

New York Six Upstate Summer Research Fellows Program

AVAILABLE RESEARCH POSITIONS, SUMMER 2018:

Please review the list of research positions available to identify a project of interest. In your application, you will identify your preference and provide a brief statement of interest. The online application portal is found here: <https://newyork6.wufoo.com/forms/k1f0gvp0rp6pdv/> or through the New York Six website at newyork6.org.

Projects

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Institution: St. Lawrence University

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Academic Department: Psychology
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Academic Department: Art and Art History
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Academic Department: Biology
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PROJECT 1

Automation and Rural Employment: A Global Analysis of the Impact of Technology on Rural Areas of Upstate New York, the UK, and Japan

Faculty Mentor: Cynthia Bansak

Academic Department: Economics

Institution: St. Lawrence University

Project Description: As the world has witnessed the rapid growth in technological progress in the past few decades, the impact of automation on the production process has become a hotly debated topic particularly with respect to the future of labor markets. As robotics and artificial intelligence have the potential to replace workers, politicians have entered into the discourse regarding the interplay between technology and various types of labor including skilled, unskilled, immigrant, and native-born workers. Whether these inputs into the production process are complements, substitutes, gross complements or gross substitutes is largely an empirical question; the overall impact depends on the production process, government policy, and other institutions which in turn affect the responsiveness to changes in prices, wages, and the cost of capital. It does appear, however, that there is a greater potential for a negative impact on local labor markets in rural areas dependent on agriculture and manufacturing where capital and labor are more likely to be gross substitutes. In this case, there could be an overall decrease in jobs for certain occupations when low-cost machines become more widely available through technological advances.

To date, the current research on the impact of high-tech robotics and artificial intelligence has been largely focused on workers in urban areas; whereas the countryside has remained in their shadow. The goal of the project is to identify and evaluate the potential impact of such automation on employment in rural areas of upstate New York; in addition, we plan to draw comparisons from selected rural regions in other industrialized nations of the world, namely the United Kingdom and Japan. The methodology will entail the collection of data to perform empirical analysis of industries impacted recently by the complexity of automation in the production process. Specifically, we will explore the role that it has played in shaping the local labor markets, their structure, and employment levels over time as well as what challenges and opportunities it poses to affected communities. The results of this study will allow stakeholders such as North Country business owners, farmers, policymakers, and academics to better understand how automation might impact local labor markets.

Responsibilities of the Research Fellow: The fellow will conduct original empirical work using statistical software and will write a 15-20 page research paper to present and submit for publication. It is expected that the fellow will be able to obtain publically available data and perform an analysis using R in R Studio as well as compile any findings in R Markdown for presentation.

New York Six Liberal Arts Consortium

Colgate University | Hamilton College | Hobart and William Smith Colleges | St. Lawrence University | Skidmore College | Union College

Desired Qualifications:

- A junior student, preferably economics major with interdisciplinary interests in global or international studies
- a solid academic record and analytical thinking
- experience in computer programming with R in R Studio, R Markdown, and Stata
- ability to conduct research and work independently
- time management and critical thinking skills

Proposed Fellowship Dates: Flexible

PROJECT 2

Behavioral Adaptation in a Rat Model of Post-Traumatic Stress Disorder

Faculty Mentor: Adam Fox

Academic Department: Psychology

Institution: St. Lawrence University

Project Description: Upstate New York is home to Fort Drum and nearly 20 thousand active duty military personnel. United States Veteran Affairs (VA) estimates that between 10-20% of veterans experience Post-Traumatic Stress Disorder (PTSD) from combat-rated experiences. PTSD can also be caused by military sexual trauma (MST)—among veterans, 23% of women reported being sexually assaulted during active duty. Understanding and treating PTSD is important nationally and in non-military populations, but because so many members of our community are active duty military it takes on even more importance here in Upstate New York.

PTSD is a trauma- and stressor-related disorder [1]. It requires exposure to death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence [1]. As a result, humans experience physical and mental trauma that manifests in multiple possible ways (e.g., thoughts and feelings; negative affect, etc.) [1]. The disorder can be behaviorally and psychologically debilitating, and affects approximately 6.8 percent of the U.S. population [2], but between 10-20% of veterans with combat experience.

Since experimentally studying PTSD in humans is impossible, non-human models have been developed. These models allow for randomized and controlled exposure to stressful events and the measurement of corresponding behavioral effects. Typically these models use rats for subjects and induce stress using one of several different protocols [3-4]. We will use a predator-scent stress (PSS) model, which involves exposing rats to bedding soaked in the urine of a predator (e.g., for example, cat urine if your subjects are rats).

