVIEW THE FULL DESCRIPTION BELOW THIS TABLE OF CONTENTS!
**Some projects are cross-disciplinary and may appear under multiple disciplines*

ASTRONOMY				
Project Title	**Keywords**	**Required Skills**	**Modality**	**# of interns**
10. Playing with the Universe: astro-education simulations in HTML5/Javascript	programming, Javascript, HTML, CSS, astronomy, simulation	Javascript, HTML, CSS - basic working knowledge	Hybrid - remote/ online with some in-person check ins	1
13. Measuring pulsar scintillation with the Allen Telescope Array	Observational Astronomy/Radio Astronomy, Data Analysis/Data Science	Students will benefit from having taken an astronomy course, but no coursework is required for this internship. No prior computational experience is necessary - students will gain familiarity with the computing	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational	3

| | | language Python and the Jupyter Notebook tool throughout the project. | research | |
| | | | | |

BIOLOGY/ CHEMISTRY				
Project Title	**Keywords**	**Required Skills**	**Modality**	**# of interns**
2. Understanding the behavior of stem cells	Stem cell biology, Focused Ultrasound, Bioenergetics	Basic Biology (at least one quarter of Biology is required), Passion, and Dedication, willing to spend extra hours at times for experiments.	Fully in-person Mostly hands-on, in-lab experience	1
3. Developing and Characterizing a Carbon Dioxide Sensor for Deployment in Extreme Environments	Sensors, Nanotechnology	Having had exposure to basic chemistry and physics (high-school level is okay), with a basic understanding of electricity concepts such as voltage, current and resistance. Introductory knowledge of circuits is helpful but not required. Basic data analysis skills (such as excel, matlab or python) is helpful but not required.	The position can be either fully remote or hybrid with mostly hands-on, in lab opportunities, depending on the interest of the intern. Prefer in-person.	1
4. Enhancing molecular oxygen level by co-culturing S.elongatus (Cyanobacteria) in hypoxic 3D-cancer cells / spheroids.	Cancer treatment, Cell biology, Radiation Oncology	At least one quarter of Biology is required.	Fully in-person Mostly hands-on, in-lab experience	1-2
5. Mimicry, mate-choice, and aggression in swordtail fishes	Evolution behavior, Mimicry, Animal Biology	Interest in evolution, behavior, or fish is the only requirement. Some background in biology—particularly evolution and genetics—is useful, but willingness to learn and ask questions is more important	OK with any modality - will leave it up to the student Mostly on the computer, computational research, Mostly hands-on, in-lab experience	1
6. Impact of the alcohol flushing enzyme on smoking	Biochemistry, Molecular Biology, Alcohol Metabolism	None	Fully in-person Mostly hands-on, in-lab experience	1
8. Making molecules dance with light	Quantum mechanics, Computational Chemistry	At least the first quarter of the chemistry series is required (Chem 1A). At least one quarter of Calculus (Math 1A) is helpful, but not required as the computer will do most of the math. An interest in quantum mechanics is useful, but not required-you'll learn what you need on the job!	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational research	1
9. PRICE: Developing a flexible and scalable software tool for rapid protein recovery from large sequencing datasets	Bioinformatics, Data Science, Genomics	Ideally, applicants would have taken at least one quarter of biology and one quarter of python programming (or equivalent). Knowledge of DNA sequencing and protein function is a plus but not required. No formal experience with software development required (I don't have any myself!). An interest in genomics, bioinformatics, and data science is key.	Fully remote, or primarily remote with optional in-person meetings. Mostly on the computer, computational research	1

11. Investigating radiation resistance of different cancer cell lines	Cancer studies, cell culture, biological assays	Basics biology knowledge and cell culture experience is a plus but not required.	Fully in-person Mostly hands-on, in-lab experience	1

