

# Provost's Undergraduate Research Mentoring Program Project Descriptions Summer 2012

Application and instructions at <http://www.upenn.edu/curf/research/grants/purm>

Unless otherwise noted, current freshmen and sophomores may apply for any listed project.

*Students are encouraged to learn more about faculty interests by reviewing faculty webpages and recent publications to determine your interest level in particular projects. To avoid confusion, students are asked not to contact faculty about their projects until you are contacted for an interview or the PURM selection process has been completed.*

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## **Annenberg**

### **ANNENBERG PUBLIC POLICY CENTER**

*Kathleen Jamieson*

#### **Project 1: Civility in the House of Representatives: 107th - 112th Congresses**

This project is to update 4 previous studies of the level of civility in the House of Representatives, using the Congressional Record and C-SPAN. Student responsibilities will be to search the Congressional Record for words contained in our incivility index, along with their context; document any words "taken down;" chart changes over time. Additional case studies on civility in the media may be undertaken. Prerequisites: prefer student planning to declare Communications major and/or has taken 2-3 Communication courses, particularly Political Communications. Participation in this project will provide a student with important research experience on a study whose findings will be disseminated nationally.

## **COMMUNICATIONS**

*Felicity Paxton*

#### **Project 1: Gendered Journeys: Women and Cycling at Penn and in Philadelphia**

National research shows that women make up roughly 24% of urban cyclists. This project aims to provide a clearer and deeper understanding of the gendered nature of cycling, with a focus on Philadelphia/Penn. How does Philadelphia compare to other major cities? Does the Penn community show greater parity in numbers? What reasons do women give for not cycling/not cycling? What impact does race have? What role do bike lanes play? What policy, educational and/or infrastructural changes would encourage more women to ride?

This research project will be of interest to students interested in a variety of fields, including gender studies, environmental sustainability, city-planning, health and societies, and communications. Responsibilities will range from doing bike counts, to organizing and co-facilitating focus groups, to conducting one-on-one interviews, to analyzing data and writing up findings. Experience with any of the above preferred but not required. Reliability and initiative are both essential.

#### **Project 2: Gender and Leadership at Penn**

In March of 2011 Princeton University published the results of a detailed study of Undergraduate Women and Leadership on its campus. A summary report can be read online here:

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<http://www.princeton.edu/reports/2011/leadership/>. We are interested in seeing whether or not similar patterns and attitudes are evident at Penn and an interdepartmental committee has been formed to look into the broad question of how gender influences leadership in our undergraduate community.

This research project will be of interest to students interested in a variety of fields, including gender studies, politics, organizational dynamics and communications. Responsibilities will involve everything from organizing and co-facilitating focus groups, to conducting one-on-one interviews, to analyzing data and writing up findings. Experience with any of the above preferred but not required. Reliability and initiative are both essential.

### **Project 3: Prominent Women of Penn: A Living History**

In AY 2013-14 both the Penn Women's Center and the Gender, Society, and Women's Studies Program will celebrate their 40th Anniversaries. In recognition of this landmark, I plan to create a web-based archive of prominent Penn women (students, alumnae, faculty and staff). The site will feature interviews, photographs, and videos and will be searchable by year as well as by topic. This research project will be of interest to students interested in a variety of fields, including gender studies, history, higher education and communications. Students will have the opportunity to work on any/all of the following: archival research (making extensive use of Penn's extensive archives); collecting oral histories; videotaping and editing original interview footage, web design and development. Experience with any of the above preferred but not required. Reliability and initiative are both essential.

## **SOCIAL POLICY AND PRACTICE**

*Jennifer Oser*

### **Project 1: Advancing Policy Education and Teaching in the U.S. and Beyond**

Following my participation in a national conference on policy education teaching, I have been invited to co-edit a symposium on advancing policy education teaching in the U.S. and beyond. The symposium will be based on papers presented at the conference, show on the site for the conference ([http://umdcipe.org/conferences/Classroom/agenda\\_and\\_abstracts.html](http://umdcipe.org/conferences/Classroom/agenda_and_abstracts.html)).

A student interested in working on this project would get hands-on experience in the following: - Assessing best practices in policy teaching in the U.S. and beyond -Selecting quality conference articles for journal publication -Managing the review process, including composing "revise and resubmit" letters to potential authors for the symposium, and assessing the quality of the revised submissions regarding acceptance. -Developing an introduction to the symposium which would draw on state-of-the-art research in the field.

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## WOMEN'S STUDIES

*Felicity Paxton*

**Project 1: Gendered Journeys: Women and Cycling at Penn and in Philadelphia**

See description under Communications

**Project 2: Gender and Leadership at Penn**

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**Project 3: Prominent Women of Penn: A Living History**

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## **Arts and Sciences**

### **ANTHROPOLOGY**

*Harold Dibble*

#### **Project 1: Paleolithic Archaeology in France**

The Penn student will be involved in all aspects of an archaeological project at the Neandertal site of La Ferrassie, located in the Dordogne region of SW France. The excavation season will be 5 weeks in duration, from July 27 to August 31. During that time, the student will learn about excavation techniques, basic artifact processing (washing, labeling), photography, and some stone tool analysis. Like all participants, the student will rotate through all of these jobs during the time of excavation. All of the crew will camp at the research dig house and eat communally. No previous excavation experience is necessary, though some previous courses in either human evolution or world prehistory would be desirable.

*Eduardo Fernandez-Duque*

#### **Project 1: Migration Patterns in the Monogamous Owl Monkey of Argentina**

The study is part of long-term plans to understand the structure of populations of owl monkeys that inhabit both gallery forests along rivers and isolated patches of forests. The goal is to begin a multi-year exploration of the individual, group and population consequences of migration patterns in the monogamous owl monkeys of the Argentinean Chaco. We will capture, radio-collar, and follow migrating animals to understand how they leave their natal group, how they interact with social groups while trying to find a reproductive position and how these dispersal patterns influence the structure of social groups in both gallery forests and islands of forests. Understanding dispersal patterns at the individual, group and population level will help us understand how social monogamy is maintained in this population. The data will also have significant implications for understanding the functioning and health of a primate population in a fragmented landscape. In the field, students will receive training in demographic, behavioral, and ecological data collection, capturing, sampling and radio-collaring of individuals, radio-tracking, data summary, analysis and management. They will also benefit from being exposed to the complexities of running an international multidisciplinary field project, through looking over the shoulder of those running the administrative and accounting aspects of the project. Additionally, students will regularly collect fecal samples for endocrinological and genetic work. Visit the following websites for additional information: <http://owlmonkeyproject.wordpress.com/>  
<http://fernandezduque.wordpress.com/>

### **Project 2: Evolutionary Demography of Owl Monkeys in a national park**

Students will assist Argentinean biologist Cecilia Juárez as she begins her postdoctoral research project. Students will collaborate in the first stage of a 3-year attempt at expanding our demographic and population-based research on owl monkeys in Argentina. The Owl Monkey Project has 15 years of demographic data on a population inhabiting a portion of gallery forest in the ranch Estancia Guaycolec. The goal is to expand that work by expanding our study of the owl monkeys groups that live in isolated patches of forests. A large number of students is necessary for the following of a large number of dispersing individuals (one student per monkey) that are the central focus of the research. In the field, students will receive training in demographic, behavioral, and ecological data collection, capturing, sampling and radio-collaring of individuals, radio-tracking, data summary, analysis and management. They will also benefit from being exposed to the complexities of running an international multidisciplinary field project, through looking over the shoulder of those running the administrative and accounting aspects of the project. Additionally, students will regularly collect fecal samples for endocrinological and genetic work. Visit the following websites for additional information:

<http://owlmonkeyproject.wordpress.com/> <http://fernandezduque.wordpress.com/>

### **Project 3: Monogamy, pairbonds and infant care in titis and saki monkeys**

The study is part of a long-term research program that Dr. Fernandez-Duque and Dr. Anthony Di Fiore (Anthropology, UT-Austin) conduct to investigate monogamy and parental care in primates of the Ecuadorian Amazon. Titi monkeys live in small, monogamous groups in which the male and female form a very strong bond. Unlike any other known primate, males provide most infant care, and the infant develops a stronger bond with its father than with its mother. Some of the questions we plan to address are: How do male and female titi monkeys share the care of their offspring? How do they maintain the pair bond between them? Is there aggression and competition among males and females of this monogamous species? The students will assist Amy Porter (Ph.D. candidate, Anthropology, UC Davis) in collecting behavioral data from three radiocollared groups of titi monkeys and two of sakis. They will participate in all-day follows of the groups that begin at dawn and finish at dusk. They will also assist Amy conducting playback experiments that simulate the intrusion of individuals in the group's territory and collaborate in the processing of samples and organizing of data. In the field, students will receive training in demographic, behavioral, and ecological data collection, capturing, sampling and radio-collaring of individuals, radio-tracking, data summary, analysis and management. They will also benefit from being exposed to the complexities of running an international multidisciplinary field project, through looking over the shoulder of those running the administrative and accounting aspects of the project. <http://owlmonkeyproject.wordpress.com/>

<http://fernandezduque.wordpress.com/> <http://www.usfq.edu.ec/tiputini/Paginas/default.aspx>

*Theodore Schurr*

**Project 1: Genetic Variation in Nahua Populations of Central Mexico**

In this project, the Student researcher will conduct molecular genetic analysis of DNA samples obtained from Nahua (indigenous) populations from Central Mexico. This work will require the analysis of mitochondrial DNA from these participants using DNA sequencing and SNP genotyping methods, as well as the statistical and phylogenetic analysis of the resulting data to clarify the genetic history and affinities of these populations with other Mexican Indian populations. On a broader scale, this project will help to elucidate the peopling of Mexico, and the emergence and spread of Aztec populations across this region. Students having a background and interests in biology and genetics are preferred, since this project involves DNA laboratory research.

**Project 2: Genetic Variation in Mayan Populations of Southern Mexico**

In this project, the Student researcher will conduct molecular genetic analysis of DNA samples obtained from Mayan (indigenous) populations from Southern Mexico. This work will require the analysis of mitochondrial DNA from these participants using DNA sequencing and SNP genotyping methods, as well as the statistical and phylogenetic analysis of the resulting data to clarify the genetic history and affinities of these populations with other Mexican Indian populations. On a broader scale, this project will help to elucidate the peopling of Mexico, and the emergence and spread of Mayan populations across Mesoamerica. Students having a background and interests in biology and genetics are preferred, since this project involves DNA laboratory research.

**Project 3: Analysis of Class I Alcohol Dehydrogenase Gene Diversity in Indigenous Altaian Populations**

In this project, the Student researcher will conduct molecular genetic analysis of genetic diversity in the Class I alcohol dehydrogenase (ADH) genes in indigenous populations living in south-central Siberia. Mutations in these ADH genes, such as ADH1B\*47His, have been commonly seen in East Asian populations, and associated with protective effects against alcoholism. However, much less is known about ADH variation in native Siberian populations. Therefore, the Student will survey variation in the regulatory and coding regions of the Class I ADH genes in these groups using DNA sequencing and SNP genotyping methods, as well as employ statistical and phylogenetic methods to analyze the resulting data. The results of this work will clarify the evolution of ADH genes in native Siberians and possibly identify the effects of selection, adaptation and/or genetic drift in these populations. Students having a background and interests in biology and genetics are preferred, since this project involves DNA laboratory research.

*Claudia Valeggia*

**Project 1: Weaning, Puberty and Menopause among the Toba of Argentina**

This study is part of the Chaco Area Reproductive Ecology Program ([www.sas.upenn.edu/~valeggia](http://www.sas.upenn.edu/~valeggia)). This is a 5-year, NSF-funded project that evaluates the interaction among biocultural variables underlying key life history transitions. The study takes place in an indigenous community (the Toba of Namqom) in the province of Formosa, Argentina. We are collecting biological and ethnographic data to evaluate the somatic, developmental, cultural, and hormonal correlates of three life history transitions: weaning, puberty, and menopause. Student responsibilities: The student(s) will travel to the field site during the summer and assist in all steps of the project. Activities include interviewing participants, collecting urine samples and anthropometric data, organizing daily and weekly research schedules, interacting with local assistants, socializing with the local population, processing urine samples, data entry, and team meetings. Requisites: Well-developed cultural sensitivity, un muy buen dominio del español, and tolerance for simple living and uncomfortable weather conditions (cold and damp in June/July/August). Lodging will be either at the Penn Field station or at homestays in the city of Formosa, located 10 km from the study site.

**Project 2: Monitoring reproductive and nutritional status through hormonal analysis of field collected samples**

This research is part of the Chaco Area Reproductive Ecology Program and supplements the field component of the Life Transitions study currently being conducted in northern Argentina. This part of the project takes place at the Reproductive Ecology Laboratory (Penn Museum). We are monitoring reproductive hormones and biomarkers of energy balance in girls and women of an indigenous population (the Toba) as they go through the pubertal and peri-menopausal transitions. The student will participate in all stages of laboratory work, including sample processing, running enzyme-immunoassays, data entry and analysis, and routine lab maintenance tasks. The student will work in close collaboration with the laboratory coordinator. Requisites: Enthusiasm and willingness to learn. Some knowledge of laboratory work is highly desirable, but not indispensable.

## **BIOLOGY**

*Ted Abel*

### **Project 1: Sleep deprivation-induced changes in protein translation and memory**

Millions of people regularly obtain insufficient sleep and one of the major effects of sleep deprivation is to produce memory deficits in hippocampal-dependent learning paradigms. Thus, understanding the cellular and molecular pathways affected by sleep deprivation is of social and clinical importance. The goal of this project is to examine a novel finding that sleep deprivation impairs protein translation and the mechanism by which protein translation initiation is altered. We hypothesize that sleep deprivation induces changes in the mTOR signaling pathway and mTOR effector proteins, such as 4E-BP1. We will elucidate the mechanism by which sleep deprivation drives mTOR phosphorylation alteration, as well as characterize changes to downstream targets to mTOR phosphorylation. A student working on this project would sleep deprive mice and perform brain dissections. The student would also learn how to use a variety of biochemical techniques – such as Western blotting, immunoprecipitation, and ELISA – to examine sleep deprivation-induced changes in the hippocampal mTOR signaling pathway. Students should have completed introductory biology, chemistry, and physics.

*Dustin Bronson*

### **Project 1: Novel insights on tree-leaf temperature via the oxygen isotope ratio of tree rings**

We seek students interested in gaining a greater understanding and appreciation for plant ecology. Students would join a lab group that is working on isotopic approaches to gain insight about plant physiology. Students will have the opportunity to travel to existing field sites in the pine barrens of New Jersey and oak forests of Tennessee. A postdoctoral research assistant will work alongside students, allowing the opportunity to collaborate and learn from an experienced research scientist. Students will collect tree cores, plant tissues, and physiological data in the field. When not in the field, students will be given opportunities to prepare their field data for laboratory analyses. These analyses include cellulose extraction, water extractions, and isotopic preparation. Students will be given an opportunity to analyze their data and format their results into a research poster to be presented at a scientific meeting. This is an excellent opportunity to learn about the plant sciences and help in preparation for graduate school. The only prerequisite is a desire to learn more about the plant sciences and the willingness to take an active role in their research project.

*M. Fevzi Daldal*

**Project 1: Mitochondrial Complex III, Cellular Energy Transduction and ROS production**

This project is to work together with a postdoctoral fellow or an advanced graduate student to study the structure, function assembly, biogenesis of bacterial and human mitochondrial cytochrome bc1 or Complex III using molecular genetics, biochemical and biophysical approaches to define the mechanisms of ROS production and signaling.

**Project 2: Maturation of cytochromes and posttranslational heme attachment to energy producing proteins**

This project is to work together with a postdoctoral fellow or an advanced graduate student to study the maturation process of c-type cytochromes using a bacterial model system amenable to molecular and biochemical genetics to understand how cells produce cytochromes that are important cellular energy transduction components

**Project 3: Cellular copper homeostasis, cytochrome oxidase assembly and human diseases**

This project is to work together with a postdoctoral fellow or an advanced graduate student to study how copper ions which are required in low amounts and yet toxic in high amounts are imported and exported from cells using a bacterial model system amenable to molecular and biochemical genetics to define the disease components that are involved in the trafficking of this metal ion in cells

## **EARTH AND ENVIRONMENTAL SCIENCE**

*Alain Plante*

**Project 1: Impact of soil carbon stability on the global carbon cycle**

The organic matter contained in soils represents a pool of carbon five times larger than all plant biomass and three times larger than the amount in the atmosphere (mostly as CO<sub>2</sub>). The annual transfers of carbon between soils and the atmosphere are also ten times greater than human emissions. So while any change in the net balance of carbon in soils has a significant impact on the global carbon cycle, our ability to predict how soil carbon will respond to disturbance (including climate change) is limited. Our research team seeks to answer questions such as: Why do certain soils accumulate large stores of carbon while others don't? Why does some carbon stay in soil for thousands of years while some is respired in a matter of months or a few years? We are currently seeking a student that is curious, motivated and willing to learn. No prior

experience is necessary, but the student should demonstrate a vested interest in the environmental, ecological or Earth sciences. Some basic background in chemistry is preferred, but not required. The student will work alongside postdocs and graduate students to perform several laboratory experiments and analyses, as well as take the lead on their own set of experiments. The student will learn and perform physical, chemical, biological and thermal methods for isolating and characterizing soil organic matter in terms of its stability to decomposition. Data entry and analysis will also be required. Results of the experiments will help answer fundamental questions about the role of soils in the global C cycle.

## **EAST ASIAN LANGUAGES AND CIVILIZATIONS**

*Nancy Steinhardt*

### **Project 1: The Mosque in China**

Student must read Arabic fluently. Project is to find secondary materials on the mosque in China in Arabic and translate or summarize them depending on the number and length. This material includes inscriptions that remains at the sites of China's mosques. Some are published, but many are not. Student has the option of using CURF money to go to China to gather materials. Enough of the summer must be spent at Penn to translate the inscriptions and secondary sources.

### **Project 2: Preparation of publishable drawings of Chinese excavations sites**

Student must be versatile with tools of architectural drawing (CAD and more) and must be able to read modern Chinese. Student will make drawings of publishable quality from Chinese sketches and other materials.

## **ECONOMICS**

*Jere Behrman*

### **Project 1: Early childhood in developing countries**

Several projects are underway investigating the determinants of and the impact of dimensions of early childhood development (e.g., nutrition, preschool programs) on various outcomes in developing countries.

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*Flavio Cunha*

**Project 1: Eliciting Maternal Beliefs about the Technology of Skill Formation** ***Rising Juniors only***

Student duties: The student will have the chance to help conduct the analysis of a new data set that documents the importance of maternal knowledge about child development on the production of human capital for the society. The student will help the researchers in the project to translate the information from mothers to mathematical representations of beliefs. The student is expected to work flexible hours and to coordinate work with other team members.

Prerequisites: Econ 104

Preference will be given to students who have taken Econ 222.

*Jesus Fernandez-Villaverde*

**Project 1: Global Economic History**

I am currently writing an innovative book on global economic history that will introduce readers to the dynamics of the world economy during the last 5 centuries. The book will be quite different from previous ones because it emphasis on global interactions and the experiences of many countries outside Europe and North America and because it will be heavily quantitative and influenced by modern economic theory. However, such work requires quite a heavy burden in terms of data collection, reading of secondary sources and, in general, checking of information from multiple databases. Students will be assigned a particular task that matches well with his/her background, language skills, and previous exposure to economics. The work will require, more than anything, being careful with data and documenting all sources as well as some entrepreneurial spirit in terms of coming with original sources of information.

*Petra Todd*

**Project 1: Pension reform in chile** ***Rising Juniors only***

Student would assist in preparing graphs/tables of results from an on-going project that analyzes the effect of a recent pension reform in Chile on men's and women's pensions. Student would also read and help summarize economic literature on retirement and savings behavior.

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## ENGLISH

*Peter Conn*

### **Project 1: A cultural history of adoption in America** ***Rising Juniors only***

The student will assist in primary research, will redact and comment on scholarly articles and chapters, and will engage with me in a sustained tutorial on both research methodology and the specific topic of the project.

*Tsitsi Jaji*

### **Project 1: Africa in Stereo: Preparing a Book Manuscript for Publication**

You will have the opportunity to assist with preparing images, sound files and text for final submission of a manuscript for publication and to assist in preparing the website that will accompany the book. This will give you a chance to refine your research skills with some pretty specific guidance, as well as to conduct some independent research particularly in terms of citation formats, and to prepare original material for the website that will accompany the book. You will gain experience with the format used by a leading university press. The topic of the book is African responses to African American music in the twentieth century, and the project would be ideal for a student majoring in English, History, Music, Africana Studies, or interested in digital humanities. Great experience if you are considering grad school. AND you'll get a special recognition in the Acknowledgements section!

### **Project 2: Classic Black: early stage research on classical music by black composers from the U.S., Britain, Africa and the Caribbean** ***Rising Juniors only***

You will get a chance to learn how to conduct original research, and to work closely with one of Penn's special collections, the Marian Anderson collection which features the papers of this Philadelphia musical legend, and the manuscript and printed scores of music she performed. I would love to work with a student who can read music, but this is not a requirement. You will be gathering material and organizing it for a new book project that examines the role of classical music in racial uplift projects by blacks from around the world. Fantastic chance to do some original research, and learn skills that will be invaluable for graduate school, but also for non-profit and law school work. Ideal for an English, Comparative Literature, Africana or Music major, but all majors welcome.

## HISTORY

*Ann Farnsworth-Alvear*

### **Project 1: Compiling a manuscript on Colombian history, culture, and politics**

Spanish fluency preferred but not required. You will be charged with reading through the manuscript (500 pages raw text), checking the fluency of all translated documents (these have been translated from Spanish to English), following up on permission letters sent to copyright holders, and working with a Web designer to help plan visual material for a website to accompany the publication. Work to be done on Penn's Campus.

### **Project 2: Research on Coca and Cocaine**

Spanish fluency preferred but not required. Aid with course preparation for a new seminar on Coca. Read scholarly and non-scholarly writings, preview documentaries, compile images. Work can be done from any location with a high-quality library.

### **Project 3: Oral Histories of Colombian migrants to Jackson Heights**

This project will happen in two parts--first, you will read methodological work on best practices in conducting an oral history project. Second, you will identify elderly Colombians who settled in NYC --it doesn't have to be Jackson Heights-- and record their memories using digital video. These will be donated to the Penn Archives.

*Vanessa Ogle*

### **Project 1: How the First Wave of Globalization Created a 'Global Village,' 1880-1930**

Today, we often talk about how the world is 'shrinking,' and how increasingly interconnected global markets, communication technologies, and organizations like the United Nations make borders and nation states irrelevant. This impression is not as new as we tend to believe. In fact around 1900, new technologies like the railway, the steamship and the telegraph led people all over the world to think that entities like single states were becoming irrelevant, that the globe was becoming a 'smaller' place. Time and space seemed to have lost their reality in this interconnected world. After all, around 1900, markets, too, had reached global extension, and even politics through the spread of empires and colonialism were increasingly conducted with a global mindset.

This research project looks at ways in which the first globalization wave from roughly 1880 to 1930 led people to think differently about time and space and to conceive of the world as more

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and more provincial place in which borders and national governments lost their meaning. Because the world was so interconnected, the project follows these interconnections from international conferences, Western European nation states like France, the British Empire in India, German colonies in Africa, today's Lebanon and Syria, and to the League of Nations, the predecessor of the United Nations. In all these different places, the project explores what different people thought about time and space, how they suddenly began to care about time management and punctuality, how they began to purchase clocks and watches to help them achieve their goals, and how people outside of Europe and the United States had to gradually change and abandon their own flexible, culturally and socially distinct understandings of time in favor of Euro-American norms and standards of punctuality and precision.

Student responsibilities include finding and reading unpublished primary documents through catalogs and other reference tools, compiling bibliographies on a given aspect of the topic, writing summaries and excerpts of materials consulted – in short, the whole range of skills normally required of academic researchers in the humanities and social sciences. In addition, if the student desires so, s/he may undertake a brief research trip to Washington, DC, to conduct research with unpublished materials at the Library of Congress/Manuscript section. Reading knowledge in one or more of the following languages desired: Spanish, Portuguese, Arabic, Italian, French.

## **HISTORY AND SOCIOLOGY OF SCIENCE**

*Katherine Mason*

### **Project 1: CDCs and the Meaning of "Public Health" in post-SARS China**

The aim of this project is to track the rapidly changing meaning of "public health" in contemporary China and how it has developed in the past 10 years in conjunction with the development of a nationwide network in China of Centers for Disease Control and Prevention. Using fieldwork materials that the professor has already collected and a short period of ethnographic and/or archival in-country research to be conducted by the student, the student will assist the professor in analyzing what this concept means to today's public health professionals. The student will also research and compile a history of the Chinese CDC system. The results of the project will be incorporated into a book project that the professor is working on. This is a great opportunity for an HSOC, Anthropology, East Asian Studies, or Public Health student to gain firsthand experience in anthropological methods and textual analysis and to get some experience doing research in China. About 7-8 weeks of the project will consist of work on the Penn campus, and 2-3 weeks will be spent in some combination of three Chinese cities (Shenzhen, Guangzhou and Beijing). Interested students who do not wish to travel to China should also apply, however, as the in-country portion of the research is optional and arranging a

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full 10 weeks of research on campus at Penn is also possible. A high level of proficiency in reading modern Chinese (simplified characters) is required; previous experience in Chinese-to-English translation is preferred. A high level of proficiency in Mandarin Chinese speaking ability is also required for students interested in conducting in-country research.

## **HISTORY OF ART**

*Gwendolyn Shaw*

### **Project 1: Strictly a Negro Art: Biography and Belief in the Work of Sargent Johnson**

This project involves assisting the professor in preparing a manuscript for publication. The student will accompany the professor on at least one research trip to the Washington DC area to examine court records and other archival resources relating to the mid-twentieth-century artist Sargent Johnson. The student will also assist the professor in locating and securing copyright releases on images for the publication.

## **LATIN AMERICAN AND LATINO STUDIES**

*Ann Farnsworth-Alvear*

### **Project 1: Compiling a manuscript on Colombian history, culture, and politics**

See description under History

### **Project 2: Research on Coca and Cocaine**

See description under History

### **Project 3: Oral Histories of Colombian migrants to Jackson Heights**

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## LINGUISTICS

*Mark Liberman*

### **Project 1: Interactive Help for Student Writers**

New NLP ("Natural Language Processing") techniques have the potential to help writers find the right word to fit into a sentence, or the right sentence structure to fit into a paragraph. But there is a large gap between students' needs and algorithms' solutions. This project aims to bridge this gap by offering network-mediated interactive assistance from good writers, and then analyzing the results to identify services that will be broadly useful to student writers and will also be within the capabilities of current NLP algorithms. Candidates should be capable writers (of English and software) who are interested in this problem.

*Florian Schwarz*

### **Project 1: Using Eye Tracking to Investigate Presupposition Processing**

The question of how different aspects of linguistic meaning are processed by speakers in real time and its implications for theories of meaning has been at the center of much recent work in psycho-linguistics and semantics. In particular, a lot of work has focused on conversational implicatures, e.g., to gain insight into when speakers understand an expression such as 'some students' as 'some but not all students'. Another important type of meaning that is distinct from simple truth-conditional meaning is that of presuppositions, which impose preconditions on the type of context in which a sentence can be uttered. For example, 'John also has a PENCIL' requires a context where it is known that John has something else as well, due to the presence of the presuppositional expression 'also.' This project, as part of a larger research enterprise in the eye tracking lab, will develop eye tracking studies that shed light on the timing and role of the interpretation of presuppositions in the overall process of utterance interpretation. Both reading time studies, where eye movements are monitored with the eye tracker during the reading of text on a screen, and visual world studies, where subjects listen to spoken text while looking at a visual display, can be employed for this.