The vast majority of research conducted using rat models of PTSD is on fear conditioning and extinction [5]. This makes sense—one of the primary criteria for a PTSD diagnosis is prolonged fear/anxiety caused by the traumatic experience. However, *almost no research exists* experimentally examining the maintenance and adaptation of adaptive behavior (i.e. positive, appetitive types of behaviors) in these models. These adaptive behaviors seem particularly important given that one requirement for a PTSD diagnosis is functional (i.e. everyday) impairment [1], and PTSD is often comorbid with depression [6]. Yet adaptive behavior is largely ignored in the study of PTSD in non-human models. We know of only one study to examine the maintenance and adaptation of appetitive behavior in a rat model of PTSD. They found impaired spatial memory but enhanced habit memory post stress exposure [7]. The researchers used a restraint/forced swim method to induce trauma.

The primary aim of the proposed research is to examine the maintenance and adaptation of a behavioral motor response sequence in a PSS model of PTSD. This experiment will expand on the very

limited research that exists on this front—extending it to behavioral response sequences (i.e. operant behavior) and a different type of trauma induction.

Responsibilities of the Research Fellow: The research fellow will take a primary role in the research. After appropriate training, the fellow will assist with animal care, experimental testing, data collection, data analysis, and dissemination of the research findings (e.g., presentations at research conferences). The fellow will work alongside the Principle Investigator (Dr. Adam Fox) and other SLU summer research students in the lab. We also engage in career building exercises (e.g., CV building, graduate school discussions, etc.) and scientific writing practice (e.g., working on a manuscript reporting our results) during the summer fellowship period.

Desired Qualifications: The fellow should have an interest in Psychology and/or Behavioral Neuroscience. Course work in these areas is desirable—especially research methods courses. Laboratory experience is also a plus, but not a necessity. The fellow does NOT need to have experience with rats or laboratory animals. We will provide the necessary training on site (there will be some online training the fellow can complete beforehand). The fellow should be aware, though, that this research involves interacting daily with rats (don't worry—they are friendly and you will become fast friends!).

Proposed Fellowship Dates: June 4 to July 30, 2018 (8 weeks total)

References:

1. Diagnostic and statistical manual of mental disorders (5th ed.). (2013). Washington, DC: American Psychiatric Association.
2. Kessler, R. C., Berglund, P., Delmer, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62, 593-602.
3. Goswami, S., Rodriguez-Sierra, O., Cascardi, M., & Pare, D. (2013). Animal models of post-traumatic stress disorder: Face validity. *Frontiers in Neuroscience*, 7, 89.
4. Daskalakis, N. P., Yehuda, R., & Diamond, D. M. (2013). Animal models in translational studies of PTSD. *Psychoneuroendocrinology*, 38, 1895-1911.
5. VanElzakker, M. B., Dahlgren, M. K., Davis, F. C., Dubois, S., & Shin, L. M. (2014). From Pavlov to PTSD: The extinction of conditioned fear in rodents, humans, and anxiety disorders. *Neurobiology of Learning and Memory*, 113, 3-18.
6. O'Donnell, M. L., Creamer, M., & Pattison, P. (2004). Posttraumatic stress disorder and depression following trauma: Understanding comorbidity. *The American Journal of Psychiatry*, 161, 1390-1396.
7. Goodman, J., McIntyre, C. K. (2017). Impaired spatial memory and enhanced habit memory in a rat model of post-traumatic stress disorder. *Frontiers in Pharmacology*, 8, 663.
8. Fox, A. E., Caramia, S. R., Haskell, M. M., Ramey, A. L., Singha, D. (2017). Stimulus control in two rodent models of attention-deficit/hyperactivity disorder. *Behavioural Processes*, 135, 16-24.
9. Czabak-Garbacz, R. (2008). Studying behavior in stress research—Not as easy as one would think. In A. V. Kalueff & J. L La Porte (Eds.), *Behavioral Models in Stress Research* (pp. 1-22). New York: Nova Science Publishers, Inc.

PROJECT 3

Eco-Arts in New York State

Faculty Mentor: Margaretha Haughwout

Academic Department: Art and Art History

Institution: Colgate University

Project Description: This Summer Research Fellowship has three parts: (i) to research existing agro-ecology and ecological artists in New York state bioregions; (ii) to help pioneer new tree/ human/ ecology networks in New York as there is identified need: and (iii) to develop ecological art making processes and help maintain an “eco-art” garden at the Schupf Art Studios in Hamilton, NY.

