



BDP Summer 2023 Undergraduate Research Projects as of December 15, 2022



NOTE: Project descriptions are still coming in; be sure to check for updates before submitting!

Participating BDPs and Research Teams:

[Nicole Baumgarth](#): Molecular Microbiology and Immunology, BSPH; Molecular and Comparative Pathobiology, SOM; Director, Lyme and Tickborne Diseases Research and Education Institute

[Chuck Bennett](#): Physics and Astronomy, KSAS; JHU Applied Physics Lab (APL)

[Arturo Casadevall](#): Molecular Microbiology & Immunology, BSPH; Infectious Diseases, SOM

[Nilanjan Chatterjee](#): Biostatistics, BSPH; Oncology, SOM

[Jeff Coller](#): Molecular Biology and Genetics, SOM; Biology, KSAS

[Lisa Cooper](#): General Internal Medicine, SOM; Health, Behavior & Society, BSPH; Community-Public Health, SON

[Chi Van Dang](#): Oncology, SOM; Biochemistry and Molecular Biology, BSPH; Kimmel

[Andrew Feinberg](#): Oncology, Molecular Biology & Genetics, Psychiatry & Behavioral Sciences, SOM; Mental Health, Biostatistics, BSPH; Biomedical Engineering, WSE

[Paul Ferraro](#): Carey Business School; Environmental Health & Engineering, WSE and BSPH

[Richard Huganir](#): Neuroscience, SOM; Psychological and Brain Sciences, KSAS

[Patricia Janak](#): Psychological and Brain Sciences, KSAS; Neuroscience, SOM

[Kathryn McDonald](#): SON; Armstrong Institute for Patient Safety & Quality, General Internal Medicine, SOM; Malone Center for Engineering in Healthcare, WSE; Hopkins Business of Health Initiative, Carey & BSPH (Health Policy and Management)

[Ulrich Mueller](#): Neuroscience, SOM; Biology, KSAS

[Eliana M. Perrin](#): Pediatrics, SOM; SON; BSPH

[Hanna Pickard](#): Philosophy, KSAS; Berman Institute of Bioethics

[Steven Salzberg](#): Biomedical Engineering and Medicine, SOM; Computer Science, WSE; Biostatistics, BSPH

[Jeremy Shiffman](#): International Health, BSPH; School of Advanced International Studies (SAIS)

[Vesla Weaver](#): Political Science and Sociology, KSAS

[Carl Wu](#): Biology, KSAS; Molecular Biology & Genetics, SOM

Nicole Baumgarth: Molecular Microbiology and Immunology, BSPH; Molecular and Comparative Pathobiology, SOM; Director, Lyme and Tickborne Diseases Research and Education Institute

Projects: We have a number of research programs in the lab that an undergraduate student could participate in. Overall, the laboratory is interested in understanding how B cells, the cells responsible for antibody production, are regulated in response to infections. We work with two mouse models of infection: Influenza virus infections and infections with *Borrelia burgdorferi*, the causative agent of Lyme disease.

1. Influenza virus infection induces a rapid and highly protective B cell response. We use flow cytometry to study the outcome of influenza infection on various B cell subsets. One project in the lab is trying to understand how B cells ability to produce a neurotransmitter (acetyl choline) affects the immune response to influenza.
2. Antibodies differ in their type (IgM, IgG, IgA). The type of an antibody determines its function, as individual immune cells have receptors that are specific for binding to these different antibody types. Furthermore, molecules of the innate immune system (complement in particular) can bind differently to the antibodies, which supports the ability of antibodies to kill pathogens that are bound. The lab is studying the function of IgM and its interactions with its receptor. IgM is interesting, as it is the only evolutionary conserved antibody from sharks to humans, yet its function has been largely overlooked. We have a mouse model of IgM-receptor deficiency as well as a model of secreted IgM-deficiency which helps us to explore its function in the context of immunization as well as infection with influenza virus.
3. Infections with *Borrelia burgdorferi* induce B cell responses that help to control the infection, but do not clear *Borrelia* from the host. The outcome is a chronic persistent infection. We have various projects in the lab to explore what particular parts of the immune response might be altered by *Borrelia* in order for it to establish persistent infection of mice. We use infections of mice and then flow cytometry, ELISA and ELISPOT to explore the B cell and the CD4 T cell responses to this pathogen. Ongoing projects aim to define the function of CD4 T cells and trying to understand how *Borrelia* alters the gastrointestinal microbiota.

