UNIVERSITY of WASHINGTON | BOTHELL

UNDERGRADUATE RESEARCH SYMPOSIUM

MAY 9, 2014  10:00 a.m. - 5:00 p.m.

- Undergraduate Research Presentations
- Interdisciplinary Discourse
- Research, Scholarship, and Creative Activity Featured

ALL ARE WELCOME!

425.352.3572
www.uwb.edu/research
THE OFFICE OF RESEARCH

“A Pathway to Success”

The University of Washington Bothell’s Undergraduate Research Symposium is an opportunity for UWB undergraduates to present what they have learned through their research experiences to a larger audience.

The event showcases projects from all disciplines and encourages interdisciplinary discourse, allowing students to learn from each other about a broad range of exciting research topics.

The Office of Research promotes and supports student and faculty research. We believe that active engagement in cutting-edge research enriches teaching and learning allowing for continuous intellectual revitalization for students, staff, and faculty across the University of Washington Bothell.
SCHEDULE OF EVENTS

10:00 a.m. | UW1-220
Opening Remarks by Gray Kochhar-Lindgren, Associate Vice Chancellor Undergraduate Learning

10:15 - 11:30 a.m. | UW1-220
10-minute Oral Presentations, Session #1

10:45 a.m. - 12 p.m. | UW1-2nd & 3rd Floor Vistas
Poster Session #1

12:00 - 1:00 p.m. | UW1-220
Lunch Panel Discussion, “Perspectives on Undergraduate Research, Scholarship and Creative Activity,” with Faculty and Students

1:00 - 2:45 p.m. | UW1-220
10-minute Oral Presentations, Session #2

2:30 - 4:00 p.m. | UW1-2nd & 3rd Floor Vistas
Poster Session #2

4:00 - 5:00 p.m. | UW1-2nd & 3rd Floor Vistas
Reception
“When Things Go Wrong at Work”

**Presenter(s):** Jiansheng (Jarvis) Xu, Ashley Thayer, Anthony Stillman

**Mentor:** Deanna Kennedy

Teams are a common temporary system that can improve working efficiency. We define efficient work as the ideal outcome the team wants. Disruptions, the events that stop workflow, impact people’s way of working either positively or negatively. If disruptions strike a medical team it can have deadly consequences. Our study examines ways to negate these outcomes. Medical teams are not the only teams to be disrupted; the data we collect will be used to improve the efficiency of production and service teams plagued by disruptions. We are using IRB approved interview scripts, online surveys, interview equipment, and professional interviews with the goal of insuring subject’s safety to conduct this research. We have accomplished the first phase that consists of interviewing and surveying teams about events that disrupted their workflow. We are currently analyzing the interviews and survey data using qualitative techniques and survey data to find trends that identify the disruptions. We will design methods that teams can apply to decrease the negative effects of disruptions. The potential benefits from our research will aid teams to be efficient especially in business and hospital settings.

“The Maya Movement & Clothing as Resistance”

**Presenter(s):** Katrina Cohn

**Mentor:** Julie Shayne

This presentation asks how weaving and clothing are used as a means of resistance within the Maya Movement of Guatemala. Although historical evidence confirms the use of back strap looms before the arrival of the Spanish, the use of traditional clothing and weaving techniques are often maligned as vestiges of colonial repression and backwardness by the dominant culture within Guatemala. Those who choose to wear traditional Mayan clothing face discrimination, stereotyping, and hostility. Mayan clothing denotes the age, marital status, and village of origin of the wearer through the use of different weaving techniques, designs, style, and color and therefore weavers are able to incorporate their cultural history and ideas into the cloth they create. Due to the high visibility, traditional meaning, and customizable nature of Mayan weaving, clothing has been adapted by Mayan resistance movements as a means of cultural resistance. I argue that weaving and traditional clothing are used by the Maya Movement to inspire pride and connection with traditional culture as a means to reassert Mayan heritage within Guatemala. This research is based on a mix of primary and secondary sources including scholarly analyses of Mayan resistance movements, history of weaving techniques and clothing, blogs, and documentaries.
“Kindering: A Model for Successful Development”

Presenter(s): Taylor Frazier
Mentor: Shauna Carlisle

Ample research supports early intervention practices for children with disabilities while the brain has a high degree of plasticity, especially before age 3. Kindering, the largest early intervention center in Washington State, provided 1,600 infants and toddlers with comprehensive services in 2013. The purpose of the current research was to analyze the developmental growth rate for children enrolled in the early intervention program at Kindering. This longitudinal study utilized test scores from the Assessment, Evaluation, and Programming System (AEPS). Using bivariate and multivariate analysis to examine the growth trajectories of 641 children ages 0-3, we expected to find that Kindering’s comprehensive model improves children’s development over time. Results were further analyzed by various demographic factors including ethnicity, income, and gender. Multivariate analysis was also used to examine whether growth rate was dependent on the age that the child entered the program, expecting to see that those who entered at a younger age will have a greater growth trajectory. We anticipate that these results will enhance the existing research about the effectiveness of early intervention, and demonstrate Kindering as a persuasive program model that can be replicated in existing and new centers.

