



BDP Summer 2026

Undergraduate Research Projects



Participating BDPs and Research Teams:

Chuck Bennett, Space, Experimental

Astrophysics and Cosmology: Physics and Astronomy, KSAS; Space Sector, APL

Melinda Buntin, Health Policy and Economics:

Health Policy and Management, BSPH; Carey

Arturo Casadevall: Molecular Microbiology & Immunology, BSPH; Infectious Diseases, SOM

Nilanjan Chatterjee, Biostatistics and Genetic

Epidemiology: Biostatistics, BSPH; Oncology, SOM

Lisa Cooper, Equity in Health and Healthcare:

Medicine, SOM; Health, Behavior and Society, BSPH; SON

Derek Cummings, Infectious Disease

Dynamics: Epidemiology, BSPH; Biomedical Engineering, WSE

David DeMille, Atomic/Molecular Physics and

Precision Measurement: Physics and Astronomy, KSAS; Research and Exploratory Development, APL

Andrew Feinberg, Epigenetics: Medicine, Oncology, Molecular Biology & Genetics, Psychiatry & Behavioral Science, SOM; Mental Health, Biostatistics, BSPH; Biomedical Engineering, WSE

Paul Ferraro, Human Behavior and Public

Policy: Carey; Environmental Health and Engineering, WSE; BSPH

Jessica Gill, Trauma Recovery Biomarkers:

SON; Neurology, SOM

Gillian Hadfield, AI Alignment and

Governance: SGP; Computer Science, WSE

Richard Haganir, Neuroscience and Brain

Sciences: Neuroscience, SOM; Psychological and Brain Sciences, KSAS

Daniel Kammen, Energy and Climate

Justice: Civil and Systems Engineering, WSE; SAIS

Kathy McDonald, Health Systems, Quality and Safety:

SON; Armstrong Inst for Patient Safety & Quality, Internal Medicine, SOM; Malone Ctr for Engineering in Healthcare, WSE; Business of Health Initiative, Carey & BSPH

Ebony McGee, Innovation and Inclusion in

the STEM Ecosystem: SOE; Mental Health, BSPH

Stephen Morgan, Sociology and Education:

Sociology, KSAS; SOE

Eliana M. Perrin: Pediatrics, SOM; SON; BSPH

Steven Salzberg, Computational Biology

and Genomics: Biomedical Engineering, SOM; Computer Science, WSE; Biostatistics, BSPH

Jeremy Shiffman, Global Health Policy:

International Health, BSPH; SAIS

David Sing, Exoplanetary Physics: Earth and Planetary Sciences, Physics and Astronomy, KSAS

Chi Van Dang, Cancer Medicine: Oncology, SOM; Biochemistry and Molecular Biology, BSPH

Carl Wu, Chromatin Biology and

Biochemistry: Biology, KSAS; Molecular Biology and Genetics, SOM

Project Descriptions:

[Chuck Bennett, Space, Experimental Astrophysics and Cosmology: Physics and Astronomy, KSAS; Space Sector, APL](#)

Three possible projects:

1. This project seeks to resolve apparent inconsistencies between multiple observational datasets, (including from the cosmic microwave background -- the afterglow of the origin of the universe), and the standard model of cosmology.

Undergraduate responsibilities or tasks: The undergraduate will play a key role in developing and running the software needed to understand the archival space mission data in detail. The undergraduate will be guided by and closely work with senior JHU scientists on specific tasks.

2. This project relates to the exciting new Canadian Galactic Emission Mapper (CGEM) radio astronomy effort. The CGEM telescope maps a large fraction of the sky to provide the data needed to better quantify the Milky Way polarized microwave emission. The new data will lead to an improved understanding of how to separate those signals from the polarized microwave signal that has travelled across the universe for billions of years.

Undergraduate responsibilities or tasks: The undergraduate will play a key role in developing and running the software needed to characterize the system, and to analyze the incoming science data. The undergraduate will be guided by and closely work with senior JHU scientists on specific tasks.