The aim is for the student to design a complete experiment, which can extend prior work on expressions like 'also' and 'again', or test further expressions, such as factive verbs (e.g., 'know'), definites ('the/his book'), implicative verbs ('manage'), clefts ('It was John who read the book'), or others. The responsibilities of the student will include acquainting themselves with the relevant theoretical issues and the basics of experimental design, designing stimuli and implementing them in the experimental software, and learning how to operate an eye tracker. Time permitting, data collection can begin during the summer, or in the fall semester. The student will be welcome

to continue to be involved in collecting and analyzing data, as well as writing up the results for publication. Students thus have the opportunity to be involved in the complete process of experimental work on language comprehension, from initial design to reporting results, and have the chance to learn about a variety of tools and methods used in experimental psycholinguistics. Some basic familiarity either with linguistics or experimental designs comparable to those used in psycholinguistic studies is highly recommended.

*Charles Yang*

### **Project 1: Irregularities in language and how children learn them**

In a widely read book, Steven Pinker (1999: *Words and Rules*, Basic Books) uses the irregular and regular verbs of English to illustrate how languages work and how children learn them. A most striking pattern in children language has the form of "hold-helded", where the child over-regularize irregular verbs. These errors are interesting because they would never be produced by adults; they must be generated by a general or DEFAULT rule, which adds "-ed" to verbs, occasionally to the exceptional irregulars. Indeed, the learning of irregular verbs has been one of the major topics in cognitive science and has shed much light on the nature of learning and language. But most languages of the world have much more complex patterns of word formation than English, famous for its morphological simplicity. In many languages, the equivalent of the default rule does not exist. For instance, in Polish, the genitive case system has three endings (adding "-y", "-u" and "-a") but none has the catch-all status of the English "add -ed" (Dabrowska 2001, *J. Child Lg*). Similar patterns have been reported in other Romance and Slavic languages. These are awkward facts for theories such as Pinker's, which are designed to look for a general rule, often taking the one covering the most number of distinct words as such.

The purpose of this project is to provide a structural, quantitative, and learning-based account for such irregularities in the world's languages. One hypothesis is that while Polish does not have default form for all three classes of words (nouns), it has a default form for each of the three disjoint classes. While traditional linguistic analyses can be found on this topic, the current project aims to provide a more quantitative basis for these linguistic description. The plan is to examine a large amount of natural speech data spoken to children and spoken by children, now available in the public domain. We are interested in quantifying exactly how many words from each of the three classes a child may hear, how many exceptions are contained within each class, and how the child learns them over the course of language development. This project would make a significant contribution to a much contested (and high profile) case study in cognitive science; after all, one aims to develop theories of language and language learning applicable not just to English but to all languages.

The project requires a dedicated student who (a) a native or near-native speaker of Slavic languages such as Polish or Russian or Romance languages such as Spanish or Italian, (b) has some linguistic background without at least 2 linguistic classes at Penn, (c) is comfortable with manipulating a large amount of linguistic data (text transcriptions) with basic programming skills.

## **Project 2: Mechanical Turks for Words**

When we see a complex and uncommon word like categorizability, even if we have not heard it before, we have a good idea of what it means. Our ability to do so means that we are capable of dividing it into its component parts (category, -ize, -able, -ity). We can also form novel words in this way; even if we don't actually know what blicketizability means, it seems like a plausible word of English if there was such a thing as a blicket. In these extreme cases it is easy to see that we are able of decomposing words and understanding what they are made of. But for a common word like played, while we can think of it as being constructed as play and -ed, we could just have memorized the word as a whole as we hear it often enough. Based on this possibility, it's an open question as to whether when we hear words like played whether we treat them as whole words or made up of pieces (morphemes) like play and -ed. This question is important as it has implications for how we understand how adults process words, how children acquire words, and how linguistic theory should represent words.

One way that researchers in psycholinguistics have approached this question is through experimental work in a paradigm called lexical decision. In a lexical decision experiment, participants are asked to decide whether a set of letters they are presented with is a word, for example to tell the difference between played and blayed. There has been a long tradition of lexical decision experiments that have tried to determine how words are represented and processed in the mind, but unfortunately despite three decades of experiments many of the results have been entirely contradictory. Recently submitted work to come out of our group suggests that these contradictory findings are caused by methodological issues of two types. The first is that the modeling techniques used were relatively crude, and over the past few years we have brought more modern statistical modeling techniques to the problem to address this. The second issue is that the number of words and subjects used in these experiments are simply too small to detect the subtle effects that are in question. To address this, we propose to use Mechanical Turk to administer lexical decision experiments to large groups of subjects over the internet. Mechanical Turk is an Amazon service that allows small tasks to be offered to for participants to perform for compensation. Mechanical Turk is becoming popular for psycholinguistic experiments as it allows studies to be run quickly with large numbers of subjects at relatively low cost, and in the Computer and Information Science department here at Penn studies of how users communicate to each other toward a shared goal have been performed. To produce and run this experiment, we require an undergraduate with programming experience, preferably in Java.

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The student would be responsible for writing the software that would administer the experiment, submitting it to Mechanical Turk, and monitoring the response of participants to the study and assembling the data they provide. They would work with faculty and graduate students on the data analysis and learn about how psycholinguistic data is analyzed.

## **NEAR EASTERN LANGUAGES AND CIVILIZATIONS**

*Heather Sharkey*

### **Project 1: Everyday Cultures of Muslims, Christians, and Jews in the 19th-Century Middle East**

What marked the start of the modern period of Middle Eastern history? Historians usually cite political watersheds, such as the Treaty of Kujuk Kaynarca of 1774, when Russia seized the Crimean peninsula from the Ottoman Empire, or Napoleon's conquest of Egypt in 1798. I suggest another possible watershed, represented in a tiny detail of behavior that illustrates much larger trends. This occurred in 1808, when there ascended to the Ottoman throne a new sultan, Mahmud II, who preferred to eat at a dinner table rather than at the kind of low tray that had been the Ottoman norm. This detail of dining and furniture suggests just how far western European cultural practices were beginning to change the everyday lives and social behaviors of Middle Eastern people, not only for sultans, but as other sources show, for humbler people, too. I am writing a book on the history of Muslim, Christian, and Jewish relations in the modern Middle East, and am keenly interested in the history of everyday life.

At this juncture I seek a student researcher who can help me to compile resources for the fourth chapter of my book, which will focus on nineteenth-century developments in the Ottoman Empire, Morocco, and Iran. I am especially eager to locate sources that pertain to elite and popular cultures of music, art, food, and dress, as well as to the incorporation of new technologies (such as photography) and social practices (such as vaccination). The student researcher will identify sources on designated themes, and prepare annotated bibliographies that can function as briefings. The student researcher will also collect PDF files and develop a bibliographic database in Zotero. The ideal applicant will be organized, self-motivated, enthusiastic about history, and capable of working independently. A background in modern Middle Eastern studies is essential.

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## NEUROSCIENCE

*Vijay Balasubramanian*

### **Project 1: Information coding by neural populations: what the eye tells the brain**

The brain encodes information in the collective electrical activity of large populations of neurons. Until recently, scientists have known little about such "neural population coding" because there were no available techniques to measure and analyze the simultaneous response patterns of large numbers of neurons. The development of new instruments, specifically the Multi-Electrode Array, is now making such studies possible. The proposed project will use multi-electrode arrays to study how visual information is encoded and transmitted in the patterned responses of many retinal ganglion cells (the output cells of the retina) to visual stimuli. We will test the hypothesis that population response patterns are adapted to the statistical structure of visual stimuli.

The PURM student will have the opportunity to assist with experiments and/or carry out data analysis depending on his/her skills. The candidate must have programming experience, preferably in MATLAB. Basic knowledge of linear algebra (matrices, eigenvalues and eigenvectors) and differential equations is helpful, as is any familiarity with machine learning techniques.

(Keywords: bioengineering; neuroscience)

## PHYSICS

*Vijay Balasubramanian*

### **Project 1: Information coding by neural populations: what the eye tells the brain**

See description under Neuroscience

*Mark Devlin*

### **Project 1: The Balloon-borne Large Aperture Submillimeter Telescope - BLAST**

We will be preparing the BLAST telescope for a flight in Antarctica at the end of the year. If all goes well, the student will travel with the telescope to Palestine, TX to help with integrating the instrument with NASA. The project is studying star formation in our Galaxy. Students with a

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wide variety of skills can be helpful. Here are a few things (but you don't have to have all of them!) - Mechanical skills: Working with tools - Software/Linux - Electronics - Enthusiasm

### **Project 2: The Atacama Cosmology Telescope**

We will be taking our new camera to the Atacama desert in Chile to integrate it with the telescope at the site. If all goes well, the student will travel to Chile to help. The project is studying the evolution of structure in our Universe. - Conditions in Chile are tough. The student must be able to pass a physical to work at 17,000 ft. - Knowledge of computers and electronics is helpful. - Ability to work with your hands/mechanical work is important. - Enthusiasm is a must!

### **Project 3: The MUSTANG camera on the Green Bank Telescope**

We are building a new camera to operate on the largest telescope in the world in Green Bank, West Virginia. The student will help the design and construction of the cryogenic receiver. They will help with the testing and integration with our detectors and hopefully make observations when it is done. The following would be helpful: - Mechanical skills - Software/linux - Electronics - Enthusiasm is a must!

## **PHYSICS AND ASTRONOMY**

*Masao Sako*

### **Project 1: The Dark Energy Survey**

Penn is involved in an exciting astronomical survey called the Dark Energy Survey (DES), which will study the expansion history of the Universe and help understand the nature of the mysterious dark energy. The DES will use a new high-throughput 520-Megapixel camera to measure the detailed properties of over 300 million galaxies and thousands of supernova explosions billions of light years away. Students will help with the data analysis, database applications, and software development. The project will start in the summer of 2012, and interested students can continue to work throughout the academic year. More information about the project can be found at the following site -- <http://www.darkenergysurvey.org/>

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## POLITICAL SCIENCE

*Daniel Gillion*

### **Project 1: Barack Obama and Changes in the Minority Community**

Has the election of a black president led to more favorable executive policies for the racial and ethnic minority community? This is a question that is discussed on news sources and media outlets but is rarely explored in the scholarly world. In our project, which will serve as the foundation for my next book, we will examine whether President Barack Obama has ushered in a new era of change for the minority community. In tackling this question, we will also address misconceptions that have become prevalent in the political discourse on black presidential representation. Thus, this project will require us to examine media sources (such as MSNBC, Fox News, and the Daily Show), review official transcript documents found in the Presidential Public Papers, and explore Census reports for information on African American, Latino, and Asian American communities. No prior background knowledge of these topics is needed. Students who engage in is project will only be required to think critically about contemporary events and be willing to examine issues of race that has arisen in Obama’s administration.

### **Project 2: It's Not the Economy, Stupid: Differences in Presidential Approval Ratings**

The president’s approval rating has long been the determining factor indicating citizens’ preferences. It’s up, it’s down, and sometimes it is all over the place. But what is driving the president’s approval rating? Some might say, in the words of James Carville, “It’s the economy, stupid.” But economic indicators such as unemployment for racial and ethnic minorities are nearly twice as bad as the national average. Yet minorities’ approval rating for President Barack Obama is higher than any president in modern history. Similar peculiarities exist when we examine historical trends among minorities and other presidential administrations. Thus, this project will explore the disparity between minority and non-minority approval ratings for the president. Students will examine Gallup poll surveys, data on individual-level characteristics (party affiliation, race, gender), and presidential actions from 1960-2012. No prior background knowledge of these topics is needed, but being able to use excel won’t hurt.

*Julia Gray*

### **Project 1: Beware of Greeks Bearing Gifts: Presidential Giftgiving and Interstate Alliances**

How can we measure alliances between states, or the influence -- both intended and actual -- that one country has on another? This project centers on a novel way of quantifying relations between states, through the gathering of a dataset of gifts given to US presidents and state dinners held at

the White House. These gifts can serve as a potential proxy for the relationship dynamics between a given pair of leaders. US presidential libraries contain extensive details on these gifts (Theodore Roosevelt once received a coyote and two Nubian lions from Ethiopia, for example). Researchers will be asked to contact presidential libraries and create a database of the gifts received by US presidents and the details of state dinners across time. This data will then be used to see if gifts indeed helped strengthen alliances or increase influence.

### **Project 2: External Funding of Regional Economic Organizations**

Outside funding from the EU, the United States, the Scandinavian donors, and Japan -- and, increasingly, China -- has been a driving force of many regional trade agreements. This initiative seeks to gather not only amounts and types of funding of regional organizations (the EU, for example, gives more infrastructural aid while USAID gives program-based funding), but also internal evaluations of the success of those funding ventures. Research assistants will collect data from USAID, the European Union's External Relations Program, the Swedish International Development Agency, and the Japanese Office of External Aid on funding extended to RTAs. USAID numbers can be obtained from the president's annual budgets, available through the Department of State, which contain annexes showing amounts and destinations, as well as sub-annexes where likely the sub-allocations for economic support would go. Other figures will come from the relevant organization.

### **Project 3: Bureaucratic Structure and Staff Qualifications in Regional Economic Organizations**

Can supranational organizations enable cooperation-- and how exactly might they do so? Why do organizations that might be ineffective persist? Does socialization occur among members of international organizations? This project gathers original data on regional economic organizations to test the microfoundations of many important arguments about international organizations. Providing objective, comparative data on how these agreements actually work on a daily basis will enable researchers to get at the microfoundations of many of these theories. Data will be gathered under the rubric of five different areas -- including bureaucratic structure, staff qualifications, and budget expenditures. Research assistants will code data on the number and types of meetings, level of staff or member-state representatives involved in meeting structure, appointment structure, degree of centralization, autonomy of staff from member states, representation of member states among staff, voting structure in organizations, number of merit versus political appointments, terms of civil servants, number and background of judges on dispute-settlement mechanisms, judge selection procedure, number of cases seen, judgment of cases, distribution of cases across member states.

*Jeff Green*

### **Project 1: Epicurean Political Philosophy**

Epicurus, founder of the one of the most influential philosophical schools of the ancient world, taught to “live unnoticed”—and this teaching usually has been understood to indicate an antipolitical or apolitical ethical standpoint. In resisting this understanding, our project will involve turning to some of the key exponents of Epicurean philosophy—Epicurus himself, Lucretius (whose *On the Nature of Things* is perhaps the single greatest Epicurean work), Atticus (with whom the anti-Epicurean Cicero exchanged a lifelong correspondence), as well as contemporary sources—in the hope of extracting a substantive, positive Epicurean political philosophy. Why? Given that ordinary citizens in contemporary mass democracies already to a certain extent live unnoticed, there is a potential value in turning to the Epicurean tradition not as a call to live this kind of life, but as a set of political strategies for enduring it. I expect this research to contribute to my current book project: *The Plebeian Addendum to Liberal Democracy*. No prior experience in political theory is required.

### **Project 2: Democracy, Inequality, and Justice**

This project calls for wide-ranging social-scientific and philosophical research on the endurance of political inequality within the world’s most advanced liberal-democratic regimes. Topics include: (a) the persistence of plutocratic structures not just in the United States (where the question of plutocracy has been widely discussed and researched), but in European and even Scandinavian polities often upheld as exemplars of political and economic equality; (b) whether it is impossible in practice to fully achieve a society where similarly talented and motivated children have equal prospects of “success” in life regardless of their family and class background, and if so how the commitment to democracy with regard to civic education might be reconceived; (c) whether it is impossible in practice to fully achieve a society where similarly talented and motivated citizens have equal prospects of influencing elections regardless of their economic background, and if so how the commitment to political equality might be reconceived; (d) how the most advantaged (e.g., superrich) members of society, often overlooked in contemporary liberal-democratic philosophies and tax structures, might have a special role to play as part of a liberal-democratic society’s commitment to justice; (e) analysis of historical regimes, like Rome’s plebeian democracy, which combined plutocratic and egalitarian elements; and (f) the psychopolitical dilemmas of ordinary citizens fated to live in imperfectly democratic regimes. I expect this research to contribute to my current book project: *The Plebeian Addendum to Liberal Democracy*. No prior experience in political theory is required.

*Nancy Hirschmann*

**Project 1: Disability and the Concept of Rights**

I will be writing a paper over the summer on disability rights as a problem of freedom. The concept of rights is closely related to freedom; rights secure the freedoms of individual citizens against the arbitrary power of the state, they are expressions of the free individual. But as feminists and other critics have argued, rights were constructed specifically for propertied white men. Difference is cast as the opposite of equality, such that bodily specificity must either be ignored in order to claim equal rights or else acknowledged but denied equal rights. I want to argue that this construal of rights is made possible by a specifically modern conception of freedom as presupposing “ability”: it is generally considered a mistake to claim that I am “unfree” to, for instance, grow gills or defy gravity, because to be “unfree” someone has to be deliberately preventing me from doing something. Instead, I am merely “unable” to do it. But the parameters of “ability” encode specific bodily norms; when a person who uses a wheelchair is prevented from entering a building that has no elevator or ramp, the possibilities for claiming her freedom is restricted are limited by the way freedom is defined, and this thereby limits her ability to make rights claims for entrance.

The paper will trace the development of this concept of freedom in the modern era and its links to “the able body.” I will then demonstrate its use in the Supreme Court’s interpretation of the ADA in cases such as Sutton and Williams, where the Court declared that workers had no rights to accommodation because their freedom was not impeded. I argue that increasing access to rights requires rethinking the concept of freedom. The student will be asked to familiarize her or himself with some of my previous writings on the concept of freedom, and from there help me uncover relevant resources and develop the argument. Specific tasks I imagine might be to write me 2-3 page summaries of the arguments offered in various articles, to “vet” them for their usefulness; and help work through some of the “classics” of rights theory, by people like Dworkin. Prior background in political theory is a definite plus, work in disability studies would be great but I realize unlikely since Penn doesn’t offer many courses.

*Michael Horowitz*

**Project 1: Religion and International Conflict**

This PURM proposal addresses the relationship between religious identity and international conflict. Despite a wave of research since September 11, 2001 on factors related to religion and conflict, international relations scholars still lack a basic understanding of how religion in general influences preferences concerning international conflict. Religion remains significantly under-studied within political science. Scholars are less likely to study topics related to religion

than other aspects of identity such as ethnicity, ideology, nationalism, or other factors. Existing research also focuses almost exclusively on the Muslim world and terrorism. Finally, almost none of the existing literature deals with how religion, as a form of identity, might influence public support for war. Can leaders successfully use religious symbols to mobilize support for war? Is the mass public more supportive of conflicts to protect a nation with the same faith tradition? Professor Horowitz is writing a book titled “Religion and International Conflict”. He is looking for an undergraduate research assistant interested in helping him during the summer with research tasks related to that book. The content of the book focuses as much on the religious wars of the past, including the Crusades, the French Wars of Religion, and the Wars of Muhammad as on issues related to the present.

The research tasks will involve gathering data on wars during particular periods of history and assessing the difference between religiously-motivated and non-religiously-motivated actors in wars. The student will also be responsible for conducting some research on more modern groups such as al Qaeda. However, the bulk of the work will likely be historical in nature. Professor Horowitz is particularly interested in people with high school debate experience, but anyone who is ready for a summer of rewarding research is welcome to apply.

### **Project 2: Leaders and International Conflict**

This PURM proposal addresses the relationship between the background experiences of international heads of state and the way they behave once they enter office. Policy makers and the electorate assume political executives’ life experiences affect their policy choices in office. Recent international relations work on leaders, however, mostly focuses on how political institutions shape leaders’ choices rather than on leaders themselves. This project turns the analytic lens onto leaders and their personal backgrounds. The idea is to link something that we believe to be true when we evaluate our candidates for office – that their prior experiences influence their behavior – with political science research that has generally ignored leaders. Professor Horowitz is writing a book titled “Leaders and International Conflict”. He is looking for an undergraduate research assistant interested in helping him during the summer with research tasks related to that book. The content of the book focuses as much on the leaders of the past as those of the present. He will be writing chapters over the summer focused on particular leaders, requiring in-depth research.

The research tasks will involve assembling sources and putting together point-by-point annotated bibliographies on particular leaders, which could include anything from more famous leaders like Saddam Hussein to more obscure European or South American leaders. The researcher might also be asked to conduct tasks related to research Professor Horowitz is conducting on the backgrounds of candidates for the presidency in the United States. The bulk of the work will likely be historical in nature and will require use of the library as well as online sources. Professor Horowitz is particularly interested in people with high school debate experience, but anyone who is ready for a summer of rewarding research is welcome to apply.

*Marc Meredith*

**Project 1: Examining School Board Politics**

School boards are the most important educational policy-making institution in the United States. However, despite the school board's role in shaping American education, little is known about their influence performance of its schools. I am looking for a student to assist me over the summer to help me research a number of questions about school boards. How do the characteristics of school board representatives compare with the constituents they represent? Why do some districts have a lot of competition for school board seats, while others have trouble finding people who want the job? To what extent do school boards perpetuate inequality in schools? I am looking for a student to study these questions with me over the summer. Student duties will include assistance in design surveys of school board members, filing public information requests, aiding in the collection of data about school boards and school board members, creating charts and graphs, and data analysis. I have a preference given for a student who can be on campus at least part of the summer.

**Project 2: Understanding Economic Voting**

One of the most robust relationships in the study of political science and economics is economic voting: the positive relationship between an area's economic performance and the performance of incumbent politicians and parties. It is not well understood why we observe economic voting. Is it the case that people respond to their own pocketbooks, and are less likely to vote for the incumbent when their own financial situation is bad? Or is it the case that people think about the well-being of their friends-and-neighbors, and vote against the incumbent even when their own financial situation is good? I am looking for a student to study these questions with me over the summer. Specifically, I am looking for someone to help me gather individual-level public opinion data about how individuals assess the president and the economy across time. We will use these data to assess how individual's assessments of the economy change as macro-economic conditions change, and how people's perceptions of the aggregate economy relate to their own economic well-being. Student duties will include assistance in collection of data from online databases, using computer software to make these data usable, creating charts and graphs, and data analysis. I have a preference for students who has strong computing skills and who can be on campus at least part of the summer.

*Brendan O'Leary*

**Project 1: Political Violence in Belfast 1920-22, and 1969-72**

(i) Checking entries into a data-base to see if they are correct (ii) Working on GIS mapping, which will require some training, to test theories about the causation and patterns of political violence (iii) If possible, and if funding exists, travel to Belfast to check public and newspaper archive regarding political killings in Belfast 1920-1922

**Project 2: The Beginnings of the Anglo-Irish Agreement of 1985**

(i) Travel to the public records offices in the UK (London and Belfast) and in Ireland (Dublin) to read and copy released cabinet documents on the start of the process that led to the Anglo-Irish Agreement of 1985. This will involve looking at materials from 1980 and 1981, and materials already released (There is a 30 year restriction rule on civil service and cabinet papers in operation in both jurisdictions)

**Project 3: The Christians of Kurdistan and Iraq**

(i) Bibliographical Search on books and articles published since 1960. (ii) Organizing interviews with diaspora representatives in the USA.

*Rudra Sil*

**Project 1: Labor Politics in Central Europe**

Assist with tracking down latest scholarly articles and news reports pertaining to industrial disputes, workers' protest, and trade union activities in Poland, the Czech Republic, and Hungary.

**Project 2: Labor Relations under Asian Authoritarianism**

Assist with tracking down latest scholarly articles and news reports pertaining to industrial disputes, workers' protest, and trade union activities in China and Vietnam.

**Project 3: Changing Nature of Labor Politics in a Global Age**

Assist with identifying and summarizing scholarly articles (in sociology, political science and industrial relations/business) that address emerging challenges and patterns facing labor movements in different parts of the world as a result of economic globalization.

*Rogers Smith*

**Project 1: Civic Horizons: Pursuing Democratic Citizenship in Modern America**

I have a long-term project to write a sequel to my 1997 book *Civic Ideals: Conflicting Visions of Citizenship in U.S. History*, which examined the politics of American citizenship laws from the founding through the Progressive era. The sequel, tentatively entitled *Civic Horizons: Pursuing Democratic Citizenship in Modern America*, will examine the politics of federal statutes and judicial decisions structuring American citizenship from 1912 through 2001. Like its predecessor, the book will examine how federal law structures many aspects and forms of citizenship. Topics include naturalization, denaturalization, and expatriation; birthright citizenship; privileges and immunities of national and state citizenship; dual citizenships; federal “diversity of citizenship” jurisdiction; rights of territorial citizens, including Puerto Ricans, and the indigenous tribes; citizenship of corporations; and variations in citizenship rights by race, gender, sexual orientation, and religion.

The chief themes concern the struggles to achieve more equal, uniform, “first class” citizenship statuses in the first 2/3 of the 20th century and the issues raised by persisting and new forms of “differentiated” citizenship ever since. Using Lexis-Nexis, previous research assistants, including a PURM student last summer, have compiled a large number of pertinent federal judicial decisions. But that work needs to be completed, and I need additional compilations of pertinent federal statutes. I also need to compile up-to-date bibliographies of pertinent secondary sources on some topics. The project is huge, and a student who begins this summer will have opportunities to continue working until graduation (and maybe beyond!). I will assign the PURM-funded student to particular citizenship topics that connect with the student’s own interests. The experience the student gains in both research methods and knowledge may then help the student pursue a related senior essay or independent research project.

*Robert Vitalis*

**Project 1: The Pseudoscientific Status of the Geopolitics of Oil**

I am interested in a. the origins and b. the criticisms of our everyday, commonsense, and overlapping social scientific understandings of two somewhat related discourses. One is about the putative problem of control of or access to oil resources. The other is what we refer to as “geopolitics.” I don’t believe that these beliefs have much if any validity and my next book is designed to show how and why this is so. My research assistants will help me develop the inventory of claims made about these matters, compile the roster of leading public intellectuals

who advance these claims, and ideally produce some short critical essays about at least some of these thinkers. Students will need to use various digital resources, in particular, JSTOR.

## **POLITICAL SCIENCE/FOX PROGRAM**

*John DiIulio*

### **Project 1: Extended States: What's the Future of "Big Government" in America and Europe?**

Measured in relation to Gross Domestic Product (GDP), total annual government spending (federal, state, and local) in the U.S. is now over 40 percent of GDP. The nation's ratio of GDP to public debt reached 100 percent in 2011, the first time that has happened since 1948. Also in 2011, policymakers in each party as well as bipartisan panels proposed plans for cutting as much as \$4 trillion from national government spending over the next ten years. But by November 2011, it was clear that no such plans would be enacted into law. Indeed, a special congressional committee failed to agree on a plan to cut \$1.2 trillion from national government spending over the next decade. Lost in all the commentary about these failed plans was the fact that, even if \$4 trillion were cut from Washington's budgets by 2021, total government spending over that period would still be about \$64 trillion, the nation's GDP-to-public debt ratio would be largely unchanged (save to become somewhat higher), and most state and many local governments would likely end the period either semi-solvent or insolvent (largely as a result of unfunded public employee pension liabilities and related stresses). But the U.S. is hardly the only modern democracy facing such severe money troubles. Most European nations have quite kindred problems, and a few (in 2011, Greece and Italy) have already "hit the wall" financially. Also, like the U.S., many European democracies are having to balance the need for austerity measures with the need to keep spending not only on vital health and human services and other programs, as well as hitherto largely unmet challenges like, in the U.S. case, nearly a trillion dollars needed to address deferred maintenance on public water works, sewers, and sewage treatment infrastructure that now threatens both public convenience and public health. And, albeit to varying degrees, both the U.S. and the European democracies are grappling with the financial crisis not only through deficit financing but by increasing their respective degrees of reliance on third-party administrators such as private/for-profit contractors, nonprofit organizations, and quasi-governmental organizations.