The faculty mentor is an ecological artist having recently relocated from urban San Francisco, and is eager to consider how an eco-arts practice can operate the context of rural New York, and thus understand more broadly how to support students’ interest in eco-arts practice. The Guerrilla Grafters (<http://guerrillagrafters.org>), an art group founded by the faculty mentor, focuses on the role of human agency in ecosystems, and the ways human engagement can support healthy ecosystems. The Guerrilla Grafters to date have primarily operated in the context of the urban environment; it is now important to understand the ways we can work in the rural context across campuses, bioregions and a range of economies. A NY6 Summer Research Fellow will help compile lists of ecological artists working in the state, the scope of their practice, the ways these artists challenge the nature/ society binary, as well as help to identify the kinds of politics and problems they address in their local communities, campuses and their larger bioregion. A Research Fellow will also help to identify networks between fruit and nut tree enthusiasts, agro-ecologists, and permaculturists in the state, and within the NY6 consortium in particular. Research as to whether there are scion exchanges for example, or other informal meet-ups among these communities will help my students, me, and local stakeholders grasp how to support and aid in the circulation of ideas and resources that demonstrate resilient bioregional ecologies and the cultures that support them. All of this research will be published to a publicly accessible blog. We would eagerly seek out accept any opportunities to offer workshops or talks on our research at any of the NY6 campuses.

In addition, the Eco-Arts Research Fellow will help with networking, events and documentation related to the faculty mentor’s ecological and social arts practice, in particular Trees of Tomorrow (<http://treesoftomorrow.life>), which is slated for a preliminary exhibition in Queens in late May and will continue with exhibition opportunities into the summer months. Work in this area manifests as outreach to existing eco-artists and local groups connected to agro-ecology, keeping website posts up to date, as well as helping to design flyers and pamphlets related to the Guerrilla Grafters work and the Trees of Tomorrow project. Print materials are a considerable aspect of this collaborative and socially-engaged work in that they facilitate the tangible distribution of our creative ideas; it is important that they stay up-to-date and relevant to the networks we operate within.

In support of the above activities, the faculty mentor and research fellow will travel to the Cornell Botanical Gardens to specifically trace the history of apple tree cultivation in the state. The student researcher will help with retaining the notes and the documentation of these activities.

This spring, we will implement a garden and greenhouse at Schupf Studios as a way to begin a dialog about ecological commons practices in the Anthropocene, and to continue to explore the ways an eco-arts practice can intervene in the binary between nature and culture. This garden will host dwarf fruit trees and companion plantings of edibles, medicinals and beneficials. The student researcher will help explore and document new grafting, and guerrilla gardening techniques in and around the garden studio. We will experiment especially with wild apple tree grafts, play with a range of growing media, experiment with dye and paint plants, creative seeding techniques, seed bombs, and moss-paint -- aiming to hone in on easily replicable methods for working with ecological arts aesthetically, conceptually, and technically in the classroom. The student will also help develop workflows and documentation process in the eco-art garden, and photographing, blogging, and posting to other social media.

By the end of the summer, this student researcher will have produced an annotated list of eco-artists and their practices, an annotated list of agro-ecology, permaculture, fruit and nut tree networks, and lists that identify problems or needs in the bioregion and extending to nearby urban areas. This student researcher will co-design and coproduce a series of new print and web material related to food forests in the Fingerlakes bioregion in the NY6 network. The student researcher will help make connections with the relevant agro-ecology organizations in the state and in the NY6 network, as well as identifying specific ways the art groups can collaborate and support. By the end of the summer, we will have new ecological art-making processes to introduce to the classroom, new pamphlets, new images, new partners, new networks, new ideas for artistic intervention, new classroom techniques, and a garden studio.