3. This project relates to the JHU Cosmological Large Angular Scale Surveyor (CLASS) telescope array that operates high in the Andes Mountains of northern Chile. The two major goals of the research are to determine how and when the first stars formed, and to determine the nature of the first fraction of a second of the universe. To achieve these goals, this research group builds new instrumentation and analyzes data from the survey. Undergraduates have assisted in the past with instrument development, data analysis, and the generation of major scientific papers.

Undergraduate responsibilities or tasks: The undergraduate will play a key role in developing custom software needed to analyze the incoming science data and/or participate in the design and/or construction of new hardware.

Preferred (or required) skills and/ or experience: Coding skills preferred, especially Python. Knowledge of the statistical analysis of measurement data is also valuable. Neither is required.

Positions available: 2

Work location: Homewood campus, Bloomberg Center for Physics & Astronomy, 2nd floor

Melinda Buntin, Health Policy and Economics: Health Policy and Management, BSPH; Carey

Project: The summer researcher(s) will provide research and modeling support to one or more of the following Center activities:

- Development and documentation of a model that evaluates how Medicare Advantage policy options impact on beneficiaries, Medicare spending, and supplemental benefits
- Development and documentation of a model that assesses potential effects of alternative episode-based payment models on Medicare utilization and spending
- Analysis of trends in the growth of Medicare Advantage spending and enrollment and healthcare spending growth patterns over time.

Undergraduate responsibilities or tasks: Review of potential data sources; obtain, clean, and organize data for analysis; analyze data for research projects; conduct literature review and synthesize Medicare policy information.

Preferred (or required) skills and/ or experience: Highly detail-oriented, deep curiosity about health care policy, strong communication skills, advanced Excel, STATA, R, or SAS skills a plus.

Positions available: 2

Work location: Hybrid; 3 days per week at 555 Pennsylvania Ave. NW in Washington DC for team collaboration.

Arturo Casadevall: Molecular Microbiology & Immunology, BSPH; Infectious Diseases, SOM

Project: We have a few open projects for students this summer. Our lab research focuses on infectious diseases and the immune response, these projects all focus on the fungal pathogens *Cryptococcus neoformans* and *Cryptococcus gattii*. Specifically, these research projects focus on the characterization of the polysaccharide capsule of *Cryptococcus*. The capsule is made up of two polysaccharides glucuronoxylomann (GXMGal) and glucuronoxylomannan (GXM). GXMGal is the minor, and simpler component of the capsule which has been well characterized. We will focus on the major component, GXM, which is reported to express six distinct repeats. This project will focus on determining the GXM motif repeat expression of cryptococcal strains to help better understand how GXM is regulated and expressed. This work will feed into both therapeutic and vaccine development.

Undergraduate responsibilities or tasks: Become familiar with, and eventually perform independent research. Experiments will vary including microbial culture, polysaccharide isolation, HPLC, SEC-MALS, ELISA, NMR, and some computer programming.

Preferred (or required) skills and/ or experience: No prior research is necessary, however an understanding of the techniques listed above will be advantageous. All techniques will be taught during the summer internship.

Positions available: 1

Work location: Depending on the project, East Baltimore campus or hybrid.

Nilanjan Chatterjee, Biostatistics and Genetic Epidemiology: Biostatistics, BSPH; Oncology, SOM

Project: Developing and applying machine learning and statistical causal inference methods for analyzing population-scale genomic, proteomic and epidemiologic datasets for the development of predictive models for disease-risk and intervention targets for disease prevention.

Undergraduate responsibilities or tasks:

- 1) Data Cleaning and Analysis
- 2) Coding
- 3) Pipeline development

Preferred (or required) skills and/ or experience:

- 1) Strong coding skills
- 2) Background in machine learning and statistical modeling

Positions available: 1

Work location: Bloomberg School of Public Health (Hybrid and flexible)

Lisa Cooper, Equity in Health and Healthcare: Medicine, SOM; Health, Behavior and Society, BSPH; SON

Project: The Johns Hopkins Center for Health Equity (JHCHE) has several potential opportunities for BDP summer undergraduate researchers. We aim to match undergraduate researchers' interests and skills with the needs of each project. Projects include:

Joining the National Program Office team (based at JHCHE) to support the Merck Foundation funded Collaborative for Equity in Cardiac Care, a \$22 million, five-year initiative aimed at enhancing access to high-quality, person-centered health care for people living with heart conditions in the U.S. Eleven organizations (health systems, CBOs, academic institutions) have received grants to support the development and implementation of evidence-informed, comprehensive programs to improve health outcomes in communities where access to timely care for cardiovascular disease is a challenge.