COMPUTER SCIENCE/ DATA SCIENCE				
Project Title	**Keywords**	**Required Skills**	**Modality**	**# of interns**
9. PRICE: Developing a flexible and scalable software tool for rapid protein recovery from large sequencing datasets	Bioinformatics, Data Science, Genomics	Ideally, applicants would have taken at least one quarter of biology and one quarter of python programming (or equivalent). Knowledge of DNA sequencing and protein function is a plus but not required. No formal experience with software development required (I don't have any myself!). An interest in genomics, bioinformatics, and data science is key.	Fully remote, or primarily remote with optional in-person meetings. Mostly on the computer, computational research	1
10. Playing with the Universe: astro-education simulations in HTML5/Javascript	programming, Javascript, HTML, CSS, astronomy, simulation	Javascript, HTML, CSS - basic working knowledge	Hybrid - remote/ online with some in-person check ins	1
14. Developing virtual histology for early diagnosis of skin cancer	Machine Learning, Medical Imaging, Diagnostic Tools	Ideally the student has taken at least one quarter or equivalent of computer science in python. Students should have an interest in learning machine learning models.	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational research, Mostly literature search, background research	1 or 2

ENGINEERING/ PHYSICS				
Project Title	**Keywords**	**Required Skills**	**Modality**	**# of interns**
3. Developing and Characterizing a Carbon Dioxide Sensor for Deployment in Extreme Environments	Sensors, Nanotechnology	Having had exposure to basic chemistry and physics (high-school level is okay), with a basic understanding of electricity concepts such as voltage, current and resistance. Introductory knowledge of circuits is helpful but not required. Basic data analysis skills (such as excel, matlab or python) is helpful but not required.	The position can be either fully remote or hybrid with mostly hands-on, in lab opportunities, depending on the interest of the intern. Prefer in-person.	1
8. Making molecules dance with light	Quantum mechanics, Computational Chemistry	At least the first quarter of the chemistry series is required (Chem 1A). At least one quarter of Calculus (Math 1A) is helpful, but not required as the computer will do most of the math. An interest in quantum mechanics is useful, but not required-you'll learn what you need on the job!	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational research	1
14. Developing virtual histology for early diagnosis of skin cancer	Machine Learning, Medical Imaging, Diagnostic Tools	Ideally the student has taken at least one quarter or equivalent of computer science in python. Students should have an interest in	Hybrid - remote/ online with some in-person opportunities Mostly on the	1 or 2

		learning machine learning models.	computer, computational research, Mostly literature search, background research	

MEDICINE/ PUBLIC HEALTH				
Project Title	**Keywords**	**Required Skills**	**Modality**	**# of interns**
2. Understanding the behavior of stem cells	Stem cell biology, Focused Ultrasound, Bioenergetics	Basic Biology (at least one quarter of Biology is required), Passion, and Dedication, willing to spend extra hours at times for experiments.	Fully in-person Mostly hands-on, in-lab experience	1
4. Enhancing molecular oxygen level by co-culturing S.elongatus (Cyanobacteria) in hypoxic 3D-cancer cells / spheroids.	Cancer treatment, Cell biology, Radiation Oncology	At least one quarter of Biology is required.	Fully in-person Mostly hands-on, in-lab experience	1-2
11. Investigating radiation resistance of different cancer cell lines	Cancer studies, cell culture, biological assays	Basics biology knowledge and cell culture experience is a plus but not required.	Fully in-person Mostly hands-on, in-lab experience	1
14. Developing virtual histology for early diagnosis of skin cancer	Machine Learning, Medical Imaging, Diagnostic Tools	Ideally the student has taken at least one quarter or equivalent of computer science in python. Students should have an interest in learning machine learning models.	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational research, Mostly literature search, background research	1 or 2

PSYCHOLOGY/ SOCIAL JUSTICE				
Project Title	**Keywords**	**Required Skills**	**Modality**	**# of interns**
7. Lifting the Bar	Applied Research, Qualitative Data Analysis, Education, Social Psychology, Social Justice, Justice Reform, Foster Care Experience	No prior research experience is required! We're looking for someone who is: - interested in social psychology and education - highly detail-oriented - passionate and curious - eager to learn - passionate about social/criminal justice * Some experience with qualitative data (collecting/analyzing) helps but isn't required	Hybrid - remote/ online with some in-person opportunities Mostly literature search, background research, Mostly hands-on, in-lab experience	1

