Susquehanna Valley Undergraduate Research Symposium

July 27

2016

Undergraduates in the region from all disciplines present their research at this annual poster symposium. Presentations will be evaluated in the areas of Biological Science, Clinical & Translational Research, Natural Science & Engineering, and Social Science & Humanities.

6TH ANNUAL SUSQUEHANNA VALLEY UNDERGRADUATE RESEARCH SYMPOSIUM

July 27, 2016

Kehr Union
Bloomsburg University
Bloomsburg, PA

Undergraduates from all disciplines present their research at this annual symposium. Presentations are be evaluated on four categories:

- Biological Science
- Clinical & Translational Research
- Natural Science & Engineering
- Social Science & Humanities

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BLOOMSBURG UNIVERSITY
BUCKNELL INSTITUTE FOR PUBLIC POLICY
GEISINGER HEALTH SYSTEM
AND
SUSQUEHANNA UNIVERSITY

WELCOME

Welcome to the sixth annual Susquehanna Undergraduate Research Symposium. This symposium is sponsored jointly by Bloomsburg University, Bucknell Institute for Public Policy, Geisinger Health System, and Susquehanna University. It is a valuable opportunity for students in central Pennsylvania to showcase their research activities, to learn about other methods and disciplines and to gain the experience of presenting at a professional conference.

The number of submissions has grown from 20 posters in the first year of the symposium to 97 submissions this year. Each year, we have been impressed with the quality of work. We congratulate the participants and their professional/faculty mentors on their presentations.

For the fourth year we have selected projects for oral presentation and will be giving awards for outstanding poster presentations in each of the four subject areas.

Special thanks to Jackqueline Sadock, John Hranitz, and Tim Pelton for assistance in organization and logistics.

We would appreciate any feedback you have to give us about the symposium this year and will incorporate your suggestions in planning for next year's event. Please send it to any of the following 2016 conference organizers (below).

Thank you for participating in this year's symposium!

The Organizers:

Heather Feldhaus, PhD, hfeldhau@bloomu.edu
   Bloomsburg University
Toshiro Kubota, PhD, kubota@susqu.edu
   Susquehanna University
Sharon Larson, PhD, slarson@geisinger.edu
   Geisinger Health System
Janet Robishaw, PhD, jrobishaw@geisinger.edu
   Weis Center for Research, Geisinger Health System
Amy Wolaver, PhD, awolaver@bucknell.edu
   Bucknell Institute for Public Policy

Keynote Speaker:

Jennifer K. Wagner, J.D., Ph.D. is the Associate Director of Bioethics Research for Geisinger Health System. She earned her Juris Doctorate at the University of North Carolina in 2007 and her Doctorate of Philosophy in Anthropology at the Pennsylvania State University in 2010 before completing post-doctoral research appointments at Duke University's Institute for Genome Sciences & Policy and the University of Pennsylvania's Center for the Integration of Genetic Healthcare Technologies. She earned a prestigious K99/R00 NIH "Pathway to Independence Award" from the National Human Genome Research Institute for her "Multidisciplinary Study of Race, Appearance, Ancestry, Discrimination & Prejudice." Prior to joining Geisinger, Dr. Wagner served in a U.S. Senator's office in Washington, DC as a 2014-2015 AAAS Science & Technology Policy Congressional Fellow, where she managed the judiciary portfolio and assisted with privacy, health, consumer protection, and environmental policy. In addition to her bioethics research, Dr. Wagner is a licensed, practicing attorney. She is a contributing editor to the Genomics Law Report, an academic editor for PeerJ, co-chair of the Ethics Committee for the American Association of Physical Anthropologists, and member of the Ethics Committee for the American Association of Anthropological Genetics. She is a member of several professional organizations, including the American Association for the Advancement of Science, the American Society of Human Genetics, the American Association of Physical Anthropologists, the American Association of Anthropological Genetics, the American Bar Association, the Pennsylvania Bar Association, and the Centre County Bar Association. Dr. Wagner is on Twitter @DNAlawyer.

Support for Undergraduate Research

Bloomsburg University

Bloomsburg University has a long tradition of active learning through research, scholarship, and creative activities by our undergraduate students. Early students achieved these goals through course-embedded projects and capstone experiences. More recently, we developed a university-wide program to further integrate longstanding and new areas of undergraduate research, scholarship, and creative activities into a vibrant scholarly community. Across all disciplines, we support faculty as Teacher-Scholars to mentor our undergraduate students by providing a wide range of on-campus seed grants, support for external funding, and professional development opportunities. New centers for research, such as the Center for Community Research and Consulting, the McDowell Institute, and the Center for Undergraduate Research directly support research, scholarship, and creative works by our students and faculty. The Undergraduate Research, Scholarship, and Creative Activities (URSCA) Program, held in the summer, supports students with financial support to conduct a project with a faculty mentor. Students receive basic undergraduate research training and engage in the scholarly community during the program. The Susquehanna Valley Undergraduate Research Symposium is an important culminating event for these students, giving them valuable experience presenting research at an interdisciplinary event involving multiple institutions. Our undergraduate research initiative would be ineffective without the broad and enthusiastic support of BU faculty, both as mentors and as members of the URSCA Advisory Group, and our administrators' innovative approaches to engaging students in the scholarly community. In Academic Affairs, Provost (Dr. Ira Blake), Associate Vice President of Research (Dr. Robert Gates), and President (Dr. David Soltz) provide remarkable administrative support for undergraduate research, scholarship, and creative activities. The College of Liberal Arts and the Bloomsburg University Center for Community Research and Consulting provided substantial staff and financial support to facilitate the event.

Bucknell Institute for Public Policy

The Bucknell Institute for Public Policy aims to educate the global citizen in three ways-general education of the student and community, curricular support through a minor in Public Policy, and fostering qualitative and quantitative research skills in the social sciences in and out of the classroom. We aim to enhance undergraduate research opportunities in the social sciences through supporting student development and encouraging more faculty members to mentor undergraduates in their own scholarship. The Institute, formally constituted in 2012, sponsors a competitive summer research program which provides students with summer stipends to work as research assistants for faculty on policy-related projects, provides additional faculty research grants which include support for students. With the Bucknell Environmental Center, we developed an Emerging Scholars program, now in its second year, which provides seed money for student-directed projects which are at an early stage of development. We organize weekly professional skills development workshops for students participating in the Institute sponsored research projects and are open to all students working on policy-relevant research, regardless of their funding source. In co-sponsoring the Susquehanna Valley Undergraduate Research Symposium, we are happy to celebrate undergraduate research accomplishments in all disciplines.

Geisinger Health System

Geisinger Health System is an integrated health services organization widely recognized for its innovative use of the electronic health record and the development of innovative care delivery models such as ProvenHealth Navigator® and ProvenCare®. As one of the nation's largest health service organizations, Geisinger serves more than 3 million residents throughout 45 counties in central, south-central and northeast Pennsylvania, and also in southern New Jersey with the addition of AtlantiCare, a National Malcolm Baldrige Award recipient. The physician-led system is comprised of approximately 30,000 employees, including nearly 1,600 employed physicians, 12 hospital campuses, two research centers and a 510,000-member health plan, all of which leverage an estimated $8.9 billion positive impact on the Pennsylvania economy. Geisinger has repeatedly garnered national accolades for integration, quality and service. In addition to fulfilling its patient care mission, Geisinger has a long-standing commitment to medical education, research and community service. For more information, visit www.geisinger.org, or follow the latest Geisinger news and more on Twitter and Facebook.

Susquehanna University

Susquehanna University makes collaborative research between undergraduate students and faculty members a priority. In fact, the university has been recognized as a leader in the field by the National Conference for Undergraduate Research (NCUR). About 90 percent of our students get professional experience before they graduate, either in the form of undergraduate research, an internship or student teaching. Students can choose from a variety of research opportunities in a number of disciplines. The Research Partners Program, begun in 1996, is one such option. Since its beginnings, Research Partners has enabled students to work with faculty on a full-time basis during the summer. In addition, thanks to a $2.25 million grant from the Richard King Mellon Foundation, students work alongside faculty to support the university's Freshwater Research Initiative, which seeks to further understand the ecological issues impacting the Susquehanna River and its tributaries. Additional grants from such sources as the National Science Foundation and the National Institutes of Health provide continued funding for faculty-student research in various disciplines. In addition to encouraging independent research and experience through internships, the university supports numerous opportunities for students to present their findings at national conferences.

Acknowledgments

Program Schedule

Registration and Poster Set Up – 8:00-9:00

Welcome Remarks - 9:15 to 9:30 a.m.

Keynote Address –9:30-10:15 – "DNAlawyer: Define Your Own Career" Jennifer K. Wagner, J.D., Ph.D. is the Associate Director of Bioethics Research for Geisinger Health System

First Poster Session - 10:30 to 11:45 a.m.

Lunch – 12-1:00

Second Poster Session - 1:15 to 2:30 p.m.

Oral Presentations

- 2:40-2:55 - Dissecting an Interaction Between the Peroxisome Proliferator-Activated Receptors (PPARs) and the Glucocorticoid Receptor (GR) in Human Malignant Melanoma by Mark R. Drumm, Ashley L. Wagner, Ellen M. Kehres, and Michael G. Borland.

- 3:00-3:15 - Expression and Analysis of Human GPRC6A Variants by Abigail Garrett, Ridge Dershem, Raghu Metpally, Hans Brauner-Osborne, Janet Robishaw, Gerda E. Breitwieser

- 3:20-3:35 - The Comfort Quandary: Do people really trust algorithms that preserve their privacy online? by Brooke Bullek and Stephanie Garboski

- 3:40-3:55 - A Geovisualization: 10,000 Years of Global Maize by Elizabeth Wilkey and Patrick Newhart

Presentation of awards and short closing remarks

Author: Walid Abourouaine

Mentors: Meg Martin and Aicha Hassane

Institution: Bucknell University

Category: Social Science & Humanties

Title: Foreign Aid and Education in Sub-Saharan Africa

Abstract:

The aim of this study is to understand the relationship between foreign aid for education and educational outcomes. More specifically, I explore the relationship between direct bilateral foreign aid for education and primary school enrollment in sub-Saharan Africa. Educational outcomes are positively correlated with high income for most countries. Most of the developed world has literacy rates of 99% and close to 100 percent of students complete a primary school curriculum. On the other hand, sub-Saharan African countries have both extremely low literacy rates (22%) and low income per capita ($762). The low income for sub-Saharan African countries restricts their ability to fund public services, especially education and health. The international community donates large sums of foreign aid each year to support countries in providing these much needed services. The United States, France, and the United Kingdom are the largest donors to sub-Saharan Africa. Looking closely as aid flows from these top donors, I analyze the relationship between these aid flows and primary school enrollment. I use two main data sources for my analysis: aid flow data from the Organization for Economic Cooperation and Development (OECD) database, which contains extensive information of aid donation patters and education outcomes data from the World Bank database. The first part of my analysis consists in descriptive analysis of the data to understand aid flow patterns over the years as both raw numbers and as a percentage of GDP. The second part of my analysis consists in using regression analysis to measure the contribution of foreign aid to increases in primary school enrollment in sub-Saharan Africa / Initial evidence confirms previous findings that former colonies received relatively more aid from their former colonial power. While the United states donate more aid to African countries as percentage of GDP, they donate less to education. In the last 20 years, 3% of Foreign Aid from the United States to Africa was donated to education while France and The United Kingdom donates respectively 13% and 8%.

Author: Nicole Adams

Mentor: Janice Mann

Institution: Bucknell University

Category: Social Science & Humanties

Title: A New Method of Thought for an Old House

Abstract:

The Packwood House Museum, located in Lewisburg, Pennsylvania, was founded by Edith Fetherston in 1972. She lived as an artist, horticulturist, student, educator, and collector, but within the limitations of a patriarchal art world that restricted her activities to genteel female pastimes such as gardening, painting, and collecting minor arts and clothing. She added to the arts in Lewisburg before her death, but it was only after that she made a greater contribution by founding the museum and donating to the Smithsonian. Fetherston's Packwood House is a part of a larger paradigm: wealthy women curating homes to create something both educational and pleasurable for the public, while ensuring their names are connected to enlightenment, intellect, and a sense of a cosmopolitan lifestyle. This work is pertinent because across the country visitation numbers to museums like Packwood House are down due to the lack of new material for the public. My research proposes a solution to this problem with a new approach to researching the history of local house museums. My research will result in an online exhibition for the Packwood House Museum that honors the enduring vision of female collectors in small towns by placing the objects collected by Fetherston within their cultural, historical, artistic, and feminist contexts. My online tour will present evidence about each of these themes through selected objects in the Packwood House collection and relevant quotes from Edith Fetherston's writings. I hope my work will explain the preconditions for traditionally feminized hobbies, but given the limited time, I discuss gardening as an example of how these components can be elaborated upon to bring new information to these institutions. A larger connection between house museums and gardening will be revealed by exploring the feminist context of women and nature. By studying Packwood's adjoining garden, I have found that women were predisposed to an interest in gardening because of 19th-century female education and migration patterns. Creating more complex narratives for house museums is the answer to increasing relevance as it will engage visitors in a fresh way and reveal new information.

Author: Jayleen Alvarado

Mentors: Michael Martin

Institution: Bloomsburg University

Category: Social Sciences & Humanities

Title: The Millennial Agenda

Abstract:

The Millennial Agenda Between the years 1982-2004 a generation was born that would the topic of many political conversations in years to follow. The Millennial generation, would be the largest demographic eligible to vote in the 2014 Midterm election here in America, and yet the least likely to show up to the polls. Two years later in 2016 the world would watch as across the sea, America's long lasting ally Great Britain would vote to end ties with a 40 year relationship that banded them and the rest of Europe through economic and diplomatic relations. A comment made by political journalist Nicholas Barrette explains exactly what comes as a result of choosing to not engage in this democratic process, "The younger generation has lost the right to live and work in 27 other countries. We will never know the full extent of the lost opportunities, friendships, marriages and experiences we will be denied. Freedom of movement was taken away by our parents, uncles, and grandparents in a parting blow to a generation that was already drowning in the debts of our predecessors." The youngest generation has almost always been the least likely to engage in the act of voting, and yet some may argue are the most passionate about political grievances. This research study focuses on identifying those variables that account for the act of voting, and what motivates the younger generation in the mixed of a somewhat controversial presidential election. Once assessed, these variables will be shared with the public through a web portal that specifically addresses Millennials and their political agendas. The website will also cover literature on current issues around the globe, the response of the younger generation, and instructions on the voting process for upcoming national elections. In creating this access for the public to learn more about the importance of being politically engaged and instructions on how to do so- the goal of this research is to analyze the variables that account for the act of not being politically engaged, and combating them head on for a brighter future for Millennials through the democratic process.

Author: Brandon Arnsberger

Mentor: Dr. Kevin Ball

Institution: Bloomsburg University

Category: Biological Sciences

Title: Role of Medial Prefrontal Cortex Dopamine D1-Like Receptors in Chronic Restraint Stress-Induced Increases in Palatable Food Craving

Abstract:

Evidence from the clinical literature suggests that relapse to unhealthy eating habits in dieters is often triggered by acute exposure to stress, palatable food, or food-associated cues (Grilo et al., 1989; Gorin et al., 2004; Torres and Nowson, 2007). Using an animal model of relapse, Ball et al. (In Press) reported recently that chronic exposure to the pharmacological stressor yohimbine following extinction of food seeking potentiated later reinstatement of food seeking induced by acute yohimbine. Furthermore, SCH-23390, a dopamine D1-like receptor antagonist, combined with repeated yohimbine injections reversed the effect of yohimbine on later reinstatement. To extend these findings, I will test the effect of chronic restraint stress on responding for food-associated cues during abstinence, as well as determine the role of medial prefrontal cortex (mPFC) dopamine D1-like receptors in any stress-related effects on food seeking. All testing will be conducted between 7:00 AM and 7:00 PM and occur in standard modular operant conditioning chambers that are housed in sound-attenuating, ventilated cubicles. Each chamber is equipped with an active and an inactive response lever. Responses on the inactive lever are recorded, but have no programmed consequences. The Sprague-Dawley rats will be separated into 4 groups: saline + unstressed, saline + stressed, SCH-23390 + unstressed, or SCH-23390 + stressed. To assess the effects of stress on incubation of craving, that is, an increase in motivation to seek food over time (Grimm et al., 2011), total number of responses during food seeking Test 1 will be compared to total number of responses during the first 30 min of food seeking Test 2 using mixed ANOVAs.

Authors: Kelly N. Barko, Ashley L. Wagner, Ellen M. Kehres, and Michael G. Borland

Mentor: Michael Borland

Institution: Bloomsburg University

Category: Biological Sciences

Title: Examination of DNA Methylation as PPAR-dependent Transcriptional Regulator Mechanism in Human Keratinocytes

Abstract:

The peroxisome proliferator-activated receptors (PPARs) are ligand activated transcription factors and member of the nuclear hormone receptor (NHR) superfamily. To date, most studies of the PPARs have examined the ligand-dependent functions of these receptors in regulating gene expression toward physiological responses. Two particular PPAR isoforms, PPARβ/δ and PPARγ, have known functions in keratinocyte biology that regulate skin homeostasis and carcinogenesis. In addition to ligand-dependent transcriptional regulation, emerging evidence suggests that NHRs may modulate gene expression through the epigenetic mechanism of cytosine methylation to generate silencing cytosine-phosphate-guanine (CpG) islands. The present study sought to examine whether PPARβ/δ and PPARγ may serve as epigenetic regulators of CpG island formation. The techniques used in these studies included 1. Computational analysis of PPAR target gene promoters to identify putative CpG islands, 2. Gene expression analysis of known PPAR target genes, and 3. Bisulfite sequencing of PPAR target gene promoters. To study these events in greater detail, a previously generated stable transgenic cell line model of PPAR over-expression in human HaCaT immortalized keratinocytes was utilized. Computational analysis of the -1000 to +1000 promoter region of three putative PPAR target gene revealed vary sizes, if any, of predicted CpG islands. Gene expression studies revealed changes in expression when PPARβ/δ and PPARγ was over-expressed; these observations were specific for some PPAR

Author: Sarah Bartra, William L. Coleman, and Jennifer J. Venditti

Mentors: William L. Coleman, and Jennifer J. Venditti

Institution: Bloomsburg University

Category: Biological Sciences

Title: Investigating the Role of Synapsin I During Human Sperm Capacitation and Acrosome Reaction

Abstract:

Capacitation and acrosome reaction are necessary for sperm to acquire the ability to fertilize an oocyte. Vesiculation of the sperm membrane and release of the acrosomal contents resembles the release of signaling molecules as a means of cell-cell communication. Proteins such as Rab3a and Munc13 have been well characterized in neurons, but also have functions in other types of secretory cells including human sperm. Synapsin proteins are an abundant family of phosphoproteins thought to regulate availability of synaptic vesicles for exocytosis by maintaining a reserve pool of vesicles. Recent findings from our lab have localized synapsin I to the human sperm equatorial segment. The purpose of this study was to investigate the role of synapsin I during capacitation and acrosome reaction. Sperm were capacitated or induced to undergo acrosome reaction in the presence and absence of anti-synapsin antibodies. Following treatment, sperm were stained with a fluorescent lectin to monitor acrosome membrane status. In certain cases, treatment with anti-synapsin antibodies during capacitation and acrosome reaction induction significantly altered the ability of sperm cells to transition to different functional states. Uncovering the role of synapsin I in human sperm will enhance our understanding of human fertilization.

Author: Stanley Beck

Mentors: Sharon Larson and Heather Feldhaus

Institution: Bloomsburg University and Geisinger Health System

Category: Social Sciences & Humanities

Title: Correlation Between Childhood Sexual Abuse (CSA) and Risk Behavior Among Adolescents

Abstract:

This project reviews the literature on the correlation between childhood sexual abuse (CSA) and risk behavior among adolescents. The project discusses the negative impacts of CSA on victim's lives, and highlights the needs for education, prevention, treatment, and intervention programs that will mitigate the effect of CSA. The literature examines adolescent victims of CSA and this being a predictor of increased risk behavior, specifically, early-onset sexual activity, suicidal ideations, and substance abuse, to include alcohol, tobacco, marijuana, and hard drug abuse/dependence. All of these risk behaviors carry negative consequences such as teenage pregnancy, early age first arrest, addiction, and death. Adolescents that come from families with lower socioeconomic statuses (SES) are more likely to exhibit risk behavior when they are a victim of CSA. This is usually due to poor social support structures that could be provided by the family. The familial unit is an intrinsic part of CSA, in its prevention, treatment, and is 30% of the time the cause. Programs that educate and target prevention are very important but, intervention and support programs are vital in stopping CSA becoming cyclic victimization due to substance abuse and or incarceration. Not only will programs like these prevent repeat victimization, but will also break the cycle of generational CSA, taking into account that 40-80% of juvenile sex offenders have themselves been victims of sexual abuse. Generational victimization can also occur in the long term when female CSA victims exhibit early-onset sexual activity that results in pregnancy, and thus creating single parent family units with low SES. The correlation between CSA and risk behavior is minimally effected by race and gender. The results from this project will also be reported to the Greater Susquehanna United Way to guide program creation, implementation, and funding in the local communities.