Support the NIMHD-funded Mid-Atlantic Center for Cardiometabolic Health (MACCH) based at JHCHE. MACCH consists of four distinct research projects supported by 3 cores aimed at advancing health equity in Maryland by addressing disparities in cardiometabolic diseases. The projects include:

- (1) Healthy for Two, a randomized trial comparing the effectiveness of an evidence-based pregnancy/postpartum health coaching/home visiting intervention to usual home visiting services in reducing postpartum weight retention among Black and Latinx birthing people at high risk for cardiometabolic health disparities;
- (2) UNLOAD-Heart Failure, a randomized trial examining the effectiveness of a multi-level intervention of problem-solving training, community health worker (CHW) support and partnership with community facilities for enhancing cardiorespiratory fitness in adults with low socioeconomic status, diabetes, obesity and asymptomatic cardiac dysfunction;
- (3) LINKED-HEARTS, a cluster-randomized trial testing the effectiveness of a multi-level intervention linking self-monitored blood pressure (BP) with telemonitoring, team-based care with pharmacists and CHWs, and provider-level interventions compared to enhanced usual care, for improving BP control among socially disadvantaged adults with uncontrolled hypertension plus diabetes or chronic kidney disease; and
- (4) DASH-Life, a pilot Food-is-Medicine intervention for adults with hypertension and type 2 diabetes residing in Healthy Food Priority Areas in Baltimore ('food deserts')—a population at high risk for adverse cardiometabolic health outcomes. All projects are nearing completion. We anticipate that DASH-Life and UNLOAD-Heart Failure may have a greater need for undergraduate researcher support.

Undergraduate responsibilities or tasks: Specific tasks depend on the project. Tasks may include: attending and participating in research team meetings, documenting research meetings and compiling agenda items, conducting follow-up data collection calls/visits with enrolled participants, literature reviews, drafting tables/figures/text for manuscripts and presentations, participating in qualitative and quantitative data collection activities, participating in the planning of annual meetings, and supporting community engagement efforts.

Preferred (or required) skills and/ or experience: Exceptional communication skills. Prior experience in research a plus. Passionate about health equity/social justice.

Positions available: 2

Work location: Hybrid/East Baltimore Campus

Derek Cummings, Infectious Disease Dynamics: Epidemiology, BSPH; Biomedical Engineering, WSE

Project: Work on development of analytical and engineering tools to use continuous mark release recapture approaches from ecology to estimate population sizes of medically important species of mosquito. Applicants will work with a team to apply design, machining, image analysis, AI based species identification and simulation tools to refine an existing methodology that our lab has developed.

Undergraduate responsibilities or tasks: Work with team to test and refine design of trap. Develop and use simulations to test design approaches for mosquito population, mobility and age estimation. Deploy trap in laboratory environments as well as in field.

Preferred (or required) skills and/ or experience: Experience with raspberry pi systems, 3d printing and design, image analysis, AI classification algorithms and simulation (in R, python or C) or a subset of these skills.

Positions available: 3

Work location: Clark Hall, Hackerman Hall, and Bloomberg School of Public Health

David DeMille, Atomic/Molecular Physics and Precision Measurement: Physics and Astronomy, KSAS; Research and Exploratory Development, APL

Project: Our group is constructing several experiments which use methods of quantum sensing to search for new particles and forces (beyond those in the Standard Model of particle physics) with an apparatus that fits in a single room. The apparatus is almost entirely designed, simulated, assembled, and tested by students prior to its final use to probe fundamental physics. Your summer research project will be to assist graduate students and postdocs in whatever aspects of experimental design/simulation/assembly/testing are most pressing when you join. Some of these projects may spin off into short-term, stand-alone efforts that can be led by an undergraduate.