STEM EDUCATION/ STEM EMPOWERMENT				
Project Title	**Keywords**	**Required Skills**	**Modality**	**# of interns**
1. Exploring the Possibilities of Virtual Reality in STEM Classes at Foothill College	Virtual Reality, STEM education	interest in STEM and VR, no prior experience or skills necessary	Mostly in-person meetings and work with some flexibility, but student should be prepared for this to be mostly an in person internship.	1
4. Enhancing molecular	Cancer treatment,	At least one quarter of Biology	Fully in-person	1-2

oxygen level by co-culturing S.elongatus (Cyanobacteria) in hypoxic 3D-cancer cells / spheroids.	Cell biology, Radiation Oncology	is required.	Mostly hands-on, in-lab experience	
12. Researching best metrics to build a science identity to recruit more first-gen/low-income students to pursue careers in science	Data Science, Psychology, Quantitative and Qualitative Research Methods, Science Education, Coding (RStudio, Qualtrics, Web Design)	Any courses in science or education would be applicable to this internship. Classes in statistics, math, research methods, or computer programming are helpful but not necessary. This internship is applicable for anyone with an interest in science, medicine, and diversity and inclusion, and is ideal for those without any prior experience.	Fully remote/ online Mostly on the computer, computational research, Mostly literature search, background research	3-4

KEEP READING BELOW FOR DETAILED DESCRIPTIONS
OF THE ABOVE OPPORTUNITIES.
Make sure you read the details as you make your selections of what project you'd be interested in!

PROJECT FULL DESCRIPTIONS

Project are organized in alphabetical order by last name of the project mentor.

Discipline(s)	STEM education
Project Title	**1. Exploring the Possibilities of Virtual Reality in STEM Classes at Foothill College**
Institution and Affiliation	Foothill College, STEM Division
Keywords	Virtual Reality, STEM education
Mentor/ supervisor	Zachary Cembellin, STEM Division Dean
Mentor bio	Zach Cembellin is currently the Acting Dean of the STEM Division at Foothill. Previously, he was a math instructor for 13 years at Foothill, including three years as department chair. He has a BS in Applied Mathematics from Chico State University and an MS in Applied Mathematics from CSU East Bay. He grew up and still lives in San Jose with his family which (besides humans) includes a black Lab, three cats, a bearded dragon, a leopard gecko, three fire bellied toads, and five fish in a fishtank. In his free time, he likes to garden, raise fruit trees, and make beats.
Project Description	Foothill College has recently started venturing into the world of virtual reality to bring teaching and learning into that technological space. Faculty, administrators, and staff are collaborating to explore the possibilities of bringing VR to Foothill. Through this project, you will research usages of virtual reality in STEM classrooms, test VR equipment that Foothill has obtained, interview faculty and students about the possibilities of VR in their classrooms, and present a proposal to the President and President's Cabinet about your findings. This is a great project for someone who's really interested in VR and also how it can be used as a tool in higher education at a place like Foothill College.
Required Skills	interest in STEM and VR, no prior experience or skills necessary
Modality/ Type of Work	Mostly in-person meetings and work with some flexibility, but student should be prepared for this to be mostly an in person internship.
Selection Process	I would prefer for the Foothill SLI team to select the student(s) that I will work with based on my requirements and their interests.
# of Interns	One intern

Discipline(s)	Biology, Medicine
Project Title	**2. Understanding the behavior of stem cells**
Institution and Affiliation	Stanford. University, Radiology, Avnesh S Thakor
Keywords	Stem cell biology, Focused Ultrasound, Bioenergetics
Mentor/ supervisor	Shashank Chetty, MCHRI Post Doctoral Scholar
Mentor bio	I have been a post doc for 2 year at Stanford. I have received MCHRI award this year. The future is amazing as the work I am currently investigating is for welfare of society and treating diseases.
Project	The students will have an exciting experience to look at the stem cells and how we

Description	grow them in lab. Also, the project will help student to learn new technique to stimulate stem cells and encrease their bioenergetics profile.
Required Skills	Basic Biology (at least one quarter of Biology is required), Passion, and Dedication, willing to spend extra hours at times for experiments.
Modality/ Type of Work	Fully in-person Mostly hands-on, in-lab experience
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	One intern