The National Academy of Public Administration (NAPA) has in recent years focused fresh scholarly attention on the U.S. and other of what are now being termed "extended states." There are a whole slew of important research questions about how these extended arose, persisted, and have changed; how they are coping (or not) with the financial challenges of the moment; differences in their responses to everything from how to downsize postal services in an era when

"snail mail" volume is dwindling to how to change tax systems to the allocation of cuts between domestic programs and defense, and more.

This project on "Extended States" will zero in on four or five major policy domains where the U.S. and several European democracies are responding to their respective fiscal challenges, examine critically the extant literatures and documents pertaining to each, gather substantial baseline data, and compile a few new datasets, all in the service of attempting to generalize meaningfully about "the future of 'big government' in America and Europe."

The two student-researchers will work closely with the professor in outlining and designing the summer research plan of attack, as well as in its execution up to and through a preliminary report (20-30 pages exclusive of charts/graphs/tables/notes) that summarizes the findings and offers preliminary generalizations.

## PSYCHOLOGY

*Robert DeRubeis*

### **Project 1: Manuscript: Physics Methods Applied to Clinical Psychology Research**

Aim: to assist in all phases of preparing a manuscript describing and explaining the appropriateness of applications of physics methods to clinical psychology research (a physicist has agreed to serve as a co-author). The assistant would help conduct a literature review, as well as organize, edit, and prepare the manuscript for submission to a peer-review journal. Literature review activities include learning to use the Zotero research interface to collect published articles and create APA-style citations and reference lists. After collecting articles from psychology journals already identified as relating to this topic, the assistant would use the reference sections from these papers, as well as additional online database searches, to identify and collect more papers.

The assistant would extract and collect relevant paragraphs (with citation information) from these papers into a single document (to be used in the organization and writing of the manuscript), label each paragraph with keywords, and use the keywords to group discussions of similar concepts across different articles. The assistant would, in collaboration with existing authors, help organize and edit the final draft so that it conforms to journal submission criteria, and assist with electronic submission of the manuscript. This would be an excellent exposure to the scientific journal manuscript preparation process. The assistant would learn to use state-of-the-art internet research tools, and would also be exposed to ideas about how to analyze clinical psychology research data. In addition, there may be the opportunity for original contribution leading to co-authorship. There are no prerequisites for this position.

### **Project 2: Secondary Data Analysis of Depression Treatment Trial**

Aim: to assist in all phases of a statistical analysis of data from an NIMH-funded depression treatment trial investigating explanations of why patients receiving cognitive behavioral therapy remained depression-free (after treatment) longer than patients receiving anti-depressant medications. The assistant would learn to use SAS under a “research apprentice” model, working alongside a mentor and becoming increasingly independent. The analysis would start with acquiring the data set and running all of the procedures required to address the research questions (including linear regression as well as “survival analysis” procedures). Time permitting, the assistant would help write up the results in peer-review journal manuscript form. This research experience would provide excellent exposure to data analysis procedures and interpretation in clinical psychology research. The assistant would learn to run programs on one of the most powerful and widely-used statistical analysis software platforms. While there are no prerequisites for this position, one or two semesters of introductory statistics would be advantageous. This position would be especially helpful for students interested in careers in psychological research, statistics, or data analysis.

### **Project 3: Simulations of Clinical Psychology Treatment Study Data**

Aim: to assist with ongoing NIMH-funded research examining methods for investigating explanations of why patients receiving one treatment might recover from a mental health disorder more quickly than patients receiving another treatment. The assistant, working closely with the mentor, would help write and run advanced SAS programs to create, analyze, and summarize results from simulated patient data sets. The assistant would also help write up the results in peer-review journal manuscript form. This research experience would provide exposure to higher-level programming using the macro syntax of one of the most powerful and widely-used statistical analysis software platforms, as well as to data analysis procedures and interpretation in clinical psychology. While there are no prerequisites for this position, one or two semesters of introductory statistics or computer science courses would be advantageous. This position might be of special interest to students considering careers in psychological research, statistics, data analysis, or computer programming.

*Lori Flanagan-Cato*

### **Project 1: Regulation of glutamate receptor subunits in the hypothalamus**

Students will have the opportunity to participate in simple surgeries, hormone administration, histology, and image analysis. Students will be responsible for maintaining an accurate lab notebook, assisting in various aspects of experiments. As a prerequisite, students should have taken several sciences classes, such as chemistry, biology, BBB109. Previous lab experience is a plus.

*Joseph Kable*

**Project 1: Mental Effort and Decision Making Strategies**

The way people make decisions has long been a subject of intense study by educators, business people, and researchers. There has been considerable research on identifying simplifying strategies, or heuristics employed by individuals. Optimal decision rules usually involve a compensatory strategy in which individuals process all relevant information and make explicit tradeoffs between decisions variables. Such strategies require substantial computational effort, and so individuals may switch to a simplifying non-compensatory strategy when faced with complicated decision tasks. While non-compensatory strategies may reduce effort, these simplifying strategies can also lead to decision inconsistencies. Very little is known about the underlying mechanism of shifts in decision strategies and what causes these shifts. The aim of this project is to use a multi-method, multi-level approach to investigate the underlying mechanisms of decision-making and what causes individuals to change to a strategy that may result in sub-optimal decisions. An undergraduate research assistant is needed for the summer to assist with conducting behavioral, eye-tracking and/or fMRI experiments. Students will gain first-hand experience with running participants in a series of experiments and with conducting statistical analyses. Applicants should have completed some coursework in cognitive psychology and/or neuroscience.

**Project 2: Decision making over time**

How do human decision use past experience to decide how long they are willing to wait for rewarding outcomes in the future? We are studying the cognitive processes that underlie persistence. The student researcher will be involved in acquiring, analyzing, and modeling data from human behavioral decision-making tasks. Main responsibilities include (1) coordinating behavioral testing sessions, and (2) writing code in scientific programming languages (previous programming experience is not required). The student will also be expected to gain familiarity with the relevant research literature and to join in discussions of other decision neuroscience projects underway in the lab.

*Ayelet Ruscio*

**Project 1: Understanding Uncontrollable Worry in Anxious Individuals**

Research in our clinical psychology laboratory seeks to identify processes that increase risk for anxiety disorders. Many anxious individuals experience worry that they find difficult or impossible to control. In this project, we will be investigating the ways in which cognitive control processes – the basic mental abilities that enable us to exert control over our thought

processes – contribute to the ability or inability to control worry. We have previously studied the role of these processes in healthy individuals and found that, when they are asked to interrupt the worry process, people perform more poorly on basic measures of cognitive ability. The current project will extend this research to a clinical population, investigating the ways in which these mental processes are engaged by worry – and attempts to control worry – in anxious individuals. Through this research, we hope to inform the development of novel treatments for intrusive, unwanted thoughts in anxiety disorders. This project is ideally suited for a student interested in clinical psychology. The student will be involved in designing and implementing study procedures, recruiting and screening clinically anxious and healthy participants, collecting and managing data, and assisting with preliminary data analysis.

### *Sharon Thompson-Schill*

#### **Project 1: Effects of non-invasive stimulation of human brain on thought, language, and memory**

Students will learn how to design and administer an experiment involving either Transcranial Magnetic Stimulation or Transcranial Direct Current Stimulation to human volunteers, in order to assess the affects of transient alterations of neural activity on complex cognitive functions. This project is supported by the National Institute on Deafness and Communicative Disorders. Applicants should have some coursework in psychology, cognitive science, or neuroscience (preferably all of the above) and should be comfortable with both Mac and PC computer systems.

#### **Project 2: Imaging Human Thought**

Students will learn how to decode thought patterns from data obtained while human volunteers are undergoing Functional Magnetic Resonance Imaging. This project is supported by the National Eye Institute. We use analysis of brain patterns to understand brain changes associated with learning and memory in humans. Applicants should have some coursework in psychology, cognitive science, or neuroscience (preferably all of the above) and should be comfortable with both Mac and PC computer systems. For this particular position, the applicant must also be comfortable with basic statistical concepts and also must have some programming ability (e.g., Matlab).

#### **Project 3: Cognitive Styles: from genes to brains to behavior**

Students will learn how to assess differences in cognitive styles (e.g., visual learners and verbal learners), and they will become involved in projects that aim to relate these differences to (i) genetic variants, (ii) neural differences, and (iii) cognitive and behavioral patterns. This project is supported by the National Science Foundation. Applicants should have some coursework in

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psychology, cognitive science, or neuroscience (preferably all of the above) and should be comfortable with both Mac and PC computer systems.

## RELIGIOUS STUDIES

*Annette Yoshiko Reed*

### **Project 1: Jewish-Christianity and the History of Judaism: The Evidence of the Pseudo-Clementines**

This project focuses on a famous but understudied fourth-century Greek text, the Pseudo-Clementine Homilies – a novel from ancient Syria that offers rare evidence for "Jewish-Christian" perspectives on the Jewish and Christian past. As part of my work completing a monograph on the text and beginning an annotated commentary, I am seeking research assistants to help [1] with the task of systematically comparing the Homilies with a parallel novel, the Pseudo-Clementine Recognitions, and [2] with identifying and checking possible quotations and allusions to biblical, New Testament, and other writings. Skills in close and careful reading are necessary, and some background in ancient Jewish and Christian literature, and/or in Greek or Latin languages, are ideal but not required. Training in the relevant databases, research tools, and reference works will be provided.

## SOCIOLOGY

*Irma Elo*

### **Project 1: The Health of Black Immigrants in the United States**

The project is designed to investigate differences in health among children of native-born and foreign-born parents among the U.S. black population. Few nationally representative data sets contain an adequate sample of black immigrants, which has hampered research on this population. The project uses multiple years of the National Health Interview Survey (NHIS) and vital statistics birth records. The advantage of the NHIS is its large sample size, which allows us to have a sizeable sample of first and second generation black children. The NHIS contains multiple indicators of child health, including: a) General Health Indices (parental reports of overall health, activity limitations, bed days in prior year, hospitalizations, missed school days); b) chronic conditions (e.g., asthma), and c) mental health/behavioral problems.

The data also contains a wide range of socio-demographic, behavioral, and health variables of the parents enabling us to examine the association of these factors with child health among

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native- and foreign-born families. Using vital statistics birth record data we can examine birth outcomes not only among foreign-born and native-born U.S. black residents but among the foreign born also by the mother's country of birth.

Duties will include literature reviews, data entry, maintenance of EndNote data base, variable coding and help with manuscript preparation and power point presentations. Students will also participate in a design of survey instruments for primary data collection. Students will participate in a research group consisting of faculty and graduate students. Knowledge of Excel and PowerPoint required, knowledge of Endnote, STATA a plus.

*David Grazian*

### **Project 1: The Social Worlds of Zoos and Museums**

For this sociological project on The Social Worlds of Zoos and Museums, I am seeking an undergraduate student who I would train in public observational techniques and fieldwork documentation. They would then be responsible for conducting observations of public behavior at a variety of zoos and science museums in the region, including the Philadelphia Zoo and the Academy of Natural Sciences. (As part of their training I would accompany them in the field during their initial research visits.) In addition to time spent in the field, they would also type up detailed field notes of their observations immediately following their observation sessions, and we would discuss them as part of their research training. They would also be asked to take digital photographs of both exhibits and human behavior during their sessions in the field. Finally, they would be responsible for assisting me with interviews with key informants in the zoo and museum industry, and transcribing digitally recorded interviews.

Since this research will be ongoing, there will be opportunities for the student to continue working on the project after the completion of the summer. In this kind of fieldwork, the ability to decipher verbal cues and interpersonal conversations in public is paramount; therefore, the student researcher would ideally be a native English speaker. Also, since the fieldwork will be conducted in family-oriented environments that cater to children, and unfortunately, in such places solitary males are typically regarded as suspect (as I have learned first-hand when I have attempted to conduct research in these spaces while unaccompanied by my wife and/or 5-year-old son). Therefore, the undergraduate researcher must be female.

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*Kristen Harknett*

**Project 1: Do Shortages of Boys in High Schools increase Sexual Risk Behaviors? An Extension of Sex Ratio Theories to the School Setting**

Using data from the National Longitudinal Study of Adolescent Health, I am exploring how school sex ratio imbalances affect dating and sexual behavior. This research takes advantage of schools as relatively bounded dating markets and examine the influence of gender composition of schools on students' sexual and relationship preferences as well as their behaviors. Because high schools are often where people form their first romantic relationships, school sex ratios potentially have a formative and lasting influence on adult relationships.

**Project 2: Stratification in Family Behavior across Education Groups in Seven Industrialized Countries: Do Welfare States and Gender Ideology Explain Variations across Settings?**

In this project, I am harnessing cross-national, longitudinal data spanning two decades and seven countries to investigate patterns of socioeconomic variation in marriage across countries. Here, I am interested in how welfare states and gender systems shape the relationship between education, economic circumstances, and marriage and other family behaviors. One aim of this research is to adjudicate between competing hypotheses about welfare state influences on marital and cohabiting unions. In particular, welfare state generosity has often been seen as a threat to marriage because welfare state support can be used in place of the earnings of a spouse; however, a generous welfare state may encourage marriage if it leads to a greater feeling of economic security.

*Grace Kao*

**Project 1: Immigrant Parents and Youth in Spain**

We plan to use a dataset from Catalonia, Spain to examine parent-child relationships in immigrant families in Spain. Students will gain a background on similar studies in the US and also gather related literature on immigrant families in other European countries.

*Melissa Wilde*

**Project 1: Sociological Research on American Religious Denominations View of Abortion**

When how and why did abortion become the polarizing issue it is today for American religious groups? An undergraduate research assistant is needed to conduct archival and library research on the timing and nature of pronouncements regarding abortion by the most important religious groups in the US. The work will include accessing, skimming and summarizing denominational yearbooks and periodicals. A strong work ethic, literacy, diligence and care are the only skills needed, although preference will be given to applicants with previous historical, archival or library research experience.

**Project 2: Sociological Research on American Religious Denominations Views of Eugenics**

An undergraduate research assistant is needed to conduct archival and library research American religious groups' views about eugenics (a white-supremacist pseudo science that believed that the human race was deteriorating because of differential birth rates in the 1920s). The work will include accessing, skimming and summarizing denominational periodicals and yearbooks as well as transcribing and coding those materials. A strong work ethic, literacy, diligence and care are the only skills needed, although preference will be given to applicants with previous historical, archival or library research experience.

**Project 3: Sociological Research on American Religious Denominations' Views of Birth Control**

An undergraduate research assistant is needed to transcribe and code American religious groups' views about birth control in the 1930s, the first era of liberalization on the issue of contraceptives in the American religious field. The work will include accessing, skimming and summarizing denominational periodicals and yearbooks as well as transcribing and coding those materials. A strong work ethic, literacy, diligence and care are the only skills needed, although preference will be given to applicants with previous historical, archival or library research experience.

## **THEATRE ARTS PROGRAM**

*Rosemary Malague*

**Project 1: Stella Adler's Feminist Subtext**

I have received a fellowship spend thirty days at the Harry Ransom Center in Austin, Texas this summer (most likely the month of July) to study the archive of famous American acting teacher, Stella Adler. The archive includes thousands of hours of video recordings of her teaching, as

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well as all of her papers. I am seeking evidence of a "feminist subtext" in her work (this follows on the publication of my book, AN ACTRESS PREPARES: WOMEN AND "THE METHOD.") I am not sure what I will find but there is scant scholarship on Adler, and no biography. I look forward to the search! Ideally, I would invite a student researcher to spend all or part of the month with me (depending on cost of travel and lodging) and assist me in this exciting archival research. If you have further questions, please let me know!

### **Project 2: The Role of the "Stricken Spouse": Performing the Sex Scandal Press Conference**

I will be presenting a paper with this title at a national conference at the end of the summer. The student's job would be to assist me in compiling the most compelling cases to study (Eliot Spitzer; David Patterson; David Vitter; James McGreevy)--as well as the spouses who held their \*own\* press conferences (Donna Hanover, whose spouse was Rudy Guiliano; Jenny Sanford, married to governor of South Carolina). The student researcher will then compile video recordings and analyses of these press conferences. Using performance studies and feminist theory, we will analyze how these political figures and their spouses "staged" and "performed" their roles. What are these performances designed to do? Do they reinforce male authority, heterosexual marriage, and the role of the "family man"? When do women, instead, use their performances to reassert their sexuality and to attain their own personal--even political--power?

The student may have the opportunity to attend the presentation at the Association for Theatre in Higher Education national conference in Washington, D.C. in early August.

### **Project 3: Women and Stanislavskian Acting**

I have been asked to contribute a chapter to the Routledge Companion to Stanislavsky (the great actor/director/acting theorist whose work transformed American acting--its influence is EVERYWHERE). My new book, AN ACTRESS PREPARES: WOMEN AND "THE METHOD" studies the American teachers who inherited/interpreted Stanislavsky's System. This project will go back to the original sources. The student will work on compiling all of the existing research on Stanislavsky and women--his historical work as well as feminist criticism of him and/or his theories. This will include creating reading lists--and reading along with me, analyzing both the theory and the historical record to see whether women were/are treated differently in Stanislavskian acting theory/tradition than men. Note: Although I am familiar with the theory, new work has been done on Stanislavsky as an historical figure, with recent scholarship on the women he directed (and, in some cases, championed). I look forward to reading these alongside to his long-published theories.

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*James Schlatter*

**Project 1: The Arts and the Transformation of Public Space**

For this research project I am interested initially in gathering a wide range of information on the recent global phenomenon of environmental art, public performance and art events that are created/staged chiefly outside the traditional confines of museums, galleries, and performance spaces. From this large gathering of information, including published accounts, video records, and interviews with and public statements by artists working in this field, I am hoping to gain some understanding of the foundational principles, philosophical perspectives, and, perhaps ideological convictions manifest in this work, even though they may have necessarily, an almost unlimited application. I am also very interested in investigating the historical foundations of this work, in particular in the alternative arts culture of the 1960's in America through Allan Kaprow's happenings, environmental theatre, and the multidisciplinary performance pieces by such artists as Merce Cunningham, John Cage, and Robert Rauschenberg.

In particular, I am very interested in investigating work that breaks out of traditional art and performances spaces into larger urban and public spaces and brings the viewer/spectator into the work as a field of experience, rendering him/her effectively a participant or even co-generator of the work. What is the cultural significance and potentially political value of this admittedly amorphous and multi-dimensional work at the start of the 21st Century? How does it help to illuminate and invigorate, and to what extent does it participate in, contemporary public culture internationally at a time of Tahrir Square, the "Occupy" movement, and even flash mobs? How does art, in its myriad forms, activate and engage public space and our shared culture in unique and potentially transformative ways? As a theatre person, actor and director, I am interested, in particular, in the presence of live performers in the work and how their activation of an event breaks down that final barrier, the secure circle surrounding the viewer/spectator. Does the viewer/spectator become in effect a participant in the event and does this then have significant political meaning when performers and viewer/spectators share a public identity within an artistically and/or theatrically activated space? Are there ethical principles involved, limits to the degree of engagement, even of intimacy, that this work provokes? In this regard I will want to chart some of the history of personal performance art since the 1970's.

I would love to work with a student who is interested in the contemporary art scene in America and possibly internationally from an artistic but also cultural and conceptual perspective, and also who is possibly, but not necessarily, a working artist. Much of the work would involve researching accounts of this kind of work, locating videos, and perhaps interviewing artists and members of companies and collectives. I would also be very interested in someone seriously interested in urban studies. I would want to conduct an ongoing dialogue with that student, engaging energetically in discussion about the issues that this work raises.

## URBAN STUDIES

*Andrew Lamas*

### **Project 1: Critical Refusals: Critical Theory Publishing Project**

A major conference took place at Penn – sponsored by the International Herbert Marcuse Society – in Fall 2011. Featured speakers included some of the world’s most important scholars and activists working on critical theories, liberation philosophies, and other socially engaged projects in the social sciences, humanities, and other disciplines. A special issue in *Radical Philosophy Review* and a special issue of *Space & Polity* – two important international journals – will feature articles and other contributions from the conference. These volumes are scheduled for publication in Winter 2012. The student selected for this summer research project will work with me (and a team of scholars around the world) to publish these two special journal issues. The student's name will appear in the published journals. The ideal student for this project is someone who: (a) is interested in theoretical and political questions across a wide range of disciplines and (b) enjoys (and excels in) research, editing, and writing.

### **Project 2: Critical Refusals: Radical Video Project**

A major conference took place at Penn – sponsored by the International Herbert Marcuse Society – in Fall 2011. Featured speakers included some of the world’s most important scholars and activists working on critical theories, liberation philosophies, and other socially engaged projects in the social sciences, humanities, and other disciplines. All of the conference lectures, presentations, and workshops were videotaped. In connection with the conference, hundreds of people marched – with Angela Davis – to the OCCUPY PHILLY encampment at City Hall. This protest march and Angela Davis' speeches (in Irvine Auditorium and at City Hall) were also videotaped. The student selected for this summer research project will work with me to edit these videos for worldwide distribution during summer 2012. The student's name will appear on these videos. The ideal student for this project is someone who: (a) is interested in theoretical and political questions across a wide range of disciplines and (b) has an interest in (and a demonstrated capacity for) video editing. The project requires a student with some experience editing videos – for example, with iMovie or Final Cut Pro X – for personal, academic, or other projects. We would like the videos to be edited in Final Cut Pro X. If you have not used this program, but you are committed to learning it, then you are still eligible to apply for this project.

### **Project 3: Political Economy Documentation Project: The Tea Party, Occupy, and the Arab Spring – Documenting Discourses of Inequality**

Political and economic power was challenged in significant ways in 2011. Contending discourses about inequality were important features of the protests – and of the counter responses. This project will document the critiques and defenses of inequality as well as the proposed responses

to inequality. The ideal student for this project is someone who: (a) is interested in learning about ways of framing and addressing the problem of inequality and (b) enjoys (and excels in) research – across a range of sources (e.g., speeches, YouTube videos, protest signs and posters, songs and chants, slogans, religious sermons, news articles and editorials, blogs, official statistical reports, policy statements by think tanks, analyses by public intellectuals, campaign rhetoric, legislative proposals).

## ***Michael Nairn***

### **Project 1: The Heirloom Garden Project**

Collards taste best after the first frost. Butter beans cannot be started until after the temperature has hit 80 degrees for four consecutive days. Lime cures most pest problems in the garden. These are just a tiny sampling of the wisdom and indigenous knowledge from Philadelphia's community gardeners. Many of the African American gardeners have their roots deep in the soil from childhoods spent in rural Georgia and North Carolina from where they came as children in the Great Migration. Many are now retired and have taken up gardening as a passion from their childhood. At the same time, childhood obesity and diabetes are at epidemic levels. Present throughout the entire socio-economic strata, these conditions have disproportionately hit African Americans and Latinos in lower income neighborhoods. In these neighborhoods food access, predominantly income access but also geographic access, limits availability to fresh food. To help combat this, the Urban Nutrition Initiative (UNI), a part of the Netter Center for Community Partnerships, and other local organizations are teaching nutrition in the public schools. At Pepper Middle School in Southwest, Jarrett Stein from UNI founded the Rebel Gardeners (The Southwest Child Rebel Gardeners) (<http://www.rebelgardeners.org>). The Rebel Gardeners maintain a garden and orchard at Pepper where during the summer, they learn to cook and to harvest produce from the garden that is sold at local farmers markets. Philadelphia's largest community garden, the Eastwick Common Ground Garden (aka The Airport Garden) is located a short distance away from Pepper Middle School. Located on land owned by the city's Department of Aviation, its continued existence is in doubt because the long-term plan for the site is a conversion to airport parking.

In 2010, Jarrett Stein and I introduced the Pepper students to the older community gardeners. Since then, the Rebel Gardeners have visited the community gardeners and interviewed them about their lives and gardening. The short interviews can be found at <http://www.rebelgardeners.org/category/eastwick-community-garden/>. In summer 2012, we wish to conduct a more extensive ethnographic study of the gardeners as well as the students, once again pairing a Rebel Gardener with a community gardener. The goal is to facilitate an inter-generational transfer of knowledge from the garden mentors to the Rebel Gardeners. There is a strong culture and knowledge of food among the gardeners as well as one of generosity. The

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study will collect and document stories from their lives focusing on their food traditions. As well as gardeners from the rural south from whom we have heard stories about attending one-room schoolhouses that were ‘for coloreds only’ and walking behind horse-drawn buggies, the garden also contains people with just as fascinating life stories from Germany, Italy, India, and Philadelphia.

The students, likewise, come from different places. While many have grown up in Southwest, there are many African immigrants from Liberia and Sierra Leone. The project will document their stories as well. Besides hearing stories of childhoods in far-away places, we have also heard (but not yet tasted) recipes for the city’s best collards, sweet potatoes, okra, and pickles while visiting the Airport Garden. The learning goal is to transfer knowledge about heritage, particularly food heritage, from the older group to the younger. The Rebel Gardeners will be assisted in their ethnographic project by students from URBS 290, Urban Agriculture which is taught in the Summer I session. There are two proposed products from the summer labor. The first is a traditional ethnographic study in which the stories of the participants are documented and preserved. Because the garden is threatened, it is unclear for how much longer the garden will survive. Additionally, because many of the gardeners are past retirement age, it is also unclear how long they will be able to garden there. The second more ambitious product for which we are seeking funding, is to produce a cookbook featuring both sets of gardeners, produce from the gardens, and recipes from the Eastwick gardeners made by the Pepper students. The goal of the cookbook is to empower youths to grow and prepare healthy food.

The undergraduate research assistant will be involved in all aspects of the project, which we anticipate will take approximately three months (May 20 – August 10) to collect information and interview the gardeners. S/he will first familiarize her/himself with ethnographic techniques, coordinate interviews, and assist in transcription and conceptualizing the cookbook.

*Elaine Simon*

### **Project 1: The Limits of Education Organizing: Tragedy and Farce at West Philadelphia High School**

For six years, Elaine Simon and her colleague John Puckett, were involved as participant observers at West Philadelphia High School— since 2005 as members of the West Philadelphia Community Partners’ education-organizing project; since 2007 as instructors of an academically based community service seminar (ABCS) at Penn that supported the high school’s Urban Leadership Academy. In 2010, the school district’s school reform initiative to turn around “failing schools” easily ended the positive momentum and that had been established by the locally-based efforts of community members, parents, students, and school staff. This project seeks to understand the different forces that account for the turn of events a way to provide

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insight into how the community based effort, which was meeting with success, became derailed and what lessons emerge. A student researcher would help Elaine Simon by carrying out historical research on WPHS' evolution both programmatically and in light of demographic changes in the neighborhood and school through several previous decades. The work will involve finding and gathering information from various types of sources, including archival research housed at Penn's archives and elsewhere; demographic data sources such as Social Explorer and Policymap; and interviews with those involved and WPHS alumni. Ideally, students will have some familiarity with collecting and analyzing demographic data, but this is not a requirement. Some knowledge of education trends can also be useful.