Responsibilities of the Research Fellow:

- Develop annotated list of eco-artists in New York state
- Develop annotated list of permaculture networks, agro-ecologists, food forests in Fingerlakes area and in New York state more broadly
- Outreach to existing eco-artists, enthusiasts and local groups connected to agro-ecology through email and print materials
- Retain notes and documentation of trip to Cornell Botanical Gardens
- Help to develop work flows and keep field notes as we pioneer an eco-arts garden at the Shupf Studios in Hamilton, NY
- Help research new ecological art making processes for the classroom, such as making moss paint, growing dye and paint plants, articulating eco-art aesthetics in the classroom

Desired Qualifications:

- Design skills
- Familiarity with Adobe Illustrator and Adobe Photoshop
- Interest in permaculture and gardening
- Fast learner
- Familiarity with annotated bibliographies
- Good at didactics and communication, swift reply times
- Google docs and note taking

Proposed Fellowship Dates: May 16-July 11, 2018 or flexible

PROJECT 4

The Sex-Biased Eyes: Sexual Dimorphism in Corneal Gene Expression

Faculty Mentor: Mahita Kadmiel

Academic Department: Biology

Institution: Colgate University

Project Description: An estimated 253 million people worldwide are visually impaired (1). Over 20 million Americans experience vision loss (2). Sex-differences in the incidence of human ocular diseases have been reported. Women are at a greater risk of developing ocular diseases than men. Statistics from 2015 show that in the state of New York alone, almost 220,000 women were visually impaired while only 173,000 men were experiencing vision impairment (2). Dry eye disease, retinal degeneration and glaucoma are some examples of eye diseases that are more prevalent in women than in men. However, molecular mechanisms underlying this predisposition are still unknown. Sex as a contributor of differences in susceptibility and pathology of a disease was largely ignored in biomedical research until recently when the National Institutes of Health (NIH) issued a mandate in 2014 for including sex as a biological variable in NIH-supported research grants.

Our recent studies (3) suggest that the apparent sex-bias in the manifestation of ocular pathology has an underlying genetic basis where eyes from male and female organisms differed at their gene level. We performed RNA-sequencing of the entire genome of mouse corneas (transparent outer most layer of the eye required for normal vision) from male and female mice to determine the contribution of sex hormones on corneal gene expression. Male and female corneas differed from each other in gene expression by 1390 genes, indicating a basal sexual dimorphism in normal adult corneas.

Systematic bioinformatic analysis of these 1390 genes would identify signaling pathways employed uniquely by each sex to maintain normal vision. To further determine the contribution of sex hormones on corneal gene expression, we sequenced the genome of mouse corneas collected from mice lacking either their ovarian hormones (by ovariectomy) or their androgens (by castration). Strikingly, the results demonstrate that the presence of sex hormones is essential for normal gene expression in the eye.

The proposed project is to analyze the RNA-sequencing datasets to identify i) Ocular signaling pathways differentially regulated by sex, ii) Genes whose expression is either dependent on or independent of sex hormones, iii) Correlate the results from i) & ii) with primary literature to discover novel sexually dimorphic genes previously associated with eye diseases. The knowledge obtained from these studies may have implications in personalized medicine, where specific therapeutic strategies could be developed for treating ocular disorders in men and women.

References:

1. World Health Organization (<http://www.who.int/mediacentre/factsheets/fs282/en/>)
2. American Foundation for the Blind (<http://www.afb.org/info/about-us/our-impact/12>).
3. Kadmiel M and Cidlowski JA; unpublished results generated at NIH/NIEHS.

Responsibilities of the Research Fellow:

General responsibilities:

- Develop a set of objectives for the project at the beginning of the fellowship with the Faculty mentor.
- In addition to working closely with the mentor on a daily basis, designated weekly communication with the mentor to discuss the progress or to troubleshoot the project.
- Maintain a Lab Notebook with the details of bioinformatics analysis (strategy used, results obtained, and next step).
- Present your research to the mentor & colleagues in a PowerPoint format.
- Present your research in poster format at the end of the summer in the research symposium organized by Colgate University.

Project-specific responsibilities:

- Learn from the mentor how to use the bioinformatics software programs (Ingenuity Pathway Analysis and Gene Ontology) to analyze the RNA sequencing data.
- With help from the mentor and through reading scientific literature, understand basic eye anatomy, and learn about common eye diseases.
- Identify signaling pathways in the cornea that are:
 - unique to males and females
 - common to both sexes
 - dependent on sex hormones
 - independent of sex hormones
- Make figures with results obtained

Desired Qualifications:

- A rising Junior or Senior student with major/minor in biological sciences.
- Enthusiasm to understand the genetic and cellular basis of human disease.
- Interest in Big Data (large datasets) analysis using bioinformatics software programs.

Proposed Fellowship Dates:

July 9th, 2018-August 17th, 2018 (6 weeks- preferred duration). The project could be extended to 8 weeks by starting a week early and ending on August 24th, 2018.