Author: Patrick T. Berridge

Mentors: Carolyn LaMacchia and William Egan

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: Investigating the Adoption of Public Cloud Computing Services

Abstract:

Cloud computing utilizes the Internet to provide businesses with high levels of computing power without the need to establish their own datacenter. Although public cloud computing is a low-cost, flexible and reliable alternative for organizations, businesses are reluctant to implement this technology. This exploratory research investigates issues which contribute to the slow adoption of public cloud technology platforms and compares three leading public cloud providers in the market. The three cloud service providers selected for this study are Amazon Web Services, Microsoft Azure, and Google Cloud Platform. Methods for data collection include a literature review, vendor documentation review, and interviews with cloud computing professionals. Analyzing the data in context of the literature confirms that the demand for public cloud services is steadily rising as firms begin to see the benefits of adoption. The data collected strongly suggest that public clouds can provide secure and agile technology at a lower cost. The research highlighted two significant barriers to cloud adoption: business leaders' lack of knowledge and experience with public cloud computing technologies; common misconceptions about security in the cloud. This research recommends that organizations should examine their current IT infrastructure to determine what areas would benefit from cloud adoption. In addition, this research suggests evaluation criterion to support the technology platform decision so that the public cloud provider selected meets the needs of the organization. Furthermore, this research suggests evaluation criterion to support the technology platform decision so that the public cloud provider selected meets the needs of the organization.

Author: Bethany Blass, Raakel Vuojolainen, Marisa Patti, and Vanessa Troiani

Mentors: Vanessa Troiani

Institution: Bucknell University

Category: Clinical and Translational

Title: Orbitofrontal Cortex Sulcogyral Patterns as a Psychiatric Risk Marker: Evidence From a Cross-Diagnostic Sample

Abstract:

Background: There is a complexity of folding that results in specific patterns within the sulci and gyri of the brain. The orientation of sulci in the orbitofrontal cortex (OFC) can be categorized into three patterns, differentiated by the continuity of the most medial and lateral sulci. The most common pattern (Type I) is found more frequently in the typical population, whereas atypical patterns (Type II and Type III) have been found to confer risk for schizophrenia. To our knowledge, no study has compared OFC sulcogyral patterns across several psychiatric diagnoses. Aims/Objective: Here we assess whether atypical patterns are schizophrenia-specific or if they are also associated with other brain disorders, including schizophrenia (SZ), bipolar disorder (BP), and attention deficit/hyperactivity disorder (ADHD). Hypothesis: Given the similarities in genetic and behavioral symptomology between SZ and BP, we predict that both SZ and BP patient groups will have higher frequencies of atypical sulcal patterns (more Type II and Type III patterns), relative to ADHD and controls. Methods: Magnetic Resonance Images (MRI) of the brain were obtained in three patient groups and controls (Total n = 200; SZ, n=57; BP, n=46; ADHD, n=41; Controls, n=56). Three independent tracers, blinded to diagnosis, traced and classified each subject's sulcogyral pattern bilaterally. Chi-squared tests determined whether the frequency of sulcal pattern distributions differed between diagnostic groups. Results: SZ, BP, and ADHD groups showed increased frequencies of atypical patterns bilaterally. Hemisphere-specific analyses showed that these atypical patterns manifest in the left hemisphere in SZ and BP and the right hemisphere in ADHD. Conclusions: Although atypical sulcogyral patterns in the OFC were previously associated with SZ, we demonstrate that atypical patterns exist in other brain disorders, including BP and ADHD. This finding serves as evidence for the developmental brain disorder (DBD) framework, which recognizes the genetic and phenotypic overlap across many neurodevelopmental and neuropsychiatric disorders. Unique hemisphere-specific frequency distributions for SZ/BP vs. ADHD may be due to the overlap of quantitative traits between SZ and BP groups relative to ADHD. OFC sulcogyral anatomy thus may be used to differentiate disorders that share common features, ultimately leading to a more personalized approach to medical diagnosis and treatment.

Authors: W. Bordash and A.Wolaver

Mentors: Amy Wolaver

Institution: Bucknell University

Category: Social Sciences & Humanities

Title: The Impact of Mean Income On Drug-Related Hospitalizations in Pennsylvania

Abstract:

It is well documented that there is a strong relationship between income level and population health. Despite the growing number of studies looking at the relationship with income, very few look at how mental disabilities, specifically drug dependency and rehab, are impacted by income and how it affects population hospitalization rates for these indicators. This project utilized hospitalization and census data starting in 2000 and aims to find out what the relationship is between income and these outcomes and how it has changed since the start of the millennium. Age and gender-adjusted rates of drug dependency, complications during pregnancy, and birth defects are calculated for Pennsylvania counties from 2000 and 2009-2014 using inpatient hospitalization data collected by the Pennsylvania Health Care Cost Containment Council. The rates were then mapped with ArcGIS and compared to maps of median income levels for each county. The hypothesis tested with these maps is whether the counties with lower income levels will have higher rates of drug dependency. The study hopes to find that by verifying this hypothesis, there is a positive relationship between income and the increasing health of the population.

Author: Haley Brown

Mentor: Claire Sammells

Institution: Bucknell University

Category: Social Science & Humanities

Title: Tourists, Travelers, or Ambassadors?: How Participants in Antarctic Cruises Understand the Impacts of Their Travel

Abstract:

Since the 1960s, Antarctic tourism has grown in popularity, peaking the interests of travelers interested in seeing rare natural wonders through adventure or eco travel. To mitigate environmental impact, Antarctica is regulated by a treaty system that restricts the number of tourists allowed to the continent each year. In addition, IAATO, travel companies, and Antarctic organizations state their desire to create "Antarctic Ambassadors" of tourists with hope that they will spread information about the endangered continent to their peers, as well as get involved in conservationist efforts. However there has been little qualitative research done concerning the perceptions of Antarctic tourists with relation how their trip affected them. The present research is based on an internet survey distributed to tourists on Antarctic cruises during the 2015-2016 season, with follow-up interviews conducted by phone with a selection of these participants. From this data, I am able to draw conclusions about how these tourists conceptualize the "white continent" and how the trip has changed them. Most considered it a life-altering experience that reaffirmed their belief in climate change. While many shared their experiences with friends, students, and peers, none became involved in any Antarctic-focused organizations or political groups, but believe such trips are valuable to conservationist efforts. Simultaneously however, tourists are uncomfortably aware of the tensions of traveling to such an environmentally sensitive place, regardless of the measures taken to minimize human impact. The majority believe that the controls currently in place to limit the potentially negative results of travel are sufficient, although a few felt that cruise companies should provide more information concerning the quantifiable impact of their cruises and how to get involved afterwards. In conclusion, while the goal of IAATO and the tourism industry is to create "ambassadors" out of Antarctic tourists, many have never heard of the concept, do not consider themselves such, or don't know what such a role would entail. The conservationist narrative touted by the Antarctic travel industry has the potential to further involve tourists, but the treaty system and tour companies themselves have yet to provide structure such a community might need.

Authors: Brooke Bullek and Stephanie Garboski

Mentors: Darakhshan Mir and Evan Peck

Institution: Bucknell University

Category: Natural Sciences and Engineering

Title: The Comfort Quandary: Do People Really Trust Algorithms That Preserve Their Privacy Online?

Abstract:

As our lives become increasingly characterized as data-rich, we find ourselves frequently relinquishing personal information in exchange for services. An investigation of the cognitive and behavioral factors behind privacy-related decisions, particularly in online environments where anonymity is taken for granted, is needed. While privacy techniques exist to safeguard users' data from malicious third parties, these techniques are often technical and nebulous to the average user. How can interfaces more adequately communicate intuition of privacy guarantees? Using Amazon's Mechanical Turk, we launched a large scale online study where participants were asked to answer sensitive questions for a "sensitive question database." They were instructed to use an anonymizing technique known as Randomized Response to protect their privacy and their real answers from being uncovered. Randomized Response uses a device (in our case, a virtual spinner) intended to randomly force users to answer "yes, "no," or truthfully. The study was intended to convey transparence of the underlying privacy protocol and provide an easily understandable alternative to obscure "privacy guarantees." Additionally, the link between trust and human-computer interaction was examined using two experimental conditions: one in which the randomizing device (i.e. spinner) was fluidly animated, and another in which the spinner instantaneously "jumped" to a segment with no animation. After engaging with three spinners, participants were instructed to select one in order to answer the final sensitive question of the survey, which was introduced as "highly sensitive." We hypothesized participants would be most likely to select the spinner with the smallest chance of a forced truthful response. Furthermore, participants would place more trust in the animated spinner, and therefore more readily admit to having engaged in sensitive behaviors. Another facet of our study was the impact of perceived security in the website used to collect data. If participants trust that the website is secure, they are more likely to answer truthfully, despite negative social connotations associated with a perceived "yes" response. The results of the study, along with analysis and discussion, will be presented at the conference.

Authors: Stephanie Byers and Shiloh Erdley-Kass (DSW)

Mentor: Shiloh Erdley-Kass

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: Perceptions of Students on the Value of Leadership in Social Work

Abstract:

Leadership is an inescapable concept and practice for all individuals, in all lines of work, and at all levels of management. Leadership practices and behaviors are influential to effectiveness, cohesion, and satisfaction in any group, organization, or community. In the field of social work, specifically, research suggests that leadership styles and organizational structure of social service agencies may contribute to program effectiveness and staff turnover (Hardina, 2005; Mary, 2005). However, many social service agencies experience poor management that may lead to job dissatisfaction and/or burnout (Maslach, 2001). By examining the base level of the education received by employees of these agencies, we hope to uncover what bachelor level social work students believe and practice in terms of leadership. This research aims to better understand student leadership perceptions and behaviors that will aid in developing best practices in social work education and may have additional benefits related to sustainability in the field, job performance, and client outcomes. Surveys have been distributed via e-mail to students in the Bloomsburg Social Work Program, as well as various other programs in Pennsylvania. These surveys include Likert-type scales and qualitative responses concerning leadership perceptions, as well as demographic information. Individuals who indicate interest through the survey may participate in focus groups being conducted at Bloomsburg University in September. Results and conclusions drawn from this study will not only be beneficial to social work education, but will contribute to an increased awareness of the impact and importance of leadership.

Author: Ryan Cadigan

Mentor: Deepak Iyer

Institution: Bucknell University

Category: Natural Sciences and Engineering

Title: Effective Theory for Domain Wall Melting

Abstract:

A variety of recent studies have shed light on the far from equilibrium behavior of quantum systems. Research suggests that this field of study may produce unfamiliar dynamical realizations of quantum states. It has been shown that in some cases a time evolving quantum state is equivalent to the ground state of an "effective" Hamiltonian where the time enters as a parameter. Here, we study the dynamical behavior of noninteracting fermions in a one-dimensional lattice starting from a "domain wall" initial state. As the system equilibrates, we look at the distribution of particles as well as correlations between particles in the system. We then compare the actual time evolving state of the system to the ground state of the effective Hamiltonian to study how long this description is valid, and when and where it breaks down using the trace distance between the full density matrices of the two systems. We generally expect that the description is valid in a given region as long as the boundary effects do not propagate into the region.

Author: Daniel P. Callen, Ellen M. Kehres, and Michael G. Borland

Mentors: Michael Borland

Institution: Bloomsburg University

Category: Biological Sciences

Title: Examination of Two Retinoids as PPAR Activators and Modulators of Melanoma Proliferation

Abstract:

The peroxisome proliferator-activated receptors (PPARs) are ligand activated transcription factors and members of the nuclear hormone receptor superfamily. Both PPARβ/δ and PPARγ have known functions in skin epidermal homeostasis, yet there is conflicting evidence for the role of these receptors in non-melanoma and melanoma cancers. While multiple independent laboratories have shown that ligand activation of PPARβ/δ reduces cell proliferation and skin tumorigenesis, it has been reported that the retinoic acid receptor (RAR) ligand all-trans retinoic acid (atRA), but not 9-cis retinoic acid (9cRA), can activate the pro-tumorigenic protein-dependent protein kinase (PDPK1)/protein kinase B (AKT) pathway via activation of PPARβ/δ. Because the AKT pathway is important in melanoma progression, the present study thus examined 1. Whether atRA and/or 9cRA can activate PPARβ/δ in human malignant melanoma cells and 2. The effect of atRA and 9cRA on malignant melanoma cell proliferation and clonal expansion. To increase the robustness of these studies, a stable transgenic cell line model of PPAR over-expression in UACC903 human malignant melanoma cells was utilized. Gene expression analyses revealed a dose-response increase in the mRNA for a known retinoid target gene, and this modulation was independent of PPAR over-expression. Furthermore, the mRNA levels for a bona fide PPAR target and PDPK1 were unchanged upon atRA administration. Surprisingly, 9cRA did increase PPAR target gene expression, but not PDPK1, expression. The administration of atRA to melanoma cells resulted in decreased cell proliferation in a PPAR-dependent manner. Finally, atRA, but not 9cRA, reduced clonal expansion surviving fraction only in cells that over-expressed PPARβ/δ and PPARγ. Overall, it does not appear that atRA activates PPARβ/δ or PPARγ in UACC903 human malignant melanoma cells. However, these results do demonstrate that over-expression of PPARβ/δ or PPARγ increases the anti-proliferative actions of atRA in malignant melanoma cells. Thus, further studies are needed to clarify the connectivity and crosstalk between the PPAR and RAR signaling pathways.

Author: Yihe Chen

Mentor: Toshiro Kubota

Institution: Susquehanna University

Category: Natural Sciences & Engineering

Title: Indoor 3D Reconstruction with Google Project Tango

Abstract:

Real-time 3D scanning is an essential tool for fields like interior design, archaeology, and virtual reality. Compared to traditional 2-D images/videos, a generated 3D model provides better representation of surrounding environments for it provides not only images but also depth information. Commercial 3D Scanners are often expensive and bulky, and require a separate apparatus for storage and processing. The Google Project Tango (Tango for short) provides a new possibility. Tango is a device (a tablet) equipped with various sensors to obtain its position, pose, and surrounding information without using GPS or other external signals. It uses Inertial Measurement Unit (IMU) to keep track of its motion in the full six degrees of freedom. It uses active laser to measure the surface orientation and distance of objects in the view. It provides Java APIs (an extension of Android APIs) to allow quick development of apps for the device. Although effective, the device with free walk-through often fails to provide accurate scanning of the surrounding due mainly to accumulation of motion tracking errors. The goal of my project is to design a low-cost high-accuracy portable 3D scanning device with a Tango tablet and a custom platform. The custom platform holds the tablet and rotates it around horizontal (X) and vertical (Y) axes. Two step motors powered by an Arduino is used to provide rotation at 90° increment in the Y-axis and 30° increment in the X-axis. A custom app reads in point clouds, triangulates them into a 3D surface, and generates a concise 3D model, which would provide further possibility to 3D space related works. A brief demonstration of the device will be given at the conference.

Author: Lauren Cram, Jordan Zezza, Judy Grisel, and Sarah Cassella

Mentors: Sarah Cassella

Institution: Susquehanna University

Category: Biological Sciences

Title: Examination of Microglial Morphology in Acute Ethanol Intoxication Mouse Model

Abstract:

Ethanol use has been shown to have varying and adverse effects on the brain. Alterations in structure and functioning of the hippocampal formation and prefrontal cortex have consistently been observed in various ethanol models, to include changes in microglial activity. Microglia are the innate immune cells of the brain, and their aberrant functioning has been implicated in the development of neurodegenerative and psychiatric disorders, such as depression and addiction. Further, evidence suggests that females are more susceptible to some of these disorder than males. As microglia progress from inactive to active states, there are observable morphological changes. In the current study, the morphology of microglia was analyzed in the hippocampal formation and prefrontal cortices of adult, naïve, male and female Swiss Webster mice treated with an acute dose of ethanol (4.0 mg/kg of 20% ethanol). Mice were sacrificed at 8, 24, and 96 hours after treatment. Brains were prepared for immunohistochemical analysis and stained for Iba-1, a microglial marker. Ongoing analysis suggests an increase in soma size of microglia in female mice compared to male mice following ethanol treatment in the regions of interest. Understanding the role of neuroimmune dysfunction in the development of psychiatric disorders may help pave the way to better treatments in the future.

Author: Jacob Daniel

Mentor: Safa Saraçoğlu

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: Using Drupal to build CCROSS, The Center for Collaborative Research in Ottoman Sociolegal Studies

Abstract:

CCROSS, Center for Collaborative Research in Ottoman Sociolegal Studies, is a project to build a platform that will allow scholars and students alike to have a place, to explore and discuss the rhetoric and transformation of the 19th-century Ottoman laws. Ottoman Empire was the largest empire at the time that utilized Islamic law extensively, albeit not exclusively. The legal transformation in that Empire had, and continue to have, long-lasting impacts on the Middle East, Balkans, and the larger Muslim world. The project involves building a website around a database that will store and display important legal codices and books published in the Ottoman Empire. It will allow people to do research on these documents and discuss them with other scholars. Dr. Safa Saraçoğlu and I will be using Drupal, a content management tool, to build this website. We will be using tools supplied by Drupal as well as many custom built utilities. The bulk of research done for this project involves finding the best tools and solutions to solve problems that arise throughout creation of the website. As we continue to build CCROSS we have found that Drupal provides a good platform and many tools that allow us to create and maintain it. However, convenience comes at a cost: Drupal is not the best fit for some of the needs of such a specific project that involves multiple languages. Drupal may not be the best tool to use for this project in the long run. Yet, in the short time we have been building CCROSS, Drupal has been found to be an easy tool with enough support to build a website that allows people to view and discuss important legal documents from 19th century Ottoman Empire.

Author: Nicolas Diaz, Jason Cantley, Seana Walsh, and Chris Martine

Mentor: Christopher Martine

Institution: Bucknell University

Category: Biological Sciences

Title: Using Ecological Niche Models to Inform Delimitation of Cryptic Species in Hawaiian Coprosma foliosa Complex (Rubiaceae)

Abstract:

The taxonomy among Coprosma spp. (Rubiaceae) in the Hawaiian Islands is complex, making it difficult to properly identify taxa in the field or even with herbarium specimens. Of particular confusion are taxa of the Coprosma foliosa Complex, which currently includes four recognized species and many synonymized taxa. As currently recognized, the complex consists of C. menziesii on Hawaiʻi Island, C. stephanocarpa and C. cordicarpa on Maui, and the widespread taxon C. foliosa on Kauaʻi, Lanaʻi, Molokaʻi, and Oʻahu. Taxa of the C. foliosa Complex occur in both native and non-native dominated mesic forests and represent the lowest elevation distribution of the genus in the archipelago. Their form varies from upright trees to lianas >15 meters in length. A recent excursion in March 2016 helped elucidate morphological and geographic differences garnered from morphometric analyses and field observations for two new taxa segregated from the C. foliosa Complex. These analyses are augmented by comparing environmental niche models among species within the Complex. Effectively, these taxa replace C. foliosa on the islands on Molokaʻi and Kauaʻi. The taxon from Molokaʻi is consistently a stout tree to over 10 meters in height, and most conspicuously differs in having two different sized seeds per fruit, earning it a tentative name of C. sp. 'asymmetrisperma'. Asymmetry is also reflected in asymmetrical fruits. The fruit apex is the result of the largest seed bulging farther than the persistent calyx, shifting the calyx slightly off-center. The newly understood Kauaʻi taxon, tentatively named C. sp. 'longipedicellata,' is different from other taxa in the Complex in being a many-stemmed shrubby liana. In addition, flowers and fruits occur on considerably long pedicels/peduncles, leaves are more pubescent, and stipule morphology differs slightly compared to other members of the Complex. Hybrids are thought to occur for both taxa on their respective islands, C. sp. 'asymmetrisperma' with C. pubens on Molokaʻi and C. sp. 'longipedicellata' with C. waimeae on Kauaʻi.

Author: Mark R. Drumm, Ashley L. Wagner, Ellen M. Kehres, and Michael G. Borland

Mentors: Michael G. Borland

Institution: Bloomsburg University

Category: Biological Sciences

Title: Dissecting an Interaction Between the Peroxisome Proliferator-Activated Receptors (PPARs) and the Glucocorticoid Receptor (GR) in Human Malignant Melanoma

Abstract:

Malignant melanoma remains one of several cancers with an extremely low survival rate. It is thus necessary to understand the complex etiology of this cancer and discover new treatment paradigms. Recent evidence has suggested the peroxisome proliferator-activated receptor (PPAR) class of ligand activated transcription factors can reduce cell proliferation and tumorigenesis in non-melanoma and melanoma skin cancers. In particular, over-expression and/or ligand activation of PPARβ/δ or PPARγ has been shown to reduce cell proliferation, clonal expansion, and ectopic xenograft growth in several models. The present study extends these previous studies to examine whether PPAR expression levels and/or ligand activation modulate the anti-proliferative effects of glucocorticoid receptor (GR) activation by dexamethasone in human malignant melanoma cells. To discern ligand-dependent and –independent events, a previously generated stable transgenic cell line model of PPAR over-expression in the UACC903 human malignant melanoma cells was utilized. To first dissect any PPAR ligand-independent interaction with the GR signaling pathway, dexamethasone was administered and the following parameters were assessed: 1. Cell proliferation, 2. Clonal expansion, and 3. Changes in gene expression of a known GR target gene. As anticipated, dexamethasone reduced cell proliferation, and these anti-proliferative effects were more robust and observed at a lower concentration in the cells over-expressing PPARβ/δ. A similar observation was found when examining clonal expansion; over-expression of PPARβ/δ reduced the surviving fraction upon administration of dexamethasone. Surprisingly, dexamethasone had no effect on PPAR-dependent target gene expression and PPAR over-expression had no effect on GR-dependent target gene expression. Thus, the added anti-proliferative effects of PPAR expression upon dexamethasone administration do not appear to be through altered GR transcriptional regulation. Further studies are currently in progress to examine the effect of PPAR modulators (agonists and antagonists) in combination with dexamethasone. In conclusion, these studies provide preliminary evidence of a novel interaction between PPARβ/δ and the GR that may be utilized in future malignant melanoma treatments.