### *George Thomas*

#### **Project 1: From Palace to Factory: The Competition for the Pennsylvania Academy of the Fine Arts**

In the fall of 2012, seven Philadelphia institutions will join in celebrating the architect Frank Furness with a group of exhibits on aspects of his work. The key exhibit will be at the Pennsylvania Academy of the Fine Arts which will use the central corridor of its main exhibit space to present an exhibit on the competition for their building, won by Frank Furness in 1871. The exhibit will entail a brief overview of the earlier buildings of the Academy, contemporary art buildings in NY and Boston, the competition designs, the development of the winning competition leading to the first ever full exhibit of the original construction drawings and ending with images of the completed building taken in 1876. A Penn student worked with me on other aspects of this large project, last summer looking at the records of the Franklin Institute, the source of the new industrial and engineer clients who changed Philadelphia for whom Furness worked.

This project will entail developing the list of materials for the exhibit, organizing their placement on the walls and then assisting in developing group texts and individual object captions that will be coordinated with the other six exhibits. The work will give the student a chance to participate from beginning to end in the organization of a major architectural exhibit, will give her the equivalent of a publication credit, and will materially assist me in pulling off the seven exhibits. The principal director of the exhibits will be George Thomas, the author of *Frank Furness: The Complete Works* (1991, revised 1996)

#### **Project 2: Building the Identity of America's Great Railroads: Frank Furness and the Reading, the Pennsy and the B&O**

This exhibit will occupy the first floor main gallery of the Library Company of Philadelphia and will coordinate and bring together for the first time images of Furness designed railroad stations for three of the great railroads of the nation. The exhibit is part of a cycle of 7 exhibits for the

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major institutions of the city, each of which has connections to Furness and his work. The work for this exhibit will involve organizing a checklist of the available materials from the Architectural Archives of the University of Pennsylvania, the Library Company of Philadelphia, and the Athenaeum of Philadelphia as well as several private collections that will be the raw materials of the exhibit. This will be coordinated with Dr. Preston Thayer whose Penn Ph.D. looked at the question of Furness' development of separate identities for three of the great railroads of the nation, the Reading, the Pennsylvania, and the Baltimore and Ohio and with Dr. Thomas, the principal coordinator of the seven exhibits that will be located around Philadelphia in the fall and winter of 2012.

The student will learn about the extent of these railroads and their industrial and cultural hinterlands and will get experience working with original exhibition materials, participate in the selection and organization of the exhibit, and then coordinate and write exhibit texts and object captions. The student will be credited in the exhibit text and will be credited in the website for the Furness project.

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## **Dental Medicine**

### **PATHOLOGY**

*Bruce Shenker*

#### **Project 1: Regulation of lymphocyte cell cycle by the bacterial-derived cytolethal distending toxin**

Several human pathogenic bacterial produce a toxin, known as the cytolethal distending toxin (Cdt) which induces cells to undergo cell cycle arrest and eventually cell death resulting from activation of the apoptotic cascade. Thus these toxins potentially serve to suppress or perturb host defenses. Student duties will be to participate in studies aimed at determining the molecular mode of action by which Cdt induces these toxic effects. Methods include cell culture, flow cytometry, Western blot and ELISA.

## **Design**

### **ARCHITECTURE**

*Yun Kyu Yi*

#### **Project 1: Integrating Building Energy Modeling with the Stochastic Human Behavior Model**

People respond differently to their surroundings. These responses influence energy consumption in buildings. Capturing human behavior and representing it in energy simulations to predict building energy consumption has been a difficult task. Previously, human behaviors have been taken into consideration by subcategorizing their different actions and activities using statistical sampling. Based on these deterministic algorithms, different schedules are developed to capture human behavior. In buildings, the HVAC system and lighting respond to indoor set points which correspond to such schedules. This preset deterministic model does pose a problem of uncertainty to capture diverse human responses to their surroundings, such as different tolerance levels and corresponding actions. The goal of this research is to develop a method that captures diverse human reactions by integrating a stochastic model with energy simulation. This research will develop a human behavior model which will be integrated with energy simulations to yield a more accurate energy simulation. This research will be the ground work to develop a human behavior model that integrates with energy simulations in a dynamic time step base manner. The research will require undergraduate support in different stages.

The research will need in-depth information to relate to the test building, such as material properties, the buildings HVAC system, building operations and lighting schedules. This field data collection will allow undergraduates to understand the complexity and uncertainty behind energy simulations. During the main research, undergraduates will observe, learn, and support building energy modeling. Additionally, in the validation stage, undergraduates will be engaged to collect and analyze real measured energy data to compare with the outcome of this research. Overall, this research will allow undergraduates an opportunity to explore energy simulation modeling which is an outstanding skill for architectural and building engineering careers.

#### **Project 2: Real Time Simulation with the Smartphone**

After a long development period, in recent years the smartphone has become ubiquitous. Smartphones go beyond mere telephony, as they take on the capabilities of both camera and handheld computer. Thus smartphones are equipped with both an array of sensors, responding to stimuli from light to sound to motion, and processing power. Having such sensors and processing power in a ubiquitous handheld device offers an intriguing, new possibility for understanding the quality of our living environments. The smartphone offers the potential for dynamic mapping of interior environmental quality, measuring the changing environmental qualities, such as light

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levels, acoustics, and even air quality and thermal comfort, over the course of days, weeks, and years. Data could be generated non-invasively, through utilizing office workers' smartphones as measurement instruments. This data could be used to generate a three-dimensional environmental map of the interiors of our cities. This map could be an invaluable aid in several respects. On one hand, this could provide students of the built environment with a new way to learn about the interior environment. On the other, it could provide municipalities and building owners with a means of assessing interior environmental conditions in relation to their efforts to reduce carbon footprints and increase comfort. Thus, the resulting data of this kind of measurement could provide raw material for future renovations, calibration for building simulation studies, and insight into indoor climatic conditions for workers. This research will be the ground work to develop applications to be utilized for real time simulations.

The research will require undergraduate support to develop an application to receive and collect environmental factors such as temperature, illuminance, and wind speed. In the validation stage, undergraduates will be engaged to collect and analyze real measured energy data to compare with the simulation outcome.

## **CITY AND REGIONAL PLANNING**

*Domenic Vitiello*

### **Project 1: Community Gardeners' Food Production and Distribution in Chicago**

Community gardens play important roles in urban neighborhoods, and some proponents claim they can feed city populations on a large scale. Yet researchers have only begun to document gardeners' actual food production, distribution, and impacts on community food systems. This project will expand on pioneering studies of community gardening and urban farming in Philadelphia, Camden, and Trenton by Prof. Vitiello and colleagues. From Philadelphia, we will conduct background research on the history, institutions, and practice of urban agriculture in Chicago. We will also travel to Chicago to participate in part of a study of community gardens in collaboration with NeighborSpace, the community land trust that preserves and supports over 80 gardens in the city, and other colleagues from universities and organizations in Chicago.

This research is replicating and elaborating upon our research in Philadelphia and New Jersey. We will tour gardens and conduct in-depth interviews with gardeners about their gardens, food production, distribution, and community food practices. This is an opportunity to expand this research to another major city in a different region, and to develop a detailed comparison of community gardens, their food production, distribution, and roles in community food systems of major U.S. cities. Students' duties will include conducting library and internet research; traveling once or twice to Chicago to visit gardens and conduct in-depth interviews; and summarizing this

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primary and secondary research in writing and Microsoft Excel. There are no prerequisites for this project, though basic familiarity with Microsoft Excel is a plus.

## **URBAN STUDIES**

*Domenic Vitiello*

### **Project 1: Community Gardeners' Food Production and Distribution in Chicago**

See description under City and Regional Planning

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## **Education**

### **APPLIED PSYCHOLOGY AND HUMAN DEVELOPMENT**

*Helen Garinger*

#### **Project 1: Utilizing popular culture to enhance & reinforce class lectures**

Description I value the significance that popular culture can contribute to a lecture. Clips from YouTube, videos, and movies, have enhanced my lectures training students to become mental health professionals and school counselors. Select clips, obscure or familiar snippets from popular culture, can demonstrate and reinforce key points in numerous aspects of counselor training such as: Relationships between therapist and client, trust, disclosure, and the use of humor. To gain an understanding of the context and purpose of the clips used in my classes, the student and I will spend time discussing courses I teach. Aim The goal of this research project is to expand my library of clips and prepare them for use in class. The undergraduate researcher will share his/her knowledge with me regarding resources.

Duties The student researcher will find appropriate TV, theatrical motion picture, documentaries, and additional media sources relevant to the subject. Required skills An interest in the topic, a sense of humor, good writing skills, a creative outlook, knowledge of current, popular, and classic TV shows, and skills searching social media sites for video content. Student Gain There is potential to transform this research into a paper for publication. The student would have to be willing to research what has been written on this subject, review articles and books, and assist me in writing the article.

#### **Project 2: Victims of female bully bosses in the workplace** ***Rising Juniors only***

I have researched adolescent female bullying and cyber bullying. These bullies maintain their behavior into adulthood. As a victim myself, I have been interested in investigating the female bully boss and her victim. I have pondered several questions regarding the female bully boss: How does the work environment perpetuate this personality type? What enables these bully bosses to thrive? What impact do they have on their victims? What can their victims do? Graduate students are conducting interviews and surveying a number of people who have been or are victims of bully bosses. The goal is to find common themes in responses. Further research can develop effective intervention strategies. Most individuals do not resort to violence as a method of settling disputes, and quitting, may be the only option to end the bullying. The objective of this study is to explore the techniques victims use to tolerate or combat their bully boss.

Duties: The student will review the completed surveys, search for common themes amongst the responses, patterns of behavior, coping mechanisms, and suggestions from the respondents. The

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required skills for the undergraduate researcher will be curiosity, an interest in the topic, and a willingness to review articles pertinent to the topic. The student will gain experience in doing qualitative research, participate in a research project, and contribute to a future article on the subject.

### **Project 3: Using Arts as Intervention Tool**

Description Creating a relationship between counselor and client is essential. How this relationship is built can require a different approach. A counseling internship student, who worked with me last year on this topic, has been using the arts as an intervention technique to connect with three troubled high school students. Another counseling intern has been working with an art therapist and adolescent girls suffering from eating disorders. I have questions to ask these counseling interns: Are there similarities utilizing creative works among troubled adolescents? How do they differ? Can the creative work reveal any issues the students confront? Can utilizing the arts as a therapeutic intervention be an effective treatment technique? How did the counseling interns evaluate about this approach?

Aim of project The aim of the project is to assess whether or not the counseling interns were successful utilizing the arts as an intervention. Required skills The undergraduate researcher needs to be interested in the arts, possess good writing skills, and enjoy working with others.

Duties The undergraduate researcher will review written findings from the counseling interns, research existing literature to support various contentions, meet with the counseling interns to discuss common themes, patterns, and make assessments. The objective for the undergraduate researcher is to contribute to a scholarly paper collaborating with other students and the professor.

## **EDUCATION**

*Stanton Wortham*

### **Project 1: The Trajectories of Mexican Immigrant Children in an American Suburb**

Growing numbers of Mexican immigrant families are now settling in areas of the United States that historically have not been home to people of Mexican origin. The immigrants in our study have moved over the past 15 years to a Philadelphia suburb inhabited mostly by whites and African Americans. The planned summer research is part of an ongoing 7-year ethnographic study. We are examining how the receiving community and Mexican newcomers interact in a variety of contexts, such as schools, health care centers and neighborhoods, focusing on how long term residents identify immigrants and on how young immigrants position themselves in their new situations. We are looking for an undergraduate research assistant who speaks Spanish

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and has some experience with Latino communities or immigrants. This student will gain experience in qualitative research methods such as interviewing, taking field notes and making contacts in the community. The student will make regular visits to the community, both on his or her own and with the research team, to observe events and speak with local residents. A significant part of the project will involve assisting teachers in summer school classes for migrant Mexican youth. There will also be meetings with the research team to participate in data analysis and archiving, and some independent data analysis done at home or on campus.

## **EDUCATION, CULTURE AND SOCIETY**

*Ameena Ghaffar-Kucher*

### **Project 1: Constructing Citizens Through Education: A Comparative Study of Curricular Discourse in Four Muslim Majority Societies**

How do nations construct citizens? This is the central question of a cross-country comparison of citizenship and social studies curricula in four Muslim Majority countries: Indonesia, Egypt, Turkey and Pakistan. Examining other societies is a way to recognize that citizenship is not a naturally endowment and that every society constructs it differently. You will be part of a larger project aimed at helping curriculum writers globally in critically examining and reforming the citizenship curricula. Specifically, each student will work on a literature review and document analysis of citizenship education in Egypt or Turkey. While Egypt is at the heart of the Arab Spring, Turkey's geographic location at the cusp of Europe and Middle East reflects a fascinating blend of influences from both West and the East in both politics and culture. How these countries are dealing with their specific challenges in terms of citizenship education is both fascinating and timely. Aside from learning the research techniques of document analysis and literature review writing, you will learn about the ways in which citizenship is constructed in different societies and become more cognizant of your own rights and responsibilities as a citizen. Students must have strong writing skills. Turkish or Arabic language skills are not required, but are preferred. Knowledge of the Middle East is also a plus.

## HIGHER EDUCATION

*Marybeth Gasman*

### **Project 1: Philanthropy among Alumni of Color at Majority Institutions**

I am working on a book related to philanthropy in communities of color. The project includes survey design and analysis, interviews and corresponding coding, literature reviews, and editing. The student will have an opportunity to learn about book writing and the publication process. S/he will also work with me to gather the research.

### **Project 2: Student Success and Degree Completion at Minority Serving Institutions**

I am working on a large project related to student success at minority serving institutions. The research includes quantitative analyses, qualitative interviews, literature review, working with national funding agencies and foundations, and participation in a research team.

### **Project 3: Center for Minority Serving Institutions**

I am securing funding for a Center for Minority Serving Institutions. In order to do so, I am submitting proposals to 12 different foundations. The student would assist with research and background for the grant proposals. This project includes working with development staff at Penn, foundations, and learning about the grant writing and research process.

## READING/WRITING/LITERACY

*Gerald Campano*

### **Project 1: How Immigrant Communities Support Children's Education**

This research project examines how immigrant communities support children's education. These are the project's two broad goals: (1) to reveal the sociocultural, political, and policy factors that inhibit or support newcomer families' efforts to participate in and advocate for their young children's education, and how these factors interact; and (2) to show how participatory action research can help leaders in a diverse faith-based organization and neighborhood organize across sociocultural boundaries to advocate for families' educational needs. Requirements, duties, and responsibilities: able or willing to learn to conduct qualitative research; conduct participant observations at the research site in South Philadelphia; take, code, and analyze fieldnotes; participate in a research colloquium and regular research meetings at the Penn Graduate School of Education; co-author literature reviews; conduct interviews with research participants if the undergraduate research assistant is fluent in either Indonesian, Spanish, or Vietnamese

### **Project 2: An Inquiry into Assessing Language and Learning Differences**

This research project is based on a partnership between a master's level course (Assessing Language and Learning Differences) at the Graduate School of Education and a faith-based organization in South Philadelphia. Master's students taking the course work with elementary school students to understand and support their growth in literacy. Among several collaborations, the master's students and linguistically diverse elementary school students exchange letters as "Penn Pals." One main goal of this research project is to examine the experiences and perspectives of the participating master's students and elementary school students.

Requirements, duties, and responsibilities: able or willing to learn to conduct qualitative research; code and analyze qualitative data collected from this research (interviews, fieldnotes, Penn Pal letters, assignments and writings of master's students, and a range of artifacts gathered from participants); transcribe interviews; participate in research meetings at the Penn Graduate School of Education; co-author literature reviews

### **Project 3: Building a University-Community Partnership**

This project focuses on further developing a university-community partnership between the Graduate School of Education and a faith-based organization in South Philadelphia. The undergraduate research assistant will conduct hands-on field research while serving as the community liaison. Requirements, duties, and responsibilities: attend and take fieldnotes at community meetings; code and analyze fieldnotes; able or willing to learn to conduct qualitative research; maintain communication with various community leaders, including leaders of youth groups and the Director of the Child Development Center; research funding and grant opportunities relevant to this university-community partnership; assist in the grant application process (literature reviews, writing, etc.); attend regular research meetings at the Graduate School of Education

## **Engineering and Applied Sciences**

### **BIOENGINEERING**

*Jason Burdick*

#### **Project 1: Molecule Delivery from Engineered Hydrogels**

The Burdick Laboratory is interested in the design and characterization of hydrogel materials for a range of biomedical applications, including tissue regeneration and drug delivery. The focus of this project will be to investigate the delivery of inhibitor molecules from engineered hydrogel systems to alter the remodeling of extracellular matrix. The student will help in the investigation of the binding of these molecules to the hydrogel, as well as to characterize the release kinetics and activity of delivered molecules.

#### **Project 2: Imaging of Injectable Hydrogels**

The Burdick Laboratory is interested in the design and characterization of hydrogel materials for a range of biomedical applications, including tissue regeneration and drug delivery. The focus of this project will be to assist in the development of imaging protocols to monitor and track hydrogel properties and degradation. Some background in imaging, such as MRI, is helpful towards our goal of imaging biomaterials.

*Christopher Fang-Yen*

#### **Project 1: A genetic and optical study of *C. elegans* feeding**

Our laboratory is interested in understanding how neural circuits generate behavior, using the roundworm *C. elegans* as a model. *C. elegans* eats bacteria through rhythmic pumping motions of its pharynx (feeding organ). In previous work we used high speed video microscopy to discover how the pharynx pumps and filters food particles (Fang-Yen et al PNAS 2009). In this project the student will use optogenetics (controlling neurons with laser beams) and genetics (analysis of mutant animals) in conjunction with high speed video microscopy to investigate the neural and genetic bases of pharyngeal behavior. Tasks include microscopy, strain maintenance, data acquisition, and data analysis. Previous lab experience and some familiarity with MATLAB are helpful.

#### **Project 2: Microfluidic devices for *C. elegans* biomechanics**

Our laboratory is interested in understanding how neural circuits generate behavior, using the roundworm *C. elegans* as a model. As part of understanding the worm's motor behavior, we seek

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to study the interplay between active muscle forces, passive elastic forces, and forces from the environment during locomotion. The student will design and fabricate microfluidic devices capable of quantifying the forces exerted by a worm, and apply them to measure force generated by wild type worms and neuronal and muscle mutants. Tasks will include microscopy, computer-aided design, microfluidic fabrication, strain maintenance, data acquisition, and data analysis. Previous lab experience and some familiarity with MATLAB are helpful.

### **Project 3: Using light and genetics to understand how worms move**

Our laboratory is interested in understanding how neural circuits generate behavior, using the roundworm *C. elegans* as a model. We will use optogenetics (controlling neurons using laser beams and light-activated ion channels) to perturb the worms' motor circuit and analyze the resulting behavior using quantitative behavioral imaging. Tasks will include microscopy, strain maintenance, data acquisition, and data analysis. Previous lab experience and some familiarity with MATLAB are helpful.

*Andrew Tsourkas*

### **Project 1: Synthesis, characterization, and evaluation of nanoparticles for x-ray imaging**

**Rising Juniors only**

Recently, there has been growing interest in the use of gold nanoparticles (AuNPs) as contrast agents for x-ray computed tomography (CT) imaging applications. However, data suggests that AuNPs are not efficiently removed from the body following intravenous injection, e.g. there is only a 9% fall in the content of gold in the liver from day 1 to 6 months. A major goal of our lab is to develop biodegradable AuNPs that can be efficiently excreted. The student working on this project will synthesize various gold-based nanoparticle formulations, characterize the nanoparticles (i.e. size, charge, etc.), and test their cytotoxicity and biodegradability. If time permits, they will also functionalize the nanoparticles with targeting ligands and identify their specificity for cancer cells.

### **Project 2: Optimization of pH-sensitive nanovesicles for targeted drug delivery**

**Rising Juniors only**

The use of nanovesicles for drug delivery applications has recently garnered a great deal of interest, because nanovesicles can be designed to carry large drug payloads, specifically target tumor sites, and degrade -releasing their contents- once internalized into tumor cells. A major goal of this project is to optimize the targeting and release kinetics of drugs from nanovesicles that are prepared in the lab. Students working on this project will synthesize various nanovesicle formulations, characterize the nanovesicles (i.e. size, charge, etc.) and evaluate their drug release

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kinetics under various conditions. If time permits, they will also functionalize the nanovesicles with targeting ligands and identify their specificity for cancer cells.

## **CHEMICAL AND BIOMOLECULAR ENGINEERING**

*Matthew Lazzara*

### **Project 1: Improving the Efficacy of anti-ErbB Chemotherapeutics**

The ErbB receptor tyrosine kinases (ErbB1-4) transmit cellular signals in normal physiology, but improper ErbB expression and regulation is also involved in cancer. Unfortunately, clinical response to therapeutics targeting the ErbB receptors is generally limited to small patient subpopulations. For example, the majority of non-small-cell lung carcinomas (NSCLC) express elevated levels of ErbB1/EGFR, but response to the EGFR inhibitors gefitinib and erlotinib is mostly limited to the 10% of NSCLC tumors with somatic EGFR mutations. These mutations alter EGFR function and render cells “EGFR oncogene-addicted.” We are developing mechanistic understanding of the differential function of these mutant receptors in order to predict settings where EGFR inhibitors may be effective and develop ways to treat NSCLC tumors without EGFR mutation. This project involves experimental studies of the biochemical pathways that govern cellular survival decisions in cultured NSCLC cells. Techniques include mammalian cell culture, Western blotting, flow cytometry, and biochemical activity assays. Prior experimental training is helpful but not required. Introductory chemistry and biology coursework is required.

### **Project 2: Development of Computational Models of Growth Factor Receptor Mediated Cell Signaling**

The ErbB receptor tyrosine kinases initiate biochemical signaling pathways in cells which direct cellular processes including migration, proliferation, and differentiation. The regulation of the receptors themselves and the downstream signaling pathways they control depends on many coupled biochemical rate processes. In order to better understand the determinants of ErbB receptor mediated signaling and to make predictions for how it might be modulated for therapeutic purposes, we are developing mechanistic and data-driven computational models of ErbB receptor mediated signaling processes. Mechanistic models consist of coupled differential equations which describe the fundamental rate processes involved in ErbB receptor binding, trafficking, and phosphorylation. Data-driven models take advantage of established methods rooted in linear algebra and statistics for determining which cell signaling events are most determinative of particular cell outcomes. Proficiency with Matlab is extremely helpful for this project.

### **Project 3: Role of Extracellular Matrix Properties in Growth Factor Receptor Mediated Cellular Processes**

The extracellular matrix (ECM) has emerged as an important determinant of cell fate decisions, for example in the differentiation of embryonic stem cells into different lineages. Although a role for ECM properties in determining receptor-mediated cell signaling processes has been hypothesized, very little has been done to quantitatively investigate a potential connection. In this project, we seek to determine the role of ECM stiffness and composition in determining the dynamics of growth factor receptor mediated cell signaling processes and a variety of cellular behaviors. This project will involve the creation of synthetic gel substrates with different stiffness and composition properties, the culture of mammalian cells on those substrates, biochemical measurements of cell signaling pathway dynamics, and measurements of cellular responses including death and proliferation. Introductory chemistry and biology coursework is required.

*Daeyeon Lee*

### **Project 1: Smart Biofilms for Oil Spill Clean-up**

Oil spills are man-made disasters that have catastrophic impact in the environment. Despite the recurrence of oil spills, there are few economically viable ways to remove/degrade oil in the water effectively. The objective of this project is to develop “smart” biofilms that can degrade hydrocarbon pollutants in water. Biofilms are aggregates of microorganisms embedded in extracellular polymeric substances (EPS), also known as “slime”. Biofilms are typically associated with a wide range of microbial infections in the body. Just like oil spills, biofilms are occurrences that should be avoided in many cases. We will take a completely different look at biofilms and ask the following question: can biofilms benefit us? We believe they can. We will develop and engineer biofilms using a bottom-up method to impart properties that will allow us to use them in environmental remediation such as oil-spill clean-up. This goal will be achieved by directly depositing bacterial cells and EPS such as polysaccharides onto surfaces with programmed structures to enable degradation of hydrocarbon pollutants in water. Our strategy combines the versatility of biofilms in degrading a wide range of contaminants with the nanostructural control of layer-by-layer assembly. The researcher will be trained to engineer biofilms and test their efficacy in decontaminating polluted water. The undergraduate researcher will be highly encouraged to work on the project beyond the summer and also to publish their results in scientific journals, as has been achieved by previous PURM researchers in the group.

### **Project 2: Rainbow Solar Cell**

World demand for energy is predicted to more than triple by the end of this century. Finding ways to provide clean energy is one of the grand challenges that face the current generation of scientists and engineers. It is clear that the conversion of solar energy, the most abundant and clean source of renewable energy, will play a critical role in the energy supply portfolio of sustainable economies. A new type of photovoltaic cell called the dye-sensitized solar cell (DSSC) has emerged as a promising and potentially inexpensive technology. One of the key bottlenecks that prevent the widespread utilization of this type of solar cell is due to the intrinsic instability of organic dyes used in the DSSC. In this project, we will replace the organic dyes typically used in the DSSC with semiconductor nanoparticles, also known as quantum dots (Q-Dots). The ultimate aim of the project is to develop a DSSC that can be sensitized throughout the visible range by sensitizing the DSSC with Q-Dots that absorbs in different ranges within visible. The researcher will be trained to generate dye-sensitized solar cells using automated LbL robots and to characterize their photoelectric responses. The undergraduate researcher will be highly encouraged to work on the project beyond the summer and also to publish their results in scientific journals, as has been achieved by previous PURM researchers in the group.

### **Project 3: Engineering Biofilms for Power Production: Microbial Fuel Cells**

A fuel cell is a device that converts the chemical energy from a fuel into electricity through a chemical reaction with oxygen or another oxidizing agent. Unlike the chemical combustion systems, these devices are able to generate power without generating CO<sub>2</sub>, the major source of green house gas. Microbial fuel cell drives a current by taking advantage of the reactions catalyzed by bacteria. The most critical component of the microbial fuel cells is the anode which comprises biofilms. We will develop and engineer biofilms using a bottom-up method to impart properties that will allow us to use them as anodes in microbial fuel cells. This goal will be achieved by directly spraying bacterial cells, cytochromes and nanomaterials onto conducting surfaces with programmed structures to enable oxidation of organic fuels. The researcher will be trained to engineer biofilms and test their efficacy in the oxygenation of organic matters. The undergraduate researcher will be highly encouraged to work on the project beyond the summer and also to publish their results in scientific journals, as has been achieved by previous PURM researchers in the group.

*Wen Shieh*

### **Project 1: Photo-Bioreactor Systems for Mass Production of Micro-Algae**

Project Description. Micro-algae are a promising feedstock for producing renewable fuels and chemicals. Micro-algae perform photosynthesis in the presence of sun light by converting

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aqueous nitrogenous matter and gaseous CO<sub>2</sub> into cellular proteins and lipids. Both environmental and energy benefits can be realized as a result of these metabolic activities, provided that micro-algae can be mass-produced. This project will attempt to establish the optimal way of mass-producing micro-algae (and therefore, protein and lipid contents) using several different types of photo-bioreactors. The growth rates of the micro-algae and the relationship to protein and lipid contents will be investigated in order to identify the desired photo-bioreactor configuration and cultivation conditions. Both Algaculture Laboratory and Biotechnology Laboratory of the Department of Chemical & Biomolecular Engineering will be available for the student to perform the experimental work. A graduate student working in the Algaculture Laboratory will serve as the mentor to the student assigned. Professor Wen K. Shieh and Dr. Miriam Wattenbarger will co-supervise the student.