Discipline(s)	Chemistry, Engineering, Nanotechnology
Project Title	**3. Developing and Characterizing a Carbon Dioxide Sensor for Deployment in Extreme Environments**
Institution and Affiliation	Stanford University, Department of Electrical Engineering, Xlab
Keywords	Sensors, Nanotechnology
Mentor/ supervisor	Sergio Cordero, PhD Student
Mentor bio	I will be a second-year PhD student in electrical engineering. I completed my final rotation with Prof. Debbie Senesky and have chosen to continue my PhD with her as my advisor. I have been part of her lab since March 2022.
Project Description	At XLab we aim to build electronics and sensors capable of operating in harsh environments where conventional silicon-based electronics cannot. The extreme environment this project currently focuses on is the underground storage wells for carbon capture and storage technology. Rather than allowing carbon emissions from energy production or industrial activity to enter the atmosphere they will be captured and stored in underground saline formations or depleted oil drill sites. However for this technology to be widely adopted risk mitigation must be put in place to ensure no leaks or undesired CO_2 migration occurs. We are currently developing a chemical CO_2 sensor that uses CO_2-sensing nanoparticles deposited on wide band gap semiconductor materials. The student working on this project would have the in-person opportunity to characterize the sensor in terms of its response time, stability, and sensitivity when exposed to CO_2. Individuals could also assist in a literature review focusing on other potential CO_2-sensitive nanomaterials to integrate with our platform.
Required Skills	Having had exposure to basic chemistry and physics (high-school level is okay), with a basic understanding of electricity concepts such as voltage, current and resistance. Introductory knowledge of circuits is helpful but not required. Basic data analysis skills (such as excel, matlab or python) is helpful but not required.
Modality/ Type of Work	The position can be either fully remote or hybrid with mostly hands-on, in lab opportunities, depending on the interest of the intern. Prefer in-person.
Selection Process	I would prefer for the Foothill SLI team to select the student(s) that I will work with based on my requirements and their interests.
# of Interns	One intern

Discipline(s)	Biology, Medicine, STEM Education/ Empowerment
Project Title	**4. Enhancing molecular oxygen level by co-culturing S.elongatus (Cyanobacteria) in hypoxic 3D-cancer cells / spheroids.**
Institution and Affiliation	Stanford University, Radiation Oncology and Medical Physics, Pratx Lab (PI- Dr. Guillem Pratx)
Keywords	Cancer treatment, Cell biology, Radiation Oncology
Mentor/ supervisor	Neel Das, Postdoctoral Research Fellow
Mentor bio	I am working as a postdoc at Stanford University from March 2022. I will be continuing on this role for next 2 years. I am aiming to be an independent researcher here after this current role.
Project Description	Oxygen plays a vital role in tumor evolution and response to treatment. For instance, following the application of therapeutic radiation, well oxygenated regions of tumor respond by up to a factor of three better than those segments bereft of oxygen. Molecular oxygen (O_2) is a potent chemical radiosensitizer. This radiosensitization does not result from any of the metabolic or physiological effects of oxygen, but instead reflects the fact that O_2 is an extremely electron-affinic molecule that participates in the chemical reactions that lead to the production and fixation of DNA damage after the absorption of energy from ionizing radiation. In our project, we are using 3D cancer cells spheroids as a model to mimic solid tumors. We are also using the S.elongatus (cyanobacteria) which naturally generate O_2 in the presence of light as a bioengineered tool to enhance molecular O_2 level in the hypoxic core of tumor spheroids. The intern(s) will be involved in analyzing the molecular O_2 consumption by various molecular and imaging analyses and eventually the regulation of hypoxic genes (HIF-1α, CA-9) using this model.
Required Skills	At least one quarter of Biology is required.
Modality/ Type of Work	Fully in-person Mostly hands-on, in-lab experience
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	1-2 Interns

Discipline(s)	Biology
Project Title	**5. Mimicry, mate-choice, and aggression in swordtail fishes**
Institution and Affiliation	Stanford University, Biology, Schumer Lab
Keywords	Evolution behavior, Mimicry, Animal Biology
Mentor/ supervisor	Tristram Dodge, PhD student
Mentor bio	I'm a second year PhD student in Biology at Stanford University, with 3.5 years to go. I'm in a fish evolution lab that does mostly genetics but also some behavior and physiology. My PI, Molly Schumer, is very supportive of undergraduate research.
Project Description	Some male swordtail fish (genus: Xiphophorus) have evolved a spot that makes them mimic pregnant female fish. We've figured out what genes control this pattern and now want to know why it evolved (ie what are the costs and benefits of having such a