Author: Emily DuBartell

Mentors: Sharon Larson

Institution: Geisinger Health System

Category: Social Science & Humanties

Title: Assessing the Relationship Between Child Sexual Assault and Obesity in Males

Abstract:

Objective: To examine the relationship between child sexual assault and consequential obesity in male adolescents. Background: The relationship between child sexual assault (CSA) and obesity has been well-documented within the literature. Much of the literature supports the notion that obesity is often a result of sexual assault. Among assaulted children, obesity is a likely outcome soon after abuse as a "defense mechanism" against predators. By making themselves physically "unappealing" children hope to avoid the attention of potential predators. However, most of the research on CSA and obesity has focused on female adolescents. Less clear is the relationship between CSA and obesity in the male population. This study explores the relationship of CSA and obesity in males. In contrast to the female population, I predict that there will be no relationship between CSA and obesity in the male adolescents. Methods: Data from the 2015 national Youth Behavior Risk Surveillance Survey (YBRSS) was used in this cross-sectional study design. A test for proportional differences was used to determine whether obese males were more likely to have been sexually assaulted compared to their non-obese counterparts. The chi-square test statistic was used to determine significance at a probability level of $p<0.05$. Results: Findings from the chi-square analysis indicate no relationship between CSA and obesity in boys ($\chi2=$____, $p=$ ___). These findings are different from previously reported findings in the female adolescent population. Conclusion: After experiencing the trauma of sexual assault, children are at risk for developing obesity. Because this relationship is stronger in females than males, interventions targeting adolescents who have experienced CSA that include education of health behaviors may not be as relevant to target the male population who have experienced CSA. Additional studies are needed to confirm gender differences in examining the relationship between CSA and obesity.

Author: Bill Dugan

Mentors: Carolyn LaMacchia and William Egan

Institution: Bloomsburg University

Category: Natural Sciences & Engineering

Title: Security Concerns in Cloud Computing

Abstract:

With exponentially increasing amount of data and processing requirements, organizations are in need of flexible technology capabilities. Although cloud computing provides an agile and secure infrastructure that is potentially more economical than a private data center, organizations are reluctant to adopt this technology. The purpose of this exploratory research is to examine the issues surrounding the security concerns of cloud computing. To narrow the scope of the research, focus is placed on the major provider of cloud computing, Amazon Web Services (AWS) and its cyber security protection mechanisms. The methodology includes an examination of relevant literature, AWS training tutorials, and an interview with a cloud computing consultant. This research reveals that the perception of a lack of adequate security is a major concern in migrating to the cloud. The data collected strongly suggests that the specific cyber security issues of concern include: availability of resources, protection of stored data, disaster recovery, and virtualization monitoring. To address these concerns, this research developed an illustration of the shared responsibility model for a secured cloud computing environment which applies to AWS implementations. In addition, this research provides recommendations for companies considering migration to the cloud. Recommendations include the selection of appropriate services and employee training in the establishment and monitoring of the AWS security services. Future research will be extended to the other major cloud providers.

Author: Morgan Eckenroth, Brian King (Ph.D.) and Vanessa Troiani (Ph.D.)

Mentors: Brian King

Institution: Bucknell University

Category: Biological Sciences

Title: Assessing the Utility of Virtual Reality on Selective Attention Bias in Children with Autism Spectrum Disorder

Abstract:

Autism Spectrum Disorders (ASDs) are a group of neurodevelopmental disorders characterized by impairments in social interaction and communication and by the presence of restricted, repetitive interests and behaviors. In particular, the prevalence of abnormal visual sensory information processing in ASD is widely recognized by the research community. Patients with ASD often have difficulty visually processing entire scenarios on a global scale without turning their focus toward local details. UltimEyes has been used with consistent success in improving visual acuity and processing. In a clinical trial with the University of California Riverside Baseball team, in was documented that there was a nearly 33% improvement in visual focus that translated into playing better baseball. UltimEyes is able to achieve these results by training the visual cortex to more quickly pinpoint low-level details critical to human adaptation. This training helps to retrain the brain's visual biases to start at the lowest level of detail. Our study aims to investigate the use of virtual reality technology to improve visual processing biases in children with ASD. Following the model of the UltimEyes application, we have successfully implemented a visual training application using the Unity Framework on a Google Cardboard compliant VR headset. Our application implements the test in an immersive, 3D world, allowing us to eliminate all distractions other than the test itself. Using this novel VR-based vision training application, we intend to conduct preliminary tests with a small cohort of subjects to assess its utility for visual training. We believe that a controlled, yet immersive testing experience will improve the testing process for these children, thus potentially improving visual training outcomes.

Author: Amarachi Ekekwe

Mentor: Vanessa Massaro

Institution: Bucknell University

Category: Social Sciences and Humanities

Title: Black Women and Violence: Understanding Fear and Movement Amongst Black Women on Bucknell's Campus

Abstract:

Studies have historically shown generalized statistics on student retention and graduation rates from colleges and universities. Though this is vital information, in order to make changes on college campuses, it is important to understand factors that prohibit certain groups of students, specifically Black women, from graduating at the same rates as their white counterparts. While it has been proven that Black women graduate at higher rates than black men, black women are statistically more likely than black men to endure compounding factors that affect their rate of graduating in 4 years. In an effort to see how these factors affect the mobility of black women at Bucknell University and their ability to feel safe on this specific college campus, I interviewed 13 black identified women who currently attend or recently graduated from Bucknell University. In addition to asking formal interview questions, all subjects underwent a cognitive mapping exercise in which they identified places on campus where they feel safe and unsafe, as well as other factors that affected their movement on campus. Before I began interviewing subjects, I predicted that identifying as a black woman on a predominantly white campus makes it harder to access different resources and feel safe on Bucknell's campus. The data I collected showed that while familiarity brought some sense of safety, different factors such as; trustworthiness in the administration and public safety and the lack of different amenities on campus, affected movement and access to resources on campus.

Author: Marcus Erdman, Anna Maria Stauffer, Victoria Herndon, Kathleen Sheridan, and Janet Robishaw (Ph.D)

Mentors: Janet Robishaw

Institution: Geisinger Health System

Category: Clinical and Translational

Title: Determining the Relationship of the GPR52 Receptor Variants to Neurological Diseases Through Genetic Association Studies and Functional Analyses.

Abstract:

G-protein coupled receptors (GPCRs) share a common topological arrangement of seven transmembrane domains. Based on this conserved motif, computational strategies reveal the existence of a few hundred receptors for which there are no known ligands or biological functions. Despite major efforts, traditional approaches have not proven efficacious for a large subset of these so-called orphan receptors. In this work, we describe an integrative strategy that captures missense variants within orphan receptors as a means of identifying their clinical importance and understanding their biological functions. For this purpose, we chose the orphan receptor-GPR52-that is predominantly expressed in a region of the brain responsible for controlling locomotion, cognition, and reward. We analyzed whole exome sequences from 51,289 individuals who receive their healthcare at Geisinger and consent to broad research use of their de-identified genomic and clinical data. This analysis identified 48 rare missense variants within the GPR52 gene that are predicted to cause malfunction of the receptor protein. Subsequently, a rare variant association test was performed on the binned variants to detect disease associations. Notably, binned missense variants within GPR52 were significantly associated with neurological and psychiatric disorders. The top disease associations included essential and other specified forms of tremor ($p=2.9\times10^{-9}$); major depressive disorder ($p=2.9\times10^{-8}$); and paralysis agitans ($p=2.9\times10^{-8}$). After correcting for multiple testing, all three disease linkages exceeded the threshold for phenome wide significance. Because such associations do not prove causality, we next performed functional analyses to determine the effects of the missense variants on the receptors' signaling properties. Patient genomic DNA was used to make plasmid constructs for sequence verification and overexpression in human cells. The wild type and variant cells were then tested for cell surface expression, constitutive activity and production of the second messenger-cAMP. We expect the results will confirm that at least a subset of the missense variants produce an attenuated cAMP response that may contribute to these disease phenotypes. Ultimately, an increased understanding of GPR52 signaling and the missense variants that cause its malfunction may lead to an improved ability to diagnosis and treat neuromuscular and neuropsychiatric disorders.

Author: Caroline Fassett

Mentor: Greg Clingham

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: The War Effort as an Instiller of Purpose and Virtue

Abstract:

I have crafted an argument about the human condition linking Tolstoy's Anna Karenina and Dickens's A Tale of Two Cities with concepts embedded in the respective philosophies of Locke and Hobbes. This argument is bolstered by research done at Jockey Hollow, a segment of the Morristown National Historical Park, especially with how historians depict the humanity of Revolutionary War soldiers when educating the public about the 'Hard Winter' of 1779-1780. I am arguing that Tolstoy and Dickens both contend that one's humanity can be rescued - ennobled or cleansed from depravity - through participation in the war effort. I specifically focused Count Alexei Vronsky and Sydney Carton, characters who I argue manifest notions introduced by Thomas Hobbes and John Locke. Vronsky, I assert, dwells within the State of Nature as envisioned by Hobbes, heedlessly violent and apathetic, and Carton in the State as envisioned by Locke, defined by good fellowship and altruism. At the various exhibits of Jockey Hollow, I was exposed to historians' aggressive intent to glorify the mundane. Though soldiers did little more than stay alive while enduring the coldest recorded winter, their time at the mountainous region is memorialized as a testament to the resiliency of their morale and camaraderie. Tying the research conducted at the historic landmark with my critical reading of the works of fiction and of philosophy, I can articulate a complex yet satisfying historical, linguistic, and moral understanding of the interconnecting issues in play. Tolstoy and Dickens's characters of Vronsky and Carton, respectively, are emblematic of disgraced or demoralized humans either saved or capable of being saved through sacrificing themselves to ordered chaos, or to the war effort. Vronsky, of the temperament mirroring Hobbes's State of Nature - wherein all external forces are challengers to fulfilled desires - is not saved. Carton, of the temperament mirroring Locke's State of Nature - wherein all external forces collaborate to fulfill desires - is saved. Both the rescue and the loss are examples of war's power to infuse humans with morality and righteousness - a truth historians commemorating the fields of Jockey Hollow enforce in their narratives.

Author: Justin Fickel

Mentors: Darrin Kass

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: Is Emotional Intelligence a Better Predictor of Managerial Success than GPA or GMAT scores?

Abstract:

The longstanding school of thought regards the primary indicator of success in academia and occupational settings is traditional scores such as GMAT scores. While the GMAT strongly predicts how students will do in their first year of the MBA program, recent studies are finding these scores are less reliable when predicting managerial success after graduation. That is where emotional intelligence comes into play. Emotional intelligence (EQ) was first proposed by Salovey and Mayer in 1990. Emotional Intelligence has five dimensions: self-awareness, self-regulation, internal motivation, empathy, and social skills. In other words, emotional intelligence can be defined by one's ability to recognize their own emotions, as well emotions of others around them. For this study, the participants will be measured by their emotional intelligence score, MBA GPA, GMAT scores, and their ILIAD assessment results. Using regression analysis, it will be determined if EQ is a better predictor of managerial success than traditional measures. The results will be presented to the Honors Program committee as well as the National Collegiate Honors Council (NCHC).

Authors: Katie Fischer, Hailey Shannon, Tara Barbarich, Matthew Persons, and David Matlaga

Mentors: David Matlaga

Institution: Susquehanna University

Category: Biological Sciences

Title: Patterns of Ground Spider Community Diversity and Richness Across Riparian Buffers Dominated by Japanese Knotweed (Fallopia Japonica)

Abstract:

Due to federal and state regulations riparian buffers are ubiquitous landscape features across much of the U.S. In Central Pennsylvania, the understory of riparian buffers is increasingly dominated by the invasive shrub Japanese knotweed (Fallopia japonica). Due to knotweed's moisture tolerance it does not occupy all of the buffer, creating a gap between the monospecific stand of knotweed and the water's edge. It is unknown if animal communities differ between buffer dominated by knotweed and buffer without knotweed abutting the river. To further our knowledge of this issue we are studying ground spider communities at five points across the buffer gradient. A total of 50 pitfall traps were placed at two sites along the Isle of Que. Ten traps were installed at each habitat type: the field past the buffer's edge, the buffer and knotweed edge, the knotweed-inhabited buffer center, the opposite knotweed edge, and nearest the river. Across this riparian habitat gradient, traps placed in the center of knotweed stands had the least spiders with lowest diversity compared to traps in other regions. Traps placed on the field edge of the knotweed captured the most spiders with the greatest diversity. The pitfall traps are checked after being open both overnight and during the day to observe any differences in nocturnal and diurnal spider diversity, and while only four samples have been taken at this time, it can be said that at least twice as many nocturnal spiders were captured as diurnal. It is expected that spider diversity would be significantly different inside of the knotweed stands than outside in either direction, but diversity would peak at the edges of the knotweed where these habitats overlap. These potential changes in spider diversity can be attributed to factors such as sunlight exposure, proximity to water, and frequency of disturbance.

Author: Lisa M Francomacaro, Katie Jaap (MD), Charles Walker (MD), James T Dove (BA), Marie Hunsinger (RN, BSHS), Ken Widom (MD), Denise Torres (MD), Mohsen Shabahang (MD, Ph. D.), Joe Blansfield (MD), Jeffrey Wild (MD)

Mentors: Jeffrey Wild, MD

Institution: Geisinger Health System

Category: Clinical and Translational

Title: Sarcopenia Predicts Poor Outcomes in Urgent Exploratory Laparotomy

Abstract:

Background: A significant proportion of acute care surgery patients undergo urgent laparotomies, a procedure associated with high rates of morbidity and mortality. Sarcopenia, generalized loss of muscle mass and function, can be measured from psoas muscle area and is a quantitative measure of physiological reserves. Recent studies have found that sarcopenia predicts worse outcomes in elective operations, but it has yet to be evaluated in emergent surgical patients.Objective: The purpose of this study is to examine sarcopenia outcomes in emergent general surgery patients. This was a retrospective review of acute care surgery patients of a rural tertiary care facility between 2010 and 2014. Patients admitted from the emergency department who had an abdominal CT scan and underwent an urgent laparotomy within 72 hours of admission were included. The primary outcomes were predictors of morbidity and mortality, including sarcopenia. Sarcopenia is defined as the lowest quartile cross sectional area of both psoas muscles, normalized for height and stratified for gender. Sarcopenic patients were compared to the upper three quartiles. Results: During a five-year period, 967 patients met the inclusion criteria. Sarcopenic patients were older than their non-sarcopenic counterparts (p<.0001). Univariate analysis found differences in abdominal wall fat, mortality, complications, and discharge destination between sarcopenic and non-sarcopenic patients (all p<.0001). Multivariate analysis controlling for age, gender, post-operative diagnosis, and procedure found that sarcopenic patients had higher mortality (OR 2.54, p<.0001), higher complication rates (OR 1.93, p<.0001), a longer length of stay (HR 0.84, p=.04), and were less likely to be discharged home (OR 0.45, p<.0001). Sarcopenic patients were more likely to undergo unplanned re-operation at a level approaching significance (OR 1.94, p=.05). Interestingly, increasing abdominal wall fat appears to have favorable outcomes in mortality, place of discharge, and complications (all p<.05). Conclusions: Sarcopenia is easily measured from admission CT scans, making it an accessible outcome predictor. In urgent laparotomies, sarcopenia was associated with morbidity, mortality, length of stay, and discharge destination. A more accurate understanding of patient risk following urgent procedures can be used to manage patient post-operative care.

Author: Ginna E. Freehling, Kathleen E. Bell, Christine M. Murphy, Erin E. Schuler, Amy M. Patterson, Kirsten Rudd, Danielle Alaimo, and Elizabeth C. Marin.

Mentors: Elizabeth Marin

Institution: Bucknell University

Category: Biological Sciences

Title: The Role of Antp in Anteroposterior Patterning of the Drosophila Melanogaster Ventral Nervous System

Abstract:

In many animals, including adult insects, particular appendages such as legs and wings are present only in specific segments along the anteroposterior (head-to-tail) body axis, implying variability in neuron type and number. In the Drosophila postembryonic ventral nervous system (equivalent to the vertebrate spinal cord), the repeated divisions of twenty-four pairs of identifiable neural stem cells (neuroblasts) generate distinct, bilaterally symmetric lineages of neurons on either side of each segment. Each neuroblast division results in two distinct sibling cell types, and these siblings accumulate during larval development, resulting in two different hemilineages that can be distinguished by axon morphology. Many of these hemilineages display segment-specific survival and axon morphology, suggesting a role for the Homeobox or Hox genes, which encode DNA-binding proteins that have been shown to be involved in anteroposterior patterning in many other contexts. Previously, we showed that the Hox protein Ubx was detectable in specific hemilineages within its expression domain (the third thoracic and first abdominal segments) in the postembryonic ventral nervous system. Moreover, loss and gain of gene function experiments demonstrated that Ubx was both necessary and sufficient to confer segment-appropriate survival and morphology in these neurons. However, Hox gene products are known to antagonize each other's expression and activity, and it was not yet clear whether Ubx acted directly in these patterning functions, or whether its effects were mediated by its neighboring Hox gene, Antp. In our current study, we find that Antp is expressed most strongly in specific hemilineages within the second and third thoracic segments - adjacent to, and overlapping with, the Ubx expression domain. Mutating Antp in lineages in the thoracic segments frequently results in morphology and/or survival phenotypes, suggesting a role for Antp in controlling axonal projection patterning in some lineages and programmed cell death in others. Experimentally expressing Antp in lineages outside of the gene's normal expression domain transforms them, producing morphologies and survival patterns similar to those of their mid-thoracic counterparts. Finally, Antp, Ubx double mutant experiments demonstrate that the phenotypes observed in Ubx- mutants are dependent on Antp function in some hemilineages, but not in others.

Authors: Madeline Galvez

Mentor: Vanessa Massaro

Institution: Bucknell University

Category: Social Science & Humanties

Title: Philadelphia- Women's Perspectives on Police Brutality and Mass Incarceration

Abstract:

Following the deaths of Alton Sterling and Philando Castile a national conversation has arisen surrounding the issues of community and policing relations. This study attempts to tell the perspective of black women in the context of police brutality and mass incarceration of black men. 13 interviews were conducted with women of the Philadelphia region focused on the topics of neighborhood violence, personal relationship to the prison system and interactions with police officers. A clear distinction was made between the attitudes of cops on foot, those on bicycles, those in patrol cars and narcotic cops. Many reported having nothing but positive experiences with law enforcement and there was a clear understanding that although more often targeted, not every black male family member went to prison unjustly. This study attempts to demystify the attitudes of black women towards law enforcement and the perspective they have on over-policing.

Author: Abigail Garrett, Ridge Dershem, Raghu Metpally, Hans Brauner-Osborne, Janet Robishaw, and Gerda E. Breitwieser

Mentors: Gerda E. Breitwieser

Institution: Geisinger Health System

Category: Clinical and Translational

Title: Expression and Analysis of Human GPRC6A Variants

Abstract:

Although osteoporosis is diagnosed in ~25% of women and ~6% of men, treatment strategies for this bone disorder are limited and focused on slowing or halting bone loss. New treatments capable of shifting the balance to increasing bone density are needed. The G protein-coupled receptor, GPRC6A, is expressed in bone cells in mice and humans (Clemmensen et al. 2013), as is a related receptor also activated by calcium, the calcium-sensing receptor, CASR. To differentiate their roles in humans, we analyzed common variants in each receptor in 51,289 individuals in the DiscovEHR GHS-REGN whole exome dataset. CASR common variants were benign polymorphisms, while GPRC6A had common loss of function (LOF) variants (stop-gain or frameshifts resulting in early termination of the protein), arguing distinct roles in human biology. A PheWAS (Phenome Wide Association Scan) was used to determine the disease association(s) of the GPRC6A common LOF variants, and we found significant associations with senile osteoporosis and pathologic fractures of the vertebrae, a common occurrence in individuals with senile osteoporosis. Results argue that loss of GPRC6A function promotes age-related osteoporosis. Surprisingly, we also found these associations for a missense variant S924L, which destroys a putative carboxyl terminal PDZ domain, suggesting that mistargeting of the variant receptor can also promote osteoporosis. The goal of this summer project was to generate the GPRC6A-S924L variant and compare its subcellular localization and signaling with wild-type GPRC6A. Our research may lead to a greater understanding of the role of GPRC6A in osteoblasts, ultimately providing a novel treatment for osteoporosis which targets the cells which generate new bone.