“Environmental Change in the Tropical Andes: Assessing Land Cover, Land Use, and Climate Change”

Presenter(s): Christopher Wright
Mentor: Santiago Lopez

As climate change brings shifts in weather and temperature patterns, we expect to see shifts in plant communities resulting in land cover changes. Located in the tropical Andes Mountains of Ecuador, Cotopaxi NP is a biologically rich and diverse region expected to undergo significant warming (around 4° C) in the coming century as a result of climate change. With nutrient rich volcanic soils surrounding a glacier covered peak, this ecosystem provides important ecological services to surrounding communities. Utilizing remote sensing techniques and geographic information systems, this analysis aims at both quantifying and qualifying changes in land cover and land use in Cotopaxi NP, specifically related to forest, grassland, and glacial extent. Thematic land cover maps are generated using unsupervised classification techniques on satellite imagery and assessed for accuracy using in situ GPS control points. The size, extent, and elevation range of land cover classes is quantified using spatial analysis. Comparing results to historic data from the region, we can use changes in these land classes to interpret environmental change due to climate and anthropogenic land use.
During a time when nearly half of the population was illiterate, literacy education and, more specifically, popular education became the center of political contention during the 1960s in Brazil. Under the direction of President Joao Goulart, illiteracy became a national issue. During this time, education theorist Paulo Freire played a central role in the education programs throughout the country. Freire’s literacy education methods aimed to develop a critical consciousness among the marginalized people of Brazil and, in turn, led to newly literate citizens fighting for their basic human rights. In this presentation, I will answer the question, how did Paulo Freire’s liberation pedagogy, which informed the Popular Education programs of Brazil during the Goulart presidency, act as forms of resistance for Brazilian peasants? To answer this question, I have consulted Freire’s literature, other scholarly books and journals, and literacy slides used in Freire’s cultural circles. I argue that Paulo Freire’s liberation pedagogy was a culturally relevant and contextually significant form of resistance because his method of vocabulary development enabled peasants to claim cultural identities and citizenship by empowering them to become agents of freedom through critical political engagement.
Oral Presentations: Session #2

1:00 PM  “Effects of Crows on Wetland Plant Communities”

Presenter(s): Alyssa Branca  
Mentor: Doug Wacker

As twilight falls on the UW Bothell campus, the skies turn black with the arrival of 10-15,000 crows (*Corvus brachyrhynchos*) that use the restored North Creek Wetlands as their winter nocturnal roost. The crows leave behind nitrogenous waste; the impact this has on floral biodiversity in the wetlands is unknown. We surveyed plant composition and collected soil samples at sites on-and off-roost in spring 2013, fall 2013, and winter 2014. We analyzed soil for moisture, pH, and levels of nitrates. Across all seasons, significantly higher levels of nitrates and lower pH levels were found on the roost compared to non-roost locations; pH levels varied both with season and by location, but there was no significant interaction effect. Plant community composition was not significantly different on and off the roost, nor did it vary significantly across seasons. The crows are changing the chemical composition of soil under their roost, but not yet affecting plant biodiversity or abundance. The North Creek Wetlands are an exemplary ecological restoration, surrounded by rapidly-developing urban centers, so any future impacts the crows have on these wetlands could cause larger ripple effects over the remaining fragmented forests, streams, and wetlands of the Lake Washington watershed.

1:15 PM  “Spatial and Vocal Behavior of the American Crow”

Presenter(s): Hussain Al-Sadoon  
Mentor: Doug Wacker

The roosting behavior of the American Crow (*Corvus brachyrhynchos*), has been widely studied, however, little research has been done on their spatial and vocal behaviors in both roosts and post-roost locations during morning departures. The Bothell campus of the University of Washington is home to a large nocturnal crow roost. Based on preliminary observations at this roost, we hypothesized that crows use different social behaviors at their roost compared to surrounding areas of congregation, which I have named rendezvous points. To test this hypothesis, vocalizations were recorded at the roost and at various rendezvous points using a Marantz audio recorder and analyzed using Raven Pro audio analysis software. Spatial dynamics were studied by observing the number of crows that were within one meter of another crow. Average call length, gap duration between syllables, and the number of syllables within calls differed between the roost and rendezvous points, however, the average number of calls and syllable lengths were not significantly different. The crows in the rendezvous points perched closer together, which might have impacted vocal behavior. Further studies need to be done in different seasons and at different roosts to be able to generalize the findings of this research.
“Training Planarians to Like the Light using Negative Stimulus”

Presenter(s): Pearl Chan & Bindu Musunuru

Mentor: Bryan White

Previous studies have shown that planaria, small invertebrate flatworms, are capable of learning. Experiments have been performed using conditioned placed preference tests with positive stimulus. We want to explore if negative stimulus would affect their learning. Planaria have been known to prefer the dark, therefore, we examined whether using a negative stimulus such as shocking the planarian while they are in the dark would cause them to prefer the light. Results of these experiments will be presented.

“Uncovering File Relationships using Association Mining and Topic Modeling”

Presenter(s): Karen Potts, Namita Dave, & Delmar Davis

Mentor: Hazel Asuncion

Software maintenance is the most time-consuming and costly part of the Software Development Life Cycle. If there is no prior knowledge of the system, developers can have trouble understanding which files need modification. Association mining has been used in the past to help identify files that are frequently changed together, within a software repository. This information can be helpful in locating files that should be changed together. Association mining can be limited by a lack of version history, therefore, in order to overcome this limitation, topic modeling was used. Topic modeling is helpful in finding topics within a corpus of documents by learning semantic topics. This is a machine learning technique that can help us to identify file relationships semantically. Our approach, Frequent Pattern Growth with Latent Dirichlet Allocation (FP-LDA), uses a combination of association mining and topic modeling to help uncover file relationships. Our technique is validated using two case studies on open source projects. Our results indicate that topic modeling used with association mining is more effective in finding file relationships than association mining alone.
“How a Whiteboard Wall Mediates Software Development Activity”