Undergraduate responsibilities or tasks: Your summer project may include any of these types of design/simulation/assembly/testing tasks: custom electronics; custom laser/optical setups; custom cryogenic systems; custom data acquisition/control systems (interfacing computers with lab instruments); custom ultra-high vacuum systems; custom high-temperature vaporization sources; etc.

Preferred (or required) skills and/ or experience:

- **Required:** must have completed at least 1 year of physics courses at JHU, including associated labs (or equivalent experience with basic instrumentation for physics), and mathematics through Calculus II (or equivalent).
- **Preferred:** Experience in coding, especially in Python; any "Maker" or hands-on lab experience.

Positions available: 2

Work location: In person at Bloomberg Center for Physics and Astronomy

Andrew Feinberg, Epigenetics: Medicine, Oncology, Molecular Biology & Genetics, Psychiatry & Behavioral Science, SOM; Mental Health, Biostatistics, BSPH; Biomedical Engineering, WSE
Project: The laboratory is investigating the role of epigenetics in gene-environmental interaction in normal development and disease. Current student projects address the epigenetics of aging, epigenetic entropy and phenotype in the collaborative cross mouse, and epigenetics of cancer metastasis. A summer project would involve computational and some laboratory analysis of epigenomic data, in collaboration with a graduate student or postdoc. Our research and publications are described in detail at <http://feinberglab.jhu.edu>

Undergraduate responsibilities or tasks: Coding in R, UNIX-based computational analysis of epigenomic data, hypothesis generation, experimental testing using ordinary molecular biology tools at the bench.

Preferred (or required) skills and/ or experience: Laboratory experience in molecular biology is required, preferably from prior research. UNIX-based computing and facility in R programming is required. The student must commit to attendance in the lab and at laboratory meetings.

Positions available: 2

Work location: East Baltimore Campus, Rangos 5

Paul Ferraro, Human Behavior and Public Policy: Carey; Environmental Health and Engineering, WSE; BSPH

Project: There are two projects in which undergraduate students participate:
An empirical study of the factors that contribute to the resilience of human and non-human individuals and communities in the face of negative shocks, like extreme events from climate change.
An empirical study that aims to replicate and extend several high-impact environmental science (social and natural science) publications to determine how robust the results are..

Undergraduate responsibilities or tasks: In project (1), the student will be tasked with helping us assess prior studies on the topic and understanding where the important gaps are in these literatures. In project (2), the student will be tasked with data analysis (specifically analyses of publications that aim to estimate the effect of one variable on another variable, such as the effect of pollution on health outcomes).

Preferred (or required) skills and/ or experience: For both projects, the main requirements are interest in the topic and some exposure to statistics. If you haven't taken a stats course but you have taken a bunch of other math courses, we can work with that. For Project 2, some familiarity with the software R, Python, or Stata, is desirable but not required if you have at least some coding experience in another context.

Positions available: 3

Work location: Homewood, Harbor East, or Remote (if remote, must be available to meet each week during US business hours).

Jessica Gill, Trauma Recovery Biomarkers: SON; Neurology, SOM

Project: Examine novel biomarkers related to neurological outcomes, including links to neuroimaging.

Undergraduate responsibilities or tasks: The fellow would be engaged in the lab, with activities ranging from wet-lab, to clinical, and analytics.

Preferred (or required) skills and/ or experience: Strong commitment to translational research. No specific skills needed.

Positions available: 1

Work location: East Baltimore campuses; hybrid

Gillian Hadfield, AI Alignment and Governance: SGP; Computer Science, WSE

Project: TBD

Undergraduate responsibilities or tasks: TBD

Preferred (or required) skills and/ or experience: TBD

Positions available: TBD

Work location: TBD

Richard Haganir, Neuroscience and Brain Sciences: Neuroscience, SOM; Psychological and Brain Sciences, KSAS

Project: To study the regulation of synaptic transmission in the brain at the molecular, cellular, circuit and behavioral level. The lab is interested in the mechanisms underlying learning and memory and higher brain function as well as the mechanisms underlying neurological and psychiatric diseases such as autism, schizophrenia and Alzheimer's disease.