These are some ongoing projects. Other projects are likely available and will be defined more precisely prior to study onset.

Undergraduate responsibilities or tasks:

The responsibility of the undergraduate student for each of the projects would differ and would be defined with the student, to match their interests and goals with the project they would be working on. Typically, undergraduates will be given research articles to read in preparation of the work and paired with a more senior person in the lab, or the PI, to discuss questions and outline experiments and goals. They will initially shadow laboratory staff and help with smaller tasks. As they acquire skills they will then be guided to perform their own assays, learn to analyze and summarize their data. They have the chance in weekly lab-meetings to present their results to other members of the lab. They will also be expected to meet bi-weekly with the PI to discuss their findings and outline future steps.

Preferred (or required) skills and/ or experience: We do not expect any prior knowledge or expertise. However, some understanding (or desire to understand) immune responses to infections and/or the basics of microbiology would greatly help. A desire to learn and to explore, to be curious, to listen and follow protocols, and to participate are the biggest assets when beginning to work in the lab. Since most of our work involves the use of mice in research, it is also needed that the student is willing to participate in research involving the use live animals.

Positions available: 2

Work location: 615 Wolfe Street - BSPH, 8th floor W8035

Chuck Bennett: Physics and Astronomy, KSAS; JHU Applied Physics Lab (APL)

Two possible projects:

1. This research project relates to the Cosmological Large Angular Scale Surveyor (CLASS) telescope array that Johns Hopkins University operates high in the Andes Mountains of northern Chile. The two major goals of the research are: (1) to determine, via measurement, the detailed process that led to the first stars forming; and (2) to determine, via measurement, the nature of the first fraction of a second of the creation of the universe. To achieve these goals, CLASS conducts a survey of the polarized cosmic microwave background radiation (the remnant glow from billions of years ago) over most of the sky. The research group builds new instrumentation and analyzes data from the survey. Undergraduates assist in CLASS instrument development and/or survey data analysis.

Undergraduate responsibilities or tasks: Specific student projects, either hardware or software, will be assigned partially based on student skills and preferences.

Preferred (or required) skills and/ or experience: Hardware and/ or computational skills are useful, but not required. A background in physics and/ or engineering is also useful.

2. This project relates to the exciting new Canadian Galactic Emission Mapper (CGEM) radio astronomy effort. The CGEM telescope will map a large fraction of the sky to provide the data needed to better quantify the Milky Way polarized microwave emission, and use that improved data and understanding 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 monitor telescope operations, 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.

Preferred (or required) skills and/ or experience: Coding skills preferred, especially Python.

Positions available: 2

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

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

Project: There are many areas of research exploring fungal pathogens in the Casadevall lab.

Some include:

1. Structure and function of catalytic antibodies: While most catalysis is thought to be carried out by enzymes, our lab and others have shown that antibodies can also carry out catalysis of the antigens that they bind.(Bowen 2016) We are working to characterize this catalysis and the kinetics against different types of targets (i.e. peptides, polysaccharides, nucleic acids). Current open projects include screening of antibodies for catalytic activity and determining the pH at which catalysis is most efficient.
2. The polysaccharide capsule of Cryptococcus: The C. neoformans capsule is required for causing Cryptococcosis disease in humans yet we understand very little about its assembly and structure. To better understand cryptococcal polysaccharides we use multiple biochemical and biophysical techniques (i.e., light scattering, NMR, Mass Spec.). Current open projects include identifying genes/proteins involved in synthesis and assembly of the capsule, determining how polysaccharides change as cells age, solving the polysaccharide structure of the strain Mu-1, and examining the effects of pH on capsule shedding.

3. Vaccines against Cryptococcal meningitis: Cryptococcus is the only known encapsulated yeast, like encapsulated bacteria which cause bacterial meningitis, we hope to exploit cryptococcal polysaccharides for vaccine development. Current open projects include purifying and characterizing capsular polysaccharides for vaccine development, and development of hybridoma cell lines to test the protective capacity of antibodies to inhibit cryptococcal disease in mice.
4. Melanin is the pigment responsible for the color of human skin, but melanin is more than a coloring agent, it is also a virulence factor and an immune compound in insects. Current open projects include characterization of the relationship between pigment and heat capture, characterization of the contents of melanin-containing vesicles, investigation of molecular structure of melanin assemblies at, and their interactions with, the cell wall, investigation of the role of melanin, and its interactors, in the mosquito immune system, and characterization of cell cycle, growth rates, and budding of melanized and non-melanized *C. neoformans*.