Presenter(s): Chunchao Zhang
Mentor: David Socha

Whiteboards fulfill a variety of purposes within a software development organization. Our research focuses on the use of whiteboards to mediate software design discussions. A sequence of images have been collected since October 2012 of a large whiteboard wall used in a local software development organization that was used to mediate the interactions among the software developers, and interactions with the rest of the organization. Our data shows a much wider variety of usage patterns than just design discussions, including as information radiator, coordination tool, and to display social norms. This research project involves analyzing images to identify different types of information that have appeared on different sections of the whiteboard wall, and using interviews of people from that organization to understand the particular lifecycles and usage patterns of these sections of information, and how these help mediate the software development work. To date, we have reviewed the literature relating to whiteboard usage and have interviewed personnel in the organization about the use of the whiteboard. We are currently analyzing videos of software developer whiteboard usage to understand operationalization of the whiteboards in software design discussions.

“Re-framing Accomodationist Methods through Empowering Andragogy”

Presenter(s): Tiarra Fentress
Mentor: Louise Spiegler

Racism is intricately woven into the fabric of our society, including our institutions. When considering institutional transformation, there is a long history of oppression one must become familiar with in order to be an effective agent of change. The target population for this research was African-American students and the legacy of systematic oppression on varying political, educational, and professional levels. It is essential to analyze the transformation of trauma to understand the positionality of African Americans today and contextualize this trauma within the realm of an educational institution in order to develop best practices. The primary focus of this research is developing practices that allow students of color to develop a strong sense of self-efficacy with a notion of institutional support that contribute to more equitable and inclusive learning environments.
We sought to evaluate the air quality implications of rail traffic at two sites in Washington State. Our goals were to quantify the exposure to diesel particulate matter (DPM) and airborne coal dust from current trains for residents living near the rail lines and to measure the DPM and black carbon emission factors (EFs). We chose two sites in Washington State, one at a residence along the rail lines in the city of Seattle and one near the town of Lyle in the Columbia River Gorge (CRG). At each site, we made measurements of size-segregated particulate matter (PM), CO2 and meteorology, and used a motion-activated camera to capture video of each train for identification. We measured an average DPM EF of 0.94 g/kg diesel fuel at both sites. Open coal trains have a significantly higher concentration of particles greater than 1 μm diameter, likely coal dust. Measurements of black carbon (BC) at the CRG site show a strong correlation with PM1 and give an average BC/DPM ratio of 52% from diesel rail emissions. Our measurements of PM2.5 show that living very close to the rail lines significantly increases PM2.5 exposure.
Poster Presentations: Session #1 & 2

10:45 AM—12:00 PM and 2:30 PM—4:00 PM

Poster #1  “Commitment Bell”

Presenter(s): Sandi Kim
Mentor: Gary Carpenter

The Commitment Bell was designed as part of a public art proposal to be placed near the North Creek wetland restoration by the Sarah Simonds Green Conservatory. I wanted the art to physically interact with the people. When art involves the viewer to touch, hear, see, smell, even taste, the memory of that art will leave a lasting impression. The more senses it entails, the more it engages the audience. Materials selected for the project focused on durability with the Northwest weather and its’ safety with the environment. Tin, bronze, cedar wood, and stainless steel materials were ideal for my project. Cedar wood not only is slow to deteriorate and durable, but is a beautiful wood for the sidewalls. Bronze bell has a distinct sound strength and power. Rain on the tin roof can create a rhythmic calming effect. The bell is encased in an open two-sided house structure, where cedar walls uphold the tin roof. The stainless steel rod is inserted in the sidewalls upholding the bronze bell in the center. Ends of the rod are bent and shaped as a turning handle bar where it requires two people to ring the bell.

Poster #2  “UPSIDEDOWN”

Presenter(s): Jeongmin Lee
Mentor: Gary Carpenter

This research was conducted as a part of a public art proposal to be placed near the North Creek wetland restoration on the grounds of the Sarah Simonds Green Conservatory, located in the lowland portion of the UW Bothell campus. The goal of the Wetland Sculpture proposal was to make the connection between social equality and environmental health and to promote social changes through artwork. The research was done through lectures, readings, and a tour of the wetlands focusing on social inequality and the impact of consumerism on the environment. My research was expressed through a 16’ black concrete sculpture. This sculpture presents the hierarchy of social power and inequality in distribution of resources. It also explores the complexity of social issues in our society and the beauty of diversity.
**Poster #3**  
**“Why was Increased Dependence on a Mutualistic Partner Selected During Evolution?”**

**Presenter(s):** Colin Feng, Marc Vrana, Ben Pham, & Sujung Lim  
**Mentor:** Kristina Hillesland  

Some sulfate-reducing bacteria can form mutualistic relationships with methanogens. In nature, diverse free-living sulfate-reducing bacteria have repeatedly evolved into obligate mutualists. We study how this process may have occurred by using a model system for evolution in the lab between a sulfate reducer, *Desulfovibrio vulgaris*, and a methanogen, *Methanococcus maripaludis*. After allowing these two organisms to evolve for 1000 generations in an environment that forces their cooperation, 12 out of 22 *D. vulgaris* populations lost the ability to reduce sulfate. We want to test whether the ratio of the two sulfate respiration genotypes (sulfate-minus, or unable to use sulfate, and sulfate-plus) relative to each other affects the fitness benefit of the sulfate-minus genotypes. To do this, we placed a sulfate-minus and plus *D. vulgaris* together and tracked their relative abundance in coculture over time. I expect to see the sulfate-minus genotypes “take over” in the course of these competitions and show a larger minus-to-plus ratio compared to the initial inoculation as a result of the sulfate-plus genotypes becoming more fit when they are rare. These data can help us better understand the mechanisms of natural selection that cause sulfate reducing populations to become obligate mutualists.