Requirements. A rising sophomore or junior who has completed CHEM 101, 102, 53 and 54 is required. Students who are interested in biotechnology and experimental are encouraged to apply. Completion of CBE 150 is beneficial for the position but not required. It is anticipated that student appointed for the project will be responsible for carrying out the assigned experimental tasks, collecting, compiling, and analyzing the experimental data, and participating in the preparation of a manuscript suitable for either conference presentation or journal publication.

## **CHEMISTRY**

*Cherie Kagan*

### **Project 1: Nanocrystal-Based Solar Photovoltaics**

Our lab pursues a vigorous program of undergraduate research in molecular and nanotechnological approaches to current problems in solar energy, metamaterials and electronics, with five active undergraduates researchers currently. PURM funding will be used to support one undergraduate researcher full-time, to understand and engineer nanocrystal-based photovoltaics (solar cells). The undergraduate researcher will learn the electronic characterization techniques for measuring solar cell efficiency, will learn how to operate state-of-the-art spectroscopic tools for measuring basic properties of the component materials (e.g. UV-Vis and Fourier transform infrared spectroscopy and fluorometry) and will be trained in every step of solar cell fabrication. Rising juniors in materials science, chemistry, chemical engineering or physics with prior lab experience preferred. The researcher will be joining a team of Masters, PhD and post-doctoral scientists working on a variety of projects, all variations related to quantum dot photovoltaics, and the ultimate goal is for a peer-reviewed scholarly paper to result from the work.

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## COMPUTER AND INFORMATION SCIENCE

*Lyle Ungar*

### **Project 1: Computer analysis of metaphors**

Although scholars (e.g. Lakov and Johnson) have argued that metaphors are fundamental to human thought, relatively little work has been done on computer-aided analysis of metaphors.\* We propose to write a computer program to take a metaphor such as "LIFE IS A JOURNEY", automatically search large collections of writings to locate example sentences embodying that metaphor ("He was at a crossroads in his career."), and extract the key components (e.g., entities, location, destination) of the metaphor using standard information extraction methods. We will compare the relations extracted from metaphors against those from similar literal sentences ("He was on his way to work ..."). Our end goal is to develop methods to improve computer understanding of natural language texts. Requirements: Computer programming at the level of CIS 121; coding will be done in python.

### **Project 2: Estimating human state from social network posts**

The words people use when they write Facebook status updates or tweets give indications of a wide variety "human states," including how happy or sad the writers are, how engaged in life they are, the quality of their relationships, the amount of meaning in their life, and their feelings of accomplishment. We are developing collections of words that signal these different states, and using them to estimate human state from social media, which requires handling the fact that words take on different meanings depending on their contexts. These different human states can then be validated by predicting a variety of outcome measures such as answers to survey questions. (We have, for example, a sample of 100,000 personality surveys, and the Facebook status updates of the people who have taken the surveys.) Requirements: Computer programming at the level of CIS 121; coding will be done in a mix of python and mySQL. (A course in databases is helpful, but not critical.)

## ELECTRICAL AND SYSTEMS ENGINEERING

*Cherie Kagan*

### **Project 1: Nanocrystal-Based Solar Photovoltaics**

See description under Chemistry

*Daniel Lee*

**Project 1: Self-Driving Cars**

Our laboratory is investigating algorithms to generally endow robots with intelligent behaviors in perception, action, and decision making. We are currently designing and constructing new robots, as well as integrating the latest research algorithms in software to control these systems. In particular, we will be modifying a self-driving car, "Little Ben", that successfully completed the DARPA Urban Challenge a few years ago. This car will be modified with the latest in embedded computation and sensing under Android/Linux operating systems. The successful applicant will join in robotics research on integrating sensors and actuators for localization and navigation, planning and coordination, and control. Applicants need to be familiar with as many aspects of mechanical, electrical, and software design and development.

*Sohrab Rabii*

**Project 1: Electronic Structure of Binary and Ternary Superconducting Ca-graphite Intercalation Compounds**

My research involves theoretical study of electronic structure and charge (momentum) density in solids. I am particularly interested in graphite based materials. I use computers to calculate total energy and wavefunctions in solid and then use them to calculate momentum densities. These can be compared to experimental measurements of their Compton Profiles. The specific system that I am currently studying is the momentum density in CaC<sub>6</sub>. I am collaborating with an experimental group at the Institut de Mineralogie et de Physique de Millieux Condenses (IMPMC), University of Paris VI. They measure the photon scattering from these compounds, i.e. measure their Compton Profiles. I use my wavefunctions to calculate the same and compare with and explain their experimental results. I have already started work to extend these studies to the ternary compound Li<sub>3</sub>Ca<sub>2</sub>C<sub>6</sub>.

Requirements: The ideal majors would be physics, chem., material science and electrical engineer with knowledge of computing and math. An advanced freshman with AP standing of the above subjects will fit very well. I hope this to be a continuing long term involvement with me.

Responsibilities: The foremost responsibility of the student is to learn and become interested in research. Specific duties involve helping me modify my current computer codes and getting involved me in carrying out my calculations. I expect the student to become co-author in the resulting publications and conference presentations.

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Mentor Areas: Studying properties of new graphite based compounds that will have future novel applications in technology.

*Jorge J. Santiago-Aviles*

**Project 1: LTCC based coupling super-capacitor**

Perform electrical and materials characterization of a low temperature co-fired ceramic self-packaged super-capacitor using electrochemical and scanning probes instrumentation. A college level chemistry course is mandatory

*Jan Van der Spiegel*

**Project 1: Organic Electronics - for brain-computer applications** *Rising Juniors only*

Organic electronics is a new approach to fabricate electronics on flexible substrates. This new technology is suitable to engineer devices to interface with biological tissues and to develop the emerging area of organic bio-electronics. In order to use this technology as an implantable platform for brain-computer interfaces, we need to better understand the fundamental characteristics of the organic devices. The project which is in collaboration with Professor C. Kagan's group involves detailed characterization of the transistors fabricated on plastic. Students will get familiar with transistor operation, organic transistor technology and contribute to our fundamental understanding of the transistor behavior. Once the technology has been optimized, the transistors will be used in high-density implantable active electrode arrays that are used to measure brain activity.

**Project 2: Smart Sensor Nodes for energy efficient buildings** *Rising Juniors only*

Our group in collaboration with Professors N. Engheta (ESE), S. Yang (MSE), and faculty in the medical school and architecture are developing new materials and sensors for use as energy efficient facades (e-skin). Students will be involved in developing sensor nodes and communication systems that measure environmental conditions of buildings. Students will learn various sensors, sensor interfacing and communication (wired and wireless). The sensors include vision, polarization, temperature, light, humidity, and others.

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## MATERIALS SCIENCE AND ENGINEERING

*Cherie Kagan*

### **Project 1: Nanocrystal-Based Solar Photovoltaics**

See description under Chemistry

## MECHANICAL ENGINEERING AND APPLIED MECHANICS

*Kevin Turner*

### **Project 1: Rapid Manufacturing of Micro- and Nano-fluidic Systems**

Micro- and nano-fluidic systems are increasingly being used for the analysis of biological samples in basic research, drug discovery, and point of care applications. Much of the research and development of these systems is performed using silicone-based polymers because of ease of fabrication. However, these silicone materials are not suitable for certain applications due to material compatibility and challenges in scaling the manufacturing processes for eventual device commercialization. Polystyrene, which is a widely used material in tissue culture labware, is a better material for many micro- and nano-fluidic application. However, polystyrene is often not used in research settings because producing devices with current manufacturing techniques is time consuming and expensive. This research project will focus on investigating a new fast and economical route to manufacture polystyrene microfluidic systems. This new approach combines laser cutting, thermal embossing, and diffusion bonding. The student on this project will design experiments to develop this new process, fabricate small-scale devices, and characterize test structures and devices using a range of techniques. The student must have a significant interest in hands-on experimental work as well strong engineering analytical skills to design devices and interpret data. It is expected that this project will lead to a peer reviewed paper.

### **Project 2: Investigating Adhesion of Carbon Nanotube Forests** *Rising Juniors only*

Arrays of vertically aligned carbon nanotubes (CNTs) can now be produced with controlled structure over large areas. These nanotube forests have unique mechanical properties because of the intrinsic properties and high aspect ratios of individual CNTs. In particular, these forests have previously been shown to exhibit high adhesion when brought into contact with other surfaces. This adhesion, which is due to van der Waals forces, is present because the nanotube forests are exceptionally compliant and can conform to roughness on surfaces. The goal of this research project is to investigate this adhesion through a combination of experiments and modeling. The experimental work will involve small-scale mechanical testing, such as nanoindentation, to probe

the adhesive properties of the forests under varying normal and shear loads. Models will be developed to understand and interpret the experimental results. The student must have a significant interest in hands-on experimental work as well strong engineering analytical skills. It is expected that this project will lead to a peer reviewed paper.

## ***Mark Yim***

### **Project 1: FlatBot**

The aim of this project is to create a small robot system capable of traversing under the chairs of an automobile. We expect to explore various technologies, such as cable drive systems and/or shape memory alloy actuators, to accomplish the task of providing mechanical power in tight spaces. We also expect to make use of modular design principles to allow the robot to adapt to new tasks and provide greater range of utility. Design requirements would aim for a robot that can pass, under it's own power or via tether, through a slot of height 2cm or less. This will support a potential NIST and Army Research Labs project proposal. Student Responsibilities and Duties: The student will be responsible for design and construction of the robot, with the supervision and hands-on support of a graduate student. Design of a cable drive system, motor controller, and/or compliant mechanism may be required as well. Materials will be provided via the PURM per-student project budget. Skills Required: The ideal student should have experience in mechanical design, fabrication, electronics, embedded programming and/or mechatronics.

### **Project 2: Mechanical Connector for Modular Robots**

We aim to advance the capabilities of mechanical connector design in terms of both strength and acceptance range for modular robotics applications. This project will use numerical and analytic methods to determine the geometric acceptance range for the given pair of mechanical self-aligning connectors in six degrees of freedom, and seek new design or parameters which expand this range. The project will also explore various metrics and applications, including robot docking, which will require further design for latching or attachment mechanisms. Student Responsibilities and Duties: The student will be responsible for helping to construct and evaluate a mechanical modular connector. The student will be responsible for geometric and stiffness analysis (e.g. with Matlab scripts). This project will be conducted in conjunction with a graduate student. Skills Required: Mechanical design and analysis, statics, strength of materials and Matlab experience are required. Experience with rapid prototyping (i.e. laser cutting, 3d printing) are strongly recommended as well.

## **Law**

### **LAW**

*Susan Yeh*

#### **Project 1: Crowdsourcing vs. Natural Language Processing of Legal Texts**

Automated text coding has exploded as a tool by researchers and businesses. Project involves applying new techniques from computer science and testing whether crowdsourcing via human computation can improve natural language processing of legal texts. Required skills: Perl/Python, C, advanced computer science background.

#### **Project 2: The Impact of Judicial Decisions: Evidence from a Randomized Experiment**

Do courts matter? Some view courts as critical in being able to effect widespread political and social change while others believe that momentous judicial decisions may be caused by, rather than be causes of, political or socioeconomic changes. Participate in constructing and evaluating a natural experiment from the random assignment of appellate judges. Required Skills: Proficiency with Stata or R.

## **Medicine**

### **BIostatISTICS AND EPIDEMIOLOGY**

*Karen Glanz*

#### **Project 1: Pilot Testing Food Marketing Interventions in Supermarkets**

The goal of this project is to design feasible, low-cost methods for designing and conduct a pilot study to evaluate the impact of varied in-store marketing strategies on their ability to: 1) increase the sale of healthy children's foods, including fresh produce; 2) decrease the sale of empty calories from energy-dense, low-nutrient children's foods; 3) be profitable, or at minimum cost neutral, to retailers and manufacturers; and 4) improve customer satisfaction/loyalty. Students will assist with data collection, store monitoring, consumer receipt coding and other study activities. Data collection often takes place throughout Philadelphia so comfort and willingness to conduct fieldwork is necessary.

#### **Project 2: Pilot Study of Pre-FDA Sunscreen Regulation on Products, Promotion, and Consumer Awareness**

The US Food and Drug Administration (FDA) announced new requirements for sunscreens sold over-the-counter that will go into effect on June 18, 2012. The goal of this research is to empirically test the impact of the new FDA regulations on packaging and consumer perceptions, knowledge and behavior. By using a longitudinal, mixed methods approach, including pre- and post- observations and surveys and an objective measure of sunscreen use, this innovative study aims to: 1) examine changes in product availability, and health and product claims on sunscreen packaging, following implementation of new FDA regulations; 2) Assess changes in consumer perceptions and knowledge about sunscreen and related health claims on sunscreen packaging following implementation of new FDA regulations; 3) examine the association of consumer perceptions, knowledge of sunscreen attributes, and knowledge of the new FDA regulations and sunscreen use (self-report and an objective measure). Students will assist with participant recruitment, data collection, skin swab processing, data analysis and other study activities. Data collection will take place throughout Philadelphia so comfort and willingness to conduct fieldwork is necessary.

*John Holmes*

**Project 1: Personal Health Information Needs and Practices of Urban African Americans**

Duties and responsibilities 1. Perform review of pertinent biomedical literature 2. Assist with developing questionnaires for social network analysis 3. Assist with developing instruments for interviews and focus groups 4. Perform data collection via face-to-face interviews of research subjects 5. Assist with statistical and qualitative analyses 6. Participate in manuscript preparation (opportunities for authorship) Prerequisites: 1. Excellent work ethic- punctuality, professional demeanor, and dedication to task completion 2. Basic knowledge of medical terminology 3. Ability to work on an interdisciplinary team including epidemiologists, social scientists, and research staff 4. Some experience with interviewing preferred. 5. Experience with analysis methods preferred, but not required.

**Project 2: What are people saying about herbal supplements on the internet? A text mining and qualitative analysis**

Duties: 1. Perform review of pertinent biomedical literature 2. Assist with text mining procedures 3. Assist with qualitative analyses 4. Participate in manuscript preparation (opportunities for authorship) Prerequisites: 1. Excellent work ethic- punctuality, professional demeanor, and dedication to task completion 2. Basic knowledge of medical and herbal supplement terminology 3. Ability to work on an interdisciplinary team including epidemiologists, social scientists, and research staff 5. Experience with text mining and qualitative analysis methods preferred, but not required.

## **CANCER BIOLOGY**

*Roger Greenberg*

**Project 1: Role of chromatin in BRCA1 dependent DNA repair**

The project will utilize a novel system developed in my lab to understand the role of chromatin modifying factors in BRCA1 dependent DNA damage responses. The student will develop stable knockdown cell lines using shRNA, perform fluorescence microscopy to determine BRCA1 recruitment to DNA damage sites, and perform chromatin IP to examine chromatin residence of BRCA1 following chromatin alterations. It is anticipated that the student will contribute data to be included in a manuscript and receive authorship for his or her efforts.

*Sandra Ryeom*

### **Project 1: Role of calcineurin in skin tumorigenesis**

Skin cancer is one of the most prevalent human cancer that causes significant morbidity and mortality in the world. Induced by a combination of genetic susceptibility and environmental factors, especially UV exposure, the incidence of skin cancer has increased in the past century due to lifestyle preference for sun exposure and early detection. Compared to the normal population, post-transplant patients on chronic cyclosporine, a potent inhibitor of the calcineurin pathway, have a hugely increased risk of skin cancer, notably aggressive squamous cell carcinoma. While immunosuppression by cyclosporine undoubtedly plays a role in this phenomenon, other immunosuppressants do not carry such a risk. In addition, individuals with Down's Syndrome, who express three copies of DSCR-1, an endogenous inhibitor of calcineurin, are actually protected from all solid tumors, including skin cancers. Therefore, this project will be focused on the role of calcineurin in skin tumorigenesis, and why two inhibitors of the same pathway result in opposing effects. Students are expected to learn basic molecular biology skills. In particular, students will learn how to cultivate animal cells in vitro, basic mouse husbandry and handling skills. Students will also learn PCR and protein quantification by western blotting, and immunohistochemistry. Knowledge of basic molecular biology is preferred, as is previous laboratory experience, but not required.

### **Project 2: Obesity and Tumorigenesis**

Obesity increases a person's risk for several life threatening diseases including diabetes, heart disease, and cancer. TSP-1, a protein best known for its ability to inhibit blood vessel formation, is also likely to be an important regulator of adipose development. Increased serum TSP-1 levels correlate with increased body mass index and insulin resistance in patients, and TSP-1 has been reported to induce adipose proliferation in vitro. At this time, it is unclear whether TSP-1 is being secreted by the adipose cells themselves, or by other supportive cell types, such as the endothelial cells that make up the blood vessels, in adipose tissue. It is important to identify the source of TSP-1 in growing adipose in order to better understand the role of TSP-1 in obesity and obesity related diseases. In this project, a student will collect adipose tissue samples from mice and use immunohistochemistry to identify the cell of origin of TSP-1. Additionally, students will perform cell proliferation assays and western blots to measure TSP-1 protein levels in cultured adipose and endothelial cells under various conditions.

## DERMATOLOGY

*Todd Ridky*

### **Project 1: Engineering Genetically Defined Human Cancer**

Students will be actively engaged in a major tissue engineering effort to generate new genetically-defined human models of invasive cancer. These models incorporate normal human stromal cells and architecturally intact stroma, in a faithful 3-dimensional context recapitulating the tumor-stroma microenvironment. Cancer cells are engineered to harbor genetic changes in central oncogenic drivers associated with spontaneous human malignancy. These new human tissue models are designed to complement conventional transgenic murine and cell line-based studies by overcoming limitations of cost, speed, and physiologic relevance through a standard experimental platform that is relatively inexpensive, rapid, and based on primary human cells in composite 3-D human tissue.

Requirements Biology, chemistry, or other life science major. Undergraduates are eligible starting the summer after their freshman year. Responsibilities Students will be given the opportunity to participate in all phases of the project including isolating and growing human cells from fresh tissues, and using viral-based gene delivery methods to introduce specific oncogenes. Students will then use the genetically altered cells to generate 3D human tissues grown both in culture incubators as well as surgically grafted onto host mice. Tissues and tumors will be followed by various imaging techniques including in vivo bioluminescence and fluorescence. Tumors will be harvested and analyzed using qPCR, immunofluorescence, deep sequencing, and microarrays. Bioinformatics approaches will be used to identify potentially important drug targets, and to develop novel therapeutic strategies for cancer. The hypotheses will be tested by attempting to block cancer development using drugs, antibodies and RNAi. Students will be expected to read relevant literature and develop proficiency in all of the experimental procedures used.

Mentor Areas Students will be actively engaged in developing physiologically relevant 3-D models of human cancer. Engineered tissues will be generated through incorporation of tumor associated genetic changes and cancer stem cells. The models will then be used to identify central elements necessary for key steps in cancer progression including invasion and metastasis. Various strategies will be used to attempt to block cancer growth and spread including using drugs, therapeutic antibodies, and RNAi technologies. It is hoped that students will use the summer experience as a high-intensity starting point for a multi-year lab experience that will continue throughout their time at Penn, and help place them in a very competitive position for top graduate programs.

## DERMATOLOGY AND INTERNAL MEDICINE

*Misha Rosenbach*

### **Project 1: Dermatology Urgent Care: Providing Immediate Dermatology Care for Immunosuppressed Patients**

Patients with impaired immune systems can develop myriad complications; often skin manifestations are the first sign of disease, which can range from medication reactions to infections to cutaneous manifestations of internal disease. The demand for dermatology outstrips the supply of providers, and there tends to be a multiple month wait for a dermatology appointment. I have created a dermatology Urgent Care Clinic, with the goal of providing appointments within 48 hours (and often on the same day) for immunocompromised patients. This clinic has been thriving over the past year, since its inception in October 2009, seeing hundreds of patients with cancer, HIV, autoimmune disease, and others with iatrogenic immunosuppression.

At this point, working with a multidisciplinary team of nurses, physicians, and statisticians, I would like to retrospectively review the patients we have seen in the Urgent Care Clinic. I would like to gather data on where the patients were referred from, and what diagnosis was rendered. Finally, I hope to survey both the patients seen, and the referring physicians, to assess their impression of the Dermatology Urgent Care Clinic, focusing on satisfaction with the process and care. The goal is to demonstrate that the creation of such rapid-access clinics can impact patient care in a positive way, and that referring providers recognize the benefits and need for such a practice. We have an electronic medical record system and administrative and nursing support through our department. We will use this to identify patients seen, and who referred them to the Urgent Clinic.

Student duties would entail:

- chart review of these cases to find the diagnosis rendered
- assisting in sending surveys to patients
- surveying referring physicians
- compiling data

Depending on student skills, the student may be involved in statistical analysis and potentially in drafting the final manuscript to publish these results. Depending on level of involvement with surveys/contacting either patients or physicians, the student may require Patient Oriented Research / CITI training and/or HIPAA privacy compliance training through Knowledgelink.

## **Project 2: iLearnDerm: Designing and incorporating smartphone technology for improved dermatology education**

Dermatology is important in all areas of medicine, but devoted dermatologic education is under-represented in medical schools. Innovative strategies to increase access to dermatology education have become necessary.

This project will focus on increasing access to dermatology education for medical students and health professionals. The widespread use of smart phones has provided a convenient and accessible platform to improve dermatology education. The main focus of the project involves creating an interactive smart phone-based learning application, iLearnDerm, which will contain clinical images with interactive questions on a three-tiered system, ranging in difficulty from beginner to advanced levels. Our hypothesis is that flashcards based upon mobile technology will increase exposure to dermatologic conditions and increase access to dermatology education with improved dermatologic knowledge.

Student responsibilities and duties will include selecting the best, most representative dermatologic images with help from mentors on the project, incorporating the images into the application, and helping the design of the final project. A strong programming background and an ability to create an application for smart phones are necessary, and a student must have the ability to program at the start of the project. The student is expected to be able to handle the programming aspects with little mentored guidance, as the project will focus on the creation and design of educational materials.

By participating in this project, the student would be expected to get increased exposure to dermatology, dermatologic terms, curriculum design, and technology-based education. Interested students also could participate in clinics where use of this would be piloted. This technology will be incorporated into a study with anticipated publication, and the student will be part of the team to work on this publication.

## **FAMILY MEDICINE AND COMMUNITY HEALTH**

*Kent Bream*

### **Project 1: Guatemala Health Initiative- Santiago Atitlan Community Health Survey**

Since 2005, the Guatemala Health Initiative (GHI) has coordinated interdisciplinary research, education, and service programming involving the School of Nursing, School of Medicine, School of Arts and Sciences, Wharton, and the School of Engineering and Applied Sciences. GHI partners with the Hospitalito Atitlán (HA) in Santiago Atitlán, Guatemala to develop and organize community initiated programs in improving the health of the Atitlán community.

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(Santiago) Atitlán is located in the Western Highlands of Guatemala on Lake Atitlán. The population is predominantly Tz'utujil Maya. The economy is primarily a subsistence economy influenced by tourism and remittances from abroad. Santiago Atitlan, Guatemala is approximately 3.5 hours from the capital, Guatemala City.

The PURM student will participate in an extended orientation and training in Philadelphia. In addition as the opportunity and student skill level permits, the student may travel with Dr. Bream on site visits to Guatemala. If you do travel to Guatemala, you will live in a home-stay that is more basic than US homes. You will work with other Penn students on this project. We anticipate travel to Guatemala in the first week of June or last weeks in July. You will need to have a good command of Spanish. For the health survey, you will work with data from the community health survey of 2005. You will work in Philadelphia with this data as well as data being collected in 2012. In addition, if needed on a site visit you will administer the survey with other Penn students. Based on the World Health Organization (WHO) community health survey, you will work with translators in a broad survey to assess the prevalence of health conditions, symptomatology, and health beliefs in the municipality of Santiago Atitlan.

**Project 2: Guatemala Health Initiative -Biomedical Library Implementation** ***Rising Juniors only***

Since 2005, the Guatemala Health Initiative (GHI) has coordinated interdisciplinary research, education, and service programming involving the School of Nursing, School of Medicine, School of Arts and Sciences, Wharton, and the School of Engineering and Applied Sciences. GHI partners with the Hospitalito Atitlán (HA) in Santiago Atitlán, Guatemala to develop and organize community initiated programs in improving the health of the Atitlán community. (Santiago) Atitlán is located in the Western Highlands of Guatemala on Lake Atitlán. The population is predominantly Tz'utujil Maya. The economy is primarily a subsistence economy influenced by tourism and remittances from abroad. Santiago Atitlan, Guatemala is approximately 3.5 hours from the capital, Guatemala City.

The PURM student will participate in an extended orientation and training in Philadelphia prior to travel to Guatemala. Additional orientation, research training and skills training will take place once we arrive in Guatemala. You will live in a home-stay that is more basic than US homes. You will work with other Penn students on this project. We anticipate travel to Guatemala in the first week of June. You will need to have a good command of Spanish. In 2011, the Hospitalito Atitlan and the University of Pennsylvania began to develop an innovative virtual biomedical library in the Atitlan region based at the Hospitalito. In the summer of 2012, we plan to begin to investigate the use of the library space and work station as well as investigate the regionalization of the resource to the broader community of the Atitlan region. The PURM student will be based at the Hospitalito as well as be expected to assess community access to the new informaton commons outside the Hospitalito. The PURM student will be performing community based primary data collection and analysis.

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## GENETICS

*David Gasser*

### **Project 1: Exercise in a mouse model of Parkinson's disease**

Coenzyme Q plays an essential role in the generation of ATP by mitochondria. A mouse that has a defect in a gene called Pdss2 is unable to make the normal amount of coenzyme Q, and this leads to the development of a severe kidney disease by the age of about 3 months. In a project started by a previous PURM awardee, these mice were also shown to have coordination problems which resemble those associated with Parkinson's disease (Ziegler et al, Mitochondrion in press). These difficulties can be demonstrated by placing the mice in certain items of equipment which are designed to collect data about the mouse's degree of coordination. It has been demonstrated in other laboratories that some neurodegenerative diseases can be ameliorated by exercise.

In this project, the student will compare the coordination of mutant mice that have been exercised with those that have not. Five times per week, some of the mice will be exercised on a rotating rod for 10 minutes, while control mice will be placed on a stationary rod. After 4 weeks, the two groups will be compared by a variety of tests that will measure their degree of coordination. The overall aim will be to study a mouse model of a human disease. The student who does this project will learn about the requirements for handling research animals humanely, keeping accurate records of behavioral measurements, and data analysis.

## MEDICAL ETHICS AND HEALTH POLICY

*Jonathan Moreno*

### **Project 1: History of the idea of progress *Rising Juniors only***

This is a very broad question in connection with a possible book on the past and future of the idea of progress in America. The research will involve both collecting and reviewing public opinion surveys on Americans' attitudes toward their and their children's futures and digging around the literature on the history of the idea of progress. I will want the intern to prepare well-references briefing materials so strong writing skills are essential. Some background in history, history of science, philosophy or PPE would be preferable.