Undergraduate responsibilities or tasks: The student will learn how to ask a basic scientific question related to neuroscience/molecular biology which we want to answer, then will help design and do experiments to try to answer this question.

Preferred (or required) skills and/ or experience: None

Positions available: 2

Work location: East Baltimore, 725 N. Wolfe Street, Hunterian 1001

Daniel Kammen, Energy and Climate Justice: Civil and Systems Engineering, WSE; SAIS

Project: Two project areas are available for summer researchers:

1. **Analytic approaches to the energy science of Innovation.** In this joint effort with colleagues at Cambridge University and New York University, we are exploring both the drivers of innovation in energy systems, that include: price declines; performance improvements (e.g. maximum efficiency) and the emergence of new fields, such as energy storage, nuclear fusion, and off-shore wind. This work was most recently published in *Nature* with a focus on nuclear power [1]. During Summer 2026 we would select one or two additional areas for deep dives on learning and innovation dynamics.

[1] Shangwei Liu, Gang He, Minghao Qiu & Daniel M. Kammen (2025) "Can China break the 'cost curse' of nuclear power," *Nature*, **643**, 1186 – 1188. <https://doi.org/10.1038/d41586-025-02341-z>

2. **Energy access and climate justice.** In this project the student would join our data science and field teams to both model the expansion of power grids in under-resourced countries (currently we are working in Kenya, Tanzania, Ethiopia and South Sudan) to look at the optimal paths of both grid expansion and the deployment and integration of mini-grids into the power sector and the health sectors (via powering urban and rural health clinics).

Undergraduate responsibilities or tasks: The student will learn how to ask a basic scientific question related to neuroscience/molecular biology which we want to answer, then will help design and do experiments to try to answer this question.

Preferred (or required) skills and/ or experience: Experience with Python, R, and some background energy systems or systems engineering.

Positions available: TBD

Work location: TBD

Kathy McDonald, Health Systems, Quality and Safety: SON; Armstrong Inst for Patient Safety & Quality, General Internal Medicine, SOM; Malone Center for Engineering in Healthcare, WSE; Hopkins Business of Health Initiative, Carey & BSPH

Project: Our “dry lab” focuses on systems-oriented research innovations and how research-driven solutions move into practice, workforce and policy. Our cross-cutting mission is to understand the innovation life cycle from creation to adoption and scale for equitable positive impact. Most of our projects have a health focus, but our interest in “knowledge to action” (K2A) research extends across fields.

Topic areas include: patient safety, health care quality, patient reported measures of diagnostic excellence, education, and systems science. As Hopkins invests in artificial intelligence (AI) capabilities and strategies, we are exploring AI-enabled research methods, AI’s role in K2A, patient-facing AI and global advances in medical AI.

Undergraduate responsibilities or tasks: Undergraduates will gain experience in various stages of research depending on the specific research project (ongoing and new ones generated by undergraduates). Research stages include formulating research questions, selecting methods and data sources, executing research plans, and summarizing research progress (both papers and presentations).

Preferred (or required) skills and/ or experience: None required, but interested in students who want to engage deeply in the mission of our work.

Positions available: 2

Work location: East Baltimore Campuses; virtual or hybrid

Ebony McGee, Innovation and Inclusion in the STEM Ecosystem: SOE; Mental Health, BSPH

Project: Undergraduates will contribute to the 400 Years Project, a digital humanities initiative led by Bloomberg Distinguished Professor Dt. Ebony O. McGee. This project documents four centuries of Black innovation in STEMM (science, technology, engineering, mathematics, and medicine) to strengthen racial and STEM identities among Black students. Summer researchers will support the expansion of the project's digital archive and interactivity by conducting guided archival research on Black innovators, verifying sources, drafting profile content, assisting with metadata tagging, navigation improvements, and helping develop or test emerging features like a curriculum tool and digital trading-card experience.