**Poster #4**  
**“The Impact of Environmental Heterogeneity on the Diversification of a Coevolved Microbial Mutualism”**

**Presenter(s):** Helen Wiltsey  
**Mentor:** Kristina Hillesland  

Evolution within the natural world causes diversification of species. How is diversification shaped by the environment and community in which evolution is occurring? One well supported cause of diversification is environmental heterogeneity, where a species will undergo diversification to adapt to different niches within an environment. We will address the impact of environmental heterogeneity on the evolution of diversification in a coculture of metabolically interdependent microbes: *Desulfovibrio vulgaris* and *Methanococcus maripaludis*. *D. vulgaris* produces hydrogen as a waste product which *M. maripaludis* then uses as a metabolite. Hydrogen is insoluble and is localized to certain depths of an anaerobic tube creating a stratification of resources. Therefore, we predict that there will be phenotypic diversity between different stratified levels of hydrogen availability. We will observe (1) if localization is an acquired heritable trait, (2) if there is a morphological variation between subcultures, and (3) if there is variation in growth rate between the levels. Identifying phenotypic differences between the levels will show that diversification has occurred. These results add to current evidence supporting diversity as a product of environmental heterogeneity. Also, these methods can be applied to broader, industrial uses of microbes and the cultivation of mutualistic coevolved species.
**Poster #5**  “The Influence of Fungal Symbionts on the Growth of Agricultural Plants in Stressful Environments”

**Presenter(s):**
Allison Kane, Charlie England, Anna Martinez, & Jaekyung Mary Lee

**Mentor:**
Charlotte Rasmussen & Warren Gold

Fungal endophytes exhibit a symbiotic relationship with plant species, helping improve tolerance to harsh abiotic conditions and protect against predation. Endophytes may be an effective method in improving agricultural crop tolerance to factors such as drought and salinity stress conditions. The effectiveness of fungal endophytes in promoting drought and salinity tolerance was tested in corn (*Zea mays*). Corn seeds were treated with endophytes from two fungal species from two different genera and, along with controls, were subjected to varied degrees of drought and salt concentrations. The effect fungal symbionts had on plants experiencing drought and increased salinity was measured through comparative analysis of root mass, total biomass and leaf tissue density between control and treatment groups. Our goals are to utilize this information to conserve limited water resources and improve agricultural production in degraded and changing environments.

**Poster #6**  “Skinship”

**Presenter(s):**
Alisa Hirota

**Mentor:**
Wadiya Udell

My research compares the cultural differences and similarities between the Japanese and American parenting style. Attachment in the parent-child relationship is important psychologically because it shapes the emotional stability of the child. The role of attachment in the US is to teach their children to be independent. Generally, American parents do not want their child to be dependent. The Japanese cultivate a form of attachment called “amae” through “skinship,” which is the desire for unconditional acceptance by the parents being completely responsive to the child’s needs for their security. This results in an interdependence relationship between the child and the parents. Both the Japanese and American forms of attachment create an emotional bond and closeness between the child and the parents. However, the differences in the parenting styles between the two cultures indicate that the Japanese are more likely to link separation with sadness, while the Americans are more likely are to link separation with fear. It may be beneficial for parents to learn how to correlate different types of parenting styles to create a society with overall good health and better perspectives.
**Poster #7**  
**“Listen to the Youth: Medical Care Needs of Youth”**

**Presenter(s):** Brooke Sullateskee-Rincon  
**Mentor:** Wadiya Udell

Youth in the juvenile justice system are faced with various health disparities such as physical illness, mental illness, and sexually transmitted diseases. Therefore, it is essential that consistent health care be readily available and accessible to these youth. However, many communities do not have efficient and consistent ways to provide health and mental health resources for this high-risk population. As a result, many detained youth lack sufficient health care, receiving much of their primary care while in detention facilities. This research project focuses on risk factors preventing continuity of health care (both physical and mental) among youth in the King County Juvenile Justice system. Through analyzing and coding over twenty qualitative interviews, risk factors preventing youth’s access to care were identified. The study explores how factors such as a lack of knowledge regarding how to navigate the medical system and youth’s rights to independently access care, create unique barriers for youth seeking and receiving care. Based on the interview analysis, and a literature review of programs fostering access to health care among adults, I propose a model to promote continuity of care among this high-risk population.

**Poster #8**  
**“Synthesis of Tafazzin for Protein Therapy”**

**Presenter(s):** Katharyn Jia, Teresa Leu, & Weiming Chien  
**Mentor:** Lori Robins & Michael Chin

Barth Syndrome is a rare X-linked genetic disorder that can cause cardiac myopathy, muscle weakness, fatigue, immune dysfunction, and childhood mortality. Barth Syndrome is the product of a mutation encoding for a single protein, Tafazzin, a phospholipid-lysophospholipidtransacylase found primarily in cardiac and skeletal muscle. Tafazzin, plays an integral role in modifying cardiolipin, a component of the mitochondria, or energy production organelles of the body. When Tafazzin, and consequently the modified form of cardiolipin are absent, the function of the mitochondrial electron transport chain, the primary pathway by which the body converts food into useable energy, is reduced. We hope to rescue defective cardiolipin modification through Tafazzin protein therapy and learn more about Tafazzin structure and function. This will be accomplished by the synthesis of enzymatically active and stable human and mouse Tafazzin using E. coli (BL21(DE3)pLysS). Overexpression of Tafazzin results in relatively pure inclusion bodies which we isolated through protein metal affinity chromatography. We produced several protein coding variants of Tafazzin in order to study the enzymatic activity of different mutants. Understanding of structure-activity relationships in Tafazzin will direct future work in Barth Syndrome treatment by facilitating in vivo studies of Tafazzin protein delivery.
**Poster #9**  "**Helicobacter Pylori & the HpAKR Enzyme**"