	spot?). By showing animations of fish (with and without spots) to real fish, we hope to understand 1) if female fish prefer males with the spot and 2) if male fish are less aggressive towards males with the spot. This project could involve the following aspects: 1) helping run/record behavioral trials 2) measure/score different behaviors from the trial videos 3) analyze behavioral data to test hypotheses 4) read scientific papers to contextualize results. Modality and emphasis on particular duties can range depending on preferences of applicant.
Required Skills	Interest in evolution, behavior, or fish is the only requirement. Some background in biology—particularly evolution and genetics—is useful, but willingness to learn and ask questions is more important
Modality/ Type of Work	OK with any modality - will leave it up to the student Mostly on the computer, computational research, Mostly hands-on, in-lab experience
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	One intern

Discipline(s)	Biology, Chemistry
Project Title	6. Impact of the alcohol flushing enzyme on smoking
Institution and Affiliation	Stanford University, Anesthesiology
Keywords	Biochemistry, Molecular Biology, Alcohol Metabolism
Mentor/ supervisor	Eric Gross, Assistant Professor
Mentor bio	I run an active research lab at Stanford University studying alcohol metabolism for the past 10 years. Most of the research we perform is using basic science models and we study how alcohol flushing impacts anesthesiology and human health (alcohol and tobacco).
Project Description	Every wonder why people flush after they drink alcohol or when using tobacco products? This is because they have a genetic variant of an enzyme known as ALDH2 that limits the ability to break down acetaldehyde. For this project, we will introduce the student to the ALDH2 enzyme and why a genetic variant in this enzyme causes facial flushing. We will provide a hands-on experience to test how the enzyme functions using a well-established assay in our basic science laboratory under the mentorship of experienced PhD scientists. The student will test how certain drugs can change the ability for the enzyme to break down acetaldehyde, including certain chemical components within tobacco products.
Required Skills	None
Modality/ Type of Work	Fully in-person Mostly hands-on, in-lab experience
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	One intern

Discipline(s)	Psychology, Education; Social Justice
Project Title	**7. Lifting the Bar**
Institution and Affiliation	Stanford, Psychology, Walton Lab/Lifting the Bar Project
Keywords	Applied Research, Qualitative Data Analysis, Education, Social Psychology, Social Justice, Justice Reform, Foster Care Experience
Mentor/ supervisor	Anmol Gupta, Research Coordinator
Mentor bio	1 year and 3 months! I'll be here until the end of next summer at minimum, and then potentially longer depending on grad school. As the Research Coordinator I manage the implementation and evaluation of the randomized control trial scale-up of the Lifting the Bar intervention, as well as work on partnership development and adapting the intervention.
Project Description	Lifting the Bar is a social psychological intervention designed to improve recidivism outcomes (e.g. returning to detention) for students transitioning out of juvenile detention by "sidelining" the bias that students face when returning to school. In the intervention, participants provide insights into their goals, challenges, and values, as well as their experiences in juvenile detention. For further information about the project, see also: https://www.youtube.com/watch?v=DolhAohOiOo The Foothill College intern will support many functions including background research, literature reviews, an analysis of the relevance of this work to other at-risk populations, qualitative data analysis and other project needs.
Required Skills	No prior research experience is required! We're looking for someone who is: - interested in social psychology and education - highly detail-oriented - passionate and curious - eager to learn - passionate about social/criminal justice * Some experience with qualitative data (collecting/analyzing) helps but isn't required
Modality/ Type of Work	Hybrid - remote/ online with some in-person opportunities Mostly literature search, background research, Mostly hands-on, in-lab experience
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	One intern

Discipline(s)	Chemistry, Physics
Project Title	**8. Making molecules dance with light**
Institution and Affiliation	Stanford University, Chemistry, Martinez
Keywords	Quantum mechanics, Computational Chemistry
Mentor/ supervisor	Diptarka Hait, Stanford Science Fellow
Mentor bio	I started in July 2022 as a postdoctoral scholar at Stanford chemistry, in the Todd Martinez group. I am planning to stick around for 2-3 years (my funding from the Stanford Science Fellows programs is for three years). My responsibilities include doing research in computational chemistry, as well as teaching/mentoring younger students in the group.
Project Description	Electrons in molecules can absorb light to gain energy and move to higher energy configurations. This excess energy subsequently moves away from the electrons to