Undergraduate responsibilities or tasks:

- Conduct archival research using dissertations, community archives, newspapers, patents, institutional repositories, social media, and other historical/contemporary sources to identify and document Black STEMM innovators
- Collaboratively cross-reference and verify sources, including noting cases of contested attribution or intellectual property theft
- Draft and edit profiles for the digital timeline, including summaries, historical context, and citations
- Assist with improving website metadata, tagging, and navigation to enhance user-experience and searchability
- Support development and user-testing of digital tools, such as the curriculum interface and the gamified trading card module
- Participate in team meetings, contribute to internal documentation, hone presentation skills, and receive close mentorship.

Preferred (or required) skills and/ or experience:

Preferred: Experience with web design and digital tools and social media tools

No prior experience with archival research or tools is necessary, training will be provided.

Positions available: 1

Work location: Remote

Stephen Morgan, Sociology and Education: Sociology, KSAS; SOE

Project: The undergraduate researcher will assist with developing speech processing models for analyzing a large and comprehensive set of radio transmissions of the Baltimore Police Department. The motivation for the overall project is described in a recent journal article, Police Radio Communications as a Measure (see <https://link.springer.com/article/10.1007/s12103-025-09851-6>). The specific goals for the next phase of the project are detailed in the concluding paragraphs of the article, and they involve curating measures of police activity from the spoken content of radio traffic, as it is distributed across time and Baltimore's 9 police districts. Some work may also involve working with radio transmissions from the Chicago Police Department.

Undergraduate responsibilities or tasks: Tasks include training and evaluating models, implementing statistical analyses, assisting with data curation and labeling.

Preferred (or required) skills and/ or experience: The student must have experience writing code. Familiarity with Python and NLP packages (e.g., Huggingface, pytorch) is preferred.

Positions available: 2

Work location: Mergenthaler Hall and Malone Hall, depending on the task.

Eliana M. Perrin: Pediatrics, SOM; SON; BSPH

Project: I study obesity prevention (particularly in populations that are disproportionately affected) and primary care. I am a pediatrics clinical and public health researcher. That means I do research that has its base in the clinical setting (general pediatrics clinics) and community, but I also study trends and populations. A lot of the work I do is with other institutions nationwide. I am a fully-funded researcher so I have a lot of projects right now that could use research coordinator support.

Two main projects are related to a successful obesity prevention program that I co-developed, called Greenlight Plus. We are funded to follow children who did and children who did not receive the program in their first two years of life until they are 6 years old. At that time (now), we are doing accelerometry, dietary recalls, and screentime interviews on them. This is for 900 children nationwide. There are lots of spin off projects, and it would be an exciting project for a student to get involved with. Another project that is funded is to get this program into the hands of 35,000 infants at 45 practices nationwide! I also have a couple of projects that are based in the Harriet Lane clinic here at Hopkins and projects related to the primary care consortium that I run.

Undergraduate responsibilities or tasks: Undergraduate responsibilities or tasks would depend on the project and student skill base but may involve literature searches, administrative tasks (mailing accelerometers, stocking and organizing booklets, etc), survey administration, organizing interviews, interviewing, qualitative coding, etcetera. Students that have worked with me have done administrative filing, but they have also published papers. It all depends on the student, the project, and the timing.

Preferred (or required) skills and/ or experience:

- **Required:** Familiarity with office software (Microsoft Word including track changes, PowerPoint, Excel), timeliness, responsibility, strong work ethic.
- **Preferred:** Spanish fluency, qualitative experience (interviewing and/or coding), prior research in a clinical setting.