**Presenter(s):**
Janelle Cruz & Amanda Chase

**Mentor:**
Lori Robins

The gram-negative bacteria *Helicobacter pylori* has been linked to stomach ulcer formation, gastric cancer, and mucosal-associated lymphoma tissue. Standard treatment of *H. pylori* bacterial infections include a combination of proton pump inhibitors, such as omeprazole and lansoprazole, with some commonly prescribed antibiotics, such as clarithromycin and amoxicillin. However, *H. pylori* has become resistant to many of these standard medication treatments. *HpAKR* is the *aldo-keto reductase* enzyme of *H. pylori* which enables the bacteria to survive and colonize in the acidic environment of the gastric lining of the stomach. We are currently expressing and purifying the *HpAKR* enzyme. The next step will be to assay the enzyme for activity and test it with small drug-like molecules to see if they can act as inhibitors. These experiments have the potential to provide a pathway to alternative treatment methods for *H. pylori* infections.

**Poster #10**  "**Expression and Purification of Homing Endonuclease**"

**Presenter(s):**
Briar Burgess, Virkamal Dhaliwal, Jason Wessels, & Courtney Korng

**Mentor:**
Lori Robins

Homing endonucleases are microbial enzymes that selectively form double-stranded breaks in DNA and drive gene conversion events via homologous recombination. One type of homing endonuclease containing the *LADLIDADG* catalytic motif recognizes long DNA sequences (22 to 24 base pairs) with high specificity and has been used for gene targeting in medicine and biotechnology. The expression and purification of the *LAGLIDADG homing endonuclease I-LtrWI* from *Leptographium truncatum* will be presented.
**Poster #11  “Thioester Hydrolysis Mechanism”**

**Presenter(s):**
Anthony Stillman & Matt Denison

**Mentor:**
Lori Robins

Thioester hydrolysis is a reaction which is important to organic and biochemists. In organic chemistry thioesters are utilized as “high energy” acyl groups for acyl transfer reactions. In biochemistry thioesters serve as substrates in a diverse set of enzyme-catalyzed reactions such as acyl transfer, Claisen condensations, and hydrolysis. We are using kinetic isotope effects (KIEs) to determine the mechanism of hydrolysis for the thioester formylthiocholine (FTC) in a variety of conditions. These conditions include: (A) non-enzymatic hydrolysis under acidic, neutral, and basic conditions and (B) hydrolysis at pH 6.8 catalyzed by butyrylcholinesterase (BChE). We have focused on developing methodology for determining the leaving-S KIE. Our method revolves around running the hydrolyzed FTC sample through an ion-exchange chromatography column that captures the FTC that didn’t hydrolyze during the reaction. The captured FTC is then analyzed to determine the thioesters’ sulfur isotope ratio in the sample. We will use this ratio data, conditions information, and the KIEs to theorize what mechanism thioesters take during hydrolysis.

**Poster #12  “University of Washington Students and the Nuclear”**

**Presenter(s):**
Alexandra Winters

**Mentor:**
Johanna Crane

My experiences as a student at UWB have illuminated a lack of interest in nuclear topics by other college students. Nuclear topics are significant because they will affect future generations. If college students are disinterested in this topic there may be large environmental and health crises for future generations. It is important to understand what is known about nuclear issues and why these topics are un-interesting/un-important to youth; with the hopes that students can be mobilized into action for the benefit of society. My interest is specific to UWB students because of the proximity of the university to the Hanford Nuclear Waste Site. When I use the term nuclear I am referring to a broad set of nuclear topics such as: medical procedures (CT scans or X-rays), nuclear waste, nuclear energy, nuclear power, and nuclear warfare. I am creating a brief survey to distribute to students on campus that will include multiple choice or scaled questions My goal is to understand the base line knowledge regarding nuclear issues amongst UWB students as well as gather an idea of why these students believe there is little interest in the subject.
**Poster #13  “Feminization of “Brain-Drain:” (Re)formationg Gender Identities of Mexican and Caribbean Migrant Women”**

**Presenter(s):**
Jessica Manfredi

**Mentor:**
Julie Shayne

Although highly-skilled women (with a bachelor's degree or above) currently migrate at a rate twice that of men worldwide, women's experiences in these migration patterns, especially to the U.S., have been largely neglected in the literature. Research on the feminization of "brain drain" conducted in other countries have displayed how women's gender identities can radically change from the sending to the receiving country, usually resulting in greater gender inequality within the public and private spheres. Paradoxically, while highly-skilled Latin American women come to the U.S. in the largest numbers, no research has documented these women's perspectives within the context of this international movement. This project explores how Mexican and Caribbean highly-skilled migrant women (re)formulate their gender identities in the workplace and household as a result of their relocation to the U.S., specifically the greater Seattle area. The methods employed include semi-structured, in-depth interviews with 10-15 highly-skilled migrant women recruited through a standard socio-scientific snowball sample. It is anticipated that, similar to previous studies on other demographic groups, the shifting social, economic, and cultural realities between the U.S. and these women's home countries have significantly impacted their gender identities, leading them to perform less productive labor and to adhere to more traditional feminine roles. This work will contribute to filling the knowledge gap on highly-skilled Latin American women within feminist migration studies, and may be used to inform policy surrounding skilled migration from the region.