Undergraduate responsibilities or tasks: Students will work closely with a mentor during the first 3 weeks to learn relevant techniques. They will then work independently, but with the help of the mentor and other lab members, on their chosen project.

Preferred (or required) skills and/ or experience: While no skills or experience are required, a familiarity with microbiology and biochemistry will be very helpful. Desire to learn and proactiveness are a must, and some basic computer skills are an asset.

Positions available: 2

Work location: East Baltimore campus, Bloomberg School of Public Health

Nilanjan Chatterjee: Biostatistics, BSPH; Oncology, SOM

Project: Analysis of large scale observational datasets to identify genetic and environmental causes of complex diseases, like cancers, diabetes and heart diseases, and use statistical machine learning methods for developing models for predicting future risks of these diseases in currently healthy individuals.

Undergraduate responsibilities or tasks: Data analysis, code development in R and Python, literature review.

Preferred (or required) skills and/ or experience: Programming skill (necessary), statistical/probabilistic inference (desirable).

Positions available: 2

Work location: Mostly virtual

Jeff Coller: Molecular Biology and Genetics, SOM; Biology, KSAS

Project: Investigation of mRNA translation and mRNA stability and application to mRNA therapeutics.

Undergraduate responsibilities or tasks: Perform basic research tasks. Assays, cloning, etc...

Preferred (or required) skills and/ or experience: Knowledge of basic chemistry and molecular biology

Positions available: 2

Work location: PCTB 503

Lisa Cooper: General Internal Medicine, SOM; Health, Behavior & Society, BSPH;
Community-Public Health, SON

Project: Under the direction of the Principal Investigators and Research Program Managers, the student will assist in the coordination of activities that support the overall work of and a specific research study at the Johns Hopkins Center for Health Equity. The Center works to promote equity in health for at-risk populations through advancing scientific knowledge, promoting sustainable changes in practice and policy, partnering with communities, raising public awareness of health inequities, and training scholars.

Undergraduate responsibilities or tasks:

- Work with study staff on data collection, data entry, data analysis, and general summaries of research findings
- May participate in research participant recruitment
- Participate in research team meetings
- Assist with preparation of study materials (e.g. flyers) and PowerPoint presentations
- Performs literature reviews
- Assist in the coordination and participates in study meetings, including the preparation of agendas and taking of detailed meeting minutes
- Assist with community engagement activities, including engagement with Community Advisory Board Meetings
- Assist with manuscript preparation and maintenance of reference library

Preferred (or required) skills and/ or experience: Computer skills, Word

Positions available: 2

Work location: Remote

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

Project: The Dang Lab summer projects will involve experimental design basic molecular technique, cell culture, and data analysis of research concerning cancer and immune cell metabolism and tumor formation and progression. The projects also include to role of the cellular molecular clock in cancer cell biology and cancer therapy.

Undergraduate responsibilities or tasks: Students should have basic college biology, chemistry and physics courses and laboratory experience is desired. Students shall have immediate report to an assigned senior member (post-docs and research associates) and provide time commitment expectation. Data collection and notebook upkeep are expected.

Preferred (or required) skills and/ or experience: Wet lab and lab software experiences are preferred.

Positions available: 2

Work location: Medical School, Cancer Research Building 1, Room 443

Andrew Feinberg: Oncology, Molecular Biology & Genetics, Psychiatry & Behavioral Sciences, 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, computational analysis of DNA methylation in leukemia, epigenetic entropy and phenotype in the collaborative cross mouse, and epigenetics of neuropsychiatric disease. 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: Homewood campus, Clark 101 and/ or East Baltimore, Rangos 5.

Paul Ferraro: Carey Business School; Environmental Health & Engineering, WSE and BSPH

Project: There are three projects in which undergraduate students can participate:

1. 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.
2. A review paper on the limitations of applying insights from the behavioral sciences (psychology, cognitive science, neuroscience) to public policy design. [it's possible that this study may be completed by June 2023]
3. An empirical study of the mechanisms through which global change affects the functioning of ecosystems.

Undergraduate responsibilities or tasks: In project (1) and project (2), 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 (3), the student will be tasked with some data analysis and literature review to help us understand how ecologists have tried to empirically identify mechanistic processes in experimental and non-experimental ecosystems.

