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ABSTRACTS FROM THE 2018 ISSUE

Research Articles:



Impact of Suspended Particles on Bacterial Concentrations in Great Bay Estuary Oysters

—Audrey Berenson (Mentor: Stephen Jones)

Vibrio parahaemolyticus bacteria are naturally occurring in marine ecosystems globally. However, with recent environmental changes, such as increased water temperature, they have an increasing presence in northeast United States waters, including the Great Bay Estuary in New Hampshire. Due to the accumulation of bacteria in filter feeders that are often consumed, such as oysters, surveillance is necessary to monitor bacteria. I spent the summer of 2017 collecting plankton, water, suspended solids (floating material), sediment, and oysters from the Great Bay Estuary to characterize how suspended solids might impact *V. parahaemolyticus* concentrations in oysters. I hypothesized that when the mass of the suspended solids increased, the bacterial concentration in the oysters would also increase, due to the oysters filtering the water around them and collecting floating particles that might have bacteria clinging to them. My data supported my hypothesis and suggested that inorganic material, such as sand and clay, plays a bigger role in this bacterial accumulation than organic material, such as plant matter and plankton. This information could be used to develop new methods to ensure consumers have access to seafood that is safe to eat.



Evaluating Plant Brushing as a Strategy for Height Control in Edible Crop Species

—Dan Birnstihl (Mentor: Ryan Dickson)

Greenhouse growers producing edible crops can encounter specific challenges when optimizing growing conditions. One challenge is soft growth associated with rapid tissue expansion. Soft growth can lead to plants falling over or soft, floppy leaves. These plants can suffer from increased disease pressure and lower market value. Controlling plant height is one way of reducing soft growth. Outdoors, winds or other external forces can create mechanical stress on plants, triggering a naturally occurring plant hormone called ethylene that reduces plant growth. I conducted an experiment during the summer of 2017 in the MacFarlane Greenhouses at the University of New Hampshire to introduce mechanical stress to hydroponic leafy greens, potted herbs, and seedling vegetables to test whether that stress would lead to reduced growth. I used an automated boom to brush plants with light plastic every hour and compared the growth of the brushed plants with the growth of plants that were not brushed. I found that the effects were species-dependent, with basil, sage, and tomato showing the greatest reductions in plant height. We also found that all brushed species showed a total reduction of shoot growth, and no significant difference in quality as defined by “leaf greenness.”



Uncovering How Occupational Therapy Could Benefit Individuals Living with Sickle Cell Disease in Ghana

—Carolyn D'Olympio (Mentors: Lou Ann Griswold and Martin Agyei)

In 2017, with funding from a Summer Undergraduate Research Fellowship (SURF), I spent ten weeks in Kumasi, Ghana conducting research on how occupational therapy may be beneficial for individuals living with sickle cell disease. At the Komfo Anokye Teaching Hospital (KATH) in Kumasi, I conducted multiple interviews with five individuals living with sickle cell disease. I also traveled to the homes of these individuals to observe how their home environment may be influencing their ability to engage in everyday life with sickle cell disease, and I interviewed healthcare practitioners about the types of services available for these patients. Through my findings, I concluded that individuals living with sickle cell disease in Ghana experience limitations in school, work, taking care of the home and family, socialization, and some leisure activities. Roles affected by sickle cell disease among these patients include the roles of mother, chef, trader, seamstress, television mechanic, and student. Varying beliefs regarding sickle cell disease in Ghana contribute to a heightened sense of stigma around the disease, and a discord exists between patients' experiences and practitioners' understanding of how sickle cell disease limits engagement in everyday life. My findings contribute to the understanding of how occupational therapy, an emerging professional field in Ghana, can assist individuals living with sickle cell disease in Ghana.



Heirs to the Frontier: James Fenimore Cooper's Influence on Tolstoy

—Christian Gum (Mentor: Cathy Frierson)

In the early nineteenth century, American author James Fenimore Cooper wrote a series of frontier novels called *The Leatherstocking Tales* (1823-1841), the most famous of which was *The Last of the Mohicans* (1826). Forty years after Cooper published his earliest work, a young Leo Tolstoy marched south into the Caucasus after enlisting in the Russian Imperial Army. Tolstoy, best known as the author of *War and Peace* (1865) and *Anna Karenina* (1873), began his literary career by writing about his experiences in the Caucasus, the frontier of the Russian Empire. With the knowledge that Tolstoy read Cooper's work, I used a Summer Undergraduate Research Fellowship (SURF) to compare how each author portrayed his respective frontier within his literature. Focusing on their environmental concerns regarding deforestation and their idolization of the rugged frontiersmen archetype, I argue that James Fenimore Cooper influenced Leo Tolstoy's depiction of the frontier in Tolstoy's 1863 novel, *The Cossacks*.