Positions available: 2

Work location: Hybrid; in-person portion at Harriet Lane Clinic/Rubenstein Building at 200 Wolfe Street

Steven Salzberg, Computational Biology and Genomics: Biomedical Engineering, SOM; Computer Science, WSE; Biostatistics, BSPH

Project:

We work in four different areas, and each student will be assigned a graduate student or postdoctoral fellow as a mentor in one of these (which you can find out more about at salzberg-lab.org):

- Computational gene finding and genome annotation. We have been working for many years on methods to identify genes, ranging from methods for bacterial gene finding to the development of a new human gene database, called CHESS. We're now using ColabFold as a new way to identify functional gene variants
- Transcriptome (RNA sequencing) analysis. Over the past decade, members of the lab along with our collaborators have developed multiple programs for RNA-seq analysis that have been adopted around the world. These include the Bowtie, TopHat, and Cufflinks programs, and more recently the HISAT and StringTie programs, with over 100,000 citations collectively. Together these programs align and assemble RNA sequencing data to reconstruct a detailed picture of all the genes and gene variants that are expressed in a tissue sample.
- Metagenomics and microbiome analysis. We have developed a variety of tools to analyze metagenomics data sets, including the widely-used Kraken and Centrifuge systems.
- Genome Assembly. We develop genome assembly algorithms to use the latest generation of sequencing technologies, pushing the technology to take on ever-larger and more complex genomes, such as our recent projects assembling the genomes of the redwood and sequoia trees. We apply these methods in collaborations with biologists to sequence the genomes of species ranging from bacteria to plants and animals. See our Genome Projects page for a partial list of the many genomes we have assembled and published over the years.

Undergraduate responsibilities or tasks: Interns will be assigned a workstation in the lab and are expected to be at the lab in person during regular working hours throughout the internship. Interns write software and analyze data as directed by the PI and graduate student supervisors. Attend bi-weekly lab meetings.

Preferred (or required) skills and/ or experience: Expertise in Unix and Python is required. Expertise in C++ and R is a plus but not required.

Positions available: 2

Work location: Center for Computational Biology, Wyman Park Building (in person only)

Jeremy Shiffman, Global Health Policy: International Health, BSPH; SAIS

Project:

The concepts of ‘social’ and ‘commercial’ determinants of health are now widely accepted in the global health field. The concept of ‘political’ determinants of health, by contrast, has received less attention in the global health field than its social and commercial counterparts. There is a need to define this concept more precisely, and to inject it more centrally into the global health field. Politics shapes health outcomes at all levels, and an understanding of politics and of governance arrangements—institutions and rules that shape collective action—sheds light on the ways in which power structures population health outcomes. We have been invited by a prominent medical journal to put together a series of articles on the political determinants of health. We expect the series will:

- Clarify the meaning of the concept of ‘political determinants of health’;
- Develop a framework, grounded in innovative political and social science research, which identifies the major political determinants of health and the relationships among them;
- Specify the ways in which politics shapes population health outcomes at global, national and local levels, and;
- Draw out a concise set of implications for action on political determinants to improve population health.

Undergraduate responsibilities or tasks: Under the careful guidance of the research team, the undergraduate will be responsible for gathering and reviewing documents that will underpin one or more of the proposed series papers. The undergraduate will also support organization of and participate in a workshop to discuss the project papers. This person will be supervised by BDP Jeremy Shiffman and Associate Research Professor Yusra Shawar. The primary responsibilities will be to collect and organize relevant articles, produce a synthesis report on key themes, and help with workshop organization.

Preferred (or required) skills and/ or experience: Interest in global health. Some research experience, especially collecting and/or analyzing qualitative data, and producing synthesis reports. Undergraduate coursework in public health, political science, sociology, anthropology, communications, history of medicine or other social sciences a plus but not required. Experience organizing workshops or conferences also helpful. Applicants should describe any relevant experience in the application. Track record of conscientiousness and reliability in past work, both professional and academic.

Positions available: 1

Work location: Articles can be uploaded to Dropbox, so there is no need to conduct the research work in a particular place, although access to Johns Hopkins library and other libraries via web to gather documents will be crucial. I and others on the research team will exercise close supervision to ensure that the undergraduates learn and gain skills from the work and perform the work carefully. Availability to be at 555 Penn (in Washington, DC) for summer workshop preferred.