## MEDICAL PHYSICS

*Alejandro Carabe*

### **Project 1: Range uncertainty in carbon therapy due to variable biological effectiveness**

The distance traveled by carbon ions within the human body during carbon ion radiotherapy to treat cancer depends on the energy of the particle and the density of the materials the particle encounters in its path. This distance can be calculated based on computational methods which in turn are based on physical laws. However, the biological effect in tissues when traversed by these particles has to be modeled using biological and physical parameters. These parameters have a certain level of uncertainty that make the calculations based on these models to be subject to the same level of uncertainty. This project will try to quantify this uncertainties for different tissues exposed to carbon ion beams of different ranges.

The student will use Matlab or Mathematica to calculate the relative biological effectiveness (RBE) of carbon ions in different tissues using an in-house developed model. It is expected that the student will produced results of international interest that will end up in a scientific publication.

### **Project 2: Is the proton or carbon ion Linear Energy Transfer (LET) a good parameter to quantify their relative biological effectiveness?**

The relative biological effectiveness (RBE) of protons and carbon ions during particle radiotherapy to treat cancer depends on the dose delivered, the tissue radiosensitivity and the particle Linear Energy Transfer (LET). While dose and LET are easy to quantify based on computational methods, the tissue radiosensitivity is subject to a great level of uncertainty. The student will investigate if RBE values derived from an in-house developed mathematical model based only on dose and LET but not on tissue radiosensitivity are sufficiently accurate to be used in particle radiotherapy for cancer treatment.

The student will use Matlab or Mathematica to calculate the relative biological effectiveness (RBE) of protons in different tissues using an in-house developed model. It is expected that the student will produced results of international interest that will end up in a scientific publication.

### **Project 3: Determination of optimal range and modulation of a proton beam to treat brain tumors**

The Linear Energy Transfer (LET) of a proton beam depends on the beam energy and modulation. Larger energy beams with larger modulation have lower LET than smaller energy and modulation ones. If the biological effectiveness of a proton beam to kill cancerous cells

increases with LET, we would need to create a map of suitable beams with better indicated energy and modulation in order to enhance the biological effectiveness of the beam. A treatment beam is ultimately determined by the location of the disease (ie. how deep is it, which determines the required proton beam energy) and its size (which determines the modulation of the beam). Different beams that deliver the same dose to the target but have different energy and modulation will be considered and a beam will be selected based on the trade off between its LET and the damage to the normal tissue surrounding the tumor. The optimal beam will be that of higher LET that causes the smallest damage to the surrounding normal tissue.

The student will use Matlab or Mathematica to calculate the relative biological effectiveness (RBE) of protons in different tissues using an in-house developed model. It is expected that the student will produce results of international interest that will end up in a scientific publication.

## MEDICINE

*Peter Klein*

### **Project 1: Expand hematopoietic stem cells in 3D culture system.**

Hematopoietic stem cells (HSCs) are adult stem cells that give rise to circulating blood cells. They also generate new HSCs throughout the lifetime of the organism (called self-renewal). HSCs are used clinically for bone marrow transplantation (BMT) to treat leukemia and other blood diseases. Our lab has found a novel method to maintain HSCs outside of the body in a one dimensional cell culture system, but we would like to test conditions that might be closer to the in vivo environment in the bone marrow. In this project we will test whether a newly developed 3D culture system mimics the in vivo environment and promotes HSC renewal. The incoming student will culture mouse HSCs in 3D culture, change medium every other day and assist the graduate student or postdoc with molecular analysis of the cultured cells after 1-2 weeks. The 3D culture system will be compared to 1D culture. Experience with cell culture techniques is preferred but not essential. The incoming student will learn basic cell culture methods, principles of HSC biology, and cell signaling and will also learn about translation of research to clinical applications.

### **Project 2: Establish miniChIP-chip to study transcription factor binding to chromatin in hematopoietic cells.**

The first “ChIP” stands for Chromatin immunoprecipitation, a powerful method to study the binding of proteins to a specific DNA regulatory regions. In ChIP-chip, it is combined with microarray technology (the second chip) and can be used to study where a protein binds throughout the genome. In this project, we will apply a newly developed ChIP-chip method to

study transcription regulation in hematopoietic stem cells (HSCs). Hematopoietic stem cells (HSCs) are adult stem cells that give rise to circulating blood cells and also give rise to new HSCs (self-renewal) throughout the lifetime of the organism. HSCs are used clinically for bone marrow transplantation (BMT) to treat leukemia and other blood diseases. The limitation of applying ChIP-chip technology to HSCs is that HSCs are a rare population and we can only harvest around 2,000 cells from one mouse. Recently a new Chromatin immunoprecipitation technique has been described that works with very few cells (1,000-10,000 cells). The incoming student will assist the postdoc in getting this method working and applying it to HSCs. Chromatin immunoprecipitation is a complex biochemical procedure requiring many steps. The incoming student will learn basic biochemical skills including crosslinking of protein to chromatin, immunoprecipitation and polymerase chain reaction.

### ***Emile Mohler***

#### **Project 1: Evaluation of Microvascular Disease in Patients with Peripheral Artery Disease**

SPECIFIC AIMS Peripheral artery disease (PAD) is a highly prevalent condition in the United States, affecting approximately 8-12 million Americans. Persons with PAD have impaired function and quality of life. Although largely thought to be a macrovascular disease manifested by atherosclerosis, the contribution of microvascular dysfunction to claudication and progression of PAD is uncertain. A more thorough understanding of the pathophysiology of claudication is required to provide the basis for new noninvasive methods of evaluation and novel therapeutic strategies. The major goals of this study are to evaluate the contribution of microvascular dysfunction to claudication and the response to supervised exercise rehabilitation. This response to exercise will be assessed with a novel noninvasive magnetic resonance imaging based method to measure microvascular blood flow that was developed and validated as part of the initial grant, and with a novel cell based vascular health profile that is currently supported by an NIH challenge award. Aim-1) To determine the relationship between treadmill Peak Walking Time (PWT) and microvascular blood flow in subjects with moderate PAD. Rationale: The ankle-brachial index (ABI) is poorly predictive of patient's claudication limited exercise tolerance. While the ABI accurately reflects the extent of narrowing within large and small conduit vessels, symptoms of claudication are more likely to reflect, not only the impact of large vessel disease, but also the ability of the end-organ (muscle) to adapt to a progressive diminution of blood flow. We hypothesize that claudication limited exercise tolerance is related to the severity of the impairment in skeletal muscle microvascular blood flow. Approach: Two hundred and forty subjects with an ABI between 0.5 and 0.8, and with claudication, will undergo measurement of the claudication limited PWT using a graded treadmill protocol. A noninvasive technique developed from the original grant submission, Continuous Arterial-Spin Labeling Perfusion Magnetic Resonance (CASL), will be used to measure microvascular blood flow mid-calf within

the gastrocnemius muscle. The hypothesis will be tested through a correlation of the PWT and CASL measured skeletal muscle microvascular blood flow. Aim-2) To determine if changes in claudication limited exercise tolerance correlate with changes in microvascular blood flow following exercise rehabilitation. Rationale: Exercise improves claudication symptoms in multiple studies. We hypothesize that improvement in treadmill PWT in response to exercise rehabilitation is secondary to improvements in skeletal muscle microvascular flow. With increasing PWT, microvascular flow will increase. Approach: One hundred and twenty of the 240 subjects recruited for Aim-1 will be recruited to participate in a supervised exercise rehabilitation program for 12 weeks. PWT and skeletal muscle microvascular flow (CASL) will be measured at 6 and 12 weeks following study entry. The hypothesis will be tested through a correlation of changes in PWT with changes in CASL measured microvascular blood flow. Aim-3) To determine if the vascular health profile, as measured with endothelial progenitor cells (EPCs) and microparticles (MPs), improves following exercise rehabilitation in patients with PAD.

Rationale: EPCs promote angiogenesis and mobilize from the marrow in response to ischemia and exercise. Microparticles, small vesicles released from dysfunctional endothelial cell membrane, play a significant role in atherothrombosis and further impair endothelial function. The vascular health profile (VHP), a cell based, high throughput, multiplexed flow cytometry assay for EPCs and cell specific MPs, is the focus of NIH challenge grant obtained by Dr. Mohler (PI). We hypothesize that improvement in treadmill PWT and microvascular blood flow after exercise rehabilitation is secondary to EPC mobilization and improvement in endothelial function, and will be associated with an improved vascular health profile ( $\uparrow$ EPCs,  $\downarrow$ MPs). Approach: The subjects enrolled in the study will have blood drawn for measurement of EPCs and MPs at baseline and at 6 and 12 weeks following initiation of exercise rehabilitation. The hypothesis will be tested through an analysis of the magnitude and direction of change in the VHP after the intervention of exercise rehabilitation. We will also test the correlation between changes in the VHP, PWT, and microvascular blood flow.

## **Project 2: COAG Study**

COAG What is the purpose of this study? The purpose of COAG is to determine whether the use of genetic and clinical information to guide the initial dosing of warfarin will improve anticoagulation control, as compared to the use of only clinical information (without genetics) to guide the initial dosing of warfarin. By comparing the two strategies in this trial, the study will be able to determine if genetic information provides added benefit above and beyond what can be done simply with clinical information. What is involved in this study? The investigational part of this study is the dose calculation using genetic and clinical factors (e.g., age, body size). There are three known variants in genes CYP2C9 that affect metabolism of warfarin, while variants in VKORC1 affect the body's sensitivity to warfarin. Clinical and genotype data will be collected on all participants, who will then be randomized to one of two study dosing intervention arms: genotype-guided dosing arm or clinical-guided dosing arm. The intervention will be applied over

these first 4-5 days of treatment. Thereafter, dose adjustments until stable dose is reached will be based on INR measurements according to standardized warfarin treatment protocol. Study visits will be followed according to the protocol visit schedule for duration of 24 weeks. The first 4 weeks of treatment duration is a blinded study phase with 20 weeks of unblinded follow-up. Who can participate in this study? - The patient (male or non-pregnant female) must be  $\geq 18$  years of age. - The patient must be an appropriate candidate for, and being initiated on warfarin therapy with target INR of 2-3, and with intent to be treated for at least 3 months. - Currently taking warfarin or prior warfarin therapy with known required stable dose will disqualify patients from participating in the study. - Women of childbearing potential cannot be pregnant at the time of enrollment and must agree to use a reliable form of contraception during this study. - Any medical condition for which warfarin treatment is contraindicated for at least 3 months, blood loss of  $> 1000\text{cc}$  requiring transfusion within 48 hours prior to randomization, expected survival  $< 6$  months, elevated baseline INR (prior to warfarin treatment) are an exclusion. - Participation in another clinical trial that prohibits participation in COAG trial. How long will patients be in the study? Patients will be enrolled in the study and followed for 6 months.

## NEUROLOGY

*James Morley*

### **Project 1: Predictors of recovery in drug-induced Parkinsonism: Relationship to Parkinson's disease**

Parkinson's disease is a neurodegenerative disorder manifest by tremor, slowness, muscle stiffness and postural instability caused, in part, by depletion of dopamine signaling pathways in the brain. Drug-induced Parkinsonism (DIP), is often caused by agents used to treat psychotic disorders, as these drugs can block dopamine receptors. Only some patients given the drugs develop DIP and, in others, Parkinsonian symptoms persist after stopping medication. One hypothesis to explain these different responses is that the drugs unmask underlying subclinical abnormalities, such as, incipient Parkinson's Disease (PD). We will perform a retrospective (chart review) case-control study will examining how the cardinal symptoms of PD and associated features (including hyposmia, REM sleep behavior disorder, constipation) differ between patients whose symptoms persisted after discontinuing medication (cases) and those whose symptoms resolved (controls). Student responsibilities will include data extraction from intake questionnaires and the medical record, statistical analysis of the data and (hopefully) preparation of a manuscript for publication in conjunction with the mentor. The student should be motivated and responsible with an interest in clinical biomedical research but need not have formal research experience or statistical training. We hope these studies will not only inform risk

assessment for patients who may be given these medicines but also open an ongoing line of investigation examining the relationship between DIP and the mechanisms underlying PD.

### **Project 2: Quantitative assessment of motor symptoms in Parkinson's Disease**

Parkinson's disease (PD) is a neurodegenerative disorder manifest by tremor, slowness, muscle stiffness and postural instability. Traditional assessment of motor symptoms in the office and for clinical trials relies on the Unified Parkinson's Disease Rating Scale (UPDRS), which assigns severity ratings from 0 to 4 based on a variety of tasks. While straightforward to perform, such ratings are inherently subjective and may lack sufficient sensitivity to document small changes. We are developing a series of computerized monitors to quantify performance on a variety of motor tasks as an objective, quantitative and more sensitive measure of symptoms and response to therapy in PD. Student responsibilities will include working with subjects and helping to administer the computerized tests together with statistical analysis of the data in conjunction with the mentor. The student should be motivated and responsible with an interest in clinical biomedical research but need not have formal research experience or statistical training. We hope these studies will aid in the development of a new set of quantitative tools to facilitate earlier diagnosis and more effective clinical trials in PD.

### **Project 3: Continuous Non-Invasive Arterial Pressure Monitoring to Detect Autonomic Dysfunction in Parkinson's Disease**

Parkinson's Disease (PD) is a neurodegenerative disease characterized primarily by motor symptoms of bradykinesia, rigidity, tremor, and postural instability. People with PD also suffer from numerous non-motor symptoms, including autonomic symptoms such as orthostatic hypotension (a drop in blood pressure on standing that can cause dizziness or fainting), which can significantly impact treatment options and quality of life. Traditional methods of measuring orthostatic hypotension can lack sensitivity, be inconvenient, or require specialized equipment and invasive administration of radiolabeled substrates. Continuous beat-to-beat changes in blood pressure and heart rate can be measured noninvasively using a device called Infinity CNAP. In this study we will evaluate whether CNAP can be used to detect changes in blood pressure that is not detected by traditional measurement. We will measure blood pressure and heart rate using traditional methods as well as beat-to-beat blood pressure and heart rate using CNAP during valsalva maneuver and in response to standing for after sitting for 5 minutes. Symptoms of lightheadedness will be measured using Domain 1 of the Non-Motor Symptoms Scale for Parkinson's Disease (NMSS). Student responsibilities will include working with subjects to take cardiovascular and symptoms measurements, statistical analysis of the data and (hopefully) preparation of a manuscript for publication in conjunction with the mentor. The student should be motivated and responsible with an interest in clinical biomedical research but need not have formal research experience or statistical training.

*David Raizen*

**Project 1: Identifying neuropeptide signaling pathways regulating fat storage**

The obesity epidemic is widely acknowledged as a major challenge to biomedical science. Identifying genes that regulate fat and that can be targeted with drugs would provide new therapeutic approaches for obesity. Among the most specific signaling pathways in the body are those mediated by small peptides called neuropeptides. There have already been a few fat-regulating neuropeptides identified (e.g. Leptin) but there are certain to be others. The PURM summer project would entail a screen to identify genes encoding neuropeptides and neuropeptide-receptors that regulate fat storage. The experiments would be performed using the powerful laboratory model organism, the round worm *C. elegans*. The approach is to perform fat staining in worms that either under-express or over-express genes encoding neuropeptides and neuropeptide receptors. Studying fat storage is a new project in my lab but, with preliminary data collected by the undergraduate student during the summer, could evolve into an elegant senior thesis

Learning goals: 1. Learn how to read the primary scientific literature 2. Appreciate the clinical importance of understanding fat storage and obesity. 3. Learn more about the biological problem of fat storage regulation. 4. Learn about the biology of *C. elegans*. 5. Learn how to use genetic data bases on the computer. 6. Learn common laboratory techniques including sterile technique and microscopy. 7. Learn methods of digital image analysis for quantification of fat staining. 8. Learn simple statistical methods used in the lab. 9. Learn how to give a scientific talk. 10. Learn the culture of science by immersion in lab environment including attending weekly journal clubs and lab meetings.

The student would be supervised directly by Dr. Raizen and by Dr. Matt Nelson, a post-doctoral fellow. Student duties 1. Maintain *C. elegans* mutant and transgenic strains daily. 2. Perform fat staining on these strains. 3. Perform microscopy on stained specimen. 4. Perform quantification of fat using digital image analysis. 5. Perform PCR to amplify genes 6. Generate transgenic animals. 7. Participate in all lab activities including lab meetings and journal clubs. Student prerequisites 1. Currently a Freshman or Sophomore, majoring in science or engineering. 2. GPA of 3.8 or better. 3. The application should include a statement of career goals and reason for interest in this particular project. 4. To apply, please contact Dr. Raizen by email [raizen@mail.med.upenn.edu](mailto:raizen@mail.med.upenn.edu)

## NEUROSCIENCE

*Joshua Gold*

### **Project 1: Making decisions in a dynamic environment**

We learn from experience to make more advantageous decisions, often by adjusting our expectations to match past outcomes. In a dynamic world, this adjustment process must itself be adaptive, because changes can occur that render past outcomes irrelevant to future expectations. For example, historical yields from a fruit tree that has since died should no longer affect future expectations. A history of stable stock prices can become irrelevant after a major change in corporate leadership. The goal of this project is to develop new behavioral tasks to test how well human subjects adaptively adjust their decisions in the face of environmental changes that can affect the relationship between past outcomes and future events. We will measure task performance for several different subject groups, including those that differ in age (e.g., young, middle-age, and older adults). We will compare their performance to that of an "ideal-observer" model to better understand the capacities and limitations of subjects under these conditions. These experiments will help inform other experiments in our laboratory that examine the brain mechanisms responsible for these abilities. The student's duties will include help with designing, implementing, testing, and using these new behavioral tasks. A strong background in mathematics and computer programming is desirable.

### **Project 2: The relationship between locus coeruleus activity and pupil diameter**

The locus coeruleus (LC) contributes to many aspects of normal brain function and clinical disorders that affect millions of people, including ADHD, anxiety, depression, and schizophrenia. A major challenge to our ability to understand the LC's contributions to these functions is its size and location, which make it difficult to study. Our laboratory is examining one possible way to overcome this challenge by testing in detail a proposed link between LC activity and pupil diameter. We measure both directly in awake monkeys. This work, if successful, would provide a powerful, non-invasive tool to help understand, diagnose, and treat pathologies of the LC system. The goal of this project is to develop and use new analysis tools to quantify relationships between LC activity and pupil diameter in our data set. A strong background in mathematics and computer programming is desirable.

*Wenqin Luo*

### **Project 1: Organization and Development of Cutaneous Pain-sensing Axonal Arbors**

Pain is a serious and costly public health issue, and creates a big challenge for family, friends, and health care providers. The first step leading to the sensation of pain is the detection of noxious stimuli by pain-sensing (nociceptive) free nerve terminals in the epidermis. Distinct from visual, olfactory, gustatory, and auditory sensory cells that usually have short cilia or microvilli (but not axons), pain-sensing neurons (nociceptors) within the dorsal root ganglia (DRG) and trigeminal ganglia (TG) grow long and arborized axons to cover the entire skin. The axonal arborization of an individual nociceptor defines the spatial resolution of pain sensation (receptive field) and the density of nociceptive axonal arbors in the epidermis determines the sensitivity to noxious stimuli. To make it more complicated, at least three physiologically and molecularly distinct populations of nociceptors – A $\delta$  nociceptors, C fiber peptidergic nociceptors, and C fiber non-peptidergic nociceptors – innervate mammalian skin simultaneously. How do the axons of different types of mammalian nociceptor arborize in the skin in order to confer the physiological spatial acuity and sensitivity for pain? This not only forms a fundamental question of developmental and sensory biology, but it provides great application potential. Since the density of nociceptive fibers in the epidermis determines the skin's sensitivity to pain and since somatosensory neurons are known to display great plasticity in remodeling their cutaneous axonal arborizations, it is conceivable that manipulating the intraepidermal nociceptive fiber density offers an effective way to manage pain.

The ultimate goal of this proposal is to elucidate cellular and molecular mechanisms by which mammalian nociceptors establish their appropriate axonal arborizations during development so that the physiological spatial acuity and sensitivity for pain is achieved, and to identify the cellular and molecular pathways that can modify the density of intraepidermal nociceptive fibers. My lab uses a combination of molecular, genetic, and anatomical approaches to address the problem. The prospective undergraduate student will work under the supervision of a postdoc or graduate student in the lab. The main responsibilities of the student includes: mouse crossing, genotyping, whole mount skin staining, image axonal arbors of individual pain-sensing neurons, and quantify data. We are looking for highly-motivated individuals who are interested at basic molecular neurobiology research.

### **Project 2: Characterization and Development of A delta nociceptors**

Children with congenital insensitivity to pain suffer from repeated injuries and as a result have a short life expectancy. Strikingly, these children are born with a loss of the small-diameter C and thinly myelinated A $\delta$  fibers, indicating that they are main pain mediators. Both C and A $\delta$  pain-sensing neurons, known as nociceptors, are subpopulations of somatosensory neurons within trigeminal and dorsal root ganglia (DRGs). Despite their importance for pain sensation, the underlying molecular mechanisms that regulate A $\delta$  nociceptor development have remained

obscure. This is in part due to the absence of molecular markers that specifically identify these neurons through development. Thus, elucidating A $\delta$  nociceptor specific markers and determining the molecular-genetic pathways underlying their developmental program is of high relevance to the prevention of pain insensitivity associated birth defects. We have taken a systematic approach using mouse genetic tools to label molecularly distinct populations of DRG neurons in order to study their anatomy, development, and function.

The prospective undergraduate student will work under the supervision of a postdoc or graduate student in the lab. The main responsibilities of the student includes: mouse crossing, genotyping, tissue preparation and section, immunostaining, and quantifying data. We are looking for highly-motivated individuals who are interested at basic molecular neurobiology research.

### **Project 3: Re-examining the functional organization of mammalian dorsal spinal cord**

One task the somatosensory system faces is to decipher both quality ("what") and source ("where") of a stimulus, thus it must be organized in a way to serve for these dual functions. The textbook dogma is that ascending somatosensory axons are organized according to the location of their receptive fields ("somatotopic map"), a notion strongly supported by lesion studies and physiological recordings. This somatotopic map is maintained along the somatosensory pathway, enabling the "where" information to be faithfully interpreted. On the other hand, different types of somatosensory fibers innervate the same region of the body to encode different aspects of the stimulus quality (or modality). Physiological recordings from several mammalian species suggest that neurons along the somatosensory pathway tend to receive modality specific convergent inputs, supposedly to preserve the "what" information. At present, however, it is unclear how modality-specific convergence occurs in parallel to the somatotopic map. This fundamental question has yet to be explicitly addressed because few tools were available to identify somatosensory fibers in a modality-specific manner. During my postdoctoral research, I discovered that a small population of somatosensory neurons expressing the neurotropic receptor tyrosine kinase (NRTK) Ret develops into mammalian rapidly-adapting (RA) mechanoreceptors by using an inducible Cre approach (RetCreERT2 mice). Now with genetic tools, my lab is in a unique position to re-examine the functional organization of the mammalian spinal cord dorsal column, which is a classic model of "somatotopic map" and is composed of ascending axons of RA mechanoreceptors, slowly-adapting (SA) mechanoreceptors, and SA mechanosensitive proprioceptors. Results of this work promise to modify the current textbook dogma about the spinal cord dorsal column.

The prospective undergraduate student will work under the supervision of a postdoc in the lab. The main responsibilities of the student includes: mouse crossing, genotyping, tissue processing and section, and quantify data. We are looking for highly-motivated individuals who are interested at basic molecular neurobiology research.

*Minghong Ma*

**Project 1: Activity-dependent modulation of olfactory cilia**

This project aims at understanding how sensory inputs modulate morphology of olfactory cilia, where odor detection is initiated, in mouse models. The student will be assisting and performing immunohistochemical experiments and taking fluorescent images under confocal microscopy.

## NEUROSURGERY

*Sherman Stein*

**Project 1: Cerebral aneurysms in the elderly: What is the best treatment?**

A cerebral aneurysm (a weak spot in the wall of an artery) affects as many as 7% of people over age 65. Aneurysms can rupture, and the bleeding can be devastating, resulting in neurological damage or even death. The treatment is to occlude the aneurysm to prevent rebleeding. Two popular treatments are applying a clip across the neck of the aneurysm and stuffing the aneurysm with tiny metallic coils. The choice between the two approaches depends primarily on characteristics of the aneurysm and the health of the patient. The elderly are often frail and burdened by comorbidities (other diseases), which impair their abilities to tolerate major surgery. It has been hypothesized that coiling, which represents a much smaller physiological stress than clipping, is associated with better outcomes. This study will review our own experience at Penn, as well as reviewing the literature and pooling data using meta-analytic techniques. We will then use decision analysis to compare effectiveness of the two approaches. In addition, we shall perform an economic analysis to compare costs. A publication is expected.

**Project 2: Obstetric brachial plexus injury: When to repair?**

As many as 1/2% of deliveries are complicated by stretch injury to the brachial plexus, the source of nerves to the muscles in the arm. Untreated, affected children are unable to fully use the affected arm, which gradually withers and becomes deformed. Some children recover over time, but this is unpredictable. Surgical repair is challenging and not always successful. Surgery done too late has a low success rate. If done too early, surgery is associated with greater risks to the infant and a greater chance it was not needed. Most clinical series are quite small. The goal of this study is to estimate the effects of surgical repair on the child's quality of life and to compare surgery done a 3 months of life with that done at 6 months. The literature will be searched, and outcomes pooled using meta-analytic techniques. We will use decision analysis to compare effectiveness of the two repair times. In addition, we shall perform an economic analysis to compare costs. A publication is expected.

### **Project 3: Hydrocephalus after subarachnoid hemorrhage: relation to treatment**

Subarachnoid hemorrhage (bleeding into the space around the brain) is usually the result of a ruptured cerebral aneurysm (a weak spot in the wall of an artery). The treatment is to occlude the aneurysm to prevent rebleeding. Two popular treatments are applying a clip across the neck of the aneurysm and stuffing the aneurysm with tiny metallic coils. The choice between the two approaches depends primarily on characteristics of the aneurysm and the health of the patient. One complication of the bleeding results from the presence of blood around the brain. This obstructs the normal pathways by which cerebrospinal fluid (CSF) circulates and is absorbed into the bloodstream. If CSF accumulates in the brain, hydrocephalus results with potentially devastating effects. It has been hypothesized that aneurysm treatment (clipping vs. coiling) affects hydrocephalus incidence, but no comprehensive review has proven it. We plan to review our own experience at Penn, as well as reviewing the literature and pooling data using meta-analytic techniques. We will then compare the two approaches, correcting for covariates (other variables affecting outcome) by meta-regression. A publication is expected.

## **ORTHOPAEDIC SURGERY**

*Louis Soslowsky*

### **Project 1: Orthopaedic Biomechanics: Tendon injury, repair, and regeneration**

There are multiple projects in our lab studying tendon injury, healing, repair, and regeneration from a bioengineering research perspective. Applications are in rotator cuff, Achilles and patellar tendons, and other tissues.