Life Cycle Assessment (LCA) Comparing Disinfection Options for Drinking Water Treatment

—Alexandria Hidrovo (Mentor: James Malley)

Drinking water treatment is essential to obtain a healthy source of water that can be distributed throughout a community. There are various methods to disinfect water, and all have trade-offs regarding public health and the environment. For example, chemical disinfectants that use chlorine can produce disinfection by-products within treated drinking water. The Environmental Protection Agency regulates these disinfection by-products because of their potential to cause cancer. Ultraviolet (UV) light is a physical disinfection method that does not produce these disinfection by-products, which is why it is becoming a preferred method for water treatment. For this research, I conducted a comparative life cycle assessment (LCA) for chemical and physical disinfection methods. The main factors considered within this LCA were energy consumption and human

toxicity risk. The results from my research support my original hypothesis that the assessed chemical disinfection method had less energy consumption and a higher human toxicity risk compared to the assessed physical disinfection method. The results show that each method has trade-offs and that this LCA can provide extensive knowledge on which disinfection method would work best for the Bethlehem, New Hampshire community based on the stakeholders' priorities.



Conservation of the Lion: Preventing an Africa without the African Lion

—Courtney Kamyk (Mentors: Drew Conroy, Jackie Abell and Emma Dunston)

The African lion (*Panthera leo*) population is diminishing rapidly, approximately 43 percent since 1993. The species is currently listed as vulnerable by the International Union for Conservation of Nature (IUCN). With numerous threats to current populations including human conflict, prey depletion, and habitat loss, the African lion is in danger of becoming endangered, or even critically endangered, in the near future. Ex-situ conservation is a proposed method of restoring populations. My research at the

African Lion and Environmental Research Trust (ALERT) in Zambia focused on correlations of boldness with natural behaviors and sociality to help further understand individual personality in hopes of connecting it with success after reintroduction. Six audio playbacks were used to assess boldness personality traits of the twelve individuals of the Dambwa pride in Livingstone, Zambia. Social interactions and daily activity budgets were also recorded. Spearman's correlations were conducted in order to examine correlations between boldness, sociality, and average daily activity. I observed some correlations between social behavior and boldness, and noticed that the Dambwa pride behaved similarly to a wild lion pride. These results provide encouraging evidence for the use of ex-situ conservation with the African lion.



Funding Business Development Services for Women Microentrepreneurs in the Philippines

—Gina Occhipinti (Mentors: Michael Swack and Evelyn Narvaez)

After lending small sums of money to poor people in Bangladesh in the 1970s, economics professor Muhammad Yunus was onto a new way to finance the poor and fight poverty: through microfinance. Since then, many approaches have been taken to lend to those in poverty, help them save money, and help them start businesses. Microfinance organizations provide loans, business advisory services, marketing help, insurance, and more. Business development services especially complement loan assistance because they provide nonfinancial help essential to running a business,

such as accounting skills, product development, supply chain management, and more. In 2017, I traveled to San Pablo City, Laguna, Philippines to research at the Center for Agriculture and Rural Development (CARD), a global leader in microfinance. With funding from a Summer Undergraduate Research Fellowship (SURF), I studied at one of CARD's institutions, the Business Development Service Foundation, Inc. (BDSFI), to research financially sustainable business models for providing high-quality business development services to microentrepreneurs. After reviewing literature in the field and interviewing clients, I found that a market facilitation model that incorporates fees or a percentage of sales would be the most feasible model. This validated BDSFI's existing practices and affirmed that they could charge clients for business development services. I also presented the organization with several other models as options.



Can Artificial Intelligence Alleviate Resource Scarcity?

—Andrew Ware (Mentors: Nick Smith and Simon Beard)

During summer 2017, I explored the implications of the potential application of artificial intelligence (AI) to resource management at the Centre for the Study of Existential Risk (CSER) at the University of Cambridge in the United Kingdom. Alongside my mentor, Dr. Simon Beard, I sought to determine the most noteworthy risks and benefits associated with developing AI that could offer agricultural guidance and that could someday offer insight into more efficient, effective, and equitable resource distribution. My research, funded by a Summer Undergraduate Research Fellowship (SURF) grant, involved discussing AI-related issues in the context of resource scarcity with academics and experts in the fields of AI, climate science, data analytics, economics, ethics, and robotics. I found that while AI could present a solution to the problem of scarcity by harnessing data and algorithms to increase agricultural yield, the technology also must be considered in the context of risks—including bias and a lack of trustworthiness. If the positive potential and risks associated with AI for resource management are thoughtfully considered throughout development, the technology could improve food security and ultimately contribute to a better future.

Commentaries:



Down the Rabbit Hole: Searching for Native Scholarship to Better Understand Populism

—Charlotte Harris (Mentor: Michael Soha)