	make the atoms in the molecules move faster. The energy from light can thus be used to drive very specific chemical reactions (by tuning which regions of the molecule absorb energy) or be lost in just heating up the original molecule, with key transformations happening within a trillionth of a second (10^{-12} s or a picosecond). This project will use computers to study the exact sequence events that happens when a molecule absorbs light, utilizing quantum mechanics to understand the perspective of both the electrons and atomic nuclei. This will help us understand how light can be efficiently used to run chemical transformations and avoid undesirable side reactions. Very specifically, we will try to see if bonds between carbon and hydrogen can be easily broken by ultraviolet light in some model molecules, which will help gain insight astrochemical reactions in space as well as health risks associated with exposure to ultraviolet light for humans. In the process, I hope that the student will also learn about how quantum mechanics can be applied to a variety of chemical problems, and maybe even play a little bit with something that strikes their fancy. Computational details: Calculations will be run with the computing cluster associated with the Martinez group at Stanford, using a quantum chemistry software package (TeraChem) that is actively being developed by group members.
Required Skills	At least the first quarter of the chemistry series is required (Chem 1A). At least one quarter of Calculus (Math 1A) is helpful, but not required as the computer will do most of the math. An interest in quantum mechanics is useful, but not required-you'll learn what you need on the job!
Modality/ Type of Work	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational research
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	One intern

Discipline(s)	Biology, Computer Science, Data Science
Project Title	**9. PRICE: Developing a flexible and scalable software tool for rapid protein recovery from large sequencing datasets**
Institution and Affiliation	Stanford University, Earth Systems Science, Dekas Lab
Keywords	Bioinformatics, Data Science, Genomics
Mentor/ supervisor	Alex Jaffe, Postdoctoral Fellow
Mentor bio	I am a new postdoc at Stanford (started August 2022) and will likely be here until summer 2025.

Project Description	In recent years, biologists have produced a wealth of DNA sequencing data describing the microbial communities associated with humans, other animals, and natural environments. These datasets have great potential for the discovery of novel enzyme variants of interest for ecology, evolutionary biology, and biotechnology; however, existing tools for searching sequence data at scale remain clunky and are not easily scaled to meet the needs of large meta-analyses. In this project, the student will aid in the development of an existing bioinformatic pipeline that efficiently searches large sequencing datasets for proteins of interest. Current project goals include the creation of new features, development of robust tests using real-world datasets, and benchmarking against existing tools, with the ultimate goal of producing a polished software package ready for distribution (and, ideally, an accompanying paper for submission to a peer-reviewed journal in the field). The student will gain hands-on experience with large DNA sequencing datasets, including metagenomic datasets, common bioinformatic tools for analyzing them, high performance scientific computing environments, and basic principles of software engineering for biology. The student will work closely with a postdoc and should expect a highly collaborative environment with shared programming and writing efforts.
Required Skills	Ideally, applicants would have taken at least one quarter of biology and one quarter of python programming (or equivalent). Knowledge of DNA sequencing and protein function is a plus but not required. No formal experience with software development required (I don't have any myself!). An interest in genomics, bioinformatics, and data science is key.
Modality/ Type of Work	Fully remote, or primarily remote with optional in-person meetings. Mostly on the computer, computational research
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	One intern

Discipline(s)	Computer Science, Data Science, Astronomy
Project Title	**10. Playing with the Universe: astro-education simulations in HTML5/Javascript**
Institution and Affiliation	Foothill College, Astronomy department
Keywords	programming, Javascript, HTML, CSS, astronomy, simulation
Mentor/ supervisor	Geoff Mathews, instructor
Mentor bio	Geoff Mathews is an astronomer with a background in secondary education. Prior research included the use of simulations in educational contexts, to support general education student reasoning in topics that would traditionally only be addressed in advanced courses. Since 2020, along with computer science professor Baba Kofi Weusijana, he has carried out the Foothill AstroSims project, making browser-based astro-education simulations to bring advanced topics within the reach of students worldwide.
Project Description	With the rise of personal computing, many astronomers have created astro-education simulations to help teach the general public about astronomical phenomena. Efforts have ranged from individuals writing a single simulation in isolation to teams writing

sets of simulations along with curricular materials. Unfortunately, many of these simulations are becoming unusable as support for technologies such as Java and Flash fade. The Foothill Astrosims project aims to support astronomy education by:

- Updating existing educational simulations from Flash to Javascript, and
- Developing new simulations to address topics formerly unsupported by the Astronomy Education community
- Curating extant browser-accessible educational simulations

Students will work with Dr. Mathews on building the simulations in HTML5/Javascript. You can find out more about the AstroSims project here.