Author: Tyler Greene

Mentors: Carl Milofsky

Institution: Bucknell University

Category: Social Sciences & Humanities

Title: The Effects of Summer Camps on Youth Delinquency

Abstract:

This year's first annual Mother Maria Kaupas Summer Camp in Mt. Carmel, PA will help to take steps towards preventing juvenile delinquency in the area by keeping kids occupied during prominent times associated with negative activities. The leadership of Mt. Carmel has recently encountered a push to enhance its community through laying a strong foundation in its youth population. Through this they have decided to create the Kaupas Camp as a summer alternative for youth ages 5-8. I plan to study how the effects of a summer camp can help to prevent possible behavior that might be linked to juvenile delinquency and poor decision making that could promote negative activity in the community. I hypothesize the intervention of a summer camp in Mt. Carmel, PA will contribute to a decrease in juvenile delinquency and enrich the youth of the area.
The methods I have used to carry out this study is participant observation through multiple visits to the camp and observing how the children respond to the various activities they are being engaged in. I have also issued a survey to the coaches of Bucknell University that have volunteered to run engaging sports clinics during the camp. Lastly, there will be a survey given to the children of the camp by STEAM, a summer camp program that has partnered with other constituents to form the camp. I will be given access to this survey as well to further investigate the idea of how the summer camp impacted the youth, from their own standpoint.
The results I expect to gather from this research will prove the importance of this new summer camp program in Mt. Carmel, PA. I imagine the ending data will from the surveys and observations will show that not only did all the working leadership involved see a difference in the youth, but also the youth themselves see the camp as a positive form of social interaction. A conclusion of this sort will help to solve the overlying project of this study that is preventing youth delinquency in the community of Mt. Carmel.

Authors: Orvil Grunmeier III and Dustin Bendas

Mentor: Alissa Packer

Institution: Susquehanna University

Category: Biological Science

Title: The Impact of Goldenrod Shoot Size on Gall Growth

Abstract:

Tall Goldenrod (Solidago altissima) is abundant in the old field by Susquehanna University. Goldenrod provides a habitat for a diverse ecosystem of insects including highly specialized parasites. Two of these parasitic insects include the goldenrod gall fly (Eurosta solidaginis) and the goldenrod gall moth (Gnorimoschema gallaesolidaginis). Females oviposit in the stems of the plant and take advantage of the goldenrod's defenses and resources to form ball and spindle galls respectively. Gall success is therefore dependent on the health and viability of the goldenrod shoots. We sampled 208 gall infested shoots, 104 of each type of gall, and recorded descriptive measurements such as height of the shoot, height of the gall on the shoot, and diameters of both the galls and the shoots. The goal of this study is to investigate the relationship between the size of the shoot, height and diameter, and the diameter and length of the gall and if this relationship is consistent for either gall type. We predict larger shoots will host larger galls of either type because they presumably have higher photosynthetic output and therefore accumulate more resources that can be available for the gall. With our results we can determine the presence and strength of a relationship that may shed light on the female's shoot selection process for both species.

Author: Christopher Hartman (PharmD Candidate), Lorraine Tusing (BA), Saritha Korukonda (MS) H. W. Wieder, and Eric Wright (PharmD/ MPH)

Mentors: Eric Wright

Institution: Geisinger Health System

Category: Clinical and Translational

Title: Community Perceptions Regarding Drug Disposal and Continuous Take-Back Programs

Abstract:

The presence of unused, unneeded and expired (UUE) medications is very common among US households today. UUE medications are susceptible to abuse and diversion, could lead to unintentional poisoning, and also pose a threat to the environment. In fact many patients taking prescription medication, including controlled substances are unaware of proper drug disposal methods. Furthermore UUE controlled substances are contributing to an even larger problem in our society, the opioid and heroin epidemic. There have been several initiatives across the country to aid in the removal of UUE medications, but the format has generally been one-time drug take-back events. Although many people participate in take-back events, many do not and the reasons why some participate and some do not are underexplored. Our objective is to quantify people's perceptions regarding drug disposal, and continuous drug take-back programs in the community by conducting a survey of a convenience sample at a single drug take-back event. We will conduct a survey at a local minor league baseball game, where local law enforcement will be holding a take-back event. As part of this initiative, participants who return any medication receive a free hotdog voucher from law enforcement. At the same time the survey will be conducted on a group of returners of medication and non-returners. We composed a 6 question survey to assess the motivations for returning medications, recollection of UUE medications in the home, and perceptions of medication take back programs. Surveys will be completed on a group of up to 40 returners, and 40 non-returners by using a convenience sampling method for comparison. Results of the survey will be compared using SAS 9.3 (Cary, NC). No personal health information will be collected. Collection and analysis of the survey is underway. Upon conclusion of this survey, we will have a better understanding of how the community disposes of medication, and attitudes toward medication take-back programs.

Author: Kyle J Haddock, H Henry Harrison, Abby E Hare-Harris, and Christa Lese Martin

Mentors: Abby E Hare-Harris

Institution: Geisinger Health System

Category: Natural Science & Engineering

Title: Development of an Automated Algorithm for Sequencing Data to Identify Candidate Genes for Developmental Brain Disorders in Recurrent Copy Number Variants

Abstract:

Many recurrent copy number variants (CNVs) across the genome, which are mediated by segmental duplications and therefore result in the same genomic region being deleted or duplicated, have been shown to cause developmental brain disorders (DBD), including intellectual disability, autism spectrum disorder, attention deficit hyperactivity disorder, schizophrenia, bipolar disorder and epilepsy. While these CNVs have been associated with DBD phenotypes, the specific gene(s) within each CNV responsible for these phenotypes has often not been identified. For example, one recurrent deletion of interest involving 17q12 is associated with renal abnormalities, diabetes, and DBD. However, variants in only one gene in this region, HNF1B, have been shown to contribute to the phenotype and only account for the renal abnormalities and diabetes; no gene(s) has yet been identified that causes the DBD phenotype. Therefore, in order to identify causative genes for DBD within CNV regions, we used whole exome sequencing (WES) data from 47,859 patient-participants from the Geisinger Health System - Regeneron Genetics Center (RGC) DiscovEHR project to identify pathogenic loss of function (pLOF) variants in genes located within DBD CNVs. We evaluated rare pLOF variants in 518 genes from 25 recurrent DBD deletions (including 17q12). All pLOF variants in these genes were processed using an automated pipeline written in the Python programming language (v2.7). Common variants that were present in >1% of all DiscovEHR participants and/or control individuals from the Exome Aggregation Consortium (ExAC) database were removed. Out of the 2,290 extracted variants, 36 were removed due to common allele frequencies; 77 of these were located within the 17q12 region. We are now examining correlations between the 17q12 pLOF variants and DBD phenotypes extracted from these patient-participants' electronic health record. We are also supplementing our data with publically-available phenotype/genotype data from NCBI's ClinVar database which includes 29 sequence changes in HNF1B, two in PIGW, and 14 deletions that exclude HNF1B. The phenotypic data from the DiscovEHR and ClinVar cohorts will be assessed jointly to determine which gene(s) are causative of the DBD phenotype associated with 17q12 deletions. This process can then be used to evaluate other recurrent regions for DBD candidate genes.

Authors: Kelly Haggerty

Mentor: David Fazzino

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: Oral Histories of Ecological and Economic Change in Franklin City, and Greenbackville, Virgina

Abstract:

Oral Histories are becoming increasingly popular in the world of anthropological research. This is especially apparent during a time of rapid change and globalization. When effectively trying to capture a story from an individual or a community, this form of methods is the best approach. Specifically, in the past century the people that resided the shoreline of the state of Virginia have lived a life to tell. Fires, hurricanes, floods, aquatic population extinction and economical downfalls caused the human population of the small towns in Virginia to change their ways quickly. Before it is too late, I believe it is time to allow them to tell their stories. Through a series of interview questions I will videotape and record the individuals that lived these experiences to share to the public for historical references. With these methods, the town will have public access to an in depth look into a history of their own environment. A form of the past lives that cannot be captured in any other way.

Authors: Sean Hake, Tia Kissinger, Jonathan Niles, and Dan Ressler

Mentor: Dan Ressler

Institution: Susquehanna University

Category: Biological Sciences

Title: Linking Brook Trout Habitats with Network Models: Using Predicted Culverts to Fine Tune Habitat Linkages

Abstract:

Pennsylvania has 62,750 streams and only 8000 of those have been sampled. Our main objective is to prioritize which streams should be sampled to find populations of Brook Trout. Using the DeWeber and Wagner model, the probability of Brook Trout being in a stream can be used in a network model to visualize the interconnectedness of trout populations. There are many features or restrictions that impact or impede fish travel in a stream. One of those features is crossings where a road and stream segment intersect. Bridges do not impact the travel of fish while culverts can be an obstruction if they have a hanging pipe. Using ArcMap, pour points were created where a crossing was located based on the intersection of road segments and a stream. Slope and flow accumulation data was then used to predict the type of crossing as either a bridge or pipe. The pipes were then added to our network model as restrictions to fish travel. We can add to the efficiency of stream sampling by indicting where obstructions make populations unlikely and thus biologists can spend more time sampling in more productive streams.

Author: James Hamm

Mentor: Carl Milofsky

Institution: Bucknell University

Category: Social Sciences & Humanities

Title: A Data Management Platform for Community Health Assessment and Data Collection

Abstract:

Since the enactment of the Patient Protection and Affordable Care Act in 2010, tax-exempt hospitals have been mandated to conduct community health needs assessments (CHNA) and implementation strategies. These assessments and strategies create an important opportunity to improve the health of communities. They ensure that hospitals have the information they need to provide community benefits that meet the needs of their communities. Additionally, these assessments allows agencies such as the United Way and the Community Action Agency the data necessary for writing grants and properly evaluating community-level disparities. The majority of health data is available on an administrative level, which means that information is collected by government departments and other organizations for the purposes of registration, transaction and record keeping, usually during the delivery of a service. But having access to data is not enough. In order to fully leverage data to improve patient outcomes, healthcare organizations must be able to integrate and align data from disparate sources, so that they can create a full and complete picture of the community health needs. Data management platforms integrate, measure, analyze, and report on a broad variety of data, and help health systems make better administrative, clinical, and financial decisions. The focus of this research was examining a number of data management platforms and comparing these platforms to the current Urban Institute system. The goal of the project was to find a platform that filled the incongruities of the Urban Institute system. The search for a platform lead to the discovery of the Healthy Communities Institute (HCI). The HCI platform offers mapping and data visualization tools that readily identify intervention opportunities for targeting resources, in addition to a database of thousands of evidence-based programs. HCI also provides current administrative data as well as customizable trackers and indicators for implementing local measures. The HCI platform provided a mode of easy access to demographic profiles, disparities profiles, a Health People 2020 tracker, and a list of evidence-based practices at the county and state level. However, the platform does not provide available data for such measures as education and transportation. Further research and, possibly the development of a platform will need to be done.

Author: Reid Harrison

Mentors: Shaunna Barnhart

Institution: Bucknell University

Category: Social Science & Humanties

Title: Community Distributed Solar Power

Abstract:

In the United States, community distributed solar has been highly successful when implemented; yet the country is stages behind leading users of solar such as Germany and Denmark. Distributed solar has generated income for owners of panels and developed into a sustainable energy model for those who can afford it. Many communities have explored different business models for implementing a solar photovoltaic (PV) system and have a wide range of reasons for desiring solar energy, such as the economic benefits of income and employment that are created and the positive environmental impacts and reduced emissions that are associated with renewable energy sources. This project aims to identify successful strategies for implementing a community distributed solar system by examining case studies from communities worldwide, with special attention to state and federal incentives for solar practices. Variables in successfully implemented community solar energy systems include financial incentives from the state and federal governments, the involvement of the community in developing the system, and the financial plan for cost-recovery (return on investment). Through surveying residents in Central Pennsylvania, this project also seeks to understand what factors motivate or inhibit adoption of household and community solar energy systems, such as economic, environmental, and social factors. Since 2011, the cost of PV system installation has dropped by more than 60% (Schneider and Sargent 2014). This has made community solar more accessible to a wider range of communities with larger deviations in income. As the price continues to fall and the price of natural gases rises again, the market for community distributed solar may begin to flourish.

Author: Daniel Hayes, Ingrid Jordon-Thade, Jason Cantley, and Chris Martine

Mentors: Chris Martine

Institution: Bucknell University

Category: Biological Sciences

Title: A Successful Solanum spp. (Solanaceae) Greenhouse Growth Model Using Integrated Pest Management.

Abstract:

Research greenhouse collections of Solanum are notoriously prone to pest infestations that often require the use of pesticides for sustained growth and pest management. The use of Integrated Pest Management (IPM) systems as an alternative to pesticide use is not well-documented for Solanum. With the aim to grow Solanum for studies in reproductive biology and systematics without the use of heavy pesticides, an IPM system was implemented in our small Rooke Research Greenhouse in 2013. Most of our study species are native to subarid tropical habitats of northern Australia, but species from the Neotropics and temperate North America are also included in the collection. The number and density of individuals has varied depending on current research projects, but the greenhouse has supported nearly 400 individuals at its peak. Most study plants are maintained for more than twelve months and experience continuous growth. With the focus on control, not eradication, practices aimed to reduce pest establishment, reproduction, and dispersal have been successfully implemented. Biological control through the use of natural enemies—predators and parasites—of common pests, alongside cultural, mechanical, and physical controls have been carefully studied and adjusted for effectiveness and longevity. Observation of the beneficial insect and target pest population levels and seasonality has aided in establishing an economically and labor friendly IPM system. Plant growth and maintenance has been successful through active management of an IPM plan. Common pests are still present, and likely always will be in low numbers, but a vigilant and adaptive IPM plan focused on maintaining a sustainable predator-prey balance should continue to support our research agenda with few limitations.

Author: Elaine Huang ; Senior author/Adviser: Jennifer K. Wagner (J.D., Ph.D.)

Mentors: Jennifer K. Wagner

Institution: Lafayette College

Category: Social Sciences & Humanities

Title: Barred from Better Medicine: Ethical and Regulatory Barriers to Inclusion of Prisoners in the Precision Medicine Initiative (PMI)

Abstract:

Residents of the Susquehanna Valley have had the chance to participate in a local precision medicine initiative since Geisinger's MyCode® Community Health Initiative was launched in 2007. With President Obama's 2015 announcement to launch the Precision Medicine Initiative® (PMI), upwards of one million Americans will have the opportunity to participate in a volunteer cohort to be formed by the National Institutes of Health (NIH). Through PMI, participants will partner with researchers to discover relationships between genetics and diseases. The NIH has voiced several goals for the PMI Cohort Program, such as ensuring that the cohort reflects the full diversity of the national population and making participation possible for all interested individuals living in the US. Despite such laudable intentions, successfully realizing this longitudinal project's inclusive vision requires considerable advance planning to overcome significant ethical and regulatory obstacles to the responsible recruitment, engagement, and retention of participants within the context of societal realities. Racial biases in criminal procedure and disparate impacts of mass incarcerations on racial and ethnic minorities are especially relevant considerations. Moreover, while changes have been proposed to the Common Rule (i.e., the federal policy for human subjects research protections), current regulations—which were developed under a protectionist paradigm in response to scandalous research practices with confined populations—dramatically limit research involving prisoners. In this broader context, we found it imperative to analyze ethical and regulatory barriers that might impede engagement and retention strategies for the PMI cohort. By examining the relevant scholarly literature, governmental policies, and advocacy group positions, we were able to form an understanding of the complicated landscape that must be navigated when planning research with prisoners, even if incidentally. Our findings provide a foundation from which the PMI Cohort Program's directors and participating health providing organizations can (1) anticipate recruitment obstacles that might frustrate inclusivity and exacerbate health disparities and (2) plan meaningful ways to manage or accommodate interruptions to participant engagement caused by arrests and incarcerations and thereby avoid unnecessary forfeitures of contributions to this effort to revolutionize medicine for everyone.

Authors: Yuxuan Huang, Dikendra Karki, and William Kyaw (Authors listed alphabetically to indicate equal contributions to the project)

Mentor: Philip Asare

Institution: Bucknell University

Category: Clinical and Translational

Title: Enabling Closed-Loop Control of Infusion in the Operating Room

Abstract:

Modern Surgery has increasing dependence on infusion pumps. Currently pumps are almost always set manually by a clinician based on observed physiologic status displayed by patient monitor. Automation of pump control by closed-loop systems has long-recognized advantages. The attention of the clinician may be directed to other matters, while desired conditions are automatically maintained. Our aim is to develop an open non-proprietary proof-of-concept platform that demonstrates the capabilities of multiparameter closed-loop control of fluid management for blood loss and secondarily, to aid in the development of virtual animal models through the use of our platform in animal trials to collect the requisite data. Currently we are working with two medical devices: CME BodyGuard 121 Twins Ambulatory Dual-Channel Infusion Pump, and Philips Intellivue MP50 Patient Monitor. The pump is provided by CME America and the patient monitor is provided by Geisinger Medical Center. We have already developed a driver, which is the software that allows us to control the device operation from a computer, for the pump. A research team in Brown University which is working towards a similar goal shared their work on Philips patient monitor, and we modified their work in order to fit into our platform. We are using Python programming language for software development because we can leverage diverse software tools to expedite development. The primary framework for data transfer between computer supervisor and medical device has also been constructed. We are using Robot Operating System (ROS) for building the framework because of its modularity, which makes the development of a big system involving multiple pieces that communicate with each other much easier. Current work will continue to construct the closed-loop system involving the Philips Patient Monitor and infusion pump using our device drivers and data transfer framework. In the future, more medical devices would be added to make the system more sophisticated and robust.

Authors: Adam Huff and Emily Stowe (Ph.D.)

Mentor: Emily Stowe

Institution: Bucknell University

Category: Biological Science

Title: Light-Dependent and Light-Independent Protochlorophyllide Oxidoreductase: Comparing steady-state mRNA levels in Fremyella diplosiphon UTEX 481 and Nostoc punctiforme ATCC 29133

Abstract:

Cyanobacteria are a diverse population of photosynthetic prokaryotes that occupy a wide range of habitats including freshwater and marine ecosystems. Their primary antenna complex, called the phycobilisome, which funnels energy absorbed by photons to the photosystem reaction centers, is comprised of various pigments called phycobiliproteins. In addition to these phycobiliproteins, which may include phycoerythrin, phycocyanin, and allophycocyanin depending on the species, many species also synthesize chlorophyll a and carotenoids. Some species of cyanobacteria are capable of undergoing a phenomenon known as chromatic acclimation (CA) through which the expression of numerous genes including those that encode for phycobiliproteins, enzymes associated with chlorophyll a synthesis, and many others are differentially regulated in response differing light conditions. These chromatically acclimating species are divided into group 3 species, which can alter their phycocyanin and phycoerythrin content, group 2 species, which can only alter their phycoerythrin content, and group 1 species, which can not alter their phycobilisome composition. Previous studies have found evidence that the genes encoding the subunits of two different forms of the enzyme responsible for the penultimate step of chlorophyll a synthesis, the conversion of protochlorophyllide to chlorophyllide (light-dependent and light-independent protochlorophyllide oxidoreductase; POR and DPOR respectively), are under the regulation of the CA response in the group 3 species Fremyella diplosiphon UTEX 481. However, so far no work has been done to characterize the regulation of these genes in any group 2 species. In this study, the steady-state mRNA levels of the genes that encode POR and DPOR were quantified in Nostoc punctiforme ATCC 29133 cells grown in red light versus green light. Preliminary findings suggest that, unlike F. diplosiphon UTEX 481, POR and DPOR steady-state mRNA levels may not be regulated by CA in N. punctiforme ATCC 29133. The transcript level present in N. punctiforme ATCC 29133 cells grown in red light versus green light do not show the same pattern as that seen in F. diplosiphon UTEX 481 cells grown under the same conditions.

Author: Emma L. Hundermark, Alexander J.H. Morris, Wilmer C. Stowe and Emily L. Stowe

Mentors: Emily Stowe

Institution: Bucknell University

Category: Biological Sciences

Title: The Characterization of a Novel Cyanobacterial Strain: Pseudanabaena SRC

Abstract:

A novel, chromatically acclimating, freshwater cyanobacteria, Pseudanabaena sp. Strain Roaring Creek, was collected and isolated from Roaring Creek in Pennsylvania in 2010; this strain has not been previously characterized. The strain was isolated from an environmental sample and cultured in the lab. Through a combination of observed physical characteristics (such as cell shape, filament length and color changes) and genetic similarities (based on whole genome shotgun sequencing) to known species, we classified and named the strain as "Pseudanabaena Strain Roaring Creek" (for its genus and the location where this strain was collected). We cataloged the genome in the NCBI database and this information is available for public use. The draft genome is explored and annotated using the online RAST server and consists of 5,478,524 base pairs and contains 5546 putative coding sequences (potential genes). Of these 5546 potential coding sequences, 3 have been identified as potential sensor kinases, which detect changes in ambient light wavelength to allow the organism to alter pigment composition of its light-harvesting antenna to optimize photosynthesis. Experimental findings (measuring the ratio of pigments in cells) classified Pseudanabaena Strain Roaring Creek as a Type III light-acclimating species meaning that this species can alter the ratio of the two predominant pigments, phycocyanin and phycoerythrin, in changing light wavelengths. This ability is not common to all cyanobacterial strains. These findings provide a strong foundation for future work on this species which include analysis of the genes involved in its chromatic acclimation.