Early in 2017, I read several popular press pieces that compared the populism of newly-elected President Donald Trump with that of former Venezuelan President Hugo Chávez. I had the nagging sense that such a comparison belied a much more complex relationship. My knowledge of media studies imparted by my communication major, and my cultural inquiry skills honed as a Spanish major and through study abroad in Spain, made me wary of accepting these think pieces as fact. A Summer Undergraduate Research Fellowship (SURF) through the Hamel Center for Undergraduate Research provided me the venue to explore the validity of popular press comparisons between Trump and Chávez. Some similarities were clear: both employed forms of populist rhetoric that positioned a sector of the population against a corrupt elite, exhibited a brash and coarse sense of humor, and had a propensity for fiery tirades against journalists. However, I thought the comparisons merited a more thorough investigation, one that considered the historical and sociocultural context of these countries' political situations. My faculty mentor, Mike Soha, lecturer in the Department of Communication at UNH, helped me design a research project to study the historical and sociocultural context of Venezuela, where Hugo Chávez had been president from 1999 to 2013. I supplemented my investigation by looking at another Latin American populist, Rafael Correa, president of Ecuador from 2007 to 2017. I followed a winding path of journal articles, academic books, and other scholarly publications. As I read, I sought out the sources cited, and read those pieces too. Some sources were only available in Spanish, so my fluency came in handy. I took extensive notes throughout my research process, alternating between Spanish and English. I came to see that the value of my research didn't lie only in the ultimate conclusion of the process; instead, its value was embedded throughout the project, in the understanding I developed along the way. The voices that truly helped me understand the contextual basis for evaluating the comparison were both native to the cultures they studied and academic in their evaluative approach. This perspective equipped me to draw my own conclusions, which were based in academic research and historical, political, and sociocultural understanding.



Bees, Birds, and Beyond: An Unexpected Journey on the Path to Conservation

—Molly Jacobson (Alum, UNH '17)

My lifelong love of nature, especially insects, led me to UNH for its renowned ecological research and its location. As a wildlife and conservation biology major, I had a nebulous vision of making a tangible, direct impact to help protect the future of the natural world, but was unsure of how to go about enacting it. In 2016 I received a Summer Undergraduate Research Fellowship (SURF) so that I could spend the summer months in the Rehan Bee Lab, assisting a postdoc with her research on native bee biodiversity and the impact of farming practices on pollinator communities. In my senior year I examined records of bumble bees from the UNH Insect Collection and our own Rehan Lab fieldwork to identify patterns and causes of their decline, as many species of bumble bee are currently imperiled in the U.S. My honors thesis compiled new information that might aid regional and national efforts in tracking bumble bee declines and informing management decisions to protect them. Yet, what I took away most from that period turned out to be the opportunities that arose because of my research. I realized how much more important outreach was to me than the actual thesis I wrote. After I graduated, I received a summer internship from U.S. Fish & Wildlife at the Rachel Carson National Wildlife Refuge in Wells, Maine. My duties centered on the nationally threatened piping plover, a small shorebird, but also included many forms of outreach. I spent several weeks creating a native bee field guide using my own macrophotography taken on refuge property. Through my research at UNH and internship at the wildlife refuge I have learned where I feel most at home: out in the world, engaging with both what I am trying to save, and the people who I can inspire to carry the torch with me.



How Do Families Try to Survive Yemen's Brutal War? Following a Spiral of Research to Unexpected Conclusions

—Rory O'Neil (Mentor: Jeannie Sowers)

I applied for the Research Experience and Apprenticeship Program (REAP) in order to learn more about how to conduct political science research. I had declared political science and international affairs as a major my first semester on campus, but wondered what research looked like in these fields. A REAP grant would mean that I didn't have to know the answer to that question; the experience itself would show me. Given my background in Arabic and my minor in Middle Eastern studies, I decided to join my mentor, Professor Jeannie Sowers, in her work studying infrastructure destruction in the new Middle Eastern wars that broke out after a wave of popular uprisings swept the region in 2011. Professor Sowers advised me to begin my research by addressing the questions, "How does the ongoing violence in Yemen affect local populations, and how are non-governmental organizations (NGOs) adapting to the conditions in Yemen to provide aid?" I came to understand my research process as a spiral. An attempt to answer an original research question led me to locate and analyze literature on the topic. This literature and analysis phase required me to synthesize the uncovered data with my own interpretations. This synthesis left me with large gaps in my research and without an answer to my original research question. I reoriented my research question to address these gaps, which led me to new literature and new analysis, and so on. Every iteration of the research spiral led me to a deeper and more detailed research question, until I reached a kernel that materialized as a unique perspective. Through several rounds of detailed research and refinement, I reached a deep understanding of the cyclical nature of modern conflict. At the close of my research, I became interested in the way in which Yemeni women interacted with their conflict environments. My research spiral, from overarching concepts of "new wars," to coping strategies, to women's roles in conflict, led me to unexpected conclusions, such as the lessening of restrictive social norms for women, that would go unnoticed at a geopolitical level. I made my own unique connections between disciplines and, most importantly, put political science research—and Yemen—on my academic radar.

Mentor Highlights:



Jo Sias Daniel

—Brigid C. Casellini

Jo Sias Daniel is a professor of civil and environmental engineering at the University of New Hampshire. *Inquiry* interviewed Dr. Daniel about her own research and her mentoring experiences with undergraduate students.



Lou Ann Griswold

—Brigid C. Casellini

Lou Ann Griswold has been at the University of New Hampshire since 1989. Currently she is associate professor and chairperson of the Department of Occupational Therapy. *Inquiry* interviewed Dr. Griswold about her own research and her mentoring experiences with undergraduate students.