Preferred (or required) skills and/ or experience: The main requirement is interest in the topics. Some familiarity with statistics, behavioral science, economics or ecology, as well as the software R, Python, or Stata, is desirable but not required. The exception is project (3), which will require prior experience with statistics and data analysis.

Positions available: 3

Work location: Remote/virtual participation is possible. Weekly lab meetings may be conducted on Homewood campus in Ames Hall. Note, due to schedule, in-person meetings may not happen until July.

Richard Huganir: 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: Assist postdoctoral fellow or senior graduate student in research projects using molecular biology, cell biology, biochemistry, mouse behavior or in vitro or in vivo microscopy techniques.

Preferred (or required) skills and/ or experience: Previous experience in a laboratory. Preferred interest in neuroscience.

Positions available: 2

Work location: Medical School Campus, 725 North Wolfe Street, 1001 Hunterian Building

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

Project: Summer fellows will assist a graduate student in their ongoing experimental work. These studies involve examining natural reward or alcohol-seeking behavior in rodent models and trying to understand the role of neural activity in the nucleus accumbens, central nucleus of the amygdala, or the BNST in this reward seeking behavior. Techniques include machine learning analysis of behavior, optogenetic manipulation of neuronal activity, and electrophysiological recording.

Undergraduate responsibilities or tasks: Animal behavioral training; data analysis; brain slicing, mounting and staining; combining optogenetics and ephys with behavior.

Preferred (or required) skills and/ or experience: Some prior experience with animal handling helps but is not necessary. Familiarity with Matlab or similar helps, but is not necessary.

Positions available: 2

Work location: Homewood Campus: Dunning Hall second floor

Kathryn McDonald: SON; Armstrong Institute for Patient Safety & Quality, General Internal Medicine, SOM; Malone Center for Engineering in Healthcare, WSE; Hopkins Business of Health Initiative, Carey & BSPH (Health Policy and Management)

Project: The “dry lab” focuses on patient safety and health care quality research with an equity lens. We work to understand how systems (e.g., health care delivery organizations, public health organizations, social service organizations, networks of organizations) shape what happens to patients and frontline health care workers as they produce health and reduce suffering from illness. Ongoing projects include exploring diagnostic excellence (safety, quality, and equity) and patients’ diagnostic journeys; generating innovative care for aging; advancing measures of patient experiences and outcomes; analyzing decision-making; and improving coordination of care. A cross-cutting project aims to develop an interdisciplinary research base for facilitating “knowledge to action” research. We are bringing together several interdisciplinary areas pertinent to this goal: implementation science, systems science and management & organization science.

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). As part of the Center for Patient Reported Measures of Diagnostic Excellence, students will work with stakeholders, support learning communities, and participate in interviews, presentations, dissemination activities.

Preferred (or required) skills and/ or experience: none required, but interested in students who want to engage deeply in the topic

Positions available: 2

Work location: East Baltimore Campus, School of Nursing, with possibility for hybrid or virtual

Ulrich Mueller: Neuroscience, SOM; Biology, KSAS

Project: We study the molecular mechanisms underlying our ability to hear sound and defects in this process that cause deafness. For this purpose we use a variety of techniques ranging from human and mouse genetics, to biochemistry and structural biology, to imaging and electrophysiology.

Undergraduate responsibilities or tasks:

The project will be adjusted to the interests of the student and focus on the study of genes that are linked to the process by which sensory cells of the inner ear function and how they are affected in disease. The student will conduct experimental work to contribute to one of our research programs. Examples for possible experiments are as follows:

1. Study expression of proteins linked to hearing loss in mouse models. Analyze genetically modified mice by immunohistochemistry, histology.
2. Study biochemical properties of proteins linked to hearing loss using molecular techniques.
3. Computational work to analyze single cell RNA sequencing data

Preferred (or required) skills and/ or experience: Some knowledge of molecular or biochemical biology would be important.