**Poster #14  “Ultrasound’s Effect on Planarian Regeneration”**

**Presenter(s):**
Anh Tran, Pearl Chan, Bindu Musunuru, Vasu Chintala, & Guy Corral

**Mentor:**
Bryan White & Pierre Mourad

Previous research and clinical studies have shown that low-intensity pulsed ultrasound have sped up bone and skin regeneration in rats and humans (Takikawa et. al 2001). However, there have been few studies to explain low-intensity pulsed ultrasound's effect on regeneration. Planaria, small invertebrate flatworms, have long-been used as model organism for the study of regeneration due to their ability to regrow any part of their body by recruiting a family of pleuripotent stem cells to the damaged or severed area. We are exploring the effects of low-intensity pulsed ultrasound on planarian's photoreceptor regeneration.
“Effects of Exogenous DHEA in Male Song Sparrows”

Presenter(s): Lindsey Jones & Sahar Khalaj

Mentor: Doug Wacker

Testosterone plays a role in aggressive territoriality in many male vertebrates during breeding. Song sparrows, *Melospiza melodia morphna*, are not only aggressive during breeding but also during non-breeding, when their testes are regressed and plasma testosterone levels are low. Studies suggest this aggression is partially mediated by an adrenal androgen/estrogen precursor, dehydroepiandrosterone (DHEA). We assessed whether DHEA exerts these effects via an androgen or estrogen receptor mediated mechanism. Male song sparrows were captured, kept on a non-breeding photoperiod (8L: 16D), and implanted subcutaneously with empty or DHEA-filled implants for fourteen days. DHEA birds had higher circulating DHEA and testosterone levels and showed increased aggression. Brains were extracted and in situ hybridization was used to label androgen receptor (AR) and aromatase mRNA. Aromatase catalyzes the transformation of androgens to estrogens. AR and aromatase mRNA expression were quantified in brain regions associated with aggressive and reproductive behaviors. In the preoptic area (POA), aromatase mRNA was higher in DHEA birds compared to controls. In the ventromedial nucleus of hypothalamus (VMH) and the periventricular nucleus of the medial striatum (pvMSt), AR expression was greater in DHEA birds. We conclude that DHEA may cause non-breeding aggression via both androgen and estrogen receptor mediated mechanisms.

“GIS-based Spatial Analysis of Rare Plant Populations on Gravel Hill Prairies: Habitat Suitability Modeling”

Presenter(s): Christopher Wright

Mentor: NSF Internship

This GIS-based spatial analysis of rare gravel hill prairie plant species was developed to characterize the habitat of known populations and identify potential suitable habitat. Habitat loss is the leading cause of species extinction. The identification of suitable habitat for rare plant species may provide the opportunity for the introduction of new populations and may act as a tool to assist land managers in determining management strategies. Utilizing information collected by the Plants of Concern monitoring program, data related to two gravel hill prairie plant species, *Cirsium hillii* and *Asclepias lanuginosa*, was used to create Multi Criteria Evaluation models. By extracting data relating to soil attributes, land cover, hydrology, and distance metrics, gravel hill prairie habitat was classified and models were generated to identify suitable habitat based on variable weighting structures. Using the greater Chicago area as the study area extent, six models were produced identifying varying amounts of highly suitable (≥90%) habitat. High suitability areas ranged from 5.6 to 117 km². Thirteen natural areas with occurrences of one or both of these species were analyzed and suitability scores compared. Suitability scores ranging from 20-100% were reported from the six models. The modeling resulted in comparable suitability scores for each natural area regardless of the model chosen. Preliminary population analysis was initiated comparing stem densities between the sites characterized as most and least suitable. Future analysis can include metrics of population health and spatial extent in order to better understand the relationship between site suitability and population dynamics.
**Poster #17  “Fecal Coliform Monitoring in the North Creek Wetlands”**

**Presenter(s):**
Phillip Van Valkenburg, Kent Parkinson, Paul Parker, Sean Naidu, Suzan Yu, James Facer, Anne Power, Jody Johnson

Throughout the past year, UWB environmental science students have been monitoring the coliform bacteria levels in the UWB/CCC wetland and North Creek as it flows through the wetland. This monitoring was motivated by the discovery last year of unusually high fecal coliform counts in North Creek within the campus boundaries. The objectives of our study are to (1) assess variability in coliform bacteria counts in North Creek as it flows onto and across our campus, (2) quantify coliform bacteria counts in the ponds, streams, depressions and bioswales of the wetland, (3) assess inputs of coliform bacteria from the campus uplands to the wetland, (4) identify sources of the coliform bacteria, and (5) evaluate the potential for the campus and its wetland to act as a source of fecal coliform bacteria to North Creek. Our working hypothesis is that the presence of a major crow roost on campus, with as many as 15,000 crows roosting overnight in the winter months, is a primary source of elevated coliform levels on campus, in the wetland, and in our reach of North Creek. This research poster reviews the methods of our team research and our findings to date.