## **PATHOLOGY AND LAB MEDICINE**

*Karuppiah Muthumani*

### **Project 1: Molecular functions of the HIV-1 accessory proteins**

Our laboratory focuses on the molecular functions of the HIV-1 accessory proteins Vpr and Nef, which are arguably the most important pathogenic factors during HIV infection. In particular, we are exploring the molecular basis for action of these proteins, interaction with host cell signaling proteins, general T cell and APC's functions, regulation of apoptosis and cell cycle arrest and finally viral protein mediated immune regulation in particular viral proteins and its interacting cellular partners are aimed not only at understanding the mechanisms involved in these pathways, but also on the development of new compounds that block these interactions, thereby

preventing viral replication and disease progression. Further, our research also extends on the regulation and function of the T cell exhaustion marker, Programmed death -1 (PD-1), which are induced during chronic viral infections such as HIV-1. Importantly, early evidence suggests that blockade of the PD-1 and its ligand PD-Ls interaction may help to counter the development of immune exhaustion during viral persistence. This investigation will identify a novel HIV-1 mechanism for exploiting the immune suppressive PD-1/PD-L and role of viral proteins pathways and suggest a role for virus-infected cells in contributing to the local corruption of immune responses that are required for viral control.

### **Project 2: Enhancement of immune responses against infectious disease by Novel Enhanced DNA prime plus protein boost strategy**

The ability to elicit an improved level of antibody responses against infectious disease is a crucial goal for a prophylactic vaccine. DNA vaccines in the past have been poor inducers of both cellular as well as humoral immunity in humans. We have focused recently on the DNA immunogen design and Electroporation delivery to improve high levels of T cell immunity to viral antigens in humans. Here we employ this advanced combination of technologies to focus on improving the B cell response induced by DNA vaccines to viral plasmid encoded antigens (HIV, CHIKV, FMDV, Dengue and RSV). Furthermore we have compared this new DNA delivery to viral antigen vaccination as well as in a DNA prime + protein boost setting.

### **Project 3: The role of Toll like receptors in the pathogenesis of viral infection**

Following vector-borne infectious diseases like Dengue and West Nile, Chikungunya has been resurging as the next important infection in south-east Asia, the Pacific region and Europe. Its potential threat as an impending epidemic in the developed world and its use as a biological-weapon warrants an urgent need for a comprehensive understanding of the viral mechanism underlying the infection. Recent data have suggested that severity of this disease may be correlated with excessive cytokine production, and have proposed serum levels of TNF- $\alpha$ , IL-1 $\beta$ , IL-6, and RANTES as biomarkers for disease severity. However, questions addressing host target cells and type of immune responses responsible for viral persistence remain unanswered. In order to gain detailed insight on the pathophysiology of viral infection, we will conduct extensive in vitro and in vivo viral infection studies to determine the role of TLR signaling pathways in the pathogenesis of viral infection.

## **PATHOLOGY AND LABORATORY MEDICINE**

*Juan Jiménez*

### **Project 1: Coronary Stent Strut Geometries - A Possible Cause for Clinical Failure** ***Rising Juniors only***

Our laboratory is searching for an enthusiastic student to participate in a research project related to in-stent restenosis. Vessel reclosure after stent implantation in coronary arteries is a frequent cause of clinical complication. We are currently using a bench top flow system that simulates coronary flow to understand how the presence of the stent device changes blood flow characteristics in coronary arteries, and how the resulting flow perturbations due to the coronary stent can be a contributor to in-stent vessel reclosure. Student responsibilities include growing cells in culture, conducting assays to quantify gene expression, conducting in-vitro experiments with cells, and basic laboratory duties. Student should have taken physics, chemistry, and biology courses.

*Carl June*

### **Project 1: Building Killer T Lymphocytes: engineering chimeric receptors**

Chimeric antigen receptors (CARs) are novel therapeutics that allow scientists to redirect T cells immunological responses towards cancer specific surface antigens. This technology was used in a successful clinical trial to clear refractory chronic lymphocytic leukemia (CLL) in patients at UPenn in 2011. As useful tools for understanding the functional mechanisms, some next generation advances in chimeric antigen receptors will evaluate methods of inducible and conditional activation and apoptosis. In this project, the student will help build and modify a drug-inducible system to express chimeric antigen receptors in human T lymphocytes, building different modifications to optimize conditions for induction and evaluate the efficacy of induced CAR function by cytokine release upon target recognition. The student will be responsible for learning and using DNA software analysis programs, cloning the modifications of an inducible system, in vitro T cell expansion and functional analysis. As a prerequisite, the student should understand the basic concept of molecular biology techniques. All other techniques, including the former, can be taught during this project experience.

*Frank Lee*

**Project 1: Regulation of the Hypoxic Response**

We are interested in how cells sense oxygen, and conversely, how they respond to low oxygen concentrations (hypoxia). This is of significant medical relevance, since hypoxia characterizes many common human diseases, including heart attack, stroke, and cancer. We are particularly interested in an intracellular signaling pathway known as the Prolyl Hydroxylase Domain protein (PHD):Hypoxia Inducible Factor (HIF) pathway, considered the master regulator of the gene response to hypoxia. The specific skills that will be learned include gel electrophoresis, western blotting, and as the student gains experience, cell culture, recombinant DNA purification, and transfection of DNA into cells. The student should be a science major, preferably in Biology or Biochemistry.

## **PEDIATRICS**

*Rebecka Peebles*

**Project 1: Gender Differences in Medical Severity and Outcomes in Adolescents with Eating Disorders**

This study is a retrospective chart review of patients treated for eating disorders at the Children's Hospital of Philadelphia over the past 5 years. Students will collect data from medical record, participate in lab meetings and educational conferences, cross check data, enter data, and being some basic analyses. They need to be interested in eating disorders, team players, detail-oriented, and responsible. There are no prerequisites.

**Project 2: Quality Improvement Drivers of Health Outcomes in Adolescents with Eating disorders**

This a QI collection, and students will be considering the first encounter to our Eating Disorders Program. Students will collect data from medical record, participate in lab meetings and educational conferences, cross check data, enter data, and being some basic analyses. They need to be interested in eating disorders, team players, detail-oriented, and responsible. There are no prerequisites.

**Project 3: Rate of Weight Gain as a Predictor of Remission in Adolescents with Eating Disorders.**

These students will involved in both the collection of ongoing data and also preliminary work toward a large grant submission. Students will collect data from medical record, participate in lab

meetings and educational conferences, cross check data, enter data, and being some basic analyses. They need to be interested in eating disorders, team players, detail-oriented, and responsible. There are no prerequisites.

## PHARMACOLOGY

*Paul Axelsen*

### **Project 1: Protein folding in reverse micelles**

We have experimental data showing that the amyloid beta protein that accumulates in Alzheimer's disease forms extended beta structure (a structure that occurs only in disease) in reverse micelles (an environment that mimics the extracellular environment in human brain). The project involves computer simulation of protein folding in a reverse micelle to account for the factors that induce this structure to form. A suitable student would have to be computer-savvy, and would learn how to run a multiprocessor Linux computer system as well as a lot about protein structure and folding processes.

### **Project 2: Biosynthesis of isotopically-labeled fatty acids**

In our work on Alzheimer's disease, we have need for polyunsaturated fatty acids labeled with stable (i.e. non-radioactive) isotopes (i.e.  $^{13}\text{C}$ ). The project involves cultivating yeast in media containing isotope-labeled fatty acid precursors and purifying the fatty acids that they produce from these precursors. The student would learn a lot about intermediary metabolism, microbiological techniques, and lipid chemistry techniques - particularly as they pertain to "omega-3" fatty acids, that are currently getting so much popular attention.

### **Project 3: Paradoxical antioxidant activity**

It is not widely appreciated that so-called dietary antioxidants can actually promote oxidative stress under many circumstances. For example, we have observed that vitamin C accelerates oxidative lipid damage in the presence of the amyloid beta proteins that accumulate in Alzheimer's disease. The project involves determining the role of trace metals such as copper in this process. The student would learn a lot about antioxidant chemistry and the interaction of bioactive metals with proteins.

*Emer Smyth and Nune Markosyan*

**Project 1: Pharmacological inhibition of PGE2 in breast cancer prevention and treatment**

Wildly used non-steroidal anti-inflammatory drugs (NSAIDs) inhibit COX-2 and COX-1 enzymes and decrease the production of pro-tumorigenic prostaglandin E2 (PGE2) by these enzymes. To study the effect of selective and non-selective COX inhibitors, mice transgenic for expression of HER2/neu oncogene that develop tumors at the age of 20-25 weeks will be fed chow containing COX-2 selective inhibitor rofecoxib, or selective COX-1 inhibitor SC560, or non-selective COX-1, 2 inhibitor indomethacin, or regular chow. Each drug will be administered in 3 regimes: 1) starting from the weaning date until tumor discovery (prevention regime), 2) from the date of tumor discovery for 4 weeks until sacrifice (treatment regime), and 3) from weaning until after 4 weeks from the tumor discovery (prevention + treatment regime). Tumor onset and growth will be monitored by palpation and caliper measurements as well as PET scanning, twice a week. 4 weeks after tumor discovery, the animals will be sacrificed and tumors harvested. Gross changes (tumor multiplicity and presence of lung metastasis) will be assessed during necropsy. Harvested tumors will be snap frozen for mRNA and protein extraction, and embedded in paraffin for immunohistochemical analysis. Student responsibilities will include: administration of food with appropriate drugs, performing tumor palpation and caliper measurements and assisting the technician in performing PET scanning on anesthetized animals, analyzing PET scan images and measuring tumor volume using software, assisting with tumor harvest and processing

**Project 2: mPGES1 enzyme as a possible target to increase tumor cell death**

Our studies show that knocking out COX-2 in mammary epithelial cells delays mammary tumor onset in mice mainly due to decreased production of pro-oncogenic prostaglandin E2 (PGE2). We have silenced PGE2 producing enzymes COX-2 or mPGES1 in mammary tumor cell lines using shRNA. To find out whether PGE2 confers resistance to necrosis, COX-2 or mPGES1 deficient cells will be cultured with or without PGE2 and then treated with tumor necrosis factor alpha (TNF $\alpha$ ) to induce cell death. Necrosis will be assessed by measuring lactate dehydrogenase (LDH) in culture medium using In Vitro Toxicology Kit from Sigma Aldrich. Student responsibilities: growing cells and maintaining PGE2 concentration in cell culture, treating the cells with TNF $\alpha$ , cell lysis and LDH measurements using the kit.

**Project 3: The effect of PGE2 on pro- or anti-tumorigenic phenotype of CD4+ T lymphocytes**

Our studies show that tumors that lack COX-2 enzyme and hence, make less pro-oncogenic prostaglandin E2 (PGE2), have more infiltrating CD4+ T cells that express markers of Th1 CD4+ T lymphocytes. To study the effect of PGE2 on polarization of CD4+ T cells towards anti-tumorigenic Th1 or pro-tumorigenic Th2 T lymphocytes, naïve CD4+ T lymphocytes obtained

from mouse spleen using microbeads will be cultured with or without PGE2, in the presence of Th1 or Th2 polarizing cytokines. At the end of polarization, transcription factors and cytokines characteristic to Th1 and Th2 CD4+ T cells will be measured by quantitative PCR and ELISA, respectively. Student responsibilities: culturing naïve CD4+ T cell on activation plate by re-feeding the cells, maintaining PGE2 and polarizing cytokine levels in culture, harvesting media and cell lysis, assisting with PCR and ELISA assays.

## PSYCHIATRY

*Olivier Berton*

### **Project 1: Manipulating vulnerability to psychological trauma using Hsp90 gene therapy in the brain**

The glucocorticoid receptor (GR) is the primary receptor for the stress hormone corticosterone (cortisol), and genetic variations affecting the signaling by this receptor have been identified as key risk factors for the development of stress-related disorders including depression and post-traumatic stress disorder (PTSD). GR signaling during stress relies on the receptor's interaction with a protein complex orchestrated by the protein chaperone Hsp90. Our lab recently found that posttranslational regulation of Hsp90 via reversible acetylation critically influences GR signaling in the brain and stress sensitivity.

Experiments conducted by the student with guidance from a postdoctoral fellow will address two questions related to these findings. First, do natural variations in Hsp90 acetylation and chaperone complex composition predict which individuals will be more vulnerable to stress? Second, can stress sensitivity be ameliorated in vulnerable mice using viral-mediated gene therapy targeting HSP90 acetylation? To answer these questions, the student will use a Social Defeat model of traumatic stress in mice, in which aggression by a larger mouse triggers a long-lived form of social aversion in a proportion of vulnerable mice, but spares stress resilient animals. Acetylation of Hsp90 and composition of the Hsp90-GR chaperone complex will be compared between mice that are spontaneously resilient and vulnerable in this model using co-immunoprecipitation and Western blotting.

In a related experiment, viral vectors overexpressing point mutants designed to mimic either the acetylated or deacetylated state of Hsp90 will be surgically injected into the brain of mice prior to social defeat. Stress vulnerability will then be evaluated using tasks examining social interactions, as well as other fear- and motivation –related behaviors. Conducting this project will provide hands-on training with animal behavior, stereotaxic surgical procedures in brain, and experience with state of the art recombinant viral vectors.

## **Project 2: Optogenetic dissection of the mechanisms underlying the therapeutic activity of cortical DBS in depression**

Many patients with severe forms of depression fail to respond to chemical antidepressants and are condemned to suffer the life-long disabling consequence of this disease. Recent clinical trials examining the effect of deep brain stimulation (DBS), with surgically implanted devices delivering high frequency electrical impulses to specific parts of the brain, have identified a number of discrete sites that induce rapid and sustained mood normalization in treatment resistant patients. Among these sites, the medial prefrontal cortex (mPFC) is a region that has produced the most consistent therapeutic effects. Although mPFC DBS is believed to restore mood by producing neuroplastic changes in emotion-related circuits arising from the mPFC the precise cellular and neural mechanisms involved remain unclear.

One hypothesis is that certain key DBS-induced neuroplastic adaptations occur in a circuit that connects the mPFC to serotonergic cell groups in midbrain raphe nuclei (i.e., the direct cellular targets of chemical antidepressants). Via this mechanism DBS could reproduce certain effects achieved by chronic antidepressant drug treatments, but in a much amplified and rapid fashion. This project will test this hypothesis using optogenetics in mice. This technique will allow spatial and temporal manipulation of mPFC–Raphe circuits using focal light application to the mouse brain.

The student will work directly with a graduate student to perform intracranial stereotaxic infusion of viral vectors driving expression of the light-activated ion channels Channelrhodopsin or Archaelrhodopsin in genetically-identified cell populations within mPFC-DRN pathway. The student will then use in vivo laser-mediated photostimulation and photosilencing coupled with behavioral evaluations and measures of neurotransmitter release to examine the role of these circuits in depression-like behaviors. Conducting this project will provide hands-on training with animal behavior, microdialysis and stereotaxic surgical procedures in brain, as well as experience with state of the art optogenetic approaches.

## **Project 3: Role of microtubule acetylation in stress and antidepressant-induced behavioral plasticity**

Recent studies have shown that various antidepressants and mood stabilizers promote protein hyperacetylation in the brain via the inhibition of histone deacetylases (HDACs). This suggests that a converging intracellular mechanism involving HDACs may underlie the activity of these medications. This hypothesis is in line with the observation that HDAC inhibitors promote antidepressant-like responses in models of depression. Although most HDAC studies in the brain have focused so far on their role in chromatin regulation, recent reports point to cytoskeletal proteins as another important class of HDAC targets. HDAC6, a cytoplasmic class IIB HDAC, has been identified as the primary deacetylase of  $\alpha$ -tubulin, a cytoskeletal component with key roles in activity-dependant synapse remodeling and intracellular trafficking.

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̢-tubulin is hyperacetylated after HDAC6 specific inhibitor treatment as well as upon deletion of HDAC6. Additionally, HDAC6 is inhibited by certain tricyclic and selective serotonin reuptake inhibitor antidepressants, such as fluoxetine and amitriptyline, as well as the mood-stabilizer lithium. Our lab has also shown that mice in which HDAC6 is knocked out in a serotonin cell specific manner have an antidepressant-like phenotype.

The overall goal of this project is to establish a functional link between the hyperacetylation of ̢-tubulin caused by inhibition or deletion of HDAC6 and their antidepressant-like effects. The student will follow one project through its completion, from expression of a non-acetylatable form of ̢-tubulin to behavior experiments and molecular verification. This will allow the student to gain hands-on experience in experimental design, brain infusion and behavior techniques as well as immunohistochemistry and molecular biology.

*Stanley Caroff*

### **Project 1: Evaluation of a Cognitively Adaptive e-treatment in Schizophrenia diagnosed Adults - A Remediation Based Approach**

We are conducting a research study at the Philadelphia VA Medical Center that offers an exciting opportunity for undergraduate students to participate in and gain experience in planning and implementing investigations in clinical neuroscience. The current study is a multi-site trial of computer-based neurocognitive remediation in patients with schizophrenia. This is an innovative and cutting-edge project designed to test whether focused neurocognitive techniques targeting specific areas of cortical dysfunction can improve cognition and social functioning in patients with this serious mental illness.

Responsibilities would include joining a dynamic investigative team, learning about schizophrenia and clinical neuroscience research, assisting with study procedures, and direct involvement in coaching patient subjects as they complete cognitive remediation on a computer-based software application package. This is particularly well-suited for students majoring or interested in pre-med, biological basis of behavior, psychology and cognitive neuroscience.

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*Sangwon Kim*

**Project 1: Cellular characterization Rett syndrome induced pluripotent stem cells-derived neurons**

Rett syndrome (RTT) is one of the most prevalent female neurodevelopmental disorders that cause severe intellectual disability. Regression is a key defining feature of RTT. During the regression stage, RTT girls display many autistic features including loss of communication and social skills, limited interest in activities or play, and poor eye contact, and initially may be given the diagnosis of autism. The discovery of the genetic cause of RTT, mutations in the MECP2 gene, a transcriptional repressor, has promoted the early diagnosis of RTT and development of mouse models. A significant obstacle to understanding the neurophysiologic bases for idiopathic ASD is the lack of a validated model of the disease. To be useful, a model must share traits of ASD, demonstrating common pathways similarly affected by the disease. To overcome this limitation, we will explore the induced pluripotent stem cells (iPSCs) from RTT patient fibroblast and further differentiate them into mature neurons. This system thus provides indefinite resources for cellular disease. In this proposal, a student will analyze cellular phenotypes of the mature neurons derived from RTT-iPSCs such as composition of neurotransmitter receptors or some of the key signaling pathways which is mediated by MECP2 genes utilizing molecular, biochemical and pharmacological tools. Moreover, these data will be compared to the primary cortical neurons isolated from mouse model of RTT.

**Project 2: The role of iron in neural circuits and behavior**

Iron is the most abundant metal in our body participating in a wide variety of metabolic processes (oxygen transport, electron transfer, DNA synthesis, etc.) but also having the potential for deleterious effects. Especially, unless appropriately chelated, iron plays a key role in the formation of harmful oxygen radicals that ultimately cause peroxidative damage to vital cell structures. Thus, evolving organisms were compelled to solve one of the many paradoxes of life, i.e., to keep “free iron” at the lowest possible level and yet in concentrations allowing its adequate supply for the synthesis of heme proteins and other iron-containing molecules. Due to iron's unique chemical nature and the brain heterogeneity, it has been very difficult to study iron in the central nerve system (CNS) and most of the studies of iron functionality in the brain have centered around its pathophysiological properties and participation in various neurodegenerative diseases as a catalyst leading to the production of reactive oxygen species (ROS). Our preliminary data and the proposed research challenge this conventional paradigm of iron biology. We hypothesize that iron is a novel second messenger which can regulate neural circuit function and consequently can modulate behavior. In this proposal, a student will perform in vitro functional imaging in brain slices using fast voltage-sensitive dye (VSD) imaging to examine a change in neural circuitry after manipulating endogenous iron level. To identify specific mechanisms modulated by iron we will use a number of stimulation paradigms, high divalent

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solutions, which isolate monosynaptic activity and specific antagonist of GABA (GABAazine) and glutamate (AMPA and NMDA, with DNQX and APV) to isolate specific components of the circuit.

*Falk Lohoff*

**Project 1: Pharmacogenetics of Generalized Anxiety Disorder**

This project will investigate genetic biomarkers for treatment response to antidepressant drugs used to treat patients with Generalized Anxiety Disorder. The student will be responsible for genotyping subjects that participated in treatment trials at UPENN for various genetic variants. Data analyses and presentation at lab meetings and preparation for publication are additional responsibilities.

*Irwin Lucki*

**Project 1: Genetic Differences in the Response to Antidepressant Drugs in Mice**

The purpose of this project is to understand reasons for genetic differences in the response to stress and antidepressant drugs between different strains of mice. Students will work on projects comparing the behavioral effects of antidepressant drugs between strains of mice. In addition, biochemical and hormonal measures will also be compared. Students will need a strong interest in psychopharmacology and the ability to work directly with rodents.

**Project 2: Involvement of Kappa Receptors in Behavioral Depression and Stress**

The purpose of this project is to understand the involvement of kappa opioid receptors in mediating behavioral responses to stress associated with depression. Students will work on projects examining the pharmacology of kappa opioid receptors using behavioral tests of antidepressant or anxiolytic activity in mice or rats. In addition, biochemical and hormonal measures will also be measured. Students will need a strong interest in psychopharmacology and be willing to work directly with rodents.

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*Paul Moberg*

**Project 1: Smell Ability in Mood Disorders** *Rising Juniors only*

This project examines smell processing in individuals with mood disorders. Students will be involved in task administration and data entry for the study. They will receive training in comprehensive olfactory testing and will also have clinical interaction with psychiatric patients.

**Project 2: CT Scanning and Facial Morphology in Schizophrenia** *Rising Juniors only*

This project examines the structure of sinuses and craniofacial abnormalities in schizophrenia. Students will learn how to conduct 3D facial scanning and CT scanning. They will also be involved in task administration and data entry for the study. They will also have clinical interaction with psychiatric patients.

*Steven Siegel*

**Project 1: Mouse models of Autism Spectrum Disorders**

Autism (ASD) is a highly heritable neurodevelopmental disorder characterized by deficits in social interactions, restricted and repetitive interests, and often-severe language impairment. Although the incidence of autism has risen steeply over the last decade, there remain few viable treatment options and relatively little understanding of how genetic and environmental factors contribute to the development of the disorder. Although animal models have greatly advanced our understanding of autism, there has been considerable difficulty assessing language deficits in such models. As a result, there has been relatively little progress addressing this core symptom of the disorder, despite that fact that language impairment is frequently the most disabling aspect of ASD. Therefore, there is a strong need to develop new measures related to language functioning that can be assessed in animal models of autism. This project seeks to further develop new methods for assessing communicative functioning in a mouse model of autism. Our approach employs electroencephalographic (EEG) techniques to measure electrical brain activity during presentation of auditory tones, analogous to methods currently used in clinical studies of autistic children. Brain imaging studies have shown that children with autism have difficulty processing auditory tones as rapidly and appropriately as typically developing children. These measures are highly predictive of language abilities. In this study, we will measure auditory brain activity in mice with a genetic deletion that is highly associated with autism as well as speech and language deficits. Completion of these studies will help better understand the genetic contribution to communication deficits in autism. In addition, this work will help develop new preclinical targets that can be used to investigate underlying brain mechanisms and potential treatments for language impairment. Students will have opportunity to attend weekly clinic with PI to obtain

clinical perspective on disorders that we study and should have background in either introductory or AP biology, chemistry, physics or Biological Basis of Behavior classes.

### **Project 2: Cellular abnormalities in a mouse model of schizophrenia**

Rationale: Reduced NMDA-receptor (NMDAR) signaling is strongly implicated in the pathophysiology of schizophrenia. However, it is unclear whether NMDAR dysfunction predominates on excitatory or inhibitory neurons and whether modulating downstream glutamatergic and GABAergic signaling can reverse neural deficits. Using cre-lox knockout mice in our lab, this project will determine selective contributions of NMDAR dysfunction on either inhibitory or excitatory neurons to electrophysiological, cognitive and negative symptom related behavioral phenotypes of schizophrenia. This will be used to assess the ability of pharmacological agents that directly modulate GABAergic or glutamatergic signaling to reverse treatment resistant deficits. Background: We previously demonstrated that NMDAR antagonists recreate many electroencephalographic (EEG) and event related potential (ERP) abnormalities of schizophrenia. Additionally, NMDAR antagonists disrupt cognitive measures such as contextual fear conditioning and novel object recognition. Previous data from our group also shows that reduction of the obligatory NMDAR subunit NR1 leads to abnormalities consistent with negative symptoms, such as reduced social interactions and nest building. As such, new therapies that modulate glutamate or GABA signaling are being developed without knowing which cell types, and therefore which changes in neural circuitry (net increase or decrease in excitation), are related to each functional measure. To address this need, studies in progress are determining the extent to which reduction of NR1 in selective inhibitory and excitatory cell populations recreates schizophrenia-related changes in cognitive and negative symptom behavioral paradigms, in vivo EEG/ERP measures, and ex vivo electrophysiology. Subsequent studies will address the extent to which specific pharmacological approaches can attenuate identified changes through facilitation or diminution of NMDAR signaling or by enhancing GABAergic function at specific subsets of GABA receptors. Upon completion of proposed studies, data will inform future clinical trials with respect to which symptom and functional domains would be expected to respond to each pharmacologic approach. Students will have opportunity to attend weekly clinic with PI to obtain clinical perspective on disorders that we study and should have background in either introductory or AP biology, chemistry, physics or Biological Basis of Behavior classes.

### **Project 3: Biological basis for social deficits in schizophrenia and autism**

Social deficits are disabling, treatment refractory symptoms of schizophrenia (SCZ). The amygdala is thought to modulate this behavior, and disruption of NMDA receptor (NMDAR) mediated glutamate transmission has been implicated. However, a detailed understanding of the cellular and regional circuit mechanisms underlying social deficits is lacking. We propose that disrupted development and functioning of glutamatergic inputs to NMDARs on basolateral amygdala (BLA) neurons can disrupt acquisition and maintenance of normal social behavior. Furthermore, increased resting activity, i.e. noise, in BLA leads to disruption of normal signal

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processing and reduced signal-to-noise ratio (SNR) for social inputs from cortico-limbic brain regions. This project will use in vivo electroencephalography, local field potentials (LFP) and multiple single unit recording in BLA and hippocampus during social behavior as well as voltage sensitive dye imaging (VSDI) and intracellular recordings in slices from mice with disrupted NMDAR signaling. Model systems include mice with constitutive reduction in NMDAR1 expression (NR1<sup>-/-</sup>) that have SCZ-like deficits in EEG and social interactions, and mice with amygdala-selective reduction in NR1 using NR1<sup>flox</sup> mice with AAVCre injections. We will also examine novel pharmacologic approaches for restoration of excitatory-inhibitory balance in BLA at rest and during social behaviors. Students will have opportunity to attend weekly clinic with PI to obtain clinical perspective on disorders that we study and should have background in either introductory or AP biology, chemistry, physics or Biological Basis of Behavior classes.

## **RADIATION ONCOLOGY**

*Alejandro Carabe*

### **Project 1: Range uncertainty in carbon therapy due to variable biological effectiveness**

See description under Medical Physics

### **Project 2: Is the proton or carbon ion Linear Energy Transfer (LET) a good parameter to quantify their relative biological effectiveness?**

See description under Medical Physics

### **Project 3: Determination of optimal range and modulation of a proton beam to treat brain tumors**

See description under Medical Physics

## **RADIOLOGY**

*Jongho Lee*

### **Project 1: Mapping brain white matter fiber orientation using MRI**

In this project, a student will perform MRI imaging to map the white matter fiber orientation in ultra-high resolution. He or she will learn the basics of MRI imaging and also the newly developed fiber orientation mapping approach developed in my lab. After the basic training,

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he/she will do his/her own experiment of mapping an in-vitro brain. This will be a good chance to learn "imaging" as a tool for research as well as to expose oneself to a cutting edge research and may contribute to develop a new brain white matter template. Prerequisites: Exposure to programming language (e.g. MATLAB) will be useful.