Positions available: 1

Work location: East Baltimore Medical Campus; 725 N. Wolfe Street PCTP1015; in person

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

Project: I am a Bloomberg Distinguished Professor of Primary Care, a pediatrician, and a researcher of obesity prevention, health disparities and primary care. I have many ongoing projects that look at the relationships between social determinants of health (food insecurity, housing, etc) and child health outcomes, particularly in families and communities that have been systematically disadvantaged. I also am a Principal Investigator on an NIH grant that is a randomized controlled trial to prevent obesity in children in doctor's offices starting when they are newborns. Finally, I am working to reboot a primary care consortium bringing together the Schools of Medicine, Nursing, and Public Health as well as the Johns Hopkins Community Physicians to elevate the stature of primary care throughout Hopkins in the areas of research, clinical care best practices, advocacy/policy, and education (getting undergrads who are going to medical and nursing school to keep thinking about primary care)!

I have a variety of projects that could use undergraduate student help depending on the student's interests and emerging priorities.

Undergraduate responsibilities or tasks: The responsibilities and tasks depend on the specific project(s). Broadly speaking, the tasks include: literature searches, help with manuscripts and grants, development and organization of obesity prevention materials, note taking at meetings, participant screening and questionnaires, help with interviews and/or focus groups, data entry, etc.

Preferred (or required) skills and/ or experience: Preferred ability to speak/write in Spanish; work with Excel; make power points; work with EndNote or RefWorks, experience with human subjects' research; experience with data entry and/or analysis.

Positions available: 1

Work location: Much of the work can likely be virtual; some in person work at the David Rubenstein Building near the hospital downtown, the School of Nursing, and occasionally at the Children's Medical Practice (Bayview).

Hanna Pickard: Philosophy, KSAS; Berman Institute of Bioethics

Project: There is growing interest in studying how social factors shape basic neurobiology and contribute to a wide range of neuropsychiatric disorders, including in particular, addiction. It is therefore critical to develop animal models that allow us to probe the neurobiological bases of social interaction, ideally improving translational validity from the bench to the clinic. This project is part of a standing interdisciplinary collaboration between Hanna Pickard, a philosopher at Johns Hopkins who works on addiction and has clinical background treating complex needs, and Marco Venniro, an animal models researcher at the University of Maryland. It aims to develop behavioral procedures and experimental tools to study volitional (subject-controlled) naturalistic social interaction among rats, as foundational to the study of social factors in rodent drug choice. The position will involve working as part of the [Venniro Lab](#) at the University of Maryland, Baltimore.

Undergraduate responsibilities or tasks:

- Design new experimental apparatus and program new tasks for social behavior in rodents
- Pilot new behavioral procedures
- Collect and analyze behavioral data

Preferred (or required) skills and/ or experience: Basic knowledge of machine learning and the ability to program is required; some background in behavioral neuroscience and demonstrable interest in neuropsychiatric disorders and/or interdisciplinary approaches to mind and behavior is desirable.

Positions available: 1

Work location: 3 days/week at the Venniro Lab, located in the University of Maryland School of Medicine, Department of Anatomy and Neurobiology, 685 W Baltimore Street HSFI, Room 265, Baltimore, MD, 21201; 2 days/week remotely (during programming phases); one meeting every 2-3 weeks either at JHU or virtually to update and report on progress.

Steven Salzberg: Biomedical Engineering and Medicine, SOM; Computer Science, WSE; Biostatistics, BSPH

Project: Our lab works on (1) whole-genome assembly, (2) transcriptome or RNA sequencing analysis, (3) computational gene finding, and (4) microbiome methods and analysis. All of our work is computational, and we collaborate closely with experimental and clinical labs to collect genomic data from humans and a wide range of other species. For more information, please visit the lab page, <https://salzberg-lab.org/>.

Undergraduate responsibilities or tasks: Summer interns are assigned to work with a Ph.D. student or a postdoctoral scientist, who provides close supervision throughout the internship. Interns attend lab meetings and learn about other research in the lab as well as their own projects. All work involves programming, usually around one or more DNA or RNA sequencing data sets.

Preferred (or required) skills and/ or experience: Familiarity with the Unix operating system and the command line is required. Strong programming skills in Python, Perl, or C++ (any one of these) are required as well.

Positions available: 2

Work location: Homewood, Wyman Park Bldg.

Jeremy Shiffman: International Health, BSPH; School of Advanced International Studies (SAIS)

Project: Sexual violence against children is a serious global problem. About one in four girls and one in 13 boys experience sexual violence at some point in their lives, increasing the risk for a host of adverse consequences. In recent years, some global and national organizations have offered support for addressing sexual violence against children. However, commitment to the issue is far from sufficient.