**Mentor:**
Rob Turner

---

**Poster #18  “Land Change in the Galapagos”**

**Presenter(s):**
Dana Walker

**Mentor:**
Santiago Lopez

We are analyzing changes in mangrove species and distribution in the city limits of Puerto Villamil in the Galapagos Archipelago using remote sensing techniques and Esri Geographical Information Systems software. We specifically want to address how new infrastructure and increased urbanization in Puerto Villamil has affected the native mangrove species that reside there. Our research will be used to negotiate an exchange of land between the Galapagos National Park Service and the municipality of Puerto Villamil. So far, we have created various maps that have helped us identify the location of different types of vegetation within Puerto Villamil. One map helped us identify four different types of mangrove; jeli (*Cibicaroyis Erectus*), white (*Laguncularia Racemosa*), red (*Rhizophora Mangle*), and black (*Avicennia Germinans*). This will help the Galapagos National Park Service analyze which types of mangrove can be negatively affected by new development in the city. Another map we created helped us identify different types of land within the city. We analyzed where lava rock, grass, mangrove, water, and infrastructure were in regard to each block of the city. This analysis will help us determine the percent of mangrove that resides within each block. So far, our research has helped us determine what types of mangrove we need to be monitoring and what areas of the city need focused conservation efforts.
“Dynamics of a Seasonal Wetland Crow Roost”

Presenter(s): Daniel Lombardo
Mentor: Doug Wacker

The North Creek Wetlands at the University of Washington Bothell campus harbors a roost of American Crows (*Corvus brachyrhynchos*) of 2,000 (summer) to 16,000 (winter) birds. I investigated the seasonal changes of: crow movements within and around the roost, the roost area, the nocturnal activities of crows in this roost, and the commute distances of crows to this roost. The arrival of crows at campus pre-roosting areas ($R^2 = 0.955$), their move from pre-roost to roost ($R^2 = 0.992$), and the time that >99% of crows are in the roost ($R^2 = 0.9942$) are strongly correlated with photoperiod. The roost area changes both seasonally and annually, averaging between 45,330m$^2$ and 127,880m$^2$. Population density also varies seasonally. Field cameras show little nocturnal movement of crows after arrival, and never show birds moving from the canopy to the ground. While flight paths to and from the roost are highly variable in direction, observations suggest that crows may be commuting to this roost from as far as 30km, and possibly greater than 40 km. This study may help us to understand why crows have chosen this, or other, wetland roost sites, and will be useful in future crow and wetland management and planning.

“UWB/CCC Wetlands Geo-Database Investigation: Mapping Boundaries, Hydrological Features, and Plant Communities”

Presenter(s): Janice Jap & Yee Man Liu
Mentor: Warren Gold, Santiago Lopez, & Charlotte Rasmussen

This project aims to map baseline boundaries of plant (vegetation communities), topographic and geomorphologic characteristics, and hydrological features in the northwestern portion of the North Creek wetlands that will be integrated in a comprehensive UWB/CCC Wetlands Geo-database. To achieve this goal, we delineated the wetland’s vegetation communities based on their characteristic species. Then, using a handheld geographic positioning system (GPS) device (Trimble Juno series), we marked the boundaries of the vegetation, hydrologic, and other notable features, so that coordinate information that conveyed the location of these boundaries can be further processed using ArcGIS, a set of software programs for mapping and analyzing geographic information. The final product of this project will be the creation of maps visualizing the previously mentioned features. Development of a comprehensive UWB/CCC Wetlands Geo-database will allow students and faculty involved in research projects to better plan and execute investigations, and analyze collected data spatially and temporally to increase understanding past, present and future environmental changes in the UWB/CCC wetlands.
**Poster #21**  
“Tag, you're it - Security in Near Field Communication (NFC)”

**Presenter(s):**  
Schuyler Knoblick

**Mentor:**  
Geetha Thamilarasu

Near Field Communication, popularly known as NFC, is designed to work at short range, which leads several systems and applications that use NFC to inherently assume that the data communication is secure due to its limited range of operation. However, there have been repeated questions raised about the security vulnerability of these near-field systems. This poster presents an introduction to NFC and address the various security threats and attacks in NFC such as eavesdropping and skimming attacks. We demonstrate the security vulnerability of this system by analyzing a real life skimming attack that was performed.

**Poster #22**  
“Pentagons Admitting i-Block Transitive Tilings”

**Presenter(s):**  
David Von Derau

**Mentor:**  
Casey Mann & Jennifer McLoud-Mann

A plane tiling is a countable family of closed topological disks $\mathcal{T} = \{T_1, T_2, \ldots\}$ that cover the Euclidean plane $\mathbb{E}^2$ without gaps or overlaps. There are 14 known types of convex pentagons that admit tilings of the plane, but it is unknown if this list is complete. An $i$-block $B$ is a patch of $i$ pentagons in a monohedral tiling $\mathcal{T}$ by convex pentagons such that

1) $\mathcal{T}$ consists of congruent images of $B$,
2) the tiling formed by $B$ is isohedral,
3) $i$ is the minimum number of pentagons for which the patch $B$ exists.

Any periodic tiling by convex pentagons is necessarily $i$-block transitive for some $i$. If all pentagons that admit a tiling of the plane admit at least one periodic tilings, then the class of pentagons admitting $i$-block transitive tilings would represent all possible pentagons that admit tilings of the plane. Combinatorial methods establish limits on the properties of vertices and edges in $i$-block tilings. The results allow an enumeration of all possible $i$-block transitive tilings by convex pentagons. This enumeration might uncover a new tiling of the plane by convex pentagons. An algorithm is being written to automate the enumeration.
**Poster #23**  “Probes in the Wild: Investigating the Nature of Probing in Software Development”

**Presenter(s):**
Diane Kerstein, Josh Brunner, Bob Anderson, & Cole Goodling

Modern software developers need to navigate constraints that halt progress towards the work they are striving to accomplish. Many of these constraints are largely invisible and caused by large amounts of code, data, and users. When encountered, developers resolve work around these constraints by running experiments involving conversations both as internal thoughts and actions, as well as externally with other team members - this is defined as probing. By analyzing videos of software developers in the workplace at a local software development company, we seek to define different categories of probing, contexts in which developers probe, and how long they probe.