*Lin Li*

### **Project 1: Imaging tumor aggressiveness**

Most cancer patients die of metastases. It will be clinically useful if we can predict the metastatic potential or aggressiveness of tumors. Our lab aims to develop novel imaging methods (e.g. NMR, optical) to investigate the tumor metabolism and function in order to identify imaging biomarkers for tumor aggressiveness. The students can help with literature search, imaging experiments, or data analysis.

## **SURGERY**

*Seema Sonnad*

### **Project 1: Multiple Mentors Survey**

Mentoring relationships between junior and senior medical school faculty are opportunities to provide support and guidance as younger academics navigate their careers and personal lives. Improved social norms have led to increasing numbers of female and minority physicians in various departments when in the past most if not all faculty consisted of Caucasian males. Growing diversity of personal (partnership and parenthood) roles as well as gender and racial identities adds layers of complexity to the dynamics of these mentoring relationships. Our goal is to better understand how evolving demographics have impacted modern mentoring relationships within preselected fields of medical academia amongst high achieving junior faculty. Of particular interest is the growth in mentoring practices, specifically the practice of mosaic mentoring, or multiple mentors for diverse personal and professional needs. Participant criteria includes junior faculty at the top ten medical schools in select departments. The procedure is to survey them about their mentoring experiences via SurveyMonkey.com, an online survey website, over several waves of invitations to collect responses. The student's role in this project would be to assist with research – reviewing and analyzing existing literature and helping with the administration and analysis of a physician survey. Authorship would be possible. There are no prerequisites for this project other than an enquiring mind and a genuine interest in the study itself.

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### **Project 2: Remote Collaborations in Clinical Research**

Not so long ago physical proximity was a pre-requisite for collaboration in knowledge-based production and research. However, technological innovations now enable information sharing and instant communication over any distance. Dramatic increases in co-authorship at a distance have been recorded in fields such as finance and economics during the latter part of the twentieth century. However, very little research has been conducted to establish whether innovative collaborations are still inhibited by geographic distance in medical research. The consequences of the findings of this study, analyzing whether long distance collaborations in medical research have significantly increased over the last two decades, are far reaching. If geography no longer plays a defining role in determining how productive a physician involved in research may be, it becomes less necessary for physicians to be physically located at elite academic institutions could potentially even entice more physicians to join or remain in academic medicine, while providing medical care services in more remote or underserved areas. The student working on this study would play an integral role in ascertaining whether, or not, long distance research collaborations among physicians have increased over time. The student would be responsible for analyzing published material by physicians over the last twenty years and determining whether co-authorships over long distances have increased. The student would receive authorship on the project (author position depending on contribution). While medical knowledge is not required, a keen interest in the topic and good organizational skills are necessary.

### **Project 3: Patient Participation in Clinical Trials**

Clinical trials play a critical role in determining the efficacy of and bringing into use medical innovations including better immunizations, diagnostic procedures and treatments. The more people who participate in clinical trials, the more rapidly information can be accumulated and the more representative the trial results will be of the true effectiveness of the new technology. Clinical trials also have an important secondary benefit – they help to provide access to cutting edge experimental therapies for all members of the community. Patients may participate in trials for many reasons; to access physicians otherwise unavailable, to receive care not covered by insurance; perhaps in the hope of being successful cured by a pioneering treatment, or simply to help further medical knowledge. We are interested in the relationships between attitudes patients have toward receiving innovative treatments for themselves and their interest in clinical trial participation. We intend to study patient treatment choices and willingness to participate in clinical trials and their relationship with attitudes towards research, innovativeness, spirituality and trust in the medical system. We will also look at difference across racial and gender lines. The student's role in this project would be to assist with research – reviewing and analyzing existing literature and helping with the administration and analysis of a patient survey. Authorship would be possible. There are no prerequisites for this project other than an enquiring mind and a genuine interest in the study itself.

## **Nursing**

### **BIOBEHAVIORAL HEALTH SCIENCES**

*Sarah Kagan*

#### **Project 1: PURM 2012: The Experience of Mohs Micrographic Surgery for Patients with Non-Melanoma Skin Cancer**

Mohs micrographic surgery offers significant therapeutic advantages in excising non-melanoma skin cancer (NMSC) of the head and neck. Several authors have explored patient outcomes of Mohs surgery but these studies have generally been confined to quality of life. The experience of NMSC patients is likely much more nuanced and complex given the central aesthetic and functional importance of the face, head, and neck in every day function and experience. We are studying the experiences of patients with NMSC who have a range of disease severity and varied frequency of Mohs surgery including repeated Mohs and reconstructive procedures, through a grounded theory approach. Data from retrospective single interviews with a clinically diverse group of participants will be combined with data from prospective observations of patient's initial clinic visits for Mohs procedures.

The student research assistant will have the opportunity to learn Grounded Theory methods (a qualitative sociological research method), do data analysis, and work with an interdisciplinary team of nurses and physicians to finalize analysis and prepare manuscripts to disseminate findings. Additionally, students with broader interests in qualitative methods will have the opportunity to link this project to data analysis in two other studies examining patient experience of oral cavity cancers. Some background in social science, interest in health professions, or both is helpful. Good writing skills are a significant advantage!

#### **Project 2: The Impact of an Interdisciplinary Team Clinic on Symptoms, Nutrition, and Function of Patients With Head and Neck Cancers** ***Rising Juniors only***

Patients with head and neck cancers experience symptoms (e.g. pain, mucositis, dysphagia, anorexia, and fatigue) that are associated either with the cancer itself or the cancer treatments (viz. surgery, chemotherapy, radiation therapy). The Joan Karnell Cancer Center at Pennsylvania Hospital developed the CARE Clinic (Cancer Appetite and Rehabilitation) to address the symptoms of patients undergoing cancer treatments. The CARE Clinic is an innovative approach that involves an interdisciplinary team composed of a nutritionist, a physical therapist, a swallowing and speech therapist, and a nurse practitioner to support patients with comprehensive assessments and targeted intervention to address symptoms that are threatening their nutrition, function, and well-being.

This project provides the student with a chance to work with the CARE Clinic team to design a study that measures and describes the impact of the CARE Clinic on patients, to submit that proposal for IRB review, and to continue to work as a research assistant on the project as it goes forward into data collection. In addition, designing the study requires the student work closely with the team and observes how the CARE Clinic team functions in care of patients. As a result, the student will join an enthusiastic interdisciplinary team dedicated to care for cancer patients and will participate in the CARE clinic during the summer. Creativity and eagerness to learn about clinical research with people who have cancer are necessary attributes but experience with clinical research is not required.

*Lea Ann Matura*

### **Project 1: Mechanistic Pathways of Fatigue and Sleep Disturbance in Chronic Illness**

Pulmonary arterial hypertension (PAH) is a chronic, debilitating disease that ultimately leads to right heart failure and premature death. PAH affects primarily women (80%) with a mean age of diagnosis of 50 years. The etiology of PAH includes: idiopathic, familial, sickle cell disease, HIV, congenital heart disease and connective tissue diseases. PAH is commonly characterized by dyspnea, fatigue, exercise limitation, lower extremity edema, and chest discomfort. Diagnosis of PAH is often delayed with the mean time of 2 years from symptom onset to diagnosis contributing to delayed treatment and increased mortality. Fatigue is a multidimensional concept that decreases one's ability to carry out daily activities, to work effectively, and to function. Our preliminary PAH data show over 90% report fatigue and 66% have difficulty sleeping. Inherent to PAH pathobiology is an inflammatory response involving proinflammatory cytokines (e.g. tumor necrosis factor  $\alpha$  and interleukin-6). Inflammation can induce fatigue and sleep disturbance even in otherwise healthy individuals, but these mechanisms have not been investigated in people with PAH. Understanding the mechanistic pathways of fatigue and sleep disturbance will allow for the development of effective interventions. The aim of this study is to determine the role of inflammation in fatigue and sleep disturbance in women with PAH. Students will begin to understand the role of inflammation in symptoms and disease. Students will assist with synthesizing the literature, analyzing and interpreting data and acquire basic scientific writing skills. Students will need to know basic library research skills and knowledge of working with Microsoft office.

## **FAMILY AND COMMUNITY HEALTH**

*Lisa Lewis*

### **Project 1: SPIRITUAL VIGNETTES TO INCREASE MEDICATION ADHERENCE AMONG HYPERTENSIVE BLACK CHURCH MEMBERS**

Hypertension is a major public health problem in the U.S. Although effective drug therapy is available to treat hypertension, the rate of medication adherence is unacceptably low in blacks. The purpose of this project is to test the effectiveness of a church-based intervention compared with standard patient education in increasing antihypertensive medication adherence in 60 black church members diagnosed with hypertension. Members randomized to the standard patient intervention will receive standard health education about their hypertension (the National Heart, Lung and Blood Institute's "Your Guide to Lowering Blood Pressure"). Members randomized to the church-based intervention will: (1) complete an interactive faith-based workbook that increases hypertension knowledge and medication adherence through the use of spiritual vignettes and (2) partner with fellow church members for peer support. We hypothesize that after three months, church members receiving the church-based intervention will have better medication adherence and better blood pressure than church members receiving the standard patient education.

One student research assistant is needed to assist with data collection, data entry and study enrollment. Data collection includes measurement of blood pressure using an automated device, measurement of medication adherence using electronic monitoring pill caps, and study questionnaires. Training will be provided for all data collection techniques. As such, the student research assistant does not need health assessment skills but must be comfortable working with diverse populations and in a church setting located off-campus in Old City, Philadelphia. The student will gain skills in health measurement, data analysis software (SPSS), manuscript preparation, and community-based research methods.

*Jianghong Liu*

### **Project 1: Data management for a longitudinal study**

In summer 2011, I will be collecting data from an on-going cohort study—Jintan Child Health project in China. This project is interdisciplinary and collaborative study between Upenn and Shanghai Jaotong University in China with the aim of examining the influence of environmental health factors on children's behavioral and cognitive outcomes. 1,600 preschool children were enrolled in 2004 and their blood lead levels, behavioral outcomes, IQ, and psychosocial factors have already been assessed at age 4-6 years. Currently, we are following-up children in their

elementary schools. Because the longitudinal study involves data organizing and management, I am seeking a undergraduate student who is interested in data management and who is able to conduct literature searches. Good writing skills are a plus. This student will be responsible for data organization and will be closely supervised by the faculty mentor. This project is ideally suited for undergraduate students who are motivated to pursue graduate studies and who are interested in the following fields: biomedical, psychology, environmental health, nutrition, child behavior, epidemiology, and biostatistics. There are opportunities for developing independent projects or senior theses derived from this study's data set.

### **Project 2: Lead exposure and children's neuro-behavioral outcomes**

Childhood lead exposure is a global public health issue. The toxic effects of lead on neurodevelopment are well-known, impacting both cognitive and behavioral development; however few longitudinal studies have assessed the long term effect of lead on neurobehavioral outcomes. This study proposes to repeat measures on IQ and behavior outcomes in the subgroup of original cohort Chinese school children. Student's involvement in this study includes collecting data on children's health, cognitive, and behavioral outcomes at research site in Jintan China. Previous research experience and beginning knowledge and skill on one of following will be very helpful: environment health, psychology, nutrition, data analysis biomedical research and proficiency in scientific paper writing. There are opportunities for developing independent projects or senior theses derived from data set from this study. There is also the possibility to continue working on the project beyond the summer.

### **Project 3: Nutrition and children's neurocognitive- behavioral outcomes**

Malnutrition caused by micronutrient deficiencies is still prevalent in developing countries, and the role of micronutrient deficiency in contributing to the development of childhood neuro-behavior outcome is under-researched. This study proposes to repeat measures children's nutrition status through food diary in addition to assess neurocognitive ability and behavior outcomes in the subgroup of original cohort Chinese school children. The student will assist in collecting food diary data from elementary school children in Jintan China. They will also be involved in data organization and literature searches. Good writing skills are a plus. Health Science background is preferred, but psychology and education background are also very helpful. She/he will also participate in data entry and analysis, and the undergraduate student will work closely with the mentor. There are opportunities for developing independent projects or senior theses derived from data set from this study. There is also the possibility to continue working on the project beyond the summer.

*Marilyn Stringer*

**Project 1: Breastfeeding Norms, attitudes and beliefs of West Philadelphia residents**

The benefits of breastfeeding are well documented in the scientific literature. Infants who do not receive human milk have an increased risk of poor health outcomes such as asthma, otitis media, diabetes, and later in life both breast and ovarian cancer. The rates of infants who breastfeeding in West Philadelphia are 74%. The purpose of this pilot study is to gather preliminary data that will lead to developing an intervention to increase breastfeeding rates in West Philadelphia. The study targets West Philadelphia residents beliefs about infant nutrition within the first 3 months of life. Four focus groups will be conducted with representatives from different residents including childbearing women, childbearing women partners, elder women of the community, and teen girls. A total of 32 participants will be interviewed. Based on the Theory of Planned Behavior, the specific study aims is to identify attitudes, norms and beliefs related to infant nutrition during the first 3 months of life. This initiative aims to conduct the preliminary work needed to develop and provide a comprehensive intervention that is theory-based, skills-based, contextually competent to promote human milk consumption during the first 3 months of infant life.

The student will assist with IRB submission, subject recruitment, and conduction of focus groups gaining a rich experience in qualitative study methods. Necessary student skills include accountability during study conduction. Depending on interest, the student will be encouraged to continue as a study team member through analysis and dissemination.

*Barbra Wall*

**Project 1: Bridging Cultural Divides: Religion and Medicine in Sub-Saharan Africa 1938-2000**

This proposal examines the interplay among local and national health care systems in sub-Saharan Africa, indigenous initiatives, and the role that religious health care providers have played in these processes. It focuses on Catholic missionary sisters in health care after World War II and shows how their practice was continually shaped and re-shaped by their interactions with structures and demands of the Catholic Church, indigenous people, government agencies, and global capitalist networks. The study features hospitals and clinics run by the Medical Mission Sisters from Philadelphia, who have hospitals and clinics in Ghana, Uganda, Kenya, and Ethiopia; the Medical Missionaries of Mary from Ireland, who have facilities in Nigeria, Malawi, and Ethiopia; and the Maryknoll Sisters from New York, who work in Tanzania, Botswana, and Zimbabwe.

## **FAMILY MEDICINE AND COMMUNITY HEALTH**

*Alison Buttenheim*

### **Project 1: Behavioral economics and health: Two intervention studies in Peru**

NOTE: Written and spoken Spanish fluency is a requirement for this position.

The student will assist with all facets of two pilot studies being conducted in Arequipa, Peru. Both interventions are informed by behavioral economics. The first is a randomized controlled trial of different strategies to encourage household participation in a door-to-door Chagas disease control campaign. The second is an mHealth pilot to encourage mothers of young children to use appropriate treatment for diarrheal disease symptoms. The student will assist with qualitative and quantitative data collection, entry/cleaning and analysis; pilot study project management; translation; literature review; and manuscript and grant writing. The student will accompany Dr. Buttenheim to Arequipa, Peru for 7-10 days in early July (travel expenses will be covered by the PURM grant). A longer stay in Peru may be possible. The student will also assist Dr. Buttenheim with the development of a new course on global child nutrition assessment and interventions.

## **Social Policy and Practice**

### **SOCIAL POLICY AND PRACTICE**

*Dennis Culhane*

#### **Project 1: Measuring Homelessness Rates**

The purpose of this study is to identify the determinants of variation in rates of homelessness as a function of several community-related domains, each consisting of a set of potential explanatory variables: housing, safety net, public spending, economics, Veteran issues, health, criminal justice, and demographic indicators. Prevalence rates of homelessness will be obtained at the CoC level, from both the HUD point-in-time and annualized counts. Community characteristics—measured at the county, CoC, VA medical facility, and state levels—will be obtained from several publicly available data sources (e.g., HUD, Census Bureau), which will be linked by geographic boundary and matched at the CoC-level. Findings from this study will support program and policy decisions intended to prevent and end homelessness. Communities seeking to reduce the prevalence of homelessness will be able to examine those factors that are potentially modifiable, and enact policy or prevention and intervention efforts intended to end homelessness.

The students' duties and responsibilities related to this project would include identifying, collecting, and aggregating publicly available data. The student would also conduct literature reviews on a number of topics related to the structural and individual determinants of homelessness. Prerequisites include a familiarity with data management software (e.g., Excel, SPSS, SAS) as well as an interest in community-level research and homelessness.

#### **Project 2: Veteran Homelessness: A Supplemental Report to the Annual Homeless Assessment Report (AHAR) to Congress**

For the past 3 years, HUD and the VA have collaborated to produce the AHAR-Veteran, and will continue to do so annually. This report is intended to provide policymakers, practitioners, and the general public with information about the extent and nature of Veteran homelessness. The information provided in this report advances the federal effort to end homelessness among Veterans in 5 years, through the collection and analysis of timely data on Veteran homelessness. In addition to the snapshot and annual estimates the AHAR-Veteran reports, the document also describes the demographic characteristics of homeless Veterans, including race, ethnicity, gender, age, and disability status. These characteristics are compared to those of other populations including the non-Veteran homeless population, the total Veteran population, and the population of Veterans living in poverty. Also discussed in this report are the locations of homeless Veterans across the country as well as how they access and use the homeless

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residential system. Finally, annual comparisons of estimates are made to suggest how homelessness among Veterans is changing over time.

The students' duties and responsibilities related to this project would include identifying, collecting, and aggregating publicly available data. The student would also have a role in report writing and editing. Prerequisites include a familiarity with data management software (e.g., Excel, SPSS, SAS) as well as an epidemiological research and homelessness.

### ***Femida Handy***

#### **Project 1: The practice and promise of philanthropy in India**

Help with research Including library and document research on indian philanthropists In India and in the USA , Investigating the historical, social and political dimensions of philanthropy in India Identifying philanthropic practices at the top and bottom of the pyramid Setting up interviews Keeping the research organized Awaiting in all levels of research in writing a book on this topic

#### **Project 2: Editorial assistant to the editors of the Nonprofit and Voluntary Sector**

##### **Quarterly** ***Rising Juniors only***

Helping editors with the online manuscript submission , reviewing and acceptance process for a first ranked peer reviewed academic journal in the field of nonprofits DUTIES This job requires maintaining complete confidentiality and integrity inn processing manuscripts that have been submitted and she erring them through the peer review process and eventual rejection or acceptance It is a great opportunity to learn about the academic writing and publishing process. Our current managing director and editors require assistance

### ***Yin-Ling Irene Wong***

#### **Project 1: Community Inclusion among People with Psychiatric Disabilities and Nondisabled Community Members in Shanghai, China**

The goal of this research project is to document and compare the levels and patterns of community inclusion among persons with psychiatric disabilities, their family members, and non-disabled community residents. Community inclusion refers to 1) the extent to which an individual participates in groups and organizations, and uses resources and services in the community; 2) the extent to which an individual engages in social interactions with community members; and 3) the extent to which an individual perceives membership and emotional connectedness in his/her community while exercising influence. The project will take place in

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Jiading District, Shanghai, in collaboration with Fudan University School of Social Development & Public Policy. The PURM student will engage in fieldwork in Shanghai for four weeks. During this pre-test phase of the study, the student will conduct face-to-face interviews with study participants using a standardized survey and will participate in focus groups with persons with psychiatric disabilities, family members, and non-disabled community members. After the fieldwork phase is concluded, the student will return to Penn and participate in analyzing and writing-up the interview and focus group data. The student will learn data collection and data analysis skills employed in a social and behavioral science research project. The student will learn how to build relationship with research personnel between two top-tier academic institutions in China and U.S.A. The student will involve in writing a research-based article for publication. Fluency in both written and spoken Chinese (Mandarin/Putonghua) is required for this project.

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## **Veterinary Medicine**

### **PATHOBIOLOGY**

*Lisa Murphy*

#### **Project 1: Surveillance for Environmental Rodenticide Exposures in Wild Birds**

Anticoagulant rodenticide (AR) poisoning has been documented in a number of bird of prey populations worldwide. In 2011 we investigated the frequency of detectable ARs in wild bird blood and liver samples from Delaware, New Jersey, and eastern and central Pennsylvania. This was the first study within this region to document detectable levels in blood and liver samples. New regulations on the sale and use of ARs were enacted by the U.S. Environmental Protection Agency (EPA) in June 2011, with the intention of reducing non-target AR exposures in wildlife species. We believe continued surveillance in 2012 will provide valuable information about the effectiveness of these new changes. The student will have the opportunity to work with birds presented to TriState Bird Rescue and Research in Newark, Delaware for rehabilitation under the direct supervision of a wildlife veterinarian. Physical exam findings and detailed histories will be documented for each bird and blood will be collected. The student will also participate in performing anticoagulant rodenticide analyses at the PADLS Toxicology Laboratory, located at the veterinary school's New Bolton Center in Kennett Square, Pennsylvania, under the supervision of a veterinary toxicologist and an analytical chemist.

## **Wharton**

### **BUSINESS AND PUBLIC POLICY**

*Santosh Anagol*

#### **Project 1: Evaluations of Recent Financial Market Policies in India**

This research project is focused on evaluating a number of major reforms and issues that have arisen in Indian financial markets in the past few years. Topics will likely include (1) Reforms in how multinational firms can invest in India (2) Reforms in the regulation of household financial markets including mutual funds and life insurance (3) Corruption legislation and how it affects businesses in developing countries. This project is currently evolving so there may be other topics as well, although all work will focus on financial market reforms in emerging economies. This is a broad project that will expose the research assistant to a variety of different areas in public policy and financial markets research.

The research assistant's tasks will likely include: 1) The assembly and analysis of primary data on Indian financial markets. 2) Newspaper and academic literature searches to develop hypotheses and understand the institutional context. 3) Weekly (or more frequent) meetings with the faculty member to discuss future directions and next steps.

## **MANAGEMENT**

*Adam Cobb*

#### **Project 1: What Type of Employer is the Family-owned Firm? *Rising Juniors only***

In recent years, family ownership and its affect on corporate strategy, decision-making and performance has received a great deal of research attention. However, what has largely been left unanswered is, What kind of employer is the family-owned firm? In this study, I plan to examine the role family ownership plays in how a firm structures its employee retirement benefits. The project necessitates creating a database of corporate ownership for a large sample of US firms. The main task of the project entails analyzing company proxy statements and manually entering data on each firm's ownership structure. Additional tasks such as literature reviews and basic data analysis will also be required.

Students will learn a great deal about inter-temporal changes in corporate ownership and how that has affected corporate decision-making and reshaped employment patterns. Students with basic knowledge of finance and data entry are encouraged to apply.

## **Project 2: Inequality and Corporate Employment: A Cross-National Comparison**

In previous work, I found a strong, negative correlation between the percentage of the labor force employed by the largest corporate employers and levels of inequality in the US over time. That is, when 10 (or 20, 50, 100) corporations employ a greater percentage of the workforce, inequality is lower. In this study, I seek to contribute to the study of societal-level inequality by more fully developing our conceptual model of the role played by corporate size and restructuring in driving societal-level inequality and empirically testing our hypotheses with a longitudinal data on a larger number of countries. The primary tasks of this study are to help me locate data on corporate employment for a large number of countries over time and assist in the building of a dataset.

*Emilie Feldman*

## **Project 1: Legacy Divestitures and Family Businesses**

In this project, we will investigate the propensity of companies owned or managed by their founding families to divest those firms' original, or "legacy" businesses, as well as the relationship between these divestitures and the subsequent performance of both the divesting parent companies and the divested business units. Duties involve collecting and coding both qualitative and quantitative data on the history, management, organizational structures, and financial performance of firms which undertake divestitures and of the business units they divest; generating summary statistics from these data; and summarizing the relevant academic literatures on family business management and divestitures. Economics majors or Wharton undergraduates with a basic background in statistics preferred.

## **Project 2: Culture Clash in Post-Merger Integration**

In this project, we will investigate the process through which firms can ease the process of post-merger integration in acquisitions where there is a strong "culture clash" between the acquiring and acquired companies, as well as the performance implications of the strategic choices firms make along this dimension. Duties involve conducting industry research on potential contexts in which to investigate this question; collecting and coding qualitative and quantitative data on the entities involved in the acquisitions; generating summary statistics from these data; and summarizing the relevant academic literature on mergers and acquisitions. Economics majors or Wharton undergraduates with a basic background in statistics preferred.

*Tyler Wry*

**Project 1: The Impact of Status and School on Radical Innovation in Nanotechnology**

This project builds on an ongoing stream of research examining the emergence and development of nanotechnology - the present aim being to decompose an inventor's status into multiple dimensions and examine how this affects his/her likelihood of pursuing path-breaking innovation. The student will be involved in all aspects of the research project. This will include reading various streams of the scholarly literature on innovation, coding data, and gathering additional data as required. If the student has capabilities with statistics, I'd like to engage them in the empirical analysis (I'd also be happy to teach them about this if it's a skill they're interested in acquiring). Finally, depending on our progress, there may be an opportunity to present work in progress at an academic conference. Some knowledge of nanotechnology would be an asset, but is not required for effective participation.

**Project 2: Misery loves Microfinance - Sometimes**

This project examines patterns of founding and performance of microfinance organizations (lenders who make small loans, typically to impoverished women, to help them start businesses) around the world. In particular, my focus is on how patriarchy within a nation creates resistance to microfinance organizations and how this affects the ways that they pursue their social mission. Student responsibilities will include a close reading and synthesis of the existing literature on microfinance to gain knowledge about the domain. In addition, the student will be responsible for researching primary sources with the aim of enriching and enlivening my quantitative analyses. This may include reviews of publicly available documents as well as talking to on-the-ground microfinance professionals.

## **OPERATIONS AND INFORMATION MANAGEMENT**

*Julia Minson*

**Project 1: Receptiveness in hostile dialogue**

This project uses laboratory social psychology methods to explore factors that make people more receptive and open-minded to the opposing views of others. In our studies participants engage in debate on socio-political issues with someone who holds an opposing viewpoint. We manipulate features of the interaction and the environment to determine which circumstances lead to the greatest level of open-mindedness. A student researcher would be involved in all aspects of laboratory research. Developing hypotheses, preparing experimental materials, transcribing, coding and analyzing data and preparing findings for publication.

### **Project 2: Effects of listing prices on final prices of commodities**

In this project we explore the effect of listing prices on final transaction outcomes. For example, should a home seller list the house higher or lower than other properties in the neighborhood to get the highest sale price? The future stages of the project will explore this question using online and laboratory methods. A student researcher would be involved in all aspects of laboratory research. Developing hypotheses, preparing experimental materials, analyzing data and preparing findings for publication. Some familiarity with quantitative research methods (like comfort with excel and or more sophisticated statistical software) would be a plus.

*Maurice Schweitzer*

### **Project 1: Emotion Regulation**

Emotions can powerfully influence our behavior. This project explores how individuals regulate their emotions. For example, individuals can choose to increase or up-regulate the anger they feel prior to a competitive interaction, like a negotiation. How individuals regulate their emotions, however, is likely to be moderated by how cooperatively or competitively situations are framed. Students engaged in this project would help with library work, running experiments, and analyzing data.