Required Skills	Javascript, HTML, CSS - basic working knowledge
Modality/ Type of Work	Hybrid - remote/ online with some in-person check ins
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	One intern

Discipline(s)	Biology, Chemistry, Medicine
Project Title	11. Investigating radiation resistance of different cancer cell lines
Institution and Affiliation	Stanford University, Radiation Oncology & Medical Physics, Pratx
Keywords	Cancer studies, cell culture, biological assays
Mentor/ supervisor	Hieu Nguyen, Postdoctoral Fellow
Mentor bio	I have been a postdoctoral scholar at Stanford University for a year and a half, with my research focus on molecular imaging techniques, including PET and CT. I will continue researching new developments in these techniques in the next few years.
Project Description	Metastasis accounts for as much as 90% of mortality in cancer and remains a challenging topic of study. Our lab previously showed that we could use positron emission tomography to trace single cancer cells in a mouse model. We are working on tracing these cancer cells long-term and searching for a radio-resistant cell line equipped with radiation resistance drugs that can enable this task. This project investigates the radiation resistance of different cancer cell lines. It is suited for a student interested in learning cell culture and different biological assays to characterize cells' resistance to X-ray therapy. The student will learn cell culturing of several common cancer cell lines such as B16, 4T1, MDA-MB-231, etc., followed by several survival assays like clonogenic, apoptosis, and DNA damage essays.
Required Skills	Basics biology knowledge and cell culture experience is a plus but not required.
Modality/ Type of Work	Fully in-person Mostly hands-on, in-lab experience
Selection Process	I would prefer for the Foothill SLI team to select the student(s) that I will work with based on my requirements and their interests.
# of Interns	One intern

Discipline(s)	STEM Education/ Empowerment
Project Title	**12. Researching best metrics to build a science identity to recruit more first-gen/low-income students to pursue careers in science**
Institution and Affiliation	Stanford University, Education
Keywords	Data Science, Psychology, Quantitative and Qualitative Research Methods, Science Education, Coding (RStudio, Qualtrics, Web Design)
Mentor/ supervisor	Gabriel Reyes, PhD Student
Mentor bio	I am a 2nd year PhD student currently on a leave of absence to work full-time on building my nonprofit that is supporting my doctoral work. Currently, I am pausing my neuroscience research to focus on STEM Education with a focus on science identity among low-income/first-generation college students.
Project Description	Beginning in February 2023, we will run the FLi Sci Scholars Program for up to 20 high school students from low-income/first-gen backgrounds to inspire them to pursue careers in scientific research. I need reviewing scientific literature to write a review paper, help preparing for qualitative interviews on the research program for high school students, and help analyzing data to measure pre-post. **1. Literature Review:** During this time, we will need help with students going through a set of articles and code them for analysis based on theme and insights from those articles. These have already been identified to address the following questions: What are the current ways that researchers in science education attempt to foster a science identity among high school students? And how many of these articles specifically target minoritized groups based on race, gender, and socioeconomic status? The intern will be responsible for reviewing these articles and coding them to address these two critical questions. Co-authorship for this project is available for interns interested in supporting this project long-term. **2. Qualitative Research Support:** In June 2023, we will be conducting 45-min - 1-hour long interviews of each of the FLi Sci Scholars after participating in the first year of the program. The intern would help support the creation of questions to ask during these interviews as well as practice testing them, identifying literature to support these questions, and play a key role in the research strategy for these interviews. Co-authorship for this project is available for interns interested in supporting this project long-term. **3. Quantitative Research Support:** By January 2023, applications would have been received by a group of high school students to attempted to apply for the FLi Sci Scholars Program. Interns interested in data analysis will be supported to analyze the data of the most recent applicant pool and integrate that with prior data gathered on science identity among low-income students. Interns will help summarize key statistics of who applied to our program as well as identify trends based on who were interested in our fellowship, what qualities made someone successful in our program, and provide recommendations on recruiting students for our third cohort. This project is ideal for interns interested in learning or growing their R programming and data visualization skills. No prior experience necessary; this is ideal for students eager for their first data project!
Required Skills	Any courses in science or education would be applicable to this internship. Classes in statistics, math, research methods, or computer programming are helpful but not

	necessary. This internship is applicable for anyone with an interest in science, medicine, and diversity and inclusion, and is ideal for those without any prior experience.
Modality/ Type of Work	Fully remote/ online Mostly on the computer, computational research, Mostly literature search, background research
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	Happy to take on 3-4 depending on interest