[David Sing, Exoplanetary Physics:](#) Earth and Planetary Sciences, Physics and Astronomy, KSAS

Project: This project will use data from the Hubble and James Webb Space Telescopes to measure the spectra of exoplanets. The overall goals are to constrain the composition of planetary atmospheres, and understand their atmospheric dynamics and planet origins. The project will include data analysis of existing time-series datasets of transit events, where a planet passes in front of the star, using existing reduction codes written in python. The scientific goals depend on the dataset, with several to choose from, but range from studying the cloud dynamics in gas giant planets to constraining the chemical composition of mini-Neptune planets.

Undergraduate responsibilities or tasks: Tasks include learning how to reduce astronomical data, becoming proficient with STScI HST and JWST reduction codes and the in-house FIREFLY reduction suite, and leading the reduction and analysis efforts for a planet. Time permitting, the student will also be tasked with writing up the results for publication.

Preferred (or required) skills and/ or experience: Python experience preferred but not required.

Positions available: 2

Work location: Homewood Campus

Chi Van Dang, Cancer Medicine: Oncology, SOM; Biochemistry and Molecular Biology, BSPH

Project 1: This project involves characterizing transgenic mice expressing a FLAG-tagged Acss2 (acetyl-CoA synthetase 2) that we are studying in the context of naive T cell biology and tumor immunology. The key question is "what are the Acss2 (known to be nuclear) target genes relevant to naive T cell maintenance and memory state establishment?" To answer this question, mice are being genotyped to identify homozygous breeding pairs from which animals will provide FLAG-tagged Acss2 in T cells (harvest from spleens) that will be subjected to Cut&Tag (a method that identifies chromatin binding of proteins) to identify genomic loci occupied by Acss2.

Undergraduate responsibilities or tasks:

- 1) learn how to genotype
- 2) learn how to harvest T cells
- 3) participate in characterizing FLAG-tagged T cells during their activation
- 4) participate in isolating T cells for Cut&Tag

Preferred (or required) skills and/ or experience:

- Familiarity with PCR for genotyping
- Experience with animal work
- Basic molecular biology experience

Project 2: This project involves characterizing a transgenic mouse bearing a FLAG-tagged Acss2 gene, allowing for the study of Acss2 in T cells at different stages of activation and differentiation. Loss of Acss2 in T cells resulted in decreased anti-tumor response, hence, understanding the role of Acss2 in the production of acetyl-CoA for the regulation of gene expression requires a molecular hook provided by the FLAG-tagged that can be detected using specific anti-FLAG antibody. Genotyping of mice to produce homozygous breeding pairs.

Undergraduate responsibilities or tasks:

1. Learn how to genotype mice to produce homozygous breeding pairs.
2. Learn how to access Acss2 levels in different T cell compartments and different activation state.
3. Learn how to perform chromatin immunoprecipitation to identify Acss2 genomic binding sites.

Preferred (or required) skills and/ or experience:

- Basic cell culture and molecular biology skills.

Positions available: 2

Work location: East Baltimore campus: Cancer Research Building 1, Rm 450, work in person

Carl Wu, Chromatin Biology and Biochemistry: Biology, KSAS; Molecular Biology and Genetics, SOM

Project: The Wu lab uses advanced fluorescence microscopy to visualize the single-molecule dynamics and spatial distributions of nuclear proteins and chromatin factors in living cells or in vitro on surface-immobilized DNA and chromatin. Students will learn and apply single-molecule imaging and computational tools to localize and track protein molecules in real time and calculate their kinetic parameters to acquire insights on the accessibility and occupancy of chromatin targets and the influence of the epigenetic landscape on target search and gene expression.

Undergraduate responsibilities or tasks: Students will join ongoing projects on imaging of chromatin and transcription proteins, working under mentorship of senior graduate students or postdoctoral fellows. Responsibilities include practice of molecular genetics and cell biology, cell culture, microscope imaging, computation and data analysis, reading and discussion of current scientific literature.

Preferred (or required) skills and/ or experience: Preference for students who are majoring in molecular and cellular biology, biomedical engineering, biophysics, or related programs and are aiming for PhD or MD-PhD studies after graduation.

Positions available: 1-2

Work location: Homewood campus, UTL research labs