Author: Ian Johnson

Mentors: Dee Ane Wymer

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: Exploring the SRAC: Preserving Native American Archaeology and Culture in Rural America

Abstract:

Located directly on the Pennsylvania/New York boarder, along the Susquehanna River, lies the Susquehanna River Archaeological Center (SRAC) – a non-profit center and museum dedicated to preserving local archaeology and engaging with current Native American groups in the region. The volunteers and staff of the SRAC create education outreach programs, host Native American dances, and public presentations by scholars, as well as displaying, archiving, and studying ancient artifacts donated to the center. With its own laboratory, and an exponential amount of materials to catalog and study, this public center also provides internship opportunities for undergraduate students from the region. My internship with SRAC, from June 1 through mid-August, ranges from hands-on involvement in a laboratory setting to "boots on the ground" in the field, as well as exploring how such a unique organization serves its local community. My poster emphasizes the experience I have gained through my summer internship with the SRAC, which includes assisting SRAC members in their first local excavation project – documenting a floodplain site that is being impacted by on-going construction activities. Our fieldwork consists of excavating a series of 1x1 meter test pits into the disturbed plowzone, screening sediment for artifacts, and documenting potential features (such as firepits). Thus far, we have recovered pottery and stone tool fragments, representing village life of circa 1100 A.D., and are analyzing spatial patterns to highlight other potential areas testing. I have also been assisting in the cleaning, labeling, and identifying these archaeological materials at the SRAC laboratory. Current plans for community outreach involve orchestrating an Archaeology Weekend for the public to visit and help excavate at our site. Working with the members of the SRAC has enabled me to gain experience that can only occur "out of the classroom" as well as a better understanding of how to work with community organizations such as SRAC as they strive to learn new ways to preserve their heritage – and as they struggle to maintain funding, community involvement, and acceptance among professional archaeologists based in larger institutions.

Author: Elizabeth Jones, Dr. Erin Keen-Rhinehart, Dr. Sarah Cassella, AmberLynn Grant

Mentors: Sarah Cassella

Institution: Susquehanna University

Category: Biological Sciences

Title: Affects of Prenatal Food Deprivation on Offspring Microglial Morphology

Abstract:

Prenatal stress is shown to have adverse effects on various aspects of the developing brain, such as alterations in neuroendocrine functioning and neuroinflammatory processes. Previous animal models and human studies have shown a clear link between prenatal stress and psychiatric disorders such as depression and schizophrenia, both of which include abnormal neuroimmune functioning. Prenatal stress leads to altered behavioral outcomes in rodent offspring, as well as changes in the morphology of microglia, the immune cells, in the offspring. Microglial morphology is indicative of their activation state and inflammatory profile of the brain tissue; cell that are relatively active will have a larger soma area, and increased densities of microglia suggest increased inflammation. To model prenatal stress, we used a food deprivation model (FD50) that involved food restriction in the second half of pregnancy of rats. Female offspring were selected for immunohistochemical analysis of the microglia in the hippocampus and prefrontal cortex, regions associated with behavioral changes that have been observed in this, and other, prenatal stress models. Using immunohistochemistry and confocal microscopy, we evaluated microglia soma area and cell density in the regions of interest. Ongoing analysis suggests that offspring of food restricted dams have increased soma area in the prefrontal cortex. Correlating neuroimmune dysfunction with behavioral and molecular changes in prenatal stress models may help us better understand developmental disorders, as well as better ways to treat them.

Author: Sarah Karasek

Mentors: Claire Lawrence

Institution: Bloomsburg University

Category: Social Science & Humanties

Title: Bizarro Fiction for a Bizarre World: Camp, Cult, Pastiche, and Punk

Abstract:

Bizarro fiction, a recently developing genre of literature often banned by libraries and bookstores for its surface level, shock value blend of gore, sex, and humorous absurdity, has been steadily growing in popularity, spreading from mainly Portland, Oregon all the way to Europe. The genre is often self-defined as the literary equivalent to the cult section of a video store. Given that cult fiction, a literary genre which includes works ranging from Ray Bradbury's Fahrenheit 451 to Anne Rice's Interview with the Vampire, is the most obvious equivalent and is defined solely by the following a work achieves, this definition of bizarro is imprecise to say the least. However, bizarro manages to achieve many of the effects of cult films, especially those which attract goth, punk, and raver subcultures (the pastiche and paracinema of Evil Dead 2 and the uncanniness of Donnie Darko are good examples), through very alternate literary means, such as a matter-of-fact tone and unexpected parallels and allusions to reality (as opposed to unexpected surrealism). For instance, where Sharknado plays with its audience by continuously drawing attention to the absurdity of a shark storm in an otherwise realistic world, Crazy Shitting Planet by Mykle Hansen calmly explains that the planet is covered in feces thrown down by floating fat people. What startles the reader is when one of the fat people carries a familiar name: Martha Hilton-Trump. These shifts to reality are often to remind the reader of social issues such as corporate greed or the paradox of progress. Popular art and literature can be understood as a manifestation of the audience's perception of the state of affairs in a particular time and place. This has long been an approach to literary criticism, but it is generally a device used with hindsight. As a culmination of my research into the authors, fans, literature, and surrounding genres, this paper will explore what the bizarro movement implies about American society through an examination of the genre's origins, themes, general style, and social context.

Authors: Kelly A Kempa, Stephen T Petrosky, Laney K Jones (PharmD/MPH), Eric A Wright (PharmD/MPH), D'Andra M Lindbuchler (MSN, CRNP), Kandamurugu Manickam (MD), and Michael F Murray (MD)

Mentors Laney Jones

Institution: Geisinger Health System

Category: Clinical and Translational

Title: Medication Use Prior to Genetic Identification of Familial Hypercholesterolemia

Abstract:

Familial hypercholesterolemia (FH) is a monogenic disorder characterized by elevated low-density lipoprotein cholesterol (LDL-C) and an increased risk of early cardiovascular disease (CVD). Phenotypically identified FH patients have a 4 times greater CVD risk as compared to other hyperlipidemia patients. There are three validated diagnostic criteria for FH, yet underdiagnosis is common. Statins are first-line therapy for treatment of FH, as they reduce LDL-C levels by as much as 60%. Despite aggressive treatment with statins, LDL-C goals are not met in over half of FH patients. Identification of a pathogenic genetic variant in one of three genes (LDLR, APOB and PCSK9) can be associated with the diagnosis of FH. Patients with pathogenic variants in one of these 3 genes were identified through genetic screening of over 50,000 Geisinger patients, and this study uses the electronic health record (EHR) to understand the pharmacologic treatment of these patients prior to genomic testing. We conducted a retrospective cohort analysis of 206 genetically identified FH patients who were identified through Geisinger Health System's MyCode Community Health Initiative. A chart review was conducted for all patients by two independent reviewers who were trained to manually pull EHR data from the date of initial documentation through April 2016. Inter-rater reliability testing was conducted upon completion of chart review and any disagreements were adjudicated by a senior pharmacist, physician or nurse practitioner. Data was collected on medication use characteristics, such as medication, dose, and the number of medication changes and monitoring, such as laboratory results, and reasons for documented medication allergies. Data was analyzed and summarized in tables. The primary outcome was to understand medication use patterns in patients with genetically diagnosed FH. Preliminary analysis of 90 charts shows that 83% of patients have been prescribed lipid-lowering therapies. Of those, more than 15% had LDL-C levels above goal and 13% had reported allergies to statin therapies, yet 100% of them were still taking a statin. Preliminary results suggest that FH patients have tried multiple lipid-lowering medications throughout their lifetime and some remain uncontrolled. We expect that optimizing medication therapy in this patient population will improve outcomes.

Authors: Tia Kissinger, Sean Hake, Jonathan Niles, and Dan Ressler

Mentor: Dan Ressler

Institution: Susquehanna University

Category: Biological Sciences

Title: Digital Elevation Models Help Us Predict Obstructions to Brook Trout Habitat

Abstract:

Brook trout are a native and keystone species in Pennsylvania whose habitat is restricted by land development, water temperature, pH, forest cover, degrading water quality, climate change, altering stream channels, and physical obstructions. These can all restrict fish movement in otherwise suitable habitat. We looked at how bridges, concrete boxes, and culvert pipes effect brook trout populations in Union County, Pennsylvania. We generated road-stream crossings in ArcMap and predicted whether there would be a bridge or other type of crossing then tested our predictions with field data. For each crossing we found the flow accumulation and slope from the statewide STRM 30 meter digital elevation model and we used the results of a logistic regression between crossing type (bridge or pipe) and log transformed data sets. Both slope and flow accumulation are significantly correlated with the stream crossing type and the regression parameters can be used to estimate whether there is an obstruction to fish passage for any stream crossing.

Author: Kurt D. Knepley and William L. Coleman

Mentors: William Coleman

Institution: Bloomsburg University

Category: Biological Sciences

Title: Distribution of and Colocalization of Synapsin I, II, and III, and Rab3a within the Earthworm Nervous System

Abstract:

Synapsins are a class of phosphoproteins which mediate neurotransmitter release at synapses by regulating synaptic vesicle pool activity and availability in axon terminals. Synapsins I and II have been shown to interact with Rab3a, a GTPase involved in neuronal calcium exocytosis. However, little is known about the role of these proteins within the earthworm nervous system. Additionally, little is known about the Synapsin III pathways in mature neurons. We used immunohistochemistry staining and epifluorescence microscopy in order to investigate the distribution of Synapsin I, II, and III and Rab3a within the earthworm nervous system under both resting and depolarized conditions. All four proteins were present throughout the earthworm nervous system both at rest and during depolarization. We also performed immunolocalization assays in both resting and depolarized conditions between Synapsin III and Rab3a, Synapsin I and Synapsin III, and Synapsin I and Synapsin II, in order to determine possible protein-protein interactions within the earthworm nervous system. Antibody fluorescence images were acquired and analyzed using ImageJ software and JACoP co-localization plugin in order to determine the degree of co-localization for each experiment. Statistical analysis produced Pearson's coefficient values between 0.769 and 0.873 for each co-localization experiment, suggesting probable interactions between Synapsin I, II, and III, and Rab3a under both resting and depolarized conditions. Future directions could include precipitation of protein complexes to confirm these interactions, and additional co-localization studies to identify other proteins that may also interact with synapsins.

Authors: Dasha Kostyuchek, Todd B Nentwig, Grace Leung, and Judith E Grisel

Mentor: Judith Grisel

Institution: Bucknell University

Category: Biological Sciences

Title: Access to Activity Wheel Access Regulates Alcohol Consumption in Mice: Effect of Varying Degrees of Beta-Endorphin Expression

Abstract:

Decades of basic research have demonstrated that genetic factors contribute to one's risk for developing alcoholism. Beta-endorphin, an opioid neuropeptide, has been shown to influence alcohol consumption specifically low levels of basal beta-endorphin are correlated with increased risk for alcoholism (Gianoulakis et al., 1996). Recently, exercise has been suggested as a potential treatment to reduce alcohol use partially due to its interaction with regulating beta-endorphin. The present study investigated whether access to a running wheel would alter alcohol intake in knockout (KO) mice unable to synthetize beta-endorphin versus heterozygous (HET) mice that could produce half the normal amount. The beta-endorphin deficient model was developed in the laboratory of Malcom Low by inserting a premature stop codon into the Pomc gene (Rubinstein et al., 1996). We hypothesize that HET mice that have access to a running wheel, will reduce their drinking more than KO, because they will experience a running wheel induced beta-endorphin release. Adult male and female KO and HET mice were individually housed with 24-hour access to food and water. We used a two bottle choice paradigm, in which the mice had access to 20% alcohol for 2 hours a day, to study alcohol consumption. The mice were randomly assigned to have either a locked or unlocked wheel placed in their home cage following baseline drinking. Our preliminary data suggests that KO and HET mice reduced their alcohol consumption while having 24 hour access to a running wheel, however the difference is more pronounced in males of both genotypes.

Author: Zach Kozick, James Dove (BA), Marie Hunsinger (RN, BSHS), Jeffrey Wild (MD), Tania Arora (MD), Joseph Blansfield (MD), Mohsen Shabahang (Ph. D., MD)

Mentors: Joe Blansfield

Institution: Geisinger Health System

Category: Clinical and Translational

Title: Clinical Compliance With the Oncotype DX Breast Cancer Test in the United States: A National Cancer Data Base Analysis

Abstract:

INTRODUCTION: Oncogenes are important in the diagnosis and treatment of breast cancer. They can give prognostic and predictive information. Oncotype Dx (OncoDx) is a commercial test that analyzes 21 genes to assess the risk of breast cancer recurrence. The test categorizes patients as low-, intermediate-, or high-risk of recurrence. Low-risk patients are recommended to omit chemotherapy and high-risk are recommended to receive chemotherapy. OncoDx is only recommended for patients who are lymph node negative, estrogen receptor positive, HER2 negative, and have a tumor greater than 0.5 cm. The aim of this study is to analyze compliance with the OncoDx test. METHODS: The National Cancer Data Base was used to assess patients eligible for OncoDx with breast cancer from 2010-2012. Compliance for OncoDx along with low- and high-risk compliance with chemotherapy recommendations were investigated. RESULTS: A total of 158,235 patients met eligibility criteria. Sixty-four percent of patients eligible for OncoDx did not receive the test. On multivariate analysis, non-compliance on testing rose with age (OR: 0.645, 95% CI: 0.638 to 0.653). Compliance was highest in patients treated at an academic center. Socio-economic factors appear to play a significant role. White and insured patients had the highest compliance on multivariate analysis. Higher median income for patients also predicted testing compliance. For low-risk patients, 5% were not compliant.   On univariate analysis, median age was higher in the compliant group (59 versus 50 years old, p<0.001). On multivariate analysis, facility type again predicted compliance. Year of diagnosis, tumor grade and size were all predictors of compliance. Mastectomy patients were also less likely to be compliant (OR: 0.742, 95% CI: 0.663 to 0.831). In high-risk patients, 10% did not comply with the recommended chemotherapy guidelines. High-risk patients showed lower compliance to receive chemotherapy if they were older, had a smaller tumor, and had well-differentiated tumor grade. CONCLUSION: OncoDx is under-utilized, with socio-economic factors influencing testing compliance. Non-compliance to chemotherapy recommendations was low in this patient population. Non-compliance is more common at non-academic centers, is significantly influenced by age, and may be a consequence of clinical and pathological results conflicting with genetic test results.

Authors: Mae L. Lacey, Jason T. Cantley, and Christopher T. Martine

Mentor: Christopher Martine

Institution: Bucknell University

Category: Biological Sciences

Title: Novel Taxon in a New National Park Helps to Disentangle Species Boundaries Among Spiny Australian Bush Tomatoes

Abstract:

Current studies on the spiny solanums (Solanum subg. Leptostemonum) of northern Australia have generated numerous hypotheses related to species delimitation. Particularly unclear species boundaries have been identified among the closely related Solanum watneyi Martine & Frawley, S. eburneum Symon, and a putatively new taxon recently collected in Limmen National Park (S. sp. 'Limmen'). The three andromonoecious taxa occur in the upper part of the Northern Territory and are members of the Australian "bush tomato clade," which encompasses around nine closely related taxa. Solanum sp. 'Limmen' appears to share many characteristics with S. watneyi and S. eburneum, yet differs conspicuously in vegetative morphology. The new taxon is immediately recognizable by its highly dissected leaves, abundant prickles, and relative lack of tomentum. It is also geographically disjunct from S. watneyi and S. eburneum, with populations so far recorded only in Limmen National Park in the northeastern portion of the Northern Territory on clayey roadsides. This differs from its closely related counterparts, S. watneyi and S. eburneum, which are found in the northwestern expanse of the Northern Territory on well-drained limestone based sandy- or clayey-loamy soil and on gray clay soil, respectively. Field collections in May 2014 and 2016 resulted in procurement of specimens for rigorous morphological comparisons of these three taxa to further investigate fruiting, floral, and vegetative characteristics. Plants grown from field-collected seeds were utilized in both morphological and molecular analyses in conjunction with field observations to determine the unique characters of S. sp. 'Limmen'. Elucidating the species boundaries among these taxa has the potential to contribute to a body of information germane to conservation efforts as well as ongoing parallel studies of plant-animal interactions and seed dispersal mechanisms within the bush tomato clade. The description of this taxon as a new species represents one of the first new taxa recognized as endemic to Limmen National Park, which was only established in 2012, and highlights the importance of supporting additional biodiversity surveys in the region.

Author: Tianyi Lan, Andrew Merz, Mark Meyer, and Cora M. Taylor

Mentors: Cora M. Taylor

Institution: Bucknell University

Category: Clinical and Translational

Title: Mapping Developmental Trajectories in 22q11.2 Deletion Syndrome

Abstract:

The subtypes of developmental brain disorders (DBD), such as intellectual disability (ID) and autism spectrum disorder (ASD), have substantial clinical heterogeneity, co-occurrence of symptoms, and diagnostic overlap. Such variability prevents clinical categorical DBD diagnoses from effectively predicting future outcomes and guiding interventions. Therefore, we have a pressing need for a comprehensive approach accounting for behavioral presentation while recognizing key factors that affect long-term phenotypic variability (e.g., genetic etiology, familial background and medical comorbidities). Our study aims to better understand longitudinal outcomes of children with 22q11.2 deletion syndrome (22qDS) by combining developmental assessments, medical comorbidities, genetic etiology, and family background in an ordinal logistic regression model in order to better predict individualized long-term cognitive outcomes for children with DBD. We have identified 15 probands with 22qDS who have been consented for research and have been entered into our research database. All of these probands have at least one developmental assessment; in addition, 7 have at least two assessments ranging through as many as five developmental assessments already completed. We will use mathematical approaches, including generalized linear mixed models(GLMMs) and generalized estimating equations(GEEs), to identify clinical factors that are the most predictive of developmental outcomes. In particular, clinical factors we investigated include genetic diagnosis, family performance on cognitive measures, and medical comorbidities. Longitudinal developmental profiles were developed for children with 22qDS informed by the child's and parents' performance on various assessments of cognition. Future results of our study has the potential to lead to an improved understanding of the quantitative effects of genetics, as well as behavioral and medical factors, on phenotypic outcome.

Author: Nathan Luftman, Jason Cantley, and Chris Martine

Mentor: Chris Martine

Institution: Bucknell University

Category: Biological Sciences

Title: Saltwater Tolerance Thresholds in the Halophytic Species Chenopodium Oahuense (Amaranthaceae) Including a New Segregate Taxon From the Island of Moloka'i in the Hawaiian Islands.

Abstract:

The Hawaiian Islands have been long identified as a hotbed of biodiversity, with widespread endemism across all islands. Chenopodium oahuense (Amaranthaceae), while endemic to Hawai'i, has been recorded on all but one island of the archipelago. Populations of the taxon occur on sandy beaches, seacliffs, and in high elevation subalpine habitats that are isolated from sea spray. However, baseline information on seed ecology is not well know for this halophytic species. Therefore, to test if a differential response to salinity has developed between populations inland and on the coast, seeds of three populations (subalpine, beach, and seacliffs) were exposed to artificial seawater to assess possible increased germination rates in the presence of salt, which occurs for many other Chenopodium species. In a second experiment, germination and growth measurements were assessed when exposed to different concentrations of artificial seawater to simulate the effects of sea salt spray. The results and conservation implications from these experiments are discussed including the recognition of an undescribed taxon that has been only recently recognized from the seacliffs of Moloka'i. Using live and herbarium material to assess morphological differences coupled with results from the sea water treatment experiments, we detail the distinctive characteristics of this new taxon for the first time. Primarily, the taxon is most noticeably different in its overall sprawling habit and semi-succulent leaves that may have evolved in response to environmental factors that occur in its habitats, which are the world's tallest seacliffs.

Author: Zilin Ma

Mentors: Deepak Iyer

Institution: Bucknell University

Category: Natural Sciences and Engineering

Title: Spreading of Waves in Disordered Media

Abstract:

The localization of classical waves in linear and nonlinear disordered media has been extensively studied in the context of the nonlinear Schr¨odinger equation. We propose to extend these works and study the spreading and transport of waves described my the massive Klein-Gordon equation with a random position dependent mass and various nonlinear terms. We anticipate localization and plan to study the conserved quantities in such a regime. Our studies are largely numerical, and the methods are susceptible to instabilities that lead to unphysical results. In this poster we describe some numerical techniques that seem appropriate for the task, and discuss their stability in the linear case. In particular, we extend the von Neumann stability analysis for the Crank-Nicolson method to the above case.

Author: Sierra Magnotta, Anushikha Sharma, and Jingya Wu ; Course Tester: Brittany Caceres

Mentors: Darakhshan Mir

Institution: Bucknell University

Category: Natural Sciences & Engineering

Title: A Student-Generated Curriculum for CSCI-187: Creative Computing and Society

Abstract:

Understanding of computing skills and concepts is no longer viewed as optional, but is knowledge that is required to progress in countless fields within and outside of computer science. Despite the need for this knowledge, non-STEM majors' participation in computing courses is still lacking. This is especially true for women and other minoritized groups. Despite much interest in encouraging a broader population to engage with computer science, there is a lack of practitioners outside of computer science who are generating curriculum and syllabi for college-level computer science courses. This project is based on the precept that students from varied disciplinary backgrounds and intermediate computing knowledge can provide a unique lens to articulate the needs of their fellow students. Unlike many professionals in the field, students are best able to express their apprehensions and preconceived notions about learning computing and programming skills. Students with varied interests and backgrounds can also articulate the need to employ computing in the service of their diverse interests. In this way, a student-generated curriculum has the advantage of providing unique insights as to how best engage students and make computing skills more accessible. Thus, we have spent ten weeks building an introductory computer science course for students specifically targeted for non-STEM majors. In this presentation we will describe how students will learn fundamental computing concepts that enable them to use computer science as a medium to express their ideas and creativity. The course involves manipulating data (including in some cases social, historical, and textual data) to create visual artifacts, and will be tested in a classroom setting in Fall 2016 on a sample size of about 24 students including 14 upperclassmen and up to 9 first-years. In addition, Brittany Caceres, '19, a student with very little computing background, is helping us test the course before we deploy it in the classroom. Through coursework based on investigating data and creating visual artifacts, our collaborative process presents a novel way of providing students with necessary computing skills while also encouraging them to think creatively about the general impacts of computing in society.