You will join a research program examining the political factors that shape priority for addressing sexual violence against children at national levels, as a means of developing strategies and spurring action to confront the problem. A core concern of the research program is studying the role of survivor networks in pushing governments to address sexual violence against children. Among the countries being considered for study are Germany, France, the United Kingdom, Argentina, Chile, South Africa and Indonesia.

Undergraduate responsibilities or tasks: You will be responsible for gathering and reviewing documents to put together reports on generating political priority to address sexual violence against children in one or more countries. You will be supervised by senior researchers on this project. Documents will include but not be limited to published scholarly articles, grey literature, media reports, and reports from international organizations, funders, NGOs and grassroots activists. The reports will include a historical narrative, a timeline of major developments, and a list of potential key individuals to interview in each of these areas as identified in the key documents collected.

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

Positions available: 2

Work location: Remote/virtual

Vesla Weaver: Political Science and Sociology, KSAS

Project: The research team will work on two projects:

1) Students will conduct ongoing research for Professor Weaver's book project, The State From Below: Racial Authoritarianism in American Democracy, based on the largest collection of narratives about policing, state violence, and resistance collected to date. Student researchers will mainly be working on collecting and analyzing several sources or oral history and testimony from the black archive collected throughout the 20th century. We will particularly be working on oral histories of black police officers as well as black police leagues including the Guardians and especially the Afro-American Patrolmen's League. We will be analyzing several themes across this cumulated set of sources that were not part of a single oral history or narrative collection project but that together represent a substantial range of Black counterpublic understandings (and critiques and aspirations) of American democracy via interactions with the state's more coercive institutions.

2) The American Prison Writing Archive research project. The Archive is the first fully searchable digital archive of non-fiction essays and poetry by incarcerated people. It is the largest body of prison witness ever amassed – at forty-one percent of the entire canon of slave narratives. However, the real importance is not its size but in how it demands a reorientation of whose expertise matters in the documentation of history (and its transformation!)-- What if we made the unfree central purveyors of knowledge in society? The 3,300 essays by incarcerated writers across 400 prison facilities offer the most extensive corpus of experiential, grounded knowledge about confinement in our time. It has already given rise to projects that offer unprecedented glimpses into living prison experience, such as "The Zo," from The Marshall Project. With funding from the Mellon Foundation, we are expanding the APWA to 10,000 essays, reaching underrepresented authors and locations, collaborating with other sites of prison witness, and expanding its visibility and impact. Students will help conduct research using the archive's holdings, help with reading essays and subject tagging/coding them, and develop thematic curations as well as data visualizations for the web interface.

Undergraduate responsibilities or tasks: For the first project, The State From Below, researchers will analyze several black American oral histories from various archives along with a team of graduate students; as well as work on filling out research on black police leagues during the 1970s and 1980s using online databases like the Afro-American Patrolmen's League records and ProQuest Historical Black Newspapers. If students have a quantitative skillset, they will analyze survey data on policing from the 2020 Cooperative Multiracial Post-Election Survey; conduct structural topic modeling and natural language processing of the transcripts.

For the second project, The American Prison Writing Archive, the tasks will be to help develop curations for both the website as well planned anthologies; examine several themes within the corpus of first-person witness of incarceration during the 21st Century; as well as help with subject tagging of essays.

Preferred (or required) skills and/ or experience:

- Experience with producing data visualizations (word clouds, maps, thematic patterns in the data, over time trends)
- Experience or interest in working with digital archives and with oral history collections
- Experience doing quantitative analysis using R, Stata (preferred, not required)
- Experience with doing literature reviews

Positions available: 2-3

Work location: Remote with regular meetings on campus with research team

Carl Wu: Biology, KSAS; Molecular Biology & Genetics, SOM

Project: The Wu lab uses advanced fluorescence microscopy to visualize the single-molecule dynamic behaviors and spatial distributions of nuclear proteins and chromatin factors in living cells of model eukaryotic organisms. Students will learn and apply imaging and computational tools to localize and track single 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 gene expression.

Undergraduate responsibilities or tasks: Students will join ongoing projects on live-cell imaging of chromatin and transcription proteins, working under mentorship of senior graduate students or postdoctoral fellows. Responsibilities include practical 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 have completed the Biology Department Advanced Cell and Molecular Biology Research Course on live-cell single-molecule imaging, or courses in biochemistry, molecular biology, cell biology, biophysics, or genetics.

Positions available: 2

Work location: Homewood campus, UTL-382 lab