**Mentor:**
David Socha

---

**Poster #24**  “To Probe or Not to Probe: What is thy Analysis?”

**Presenter(s):**
Stanley Sha, Ruby Heglin, & Andre McKay

Our research is about the nature of probes in a software development environment. Probes can be considered an act of gathering or exposing information to validate or refute knowledge. Examples of probing behavior can be perturbing the systems to see the results and asking questions to other programmers, but when do these behaviors become interruptions in the workplace? What are the positive as well as the negative interruptions that these probes cause in a highly mentally intensive workplace, such as ones in the software development field? Also what are the patterns that arise from the probes? By analyzing videos of programmers in the actual workplace we will get a better sense of what is considered to be an interruption and what is a probe.

**Mentor:**
David Socha
Poster #25  “Extra-pair Programmers Interactions”

Presenter(s):
Joseph Shadwich,
Kevin Nguyen,
Robert Bradenburg,
& Dallas van Ess

Mentor:
David Socha

Do many hands make light work, or are too many cooks in the kitchen? Our research draws upon a collected set of videos from a software development organization based in the Pacific Northwest from 2013 and 2014 by Dr. David Socha. This data was collected to analyze how the software development organization operates within the concept of pair programing (two programmers working on an operating system to program simultaneously). We have analyzed the video to try and answer the questions: (1) does the role of an external (new co-worker outside of the original two programmers) influence the original two programmers? (2) does that new group form a tracked model that can be defined? (3) what are the different types of extra-pair interactions? and (4) what other traceable influences affect extra-pair programming? These questions are asked to focus in on the creation (mapping of response(s) to new programmer/manager) of a behavior database to be used in future analyses outside the current studied set of data.

Poster #26  “Pair Programming, Evolved (or has it?)”

Presenter(s):
Koukeng Yang & Connor Blaser

Mentor:
David Socha

With the advent of the digital age, businesses and corporations are more than ever in need of software and software developers. Along with the growing need, many software development businesses have swapped over to faster development practices. Pair programming is a rapid software development practice that many software developers are familiar with, but how has pair programming been practiced in the modern workplace since its first introduction? How has pair programming changed from its original methodology? This paper uses recorded video data from an observational case study to address some of the questions related to the practices of modern pair programming. This paper compares a particular software development company’s practices of pair programming to the original pair programming practices drafted by Kent Beck and the other pair programming forefathers. By gaining this knowledge, modern software companies can make better decisions towards providing the proper tools and environments for their software developers.
Poster #27  “Beneficial Detriments”

Presenter(s):
Andreas Chew, James Hanks, & Jason Dailey

Mentor:
David Socha

Interruptions are a part of life, and are typically thought of as a negative thing. An interruption can be a detriment to one person, while at the same time be a productive boost for another. By examining videos of software developers working in their normal environment, we are exploring how different types of interruptions (intrusions, distractions, and breaks) affect software developers working together to develop code. We are investigating the benefits and detriments that come from interruptions in the workplace of professional software developers to gain a better understanding of the short-term effects after someone or a team is interrupted.

Poster A, B, & C  “Undergraduate Research: Through the Arts Project”

Presenter(s):
Paula Tica, Kee Chang, Saurabh Sharma, & Jason Kozodoy

Mentor:
Randi Courtmanch, Charlotte Rasmussen, & Kara Adams

As part of a Center for University Studies and Programs Community Engagement through the Arts Class (CUSP 120B) we are using the CRAFT model: contact, research, action, feedback and teaching, to create a work of art that will be used to build awareness that undergraduate research, scholarship and creative activity is accessible to everyone and can be done in all disciplines. Working with University of Washington Bothell (UWB) faculty, staff and students, we are conducting interviews and asking UWB community members questions about their ideas and attitudes regarding research to create a thought-provoking piece of art. We would like your thoughts and ideas in response to the following questions:

A) What is research? What does it look like?
B) How does one get involved in research at UW Bothell?
C) What are the steps needed to conduct research?
Thank you!

Undergraduate Research 2014—2015 Events

- Undergraduate Research Fair: Oct 15 and 16th, 2014 @ The North Creek Event Center
- UW Bothell Founder’s Fellow application deadline: December 5th, 2014
- Undergraduate Research Week: January 26—30th, 2015
- Undergraduate Research Symposium: May 8th (tentative), 2015

Undergraduate Research Project Room

- Available for students to use (by appointment)
- Available for students to checkout (see schedule)

Project room
Undergraduate Research Office
(Student Success Center UW-188)

To checkout an iPad
Undergraduate Research Help Desk
(Student Success Center UW-160)
Mon/Wed: 1:30 p.m-5:00 p.m.
Tue/Thurs/Fri: 12:00 a.m-3:00 p.m.
For more information
http://www.uwb.edu/research/undergraduate-research/resources/ipad-information

Like us on Facebook:
https://www.facebook.com/UWBOfficeOfResearch

Undergraduate Research- UW Bothell
UW-188
research@uw两者
425-352-3781