Author: Sabrina Malagon and Stephanie Salazar

Mentors: Ruth Tincoff

Institution: Bucknell University

Category: Social Science & Humanties

Title: Early Verb Comprehension in Toddlers in Relation to Motor Development

Abstract:

Infants understand words even if they cannot speak them. For example, 16- month-olds comprehend verbs (e.g., drink, wave) by looking significantly longer at videos of the actions that match the words than to videos that did not match (Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987). Other research, however, shows younger infants fail to understand verbs (e.g., hugging, running; Huttenlocher, Smiley, & Charney, 1983; Meints, Plunkett, & Harris, 2008). We hypothesize that infants' motor skills might relate to their verb comprehension. For example, a toddler who has started walking might understand "walk" while a toddler who has not started walking might not. Alternatively, verb comprehension might be guided by other mechanisms.

Abstract: Author: Emily Mausteller, Michelle Gillette, Rachel Snyder, and Tanya Matlaga (Ph.D.)

Mentors: Tanya Matlaga

Institution: Susquehanna University

Category: Biological Sciences

Title: Examining Terrestrial Soil Invertebrates to Understand the Impacts of Climate Change on the Red-Backed Salamander (Plethodon Cinereus)

Abstract:

Climate change is becoming an increasingly prevalent topic as it affects populations globally. Amphibians may be especially sensitive to climate change because of their specific habitat requirements. At Camp Karoondinha in Millmont, Pennsylvania, we examined the abundance and diversity of terrestrial soil invertebrates in an artificial climate change scenario. The invertebrates are a primary food source of terrestrial salamanders and their decline would initiate a trophic cascade, thereby leading to a decline in the abundance of salamanders. By examining the soil invertebrates, we can gain an understanding of both the direct and indirect effects of climate change on terrestrial salamanders, specifically the red-backed salamander (Plethodon cinereus). A study using cover board arrays to examine the demography of P. cinereus at Camp Karoondinha has been in operation since 2013. In three of the nine sites, we applied a snow removal treatment to imitate potential impacts due to climate change anticipated in the northeastern U.S. We collected three leaf litter samples from each site in spring and fall 2015 and processed the samples in a Berlese funnel apparatus to collect soil invertebrates. We quantified the invertebrates and identified them to class level (Collembola, Diplopoda, etc.). We also used a gastric lavage procedure on P. cinereus to determine which invertebrates are the primary food source of this species. Results show that the invertebrates found in the leaf litter samples are consumed by red-backed salamanders. The invertebrate analysis from spring 2015 showed no significant differences in abundance and diversity of invertebrates between snow removal treatment sites and control sites. The examination of fall 2015 and spring 2016 samples is in progress. We expect our results to provide insight into how climate change will impact terrestrial salamanders in northeastern U.S. forests.

Author: Rachel McDonald

Mentors: Kevin Ball

Institution: Bloomsburg University

Category: Biological Sciences

Title: Sex Differences in an Animal Model of Relapse to Highly Palatable Food Seeking

Abstract:

Relapse to unhealthy eating habits in dieters is often triggered by acute exposure to stress, palatable food, or food-associated cues (Grilo et al., 1989; Gorin et al., 2004; Torres and Nowson, 2007). Using an animal model of relapse, Ball et al. (In Press) reported recently that chronic exposure to stress following extinction of palatable food seeking potentiated later reinstatement of food seeking induced by acute stress. Furthermore, SCH-23390, a dopamine D1-like receptor antagonist, combined with repeated stress reversed the effect of stress on later reinstatement. Although the recent findings of Ball et al. (In Press) point to a neuropharmacological mechanism whereby chronic stress can potentiate relapse to palatable food seeking, the findings are based on studies using only male rats. It is possible that chronic stress has differential effects on male vs. female food-seeking behavior. Indeed, one of the brain regions critical to relapse, the medial prefrontal cortex (mPFC) (Sun and Rebec, 2005; Nair et al., 2011), is sexually dimorphic in rats (Kolb and Stewart, 1991; Markham and Juraska, 2002; Garrett and Wellman, 2009). Moreover, whereas chronic stress produced dendritic retraction in male mPFC, female rats showed stress-induced dendritic proliferation in the same region (Garrett and Wellman, 2009). Based on these findings, I hypothesize that chronic stress will have differential effects on relapse to palatable food seeking in male vs. female rats

Author: Yilan Miao and Dr. Courtney Thomas

Mentors: Courtney Thomas

Institution: Susquehanna University

Category: Natural Sciences and Engineering

Title: Creation of Clb2-YFP and Nap1-YFP to be Used With Elm1-CFP to Analyze Protein Interaction and Budding Yeast

Abstract:

Proteins located at the bud neck structure ring structure coordinate the cell morphology and nuclear division in Saccharomyces cerevisiae. The serine/threonine-protein kinase Elm1 is required for coordination of cell growth and cell division in a budding yeast. Previous work showed that Gin4p, Nap1p and Clb2p were found to co-purify with Elm1p. To verify these interactions, fluorescence resonance energy transfer (FRET) could be used. Plasmids which code for a cyan fluorescent protein (CFP) and yellow fluorescent protein (YFP) were used as a template for polymerase chain reaction (PCR). The amplified cassettes could be used to transform Saccharomyces cerevisiae. During this work, yeast strains expressing Clb2-YFP and Nap1-YFP were created. These strains will be used to verify the co-purification results via FRET.

Author: Elizabeth Miller

Mentor: Safa Saracoglu

Institution: Bloomsburg University

Category: Social Sciences & Humanities

Title: Deciphering Osama bin Laden's Radicalization Based on United States Actions, Policies and Presence 1990-2001

Abstract:

This research on the radicalization of Osama bin Laden analyzes the foreign and military policies of the United States along with their relations and presence in Afghanistan and Saudi Arabia from the mid 1980s to September 11, 200 to decipher some causes of Osama bin Laden's radicalization. This research also shows the growing threat level of Osama bin Laden perceived by the United States. Examining these policies provides a background into understanding bin Laden's grievances with the United States government and why he justified the terrorist attacks on U.S. soil on September 11, 2001. The actions of the United States were not the only facilitators to his radicalization, but the paper argued that these actions played a major role, and maybe a definitive role that lead to his breaking point inflicting massive casualties to United States citizens. Many do not understand why the United States, why the American people? This research attempts to provide some of bin Laden's arguments as to why he planned an attack on the American people, why implementing jihad on a Western country like the United States was necessary to him. He used the military actions and government policies of the United States, concerning the Middle East and used them as a justification for attacks, whether it was right or wrong. The purpose of this research is to show that the United States' actions in the Middle East had unintended consequences. In researching this topic, a multitude of primary sources are analyzed. I am examining State Department Cables, Osama bin Laden's fatwas (religious opinions or rulings), newspapers, CIA reports, Presidential Addresses, Executive Orders, and National Security Memorandums, among others. I recently contacted Peter Bergen, the CNN National Security Analyst, and he agreed to discuss his 1997 interview with bin Laden with me. This conversation will be included in the research. In addition secondary source material was analyzed to show the influence of other radical Islamic fundamentalists, like Sayyid Qutb from Egypt. The overall goal is to continue the research paper I have already started to show the overall importance and complexity of Osama bin Laden's radicalization.

Author: Madeline O. Minneci, Marissa W. Mitchel, and Abby E. Hare-Harris

Mentors: Abby Hare-Harris

Institution: Bucknell University

Category: Clinical and Translational

Title: Deviance Index Correlates With Quantitative Autistic Traits in Individuals With Reading Impairment

Abstract:

Individuals with neurodevelopmental disorders (NDDs) are characterized by the severity of deficits and timeline of attainment of milestones within developmental domains. Individuals fall into one of two broad developmental trajectory categories: developmental delay (DEL) and developmental deviance (DEV). DEL is described as a lag in the attainment of milestones across developmental domains, while DEV is described as a non-sequential attainment of milestones within a domain and is associated with autism spectrum disorder (ASD). In our previous study, we used a quantitative metric called deviance index (DI) to assess the degree of DEV in individuals with language impairment (LI) and/or ASD from the New Jersey Language and Autism Genetics Study (NJLAGS). DI measures DEV by quantifying atypical distribution of item-level responses in standardized assessments of development. DI is defined as the sum of the weights of incorrect items multiplied by the total number of subtest items. Item weights were defined as the percentage of unaffected participants who answered a question correctly. A higher DI score is indicative of a higher degree of DEV. We found that DI was positively correlated with ASD traits and individuals with ASD+LI exhibit a higher degree of DEV than those with LI-only. In the current study, we used DI to assess DEV of reading abilities in NJLAGS participants. We redefined the NJLAGS cohort into groups based on measures of autistic traits and reading abilities: unaffected (n=304), ASD (n=18), RI (n=76), and RI+ASD (n=20). We calculated DI weights as the percentage of participants without RI/ASD. We found that individuals with RI+ASD had significantly higher DI scores than those with RI-only in measures of reading and decoding as well as expressive, pragmatic, and higher-order language. Similar to our previous analyses, DI was correlated with a quantitative measure of autistic traits for all measures. These results indicate that individuals with RI+ASD exhibit a higher degree of DEV than individuals with RI-only, supporting previous reports of association between ASD and DEV. DI allows for a better understanding and description of NDDs with potential applicability for improved diagnosis and clinical care.

Author: Alvaro Montoya, Eric Gosslein, Peter Kerns, and T. Wade Johnson

Mentors: T. Wade Johnson

Institution: Susquehanna University

Category: Natural Sciences and Engineering

Title: Characterization of 1-amino-9,10-Anthraquinone in the A1 Site of PS I Complexes of the Plastoquinone-containing Mutants of Synechocystis sp. PCC 6803

Abstract:

In photosystem I of higher plants and cyanobacteria, phylloquinone (PhQ) acts as the secondary electron acceptor occupying the A1 site between A0 and the Fe-S clusters of the electron transport chain. Phylloquinone-less mutants, menA and menB, of the cyanobacterium Synechocystis sp. PCC 6803 have plastoquinone (PQ) occupying the A1 site and is capable of functioning as the electron acceptor in place of PhQ. Here we report experiments in which the growth medium of the mutant cells was supplemented with highly reducing 9,10-anthraquinones (AQ). As a result, the menA and menB mutants appeared to utilize the anthraquinone in the A1 site. The potentials of the supplemented AQ's are significantly more reducing than either PhQ and PQ by as much as 400mV. Because of this, the quinones may approach or exceed the potential of the primary acceptor, A0, and lead to unusual electron transition behaviors. The function of quinone molecules in the A1 site of the mutants was monitored by a home built pump probe laser system. The probe beam monitors the recombination of the electron from the terminal FeS clusters of PSI (e.g. P700+/F¬A/B¬¬-) The P700 back reaction kinetic lifetime changes as a function of quinone. The plastoquinone mutants shows a 3ms lifetime and samples containing AQs (e.g. 1-NH2-AQ) having longer lifetimes (100+ms). In decreasing the temperature, lifetimes change as a function of electron transfer pathways options. Glycerol is used as a cryogen but also seems to have a direct effect on the lifetimes. Room temperature and low temperature experiments with 1-NH2-AQ in various glycerol concentrations showed an altered lifetime. We suspect that these factors may play a role in extending the kinetic back reaction of the reducing AQ in the A1 site, resulting in a loss of the longer phase. We are currently characterizing and exploring these observations to develop a hypothesis on the effect.

Author: Nina Nevarez

Mentors: Christopher Magee, Tony Massoud

Institution: Bucknell University

Category: Social Science & Humanties

Title: Diffusion of the Arab Spring Movements Through Contagion and Demonstration

Abstract:

The Arab Spring has been a major topic of interest for scholars in a variety of fields since its beginnings, leaving many to investigate how the social and political movements progressed throughout much of the Arab world. Sometimes the protests and their "movement" across borders have led scholars and journalists to classify the effect as contagious, which creates the false impression that there is direct in-person link between the individual Arab Spring movements, as well as providing a negative connotation that discounts the rationality behind the protests. By conducting a literature review on both scholarly sources and news sources, it is evident that the movements in the various Arab countries shared some common elements and inspirations but that classifying them as a contagious diffusion without detailed explanation results in a mischaracterization of the events. While some may view the contagion effect as an effective way to capture the happenings of the Arab Spring, it neglects not only the individuality of the movements but also the more accurate depiction of them as mainly a product of the demonstration effect, where protesters were inspired by others to take action and not directly influenced through contact. While the contagion effect focuses on the emotional and social cues shared transnationally, classifying the Arab Spring as protests mainly inspired by the demonstration effect more correctly encompasses the subject by successfully capturing the spectrum of grievances and the methods through which these became known in each country.

Authors: Peter Lucas Nicolois and Mike DiDomenico

Mentor: Evan Peck

Institution: Bucknell University

Category: Natural Sciences and Engineering

Title: Using Wearables to Predict Dusceptibility to Implicit Biases

Abstract:

When people are stressed, research has shown that they are more susceptible to their implicit biases. However, a study by Lueke and Gibson, noted in the 2015 Implicit Bias Review, found that "mindfulness meditation was associated with a decrease in participants' implicit race and age bias" (2015 Implicit Bias Review, Lueke & Gibson). That study implies that if people were more aware of their negative biases, they would be able to reduce or eliminate them. Our research intends to identify and measure correlations between implicit biases, a factor for poor decision making, and physiological responses. To do this, we leverage the popularity of wearable computers as they become more comfortable and convenient, providing useful data about the wearer. These lightweight computers contain physiological sensors that deliver data in real time, and provide insight into the user's psychological state. Since a physiological response and cognitive workload can both be correlated with biased behavior, we explore measurable correlations between physiological signals and worse decision making (or biased behavior). We use machine learning methods to generate a model for evaluating the physiological data, including GSR, skin temperature, and heart rate, along with known cognitive load, that will allow a system to predict when an individual may be more susceptible to unconscious biases. The wearable device we use in our experiments is the Empatica E-4, which is worn on a participant's wrist. In order to train the machine learning system, we use an n-back test, a test already well validated in the psychology community to cause high cognitive load. Afterwards, participants will take Implicit Association Tests (IAT) - a task that highlights our subconscious biases - while simultaneously experiencing varying workload simulated by a digit memorization task. We will record data from the participants during the test, along with the workload they are under, and attempt to simulate real time predictions of workload along with mistakes and biases of the participant.

Author: Courtney Pachucki

Mentors: Drue Coles

Institution: Bloomsburg University

Category: Natural Science & Engineering

Title: Ethical Agents: An Analysis of the Inadequacies of Top-Down Approaches

Abstract:

Allen, Smit, and Wallach describe in their paper "Artificial morality: Top-down, bottom-up, and hybrid approaches" two main strategies for implementing artificial morality in machines. Top-down approaches implement "moral theories" while bottom-up approaches describe "environments" for machines to learn in. The goal of this paper is to argue that a machine whose morality has been implemented by a top-down approach cannot be sufficiently independent enough for it to be classified as a full ethical agent, therefore the only options for creating moral agents are bottom-up and hybrid approaches.

Author: Professor Zhiqun Zhu and Jake Papa

Mentors: Zhiqun Zhu

Institution: Bucknell University

Category: Social Sciences and Humanities

Title: Chinese Investments in Latin America: The Mexico Question

Abstract:

The objective of this research is to explore the trends of China's investments in and relations with Latin America. More specifically, this research explores the relationship between China and Mexico in comparison to China's relations with other Latin American countries. It will shed light on the current state of Chinese-Latin American economic, political, and cultural relations, and particularly relations between China and Mexico. China's economy has been rapidly growing for the past 40 years through the process of embracing free-market principles. Since joining the World Trade Organization in 2001, China has expanded trade with multiple partners around the world, most notably the United States, EU, and Japan due to their economic power. It often goes overlooked, however, that China also has robust economic ties with many countries in Latin America, which provide large quantities of raw materials and agricultural goods to China. As a result, China has become a top trade partner of many countries in the Western hemisphere. Not all Latin American countries have strong economic ties with China, and some have received more investments from China than others. It is puzzling why Mexico, a major economy in the region, has not received as many investments from China as Brazil and Argentina have. Our hypothesis is that Mexico's relationship with China is not nearly as strong as relations between China and some other Latin American countries due to a host of political, economic, geographical, and cultural factors. To conduct this research, we have accessed writings of US, Chinese, and Latin American experts on China's economic relations with Latin America. We have looked at economic data as well as non-economic analysis. At this point in our research, we can tentatively conclude that our hypothesis is valid. There is indeed a spectrum of relationships between China and Latin America, ranging from strong to weak, and Mexico's economic ties with China are relatively weak because of a variety of reasons that can be categorized into economic, political, geographical, and cultural differences that exist between Mexico and other countries in Latin America.

Author: Harold Post Jr

Mentors: Lisa Stallbaumer-Beishline

Institution: Bloomsburg University

Category: Social Science & Humanties

Title: History and Responsibility: Transforming a Historical Event into a Commercial Product

Abstract:

Historical events have long been used as inspiration for storytelling, but how does the storyteller chose between the parts of the event to include and those to exclude? This has been one of the main questions throughout my research. The commercialization of such historical narratives led to the speculation as to whether commercialized products could be historically accurate. One of the best methods for researching these questions involved some first-hand experimentation, i.e., turning a historical event into a commercial product. I chose the persecution of homosexuals during the Third Reich as such an event to transform into a commercial product. The methodology of such an activity had three distinct stages: (1) analyze the role of homosexuality and homosexual behavior in films involving Nazism and Fascism, (2) utilize my previous research into the subject and conduct further research at the United States Holocaust Museum and Memorial, and (3) write a full-length feature film screenplay about the persecution of homosexuals during the Third Reich. The analysis of the role of homosexuals and homosexual behavior in films mirrored the historiography of the persecution of homosexuals in several regards. At first, filmmakers viewed homosexuals not as the persecuted, but as the persecutors. Eventually, homosexuals became background characters for light relief; however, they provided no influence over plot or the development of other characters. It was not until the mid-1980s when homosexual characters became devices to further story. With the emergence of the gay rights movement, homosexuals became main characters to carry stories on their own. With this knowledge of their role in the past and along with my extensive research, I went about turning the persecution of homosexuals into a screenplay. Along the course of the transformation, several questions came to the foreground that are in the process of being answered—how can one turn an event as violent and tragic as the Holocaust into a product of entertainment, can history be told in a way that generates truth and accuracy through cinematic means rather than the academic, and what is the responsibility of the storyteller towards his/her historical material?

Author: Rebecca Reeve

Mentors: Janice Mann

Institution: Bucknell University

Category: Social Sciences & Humanities

Title: Feminism in the Archives: Packwood House Museum

Abstract:

Packwood House Museum, founded in 1976 in Lewisburg Pennsylvania by Edith and John Fetherston is one of the first "House Museums" in Union County. It contains the objects collected by Edith Fetherston, the canvases she painted, the garden she designed and an archive of papers relating to her and her husband, John Fetherston. The archives span the history of both Edith's and John's careers, interests and family histories. My project seeks to begin the digitization process of the Packwood House Museum's archival collection of postcards, letters, journals and ephemera. I hope to create an organizational process that will allow future research students to continue digitization in other sections of the archives. I chose to focus specifically on Fetherston's postcard collection, both those received and collected, as they shed significant light on who she was as a person and collector. While most of the objects inside the museum were collected and curated by Edith Fetherston, her representation in the archives, in terms of how organized and documented her papers are, is considerably less than that of her husband, John. While John Fetherston did make significant contributions to New York City through the creation of the Department of Sanitation, the archive is split evenly in terms of space between husband and wife. Even though this is the case, past archivists have dedicated significantly more time to keeping an explicit record of John's documents where there is little to no information on that of Edith. This research has opened up the question of whether or not archiving is a historically gendered practice. If this is indeed the case, the archival process as a whole needs to be examined in its tendencies to favor male patrons or creators and the heightened dedication to preserving their works and words over those of their female counterparts. There remains a clear lack of documentation and devotion given to Edith Fetherston in the Packwood House Museum archives and I plan on creating a finding aid and an online resource that will better document scope of the archives, giving equal attention to both Edith and John Fetherston.

Author: Brook Reichenbach

Mentors: Jessica Defenderfer

Institution: Bloomsburg University

Category: Social Science & Humanties

Title: Media-Framing: Revealing Donald Trump's Character through the Eyes of the Beholder(s)

Abstract:

With presidential elections quickly approaching, this is an ideal time to study media framing of Donald Trump's speeches and the effect of ideological biases on this framing. However, since Donald Trump has only recently become a prominent figure in the media news, few have analyzed representations of his candidacy through the lens of media framing. I analyzed transcripts from three TV News stations, FOX News (conservative), MSNBC (liberal), and CNN (independent), between the dates of February, March, and April 2016. A content analysis was performed on three categories of terms, leadership qualities, character words, and party based words, to answer the question of how media outlets vary their use of ideological, leadership, and character base terms of Donald Trump. This poster will discuss the effects of media framing and explore potential consequences of any framing found in analysis on voter perception.