Discipline(s)	Astronomy, Computer Science, Data Science, Physics
Project Title	**13. Measuring pulsar scintillation with the Allen Telescope Array**
Institution and Affiliation	The SETI Institute, Allen Telescope Array Team, Mountain View, CA
Keywords	Observational Astronomy/Radio Astronomy, Data Analysis/Data Science
Mentor/ supervisor	Sofia Sheikh, NSF-ASCEND Postdoctoral Fellow
Mentor bio	I am a radio astronomer who graduated with a dual-title PhD in Astronomy and Astrobiology from Penn State last summer (June 2021). Since January 2022, I have been working on the Allen Telescope Array, a radio telescope in Northern California, as a post-doctoral fellow at the SETI Institute, a non-profit astrobiology research center. My fellowship lasts for 3 years, so I will be in this position until the end of 2024. As part of my fellowship, I am providing a broader impact of mentorship through the existing Research Experience for Undergraduates (REU) program at the SETI Institute, and I also want to provide mentorship through programs at community colleges in the Bay Area (which is how I connected with the Foothill SLI program).
Project Description	Pulsars are dense, spinning cores of dead stars which emit strong radio waves from their magnetic poles. We can study their emission and investigate their properties by collecting their radio waves with radio telescopes such as the Allen Telescope Array in Hat Creek, CA. Sometimes, however, we're not interested in the pulsars themselves, but the gas that they travel through along the way, known as the "interstellar medium". Just like Earth's atmosphere makes stars twinkle, or sunlight dances on the bottom of a swimming pool, the interstellar medium warps the pulsar's radio waves as they travel through it, in a process known as "scintillation". A better understanding of scintillation leads to better pulsar timing, which could eventually lead to gravitational wave measurements by using pulsars as a cosmic laboratory. In this project, students working with me will learn to measure pulsar scintillation from datafiles taken with the Allen Telescope Array.
Required Skills	Students will benefit from having taken an astronomy course, but no coursework is required for this internship. No prior computational experience is necessary - students will gain familiarity with the computing language Python and the Jupyter Notebook tool throughout the project.
Modality/ Type of Work	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational research
Selection Process	I would prefer for the Foothill SLI team to select the student(s) that I will work with based on my requirements and their interests.

# of Interns	Willing to take up to 3 interns who will be mentored in a small group cohort style.

Discipline(s)	Computer Science, Engineering, Medicine
Project Title	**14. Developing virtual histology for early diagnosis of skin cancer**
Institution and Affiliation	Stanford, School of Medicine, Winetraub Lab
Keywords	Machine Learning, Medical Imaging, Diagnostic Tools
Mentor/ supervisor	Yonatan Winetraub, Instructor
Mentor bio	I have started my lab this year at Stanford after completing my PhD in biophysics. My resarch focuses on combining machine learning and optical imaging for early detection of skin cancer
Project Description	The student will join the lab's main project "developing next-generation medical imaging technologies enabling virtual biopsy for early diagnosis and tumor margin detection of skin and brain cancers". The lab combines machine learning and optical imaging to create realistic and accurate histological images of skin tissue to assist clinicians in determining tumor margins and treatment. More specifically, the student will help by evaluating several machine learning models to see how they perform. You would read 1-2 papers and help us implement methods from the paper to improve our algorithm.
Required Skills	Ideally the student has taken at least one quarter or equivalent of computer science in python. Students should have an interest in learning machine learning models.
Modality/ Type of Work	Hybrid - remote/ online with some in-person opportunities Mostly on the computer, computational research, Mostly literature search, background research
Selection Process	I would prefer to review a small (3 - 5) set of student applications and pick my 1 or 2 top choices to make offers to.
# of Interns	We can do one, two if they are well motivated.