Author: Abigail Ruths

Mentors: Sharon Larson

Institution: Geisinger Health System

Category: Social Sciences & Humanities

Title: How Does Participation in Physical Education Class Differ Between Depressed and Non-Depressed Youth?

Abstract:

Objective: To explore the relationship between feelings of sadness/hopelessness and physical education class attendance in youth grades 9-12. Background: It is widely accepted that physical activity improves overall health. In particular, it can mitigate depression. Physical education classes are intended to "provide students with the knowledge, skills and confidence needed to participate in health enhancing physical activities for a lifetime, not just their time in school." This may be even more important in students who show signs of depression at an early age. However, little is known about how depressed youth participate in physical education (PE) classes. Hypothesis: Depressed youth are less likely to participate in physical education class. Data/Methods: This study aims to investigate whether differences in participation in PE exist between youth that are and are not depressed. Data from the 2013 Youth Risk Behavior Surveillance Survey was used in this cross-sectional study design. Data analysis was conducted using a test of proportional differences. The Chi-squared test statistic was used and statistical significance was determined at a probability level of $p < 0.05$. Results: Depressed youth demonstrated significantly lower levels of PE participation ($X2 = ?$, $p = ?$). Conclusions: Lower participation in PE among depressed youth is detrimental to mental health status. Practical implications include investigating whether changes in PE curricula would encourage greater participation among depressed youth.

Author: Samantha Salazar

Mentors: Toshiro Kubota

Institution: Susquehanna University

Category: Natural Sciences & Engineering

Title: Segmentation of the Left Ventricle using Isotropic 4D MRI

Abstract:

Magnetic Resonance Imaging (MRI) is used to obtain images of the body using magnetic fields and radio waves. The use of this non-invasive technique has been proven effective to diagnose cardiovascular diseases. However, automating the diagnosis process has been difficult because of the complexity of the heart with many intricate components. Furthermore, its perpetual motion makes it hard to get clear cut images. In this project, our goal is to segment the left ventricle from the isotropic 4D (3D + time) MRI images. The data provides 3D volumes in motion, thus can provide more comprehensive information than EKG and echocardiograms. We are interested in the health of the left ventricle since its main function is the pumping of oxygenated blood to the entire body, and its malfunction causes most cardiac pathologies. Our algorithm takes the 4D images and a click point placed inside the left ventricle, and attempts to segment the left ventricle at the beginning of the systolic phase. It consists of two major steps: extraction of areas with high intensity values (called foreground) and extraction of a near-convex part from the foreground at the click point. Four MRI data were provided by the Fronwalt Lab at Geisinger Hospital with manual annotation of the left ventricle. We tested our algorithm with the data set and used Jaccard similarity measure to evaluate the performance quantitatively. The average similarity measure across four data sets and five different click points was 73% and the average running time was 24.3 seconds on a PC with 3.40GHz CPU and 8MB RAM. Future works include extraction of the right ventricle of the heart, which takes deoxygenated blood and pumps it to the lungs. The right ventricle has non-convex shape and thus is more challenging to segment than the left counterpart. Another future direction is to segment the ventricles in the 4D domain as a whole.

Author: Catherine Scott

Mentors: Ruth Tincoff

Institution: Bucknell University

Category: Social Science, Arts & Humanties

Title: Parent-Infant Interactions during Motor Play: Implications for Developing Verb Comprehension

Abstract:

The first words that infants understand are nouns and then verbs follow subsequently (Fenson 1994). In infant development research, it is recognized that sizeable progress in word comprehension is accompanied by large advances in motor abilities, most notably the onset of walking. It is also recognized that these parallel changes have a "complex", "multifaceted" relationship (Iverson 2010). In the present study, we explore the relationship between motor abilities and word comprehension, specifically how infants' emerging motor abilities might shape the way parents communicate with infants about actions. We hypothesize that parents might use action words, verbs, while infants are engaged in the motor actions in ways that might highlight the word meaning relationships, thus helping infants to understand verbs. Alternatively, there might be little correspondence between parents' words and infant actions suggesting other mechanisms that support verb comprehension. To investigate these hypotheses, we asked parents to play a motor activity game with their infant in which the goal is to encourage the infant to do different actions (e.g., clap, stand, walk, climb, clean). The procedure consists of presenting parents with a practice phase and then a set of 12 action words from three categories: whole body (Jump, Dance, Walk, and Run), whole body with object (climb, slide, kick, ride), and manual with object (clean, throw, sweep, read). Parents introduced each action to their child in a random order and in whichever way felt comfortable. The sessions were video recorded with parent consent. Subjects of this study were parents and infants recruited from the local community, with 27 included pairs in total. We used ELAN (EUDICO Linguistic Annotator) to view the recordings, mark the segments for each target action, transcribe the parent's speech, and to code the parent and infant behaviors and the infant's vocalizations. Data coding and analyses are still in progress.

Author: Jordan Sechler, Lane Harrison, and Evan M. Peck

Mentors: Evan M. Peck

Institution: Bucknell University

Category: Natural Sciences and Engineering

Title: Sightline: A Tool to Unify Interactive Visualizations on the Web

Abstract:

For any given topic on the internet, there are numerous datasets, each of which may be visually communicated using any number of representations. The internet has created communities which create large numbers of data visualizations, but these visualizations exist mostly in isolation from each other, and even those which share a topic are rarely aggregated together. This begs the question, how can we leverage the web's existing ecosystem of rich interactive visualizations to help people discover, compare, and investigate the complexities of the 21st century? We present Sightline - a web application that seeks to unify the disparate visualization ecosystem on the web. Sightline is a two part system. The first is a Google Chrome browser extension which runs in the background as a Sightline user browses the web, and activates itself when the user visits a page containing a data visualization. The extension then submits some relevant data about the site, alongside an image of the visualization to the second part of the system, the server. The server receives the information from the Chrome extension, and uses the IBM Watson AlchemyLanguage API to gather even more information about the site, such as keywords, concepts, and categories the site may fit. Users can then view this information, and all of the visualizations we have collected, on our website, sightlinevis.com Sightline maintains a personal browsing history for each user, which allows them to visit Sightline and rediscover visualizations they didn't save in a typical fashion, like bookmarking. Users can only see their personal browsing history. Sightline provides a discovery service for users by using the aggregate data of all of our users to provide categories like "trending", which allow users to discover visualizations that are popular among other users of the site. We also provide an interface for searching the visualizations we have collected, so that, for example, a politically conscious user could search for visualizations related to elections. Our goal is to encourage the development of tools and systems that leverage the diversity and rich information already existing on the internet.

Author: Bryan Semon

Mentors: Peter Stine

Institution: Bloomsburg University

Category: Natural Science & Engineering

Title: Harmonic Oscillations in the Central Star Planetary Nebulae NCG 6826

Abstract:

This research was focused on finding all periods of oscillation in the central star of planetary nebula NGC 6826. All stars oscillate to some degree, but the reason for the oscillation and the period of that oscillation can tell you a lot about the star (mass, density, spots, etc.). From our preliminary data there seemed to be a long term oscillation that was yet to be noted in any publications on this star. Though all periods of oscillation were looked at, it was these long term ones that were of particular interest. The data confirmed initial suspicions that there was indeed a long term oscillation. There was significant variation on a period of about 15 months.

Author: Ariel Senackerib

Mentors: Janice Mann

Institution: Bucknell University

Category: Social Sciences and Humanities

Title: Dreaming of Asia: The Artwork of Edith Fetherston

Abstract:

The Packwood House Museum, located in Lewisburg, Pennsylvania, displays objects collected by Edith and John Fetherston, over one hundred canvases painted by Edith, and a garden she designed. Edith Fetherston was a well educated American woman collector, with an interest in foreign cultures. This interest resulted in her extensive travels, and an interest in Asian objects which she collected and displayed in her house and the use of "exotic" imagery in her paintings. Fetherston's paintings, still on display at the Packwood House Museum, have never been studied previously. She worked primarily in the first half of the 1930's and created most of her work in a short period of time. This resulted in works that are mainly consistent in style and content. My project examines her paintings within context with her sketchbooks, photographs, and other preparatory materials. I will examine her artwork in terms of her life as a wealthy female collector for whom painting was as just one part of a gentile lifestyle. While Fetherston had some artistic education during her period of painting, she never received extensive formal artistic training. She was encouraged by her teachers at the Carnegie Institute to pursue her own style. This led her to establish a painting style of colorful impressionistic settings and backgrounds, with highly detailed flowers, Asian vases and imagery floating on top of it.The prevalence of Asian objects and influences in her designs are visible, and show Fetherston's interest in other cultures and intellectual pursuits. I will demonstrate that her body of work represents her interpretations of other cultures, in combination with her own philosophical and artistic ideas. Due to the limitations of the time I will focus on a few paintings that are the most characteristic of Fetherston's works that use Asian imagery. Considering this is the first research to be done on these paintings, this will offer new insight on her work, and place her into a broader artistic context of American painters examining the exotic at this point in time.

Author: Laura M. Sitler and Christopher P. Hallen

Mentors: Christopher P. Hallen

Institution: Bloomsburg University

Category: Natural Sciences and Engineering

Title: Whose Electrolytes Were These? A Water Quality Survey of the Towanda Creek Watershed, Bradford County, PA

Abstract:

When determining the water quality of a body of water, evidence of what is happening in the environment is present in the samples. Bradford County is highly active with a large number of fracking wells and the impact on the environment is a major concern. While no major leaks or accidents have happened in the past five years from any of these wells, their impact on Towanda Creek was the focus. Two separate sampling trips were taken to Bradford County for sampling of Towanda Creek from Canton to Leroy. An Exo2 Sonde was used to take in situ measurements of pH, conductivity, turbidity, and dissolved oxygen of the water before the samples were transported back to the lab for further analysis. Upon the initial measurement of Towanda Creek, the conductivity levels were much higher than expected for freshwater samples in northern Pennsylvania with the average conductivity within the creek at 2645 mS/cm. Using the Sonde, it was discovered that the tributary, Alba Creek was the main source of the high levels of electrolytes with an average conductivity reading of 3286 mS/cm. When tested in the lab, ICP-OES detected levels of lead, cadmium, and arsenic above the maximum contaminant level (MCL) for drinking water. This raises concern because this is the source of water for cities/boroughs along the creek. The IC also detected a relatively high level of calcium but not higher than the MCL. When determining the water quality of a body of water, evidence of what is happening in the environment is present in the samples. Bradford County is highly active with a large number of fracking wells and the impact on the environment is a major concern. While no major leaks or accidents have happened in the past five years from any of these wells, their impact on Towanda Creek was the focus. Two separate sampling trips were taken to Bradford County for sampling of Towanda Creek from Canton to Leroy. An Exo2 Sonde was used to take in situ measurements of pH, conductivity, turbidity, and dissolved oxygen of the water before the samples were transported back to the lab for further analysis. Upon the initial measurement of Towanda Creek, the conductivity levels were much higher than expected for freshwater samples in northern Pennsylvania with the average conductivity within the creek at 2645 mS/cm. Using the Sonde, it was discovered that the tributary, Alba Creek was the main source of the high levels of electrolytes with an average conductivity reading of 3286 mS/cm. When tested in the lab, ICP-OES detected levels of lead, cadmium, and arsenic above the maximum contaminant level (MCL) for drinking water. This raises concern because this is the source of water for cities/boroughs along the creek. The IC also detected a relatively high level of calcium but not higher than the MCL.

Author: Katie Starliper

Mentor: Julie Vandivere

Institution: Bloomsburg University

Category: Social Science & Humanties

Title: 1000 Words: Degrees of Relation Between the Written and the Visual

Abstract:

The goal of this project is to express the relationship between the written word and visual art. It seeks, ultimately, to understand the two not as uniquely different means of expression, but as two points on a spectrum with degrees of intersection. This issue was approached by first understanding how a similar (albeit more extremely opposed) pair, the organic and the mechanical, find a similar overlapping. This understanding was gained through the late works of the modernist writer Virginia Woolf, as she was a member of the Bloomsbury society, a group of writers and artists living and working together in the 20th century. Work on this subject was presented at the 26th International Conference on Virginia Woolf in Leeds, United Kingdom. Using this understanding of the fine degrees of relations between two opposing ideas, a collection of artwork was created discussing the relationship between words and art. This collection addresses three degrees of relation: bodies of text (specifically poetry), individual words, and letters. Understanding how each element of the written translates to the visual makes apparent how the two seemingly separate entities are in fact interdependent forms of expression. When understood in this manner, evaluation of art and text can be expanded, and the experience of the visual arts and reading can take on a new dimension.

Author: Rachel Snyder, Emily Mausteller,and Dr. Tanya Matlaga

Mentors: Tanya Matlaga

Institution: Susquehanna University

Category: Biological Sciences

Title: Do Forest Roads and Streams Restrict Movement of Red-Backed Salamanders (Plethodon Cinereus)?

Abstract:

Landscape features such as roads and streams can inhibit movement of species with poor dispersal capabilities and high sensitivity to habitat alteration. Terrestrial salamanders are generally thought of as incapable of long distance movements. However, records suggest that individuals will travel up to 90 meters to return to their territories. Different sexes and size classes of salamanders may vary in their return rates. Our study examines whether forest roads and streams are potential obstacles in the return of red-backed salamanders (Plethodon cinereus) to their territories. The red-backed salamander is abundant and widely distributed, and behaviorally and physiologically similar to other terrestrial salamander species. We began an experimental study at Camp Karoondinha in Millmont, PA in June 2015 to quantify recapture rates of P. cinereus after displacement across roads and streams. All salamanders collected within six cover board plots (40 cover boards each) were marked using visible elastomer and then assigned to either the control and returned to the cover board it was found under, or a treatment, displacement 25 or 50 m through either the forest or across a stream or road. Of our current sample size of 192 marked individuals, 23% have been recaptured. Approximately 39% of individuals in the control, 26% displaced 25 and 50 meters into the forest, and 16% and 8% displaced over a barrier, 25 or 50 m respectively, were recaptured in their original cover board plot. Our results so far suggest that P. cinereus are capable of moving across barriers but return rates are reduced with greater distance and when an obstacle is present. We expect to continue our study until summer 2017 and then compare return rates across treatments, sexes and size classes to better understand the effects of roads and streams on terrestrial salamander movement.

Author: Anton Soloviev and Toshiro Kubota

Mentors: Toshiro Kubota

Institution: Susquehanna University

Category: Natural Sciences & Engineering

Title: Machine Learning With Brain-Inspired Architecture

Abstract:

Numenta Platform for Intelligent Computing (NuPIC) is an open source project designed to allow its users to experiment with an unsupervised machine learning model. Its main purpose is to detect patterns in data. It does not require any labeled data for training, thus is more amiable to human-like learning than supervised models. The platform is still evolving and changing, which makes adopting the technology for custom applications challenging. The goal of our project is to investigate the strengths and weaknesses of NuPIC by applying it to a specific pattern detection problem, namely EKG anomaly detection. The application is important in its own right because it can be used to help diagnose various kinds of heart disease. Furthermore, EKG anomaly detection is a challenging problem because the data that is being analyzed is biological, meaning it is not consistent and the patterns are hard for current machines to predict. Expected outcomes of our research are to successfully implement a different type of machine learning model and to have it predict and analyze anomalies within EKG. We also provide instructions and tips for creating a pattern detection application with NuPIC.

Author: Lydia Stebbins

Mentors: Faith Warner

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: The Shift from Local Market to Supermarket in Mexico

Abstract:

With the global epidemic of obesity and its related health concerns on the rise, it is important to consider what has changed throughout the world to result in such a health crisis. The shift from local market to supermarket should then be of great interest for the global community, as it could be a key contributing factor to this new global problem. My research work targeted this global trend, evaluating why the local market practices in Mexico seem to be falling behind the shopping experience offered by the supermarkets. I hypothesized that while many would still visit the local markets for the interpersonal relationships built within that environment, as the new generation rose their interest in the culturally significant local markets would fade in front of the ease of the supermarkets. To test my hypothesis I traveled to Xalapa, Mexico to evaluate for myself the local market scenes. I visited various local markets and supermarkets to observe those who visited and the produce offered. I performed semi-structured interviews to develop a better understanding of the local market culture and importance. I also conducted online surveys to gather a larger pool of data from a variety of demographics to further understand the population's opinions on the local markets and supermarkets. What I found after evaluating my own observations and the results of the online surveys is that my hypothesis was half correct. The youngest generations preferred the supermarket, the middle generations seemed to lean toward both markets while the older generations seemed to show a slight tendency toward the supermarkets. For the global community, this trend seen in the Mexican markets is of severe importance. As supermarkets occlude the local markets what effect will this have on the local communities, their cultural dishes, their preferences in food, and the effect on their waistlines? To begin combating the global obesity we must first consider its origins, which may very well begin with the exchange of the local produce offered in local markets for the processed goods and imported produce of supermarkets.

Author: Andrew Steely, Ciara Whipp, Carl Faust, and John Huennekens

Mentors: Carl Faust

Institution: Susquehanna University

Category: Natural Sciences and Engineering

Title: Spectroscopic Studies of the $4^3\Pi$ Electronic State of the NaCs Molecule

Abstract:

We present results from experimental studies of the $4^3\Pi$ electronic state of the NaCs molecule. Sodium and cesium metal were loaded into a five-arm heat pipe oven and heated to a temperature of 300º C. Two narrow-band, tunable cw lasers were used in a pump-probe scheme to induce transitions in the molecule. Transitions were detected by observing fluorescence through a side arm of the heat pipe with a photomultiplier tube. The total energy of the molecule can be broken down into it three types of motion: electronic, vibrational, and rotational. The electronic energy of the molecule is represented by a potential energy curve, which shows how the electronic energy varies with internuclear separation. Theoretical calculations of NaCs potential energy curves indicate that the $4^3\Pi$ electronic state displays a unique double minimum structure. Observations of fluorescence from discrete rotational and vibrational levels associated with the $4^3\Pi$ electronic state display unique patterns because of this double minimum structure. Collisions with other species present in the heat pipe allowed a larger range of rotational levels to be excited and entered into the dataset. Further information can be obtained by resolving the fluorescence associated with transitions from the $4^3\Pi$ to a lower unbound electronic state. These, so called, bound-free spectra show significant interference features due to the double minimum. Simulations of resolved bound-free fluorescence spectra using the BCONT program were used for identification and preliminary adjustment of the theoretical potential energy curve. Spectroscopic constants describing the observed rotational and vibrational level energies of the $4^3\Pi$ electronic state are presented as a preliminary step toward an experimentally accurate potential energy curve for this state.

Author: Aviel Justice Stein

Mentors: Toshiro Kubota

Institution: Susquehanna University

Category: Natural Science & Engineering

Title: Application of Supervised Deep Learning to Hyperspectral Bathymetry Problem with TensorFlow

Abstract:

Estimating the depth of shallow water via remote sensing is an important task for maritime navigation and environmental monitoring. Hyperspectral imaging has been shown effective for the purpose, yet estimates by state-of-the-art analytical methods can be off by as much as a meter, even in calm water. In this work, we investigate if supervised deep learning can be used to improve the state-of-the-art. We approached this problem by using different styles and depths of neural network. The hyperspectral data was collected by a Hyperspectral Tethered Spectral Radiometer Buoy (HTSRB). We have access to seven transects work of data, each with about 500 depths measured and associated hyperspectral data at 61 wavelengths. To create and run the neural networks we used TensorFlow, a modular machine learning software library created by Google. Our initial work with convolutional neural nets showed significant promise. The results of network with two convolutional layers resulted in 0.195 meters of error on average which is down from the average of 0.340 meters by a state-of-the-art analytical model. We are in the process of collecting more data from a wider variety of networks. We will measure the performance of each network by comparing its runtime and average error so that we can identify important parameters.

Author: Daniel J Steinhauser

Mentors: Mathew C. Ricker

Institution: Bloomsburg University

Category: Natural Sciences & Engineering

Title: Quantification of the Spatial Extent and Water Quality Improvement Functions of Alluvial River Islands in the North Branch Susquehanna River Basin

Abstract:

Eastern Pennsylvania's history of coal mining is known to have caused environmental degradation to the land and water systems of the region. River islands in the North Branch Susquehanna River have been found to capture large quantities of anthracite coal during flood events, as sediment velocity slows due to obstruction by vegetation. Soil samples (n = 10) gathered on the surface of two river islands were examined under a microscope for visible quantities of coal pollution and analyzed using X-ray fluorescence to measure the concentrations of lead, arsenic, and zinc retained in the upper 10 cm of sediment. The percentage of coal sand found within the collected samples ranged from 2 – 10.5% and metal concentrations ranged from 13.1 – 35.33 ppm Pb, 7.67 – 16.82 ppm As, and 82.87 – 348.83 ppm Zn. On average, samples possessed elevated concentrations of Pb and several times higher concentrations of Zn in comparison to Pennsylvania background levels. Lenses of high concentrations of coal pollution have been found within river island soils to a depth of 1.5 meters, and are believed to appear as deep as 5 meters. These levels have decreased in more recent sedimentation, in response to modern environmental policy. The presence of elevated concentrations of metals on the island surfaces suggests these islands continue to be a major water quality improvement function and preservation of these landscapes is necessary to protect downstream waterways.

Author: Christiana Straub

Mentors: Toshiro Kubota

Institution: Susquehanna University

Category: Natural Sciences and Engineering

Title: Reconstruction with Flags: An Experiment in Computer Vision Using Tracking to Develop Three Dimensional Models

Abstract:

The goal of this project is to automatically track flags in outdoor with an uncalibrated and unconstrained video camera and compute the distances between these flags accurately in three dimensional space, up to the scale. Such a tool would be highly useful for many scientific experiments where spatial arrangements indicated by markers need to be recorded. With advances in unmanned aerial vehicles, the value of this tool will definitely increase. In this part of the project, we use an uncalibrated hand-held camera to record a scene comprised of multiple different colored flags laid out in an open lawn area. The size of the flags are relatively small and multiple flags of the same color are placed in groups around the lawn. Video clips are taken by circling around the experiment area once and are typically about forty seconds in length with one thousand frames. We will use a custom program made with OpenCV to detect and track these flags automatically. Afterwards we will use an off-the-shelf tool, VisualSFM, to compute the 3D coordinates of the tracked flags. Once that is done we will compare the accuracy of this approach to a software called Blender which requires manual detection and semi-manual tracking. As of this writing, the data is being collected and therefore any results along with performance comparisons will be presented at the conference. In the future we would like to be able to obtain fully automated implementation of the application where reconstruction is done online in real time. This will require serious improvements of both the detection and tracking, as well as a new algorithm for reconstruction. Finally, testing this algorithm with visual data collected by a drone needs to be done. Our work here is just a small stepping stone towards tackling a larger problem. We hope that it will help us advance toward a greater understanding of computer vision and potentially human vision as well.

Author: Megan Summers

Mentor: Kevin Myers

Institution: Bucknell University

Category: Biological Sciences

Title: Metabolic Preparatory Responses to Flavor-Nutrient Learning and its Effects on Subsequent Meal Patterns.

Abstract:

Preferences for certain flavors above others are learned through experience. In rats, a flavor paired with intragastric glucose infusion is preferred and consumed in higher amounts as compared to a flavor paired with intragastric water infusion. From an evolutionary standpoint, consuming larger meals of calorically dense food is more efficient than foraging for food more often. This has been believed to be a factor in the overeating of high calorie foods seen in society today. New data shows a different effect of flavor-nutrient pairing on overeating and weight gain. A recent study indicates that individuals who showed the largest intake of the flavor paired with intragastric glucose gained the least amount of weight on an ad libitum cafeteria diet (Myers). The current study looks at possible explanations for how learned control of metabolic preparatory responses may be one way flavor-nutrient learning helps to protect against weight gain. 17 male rats received intragastric (IG) catheters 1 week prior to training. All rats were habituated to boxes equipped for counting licks with 0.2% unflavored saccharin. Each rat was randomly assigned to have either cherry or grape be paired with IG glucose (CS+) while the other is paired with IG water (CS-). We hypothesize that CS+ flavors will cause a learned rate of gastric emptying that allows for release of digested material from the stomach into the intestines at a constant correct rate. Testing for gastric emptying is done post 10-min access to the flavor being tested through blood sampling at 0,10,30 and 60 min. In addition, meal patterns may change as a result of preparatory responses. Rats are given 30-min sessions to a flavor with IG infusion and then placed in an operant box that gives second by second resolution meal patterns. Sessions were done with CS+ flavor and IG glucose, CS+ flavor and IG water, CS- flavor and IG glucose and CS- flavor and IG water to control for confounding variables. The overarching purpose of this study is learned experience with flavors paired with post-ingestive consequences and their physiological effects on appetite.

Author: Maggie Carlson and Louis Tobias

Mentors: Elizibeth Durden

Institution: Bucknell University

Category: Social Sciences & Humanities

Title: Dreamers: Immigrant Youth Fighting for Opportunity

Abstract:

Since changes in U.S. immigration policies in the 1980's and 90's, there has been an increasingly large, settled undocumented population nationwide. As a result of their family's residency in the United States, a remarkable portion of foreign-born children reside and grow up in the US without legal status. The Development, Relief, and Education for Alien Minors (DREAM) Act was first introduced to Congress in 2001 as a potential pathway to citizenship for qualified undocumented immigrants who traveled to the US as children. 15 years later, the DREAM Act remains in congressional gridlock. In response, President Obama enacted the Deferred Action for Childhood Arrivals (DACA) program in June 2012, an Executive Order that protects undocumented immigrants of a specific age, residency, and educational criteria from deportation. These young immigrants have been named the "DREAMers." This work explores how immigrant youths have pushed immigration policies to better serve themselves and their community. Additionally, it looks at how immigrant youths have responded to oppressive immigration policies that have literally destroyed immigrant communities.

Author: Patsy VanDyke

Mentors: Faith Warner

Institution: Bloomsburg University

Category: Social Sciences & Humanities

Title: Why Do People Cycle?

Abstract:

The cycling culture is an interesting mixture of adults, including the young and old, the novice, the professional, and anywhere in between. Through ethnographic research, I peered through the anthropological lens at cycling in order to gain a perspective on how cycling enthusiasts overcome sociological, psychological, and biological problem and issues. Commonly, many people are able to manage issues such as depression and health concerns, but what is uncommon is the way in which cyclists are better able to battle a multitude of problems of the human experience through the simple act of balancing oneself on two wheels and going for a spin. The methods I used to explore the world of the bicycle include interviews, surveys and participant observation. This research presents the members of this subculture and as they practice recreation, health, transportation, sport, and environmental activism and awareness through cycling. By peeling back the layers of what normally is thought of as a simple act, this study on cycling indicates that there are many benefits to be gleaned from a childhood pastime. Bicycle culture holds numerous facets, many of which can educate each of us for a better lifestyle, not only for our own health, but for our only home, planet earth.

Author: Shana Wagner, Sarath Babu Krishnamurthy, Janet Robishaw, David J Carey, and Raghu Metpally

Mentors: Metpally, Raghu

Institution: Geisinger Health System

Category: Clinical & Translational

Title: Genetic Variant Burden of Pharmacogenomic Genes from 51,289 Individuals Analyzed Through Whole Exome Sequences (WES) from Discover Study Cohort

Abstract:

Personalized medicine uses an individual's genetic information, in combination with family history, lifestyle and environmental conditions to customize health management, and can provide more educated predictions about a patient's risk of developing certain diseases, and response to drugs. Genetic factors can account for a high percentage of patient variability to drug response. The same dose of one medication can be effective for one patient, while being ineffective and/or toxic for another. Adverse effects can impact a substantial percentage of health care costs and are the fourth leading cause of death. Genetic information (linking genotypes to phenotypes) in healthcare has potential benefits, by allowing doctors to make better informed clinical decisions, to implement targeted therapies, and to select alternate medications available or adjust the drug dose, which can reduce the probability of adverse drug reactions in patients. To take the initial steps towards pharmacogenomic return of incidental reports, the following were attempted: 1) build a WES based workflow to quantify the genetic variation among pharmacogenes (Table 1) and link identified clinically actionable (CPIC) gene variants to Electronic Health Records of patients, 2) quantify the impacted drug prescriptions by CPIC variants effecting metabolism of these drugs, and 3) build a personalized pharmacogenomic clinical report with the CPIC recommendations. Variants identified need validation in a CLIA-certified Lab, before including in consenting patients' health records. Table 1: Selected Cytochrome P450 gene variants among DiscovEHR individuals, with minor allele frequencies in different cohorts / Gene StarAllele Homozygous Heterozygous GHS_AF 1kgP1_AF 1kgP3_AF Exac_AF deCODE_AF ESP6500E_AAF / CYP1B1 *3 12.54% 31.87% 0.5682 0.61 0.6148 0.619 0.556 0.56 / CYP4F2 *3 5.18% 25.73% 0.2871 0.22 0.2368 0.272 0.302 0.29 / CYP1B1 *4 1.98% 17.59% 0.1833 0.1 0.09964 0.155 0.206 0.19 / CYP2W1 *6 1.97% 17.48% 0.1821 0.22 0.1825 0.19 0.224 0.18 / CYP4F2 *2 1.81% 16.72% 0.1745 0.16 0.1571 0.16 0.156 0.17 / CYP4B1 *3 1.05% 13.04% 0.134 0.15 0.1845 0.15 0.118 0.13 / CYP2C9 *2 0.94% 11.92% 0.1233 0.07 0.04792 0.091 0.112 0.13 / CYP3A43 *3 0.27% 6.22% 0.06354 0.12 0.1246 0.067 0.03 0.05 / CYP2C9 *3 0.26% 6.65% 0.06724 0.04 0.04852 0.064 0.051 0.07 / CYP1A1 *4 0.08% 4.21% 0.04199 0.02 0.1378 0.031 0.033 0.05 /

Authors: Patricha Williams

Mentor: Vanessa Massaro

Institution: Bucknell University

Category: Social Science & Humanties

Title: Misdemeanor Crimes and Over-policing in Philadelphia

Abstract:

Our research focuses on misdemeanor crimes, over policing and their combined effects on the minority communities in Philadelphia. With its rapidly growing prison population, Philadelphia is creating new prisons and it is almost impossible to live in a minority community without knowing at least one person who has been incarcerated. We wanted to understand the correlation between these two issues and learn the experiences of the residents of these communities. To do this, we analyzed maps showing crime rates, incarceration, and race to choose specific areas to evaluate. After gathering records from the city of Philadelphia, we conducted focus groups to learn different perspectives and gain an intimate understanding of the attitudes towards over policing. From this, we have learned that there is a strong lack of community and discontent with authority. These attitudes come from feelings of exploitation and abuse of power, mostly concerning arrests over non-violent crimes.

Author: Elizabeth Wilkey and Patrick Newhart

Mentors: Emma Gaalaas Mullaney

Institution: Bucknell University

Category: Social Sciences & Humanities

Title: A Geovisualization: 10,000 Years of Global Maize

Abstract:

Maize (Zea mays) was originally domesticated in the central highlands of Mexico approximately 10,000 years ago, and continues to be an essential food source across the Americas to this day. Exceptionally versatile in use, maize has been disseminated around the world, following patterns of trade and colonization, and is now a dominant global crop. This project uses GIS technology to create an interactive time-lapse geovisualization that traces historical and contemporary patterns of global maize production. We utilize two primary sets of data: 1) government and industry records of national and sub national maize production by weight from 1960 to the present; and 2) recorded dates of the introduction of maize to particular countries and regions from scholarly literature in the fields of archaeology, biogeography, and ethnobotany. We integrate and standardize these distinct sources as a central database, and process them into an interactive global map of spatial and temporal changes in maize production during the past 10,000 years. We use Esri mapping tools ArcCatalog and ArcMap in order to visualize the data, and Esri web tool ArcGIS to render it to an online database. Our geovisualization tool allows us to analyze global maize production in innovative ways. Using theories from the field of political economy, we will identify and interpret gaps in existing data sets. Initial findings suggest that the many small scale maize producers and diverse varieties of maize in Central and South America often go uncounted, as do the informal maize markets that are central to the livelihoods of smallholders in many countries. This raises several important questions about structural deficiencies in global and domestic agricultural data, and the implications for economic and environmental policy. By using an innovative methodology to illuminate existing scientific knowledge of global maize production over time, as well as precise avenues for future inquiry, this research advances the field of agricultural geography and cognate disciplines in the social and natural sciences. References: See USDA/NASS https://quickstats.nass.usda.gov and INEGI http://www3.inegi.org.mx/sistemas/biinegi/ for more information on maize production data. See Aceituno (2013), Bonzani (2006), and Piperno (2009) for more information on archaeology, biogeography, and ethnobotany fields of study utilized in this project.

Author: Jessa M. Wood

Mentors: Ted Roggenbuck

Institution: Bloomsburg University

Category: Social Sciences and Humanities

Title: Continual Assessment in the Writing Center

Abstract:

The importance of assessment of writing centers is widely discussed in the composition and rhetoric literature. Assessment work is crucial for universities because of the growth of writing centers at campuses across the country. These programs demand significant funding, but are often under-assessed because the humanities faculty that direct writing centers lack familiarity with assessment methodologies (McKinney). When rigorous assessment is conducted, scholars largely focus on one-time projects (White, Elliot, and Peckham 18). This tendency is problematic because of the complex nature of writing development: students' abilities do not grow linearly, but rather both develop and regress in sometimes-mysterious patterns (Sommers and Saltz). My presentation will argue that routine assessment tools - instruments that can be used and reused semester after semester, year after year, even by those inexperienced with assessment - can help fill this void in the field's assessment toolkit. By examining my own writing center's assessment methodologies, I identified both gaps in our knowledge and opportunities for more rigorous data collection. I subsequently developed routine assessment instruments that we anticipate will augment our existing assessment work, which will be explored in this presentation. This exploration will also illuminate similar work other writing centers and academic programs can easily do to strengthen their own assessment practices. Works Cited McKinney, Jackie Grutsch. Peripheral Visions for Writing Centers. Logan, UT: Utah State University Press, 2013. Print. Sommers, Nancy, and Laura Saltz. "The Novice as Expert: Writing the Freshman Year." College Composition and Communication 56.1 (2004): 124-149. Print. White, Edward M., Norbert Elliot, and Irvin Peckham. Very Like a Whale: The Assessment of Writing Programs. Logan, UT: Utah State University Press, 2015. Print.

Author: Yunyingying (Sarah) Xu

Mentors: Darakhshan Mir

Institution: Bucknell University

Category: Natural Sciences and Engineering

Title: An Empirical Attack on Variants of Data Aggregation

Abstract:

More data about our lives has been generated in the past five years than during all of human history. The ubiquity of data regarding individuals' lives could potentially pose a threat to their privacy. Nonetheless, it could also enable efforts to benefit society at large when in the hands of researchers. As a result, the need arises for an investigation of techniques that will preserve individuals' privacy while enabling use of such data. One ad-hoc methodology with the assumption of protecting individual identities is data aggregation, which has been heavily used in the context of the US Census and genomic data. However, no formal arguments are behind this assumption and previous work in the context of genomic data has disproven its validity. In contrast, the formal framework of ϵ-differential privacy aims to provide a rigorous proof to reason about the bounds on the risk of individual exposure when releasing (aggregate) information about a dataset using the privacy parameter ϵ. Even though ϵ provides a knob for adjusting the privacy vs. utility of the resulting aggregated data, there is little practical understanding the risk of exposure for a particular individual associated with varying ϵ, which is particular important to the policy makers and the general public. Our study aims to quantify the empirical performance of this risk-utility knob associated with various values of ϵ. Like Dwork et al., we characterize the traceability of an individual from aggregate data. We do this by making different assumptions about a potential attacker, considering a continuum of aggregate data with varying levels of utility that correspond to different ϵ, and perform empirical attacks to trace individuals from the aggregation. Using simulated genomic data, and the fundamentals of Hypothesis testing, we translate the various values of ϵ to the empirical likelihood of tracing individuals. With this quantification, and the resulting visualization, we transform the abstract and seemingly arbitrary ϵ to a "language" that could be meaningful to legal experts and others when establishing privacy policy, and provide a more prescriptive association of ϵ to the risk of identifying an individual from an aggregated dataset. Reference: Science, N., Networking, T. C., & Program, D. (2016). National Science and Technology Council Networking and Information Technology Research and Development Program FEDERAL CYBERSECURITY RESEARCH AND DEVELOPMENT, (February). / [2]Dwork, C. (2006). Differential Privacy. Proceedings of the International Colloquium on Automata, Languages and Programming, Part II (ICALP), 1–12. http://doi.org/10.1007/11787006 / [3] Homer, N., Szelinger, S., Redman, M., Duggan, D., Tembe, W., Muehling, J., … Craig, D. W. (2008). Resolving individuals contributing trace amounts of DNA to highly complex mixtures using high-density SNP genotyping microarrays. PLoS Genetics, 4(8). http://doi.org/10.1371/journal.pgen.1000167 / [4] Sankararaman, S., Obozinski, G., Jordan, M. I., & Halperin, E. (2009). Genomic privacy and limits of individual detection in a pool. Nature Genetics, 41(9), 965–967. http://doi.org/10.1038/ng.436 / [5] Dwork, C., Smith, A., Steinke, T., Ullman, J., & Vadhan, S. (2015). Robust Traceability from Trace Amounts. Proceedings - Annual IEEE Symposium on Foundations of Computer Science, FOCS, 2015-Decem, 650–669. http://doi.org/10.1109/FOCS.2015.46

Author: Tongyu Yang

Mentors: Brian R. King, Vanessa Troiani, and Antoinette DiCriscio

Institution: Bucknell University

Category: Natural Sciences & Engineering

Title: Using Deep Learning to Analyze Images That Have High Interest from Children with Autism

Abstract:

Autism Spectrum Disorders (ASDs) are characterized by social difficulties that many researchers think come from atypical attention that these individuals have toward stimuli and their features, and this is particularly true with vision. Recently, researchers have worked to measure levels of visual salience with subjects who have autism. Visual salience is the distinct subjective perceptual quality which makes some items in the world stand out from their neighbors. The work of Wang et al used a large set of images with eye tracking data to show significant differences in the visual salience between autistic subjects and their counterparts [1]. In this study, we investigated the use of deep learning to learn distinctive characteristics in real-life objects that have a varying level of interest from children with autism. Deep learning, a branch of machine learning, has been successfully used in classifying and identifying patterns and objects in images. It relies on neural networks and provides the closest existing model to the actual brain. Just as the visual systems of humans function with multiple layers, deep learning also works in a hierarchical fashion by using a cascade of many levels of artificial neurons. The neurons of lower levels combine specific details of the inputs to form increasingly general abstractions, ultimately combining them to form the output classification. We use a publicly available deep learning framework called Caffe to process and analyze images that have been classified to have high or low autism interest which was determined through eye tracking technology. To this end, we developed a deep learning model applied to the two groups of images, and compared and contrasted the abstract features in the model after training. Our initial results are promising, showing 100% accuracy on training data and 70% accuracy on test data. More importantly, we generated visualizations of the intermediate levels of the neural net, demonstrating how certain neurons learn specific features in each image set. We are working on gathering a larger image dataset, as well as evaluating different model structures and improving visual representations of the deep learning model. [1] Shuo Wang, Ming Jiang, Xavier Morin Duchesne, Elizabeth A Laugeson, Daniel P Kennedy, Ralph Adolphs, and Qi Zhao. Atypical visual saliency in autism spectrum disorder quantified through model-based eye tracking. Neuron, 88(3):604–616, 2015.

Author: Christopher Zhang, Heinric Williams, and Thomas Prince

Mentors: Thomas Prince

Institution: Geisinger Health System

Category: Clinical and Translational

Title: Is Too Much 8q Bad for You? TCGA Analysis of the HSF1 Cancer Signature

Abstract:

Background: Cancer is a disease marked by severely altered gene expression and unchecked cell proliferation. Heat shock factor 1 (HSF1) is the primary transcription factor responsible for initiating the cellular stress response and the expression of heat shock proteins. In cancer, HSF1 is often over-activated as tumor cells become addicted to the cellular stress response due to their continued proliferation in their self-created toxic environments. Furthermore, chromosome binding studies have shown that HSF1 binds the regulatory regions of a large number of genes in tumor cells not known to be related to the stress response. HSF1 binding to this group of 457 genes, referred to as the HSF1 Cancer Signature (CanSig), has been linked with increased tumor malignancy and poor clinical outcomes. However, the associated mRNA levels of the HSF1 CanSig from clinical samples have not been reported. The Cancer Genome Atlas (TCGA) is a national research initiative to characterize each tumor type at the molecular level including mRNA expression levels and whole genome sequencing. Objective: The aim of this research project was to analyze the mRNA expression levels of the HSF1 CanSig across 30 tumor types. We hypothesized that discernible biological trends would emerge that may explain the role of the HSF1 CanSig in promoting tumor malignancy. Methods: Using a set of bioinformatics tools and websites we determined the over and under expression of the HSF1 CanSig by 2 standard deviations across each tumor type. We then sorted the list to enrich for the most highly altered genes and looked at chromosomal location, gene ontology and where possible clinical associations. Findings: This analysis revealed that a considerable number (~20%) of the most over-expressed genes of the HSF1 CanSig are located on chromosome 8q. This supports a number of earlier studies suggesting that 8q is involved in promoting tumor development. Additionally, gene ontology analysis of the breast cancer cohort indicates that HSF1 may be involved in Cajal body and telomere maintenance, thus providing a possible mechanism for tumor development.

Author: Zemeng Zhou, Amy Wolaver

Mentors: Amy Wolaver

Institution: Bucknell University

Category: Clinical and Translational

Title: Analyze Diabetes Hospitalization Across Region in Pennsylvania with Impatient and Environmental Factors

Abstract:

This paper examines the differences in hospitalization outcomes in Pennsylvania. Age and gender-adjusted rates of diabetes hospitalization are mapped with ArcGIS and compared across counties in Pennsylvania. Since health outcome varies differently across regions, this paper further explores how possible explanatory factors are correlated with diabetes hospitalization, including average income and primary care physicians per capita by comparing county differences in these characteristics to the county diabetes hospitalization rates. Moreover, this paper investigates factors that affect the discharge outcomes for patients hospitalized with diabetes, for example, the probability of amputation and length of stay. The data used ranges from year of 2009 to 2014 and consists of inpatient discharge data from hospitals in Pennsylvania collected by the Pennsylvania Health Care Cost Containment Council matched with data on other geographic factors from Robert Wood Johnson's County Health Rankings.