2015-2016 DYF Awardees' Info and Abstracts

1. Name (Last, First): Verney, Mike
Program/Dept: History
Dissertation Chair/Advisor: Eliga Gould
Abstract: This dissertation examines the world-wide American maritime empire by looking at the fifteen exploring expeditions that the United States Navy dispatched around the world before the Civil War. These voyages ranged from the South to the North Pacific, from Japan to the Holy Land, and from South American rivers to the frozen Arctic Sea. Each one had a unique set of goals, including antipiracy, evangelicalism, filibustering, rapprochement, and trade. Yet despite their diversity, antebellum American naval exploration was grounded in a common expansionist and imperial impulse that was reflective of the age of Manifest Destiny. This project will study that impulse as it pertained to oceanic expansionism in the early nineteenth century. It is important because it places the story of antebellum American imperialism, which is so often focused on westward expansion, into a global maritime context.

2. Name (Last, First): Welter, Catherine
Program/Dept: English
Dissertation Chair/Advisor: James Krasner
Abstract: L. Davis, noted disability studies scholar, has argued that our concept of normalcy originated in the nineteenth century. My work focuses on how the Victorian novel, which played an important role in shaping cultural and bodily norms, also provided means of resistance for those whose bodies and abilities were marked as "abnormal." I cover a range of texts to study the ways in which transgressive movement and embodiment enabled characters identified as "disabled" or "different" to rebel against constraints forced on them by others. This project will advance the field of Victorian Studies by filling a gap in the existing scholarship and by taking a unique, interdisciplinary approach. In addition to formulating new ways of reading bodies in the Victorian novel, my application of disability and mobility theories to these texts will allow me to theorize new modes of resistance for people labelled "abnormal" today.

3. Name (Last, First): Thompson, Megan
Program/Dept: Genetics
Dissertation Chair/Advisor: Estelle Hrabak
Abstract: Due to modern agricultural irrigation practices, farm lands are gradually being polluted by salts.Most crop species are sensitive to high salt levels which, in turn, affects yield. Consequently, there is a pressing need to understand how plants cope with salt stress. My research goal is to understand plant growth responses to salt at the biochemical and genetic level. Studying the biological pathways involved in salt stress response can be used to develop crop plants that are better adapted to high salt conditions and thus increase food production.

4. Name (Last, First): Smith, Matthew
Program/Dept: Natural Resources and Earth Systems Science
Dissertation Chair/Advisor: John Aber
Abstract: With the human population continuing to grow exponentially, the need for new and efficient waste management systems has never been more important. This is especially true for agricultural systems, which are primary contributors to global warming and degraded water, largely due to poor waste management. Policy makers often look to composting to address these concerns, yet few technologies are capable of fully handling these issues. My dissertation is focused on developing a new

alternative energy composting system, capable of extracting heat from the composting process, while also processing greenhouse gases and runoff from the waste streams. There are only four systems of this kind in the world, with UNH having the only research operation. Results from my research will streamline the methods used to build and operate this novel composting system, which can be used to process any organic waste in any region across the world.

5. Name (Last, First): Moore-Vissing, Quixada
Program/Dept: Education
Dissertation Chair/Advisor: Bruce Mallory
Abstract: American public schools could improve education, level inequality, and empower youth. School reform programs have emerged to facilitate these goals but many fail to engage the local community's wisdom and decision-making. Through constructivist grounded theory analysis, this dissertation is a civic engagement case study that analyzes a K-12 school district's collaboration with a public land-grant university to address documented school and community insufficiencies. The K-12 school has gained national attention for its community-engaged reform efforts and this study will be the first to systematically analyze how universities fulfill their landgrant mission to help schools and towns create vibrant, sustainable, community-engaged public education systems. By understanding how to build and sustain civic engagement structures through school-university partnerships, this study will provide assistance to other K-12 public schools seeking best practices for John Dewey's community-based democratic education, as well as inform the democratic mission of public land grant universities.

6. Name (Last, First): Liu, Qian
Program/Dept: Computer Science
Dissertation Chair/Advisor: Robert Russell
Abstract: Picture countless vehicles meet at a highway intersection. Competition for the intersection (a shared resource) causes congestion. Consider that the highway is InfiniBand, a switch-based network architecture used to interconnect computers within a data center. The intersection is a InfiniBand switch. The vehicles are data packets from computers. Network congestion is the result of competition among packets for shared resources. If no countermeasures are taken, congestion degrades network performance, causes long communication delay, and increases power consumption. Congestion control is the countermeasure for relieving congestion. Unfortunately, current InfiniBand congestion countermeasure and other proposed alternatives either lack effectiveness for various network conditions, or require big changes in hardware. My work proposes and is evaluating a new InfiniBand congestion countermeasure that doesn't require hardware changes, nor does it need the complex configuration necessary in the current InfiniBand congestion countermeasure. It reduces congestion, improves network performance, and works effectively under different network conditions.

7. Name (Last, First): Hemmati, Shohreh
Program/Dept: Chemical Engineering
Dissertation Chair/Advisor: Dale Barkey
Abstract: Growing energy demand, increasing fossil fuel costs, and environmental pollution concerns illustrate the necessity of efficient and clean power sources. It is estimated that nearly 30 TeraWatts of power will be needed globally by 2050. Utilizing clean and non-carbon emitting energy sources such as solar energy coupled with ability to meet the increasing energy demand is inevitable. Harvesting of solar energy as an abundant source requires a cost efficient method, and photovoltaic energy conversion is a promising technology. The synthesis of silver nanowires to formulate conductive inks show great promise to improve solar panel efficiency as they can

be screen printed on panels at lower cost forming conductive grids with high conductivity. My research at UNH focuses on synthesis of silver nanowires at large scale to formulate conductive inks suitable for economical screen printing process to form conductive grids with high conductivity, and application for solar panel manufacturing.

8. Name (Last, First): Gao, Xiongzhuo
Program/Dept: Biochemistry
Dissertation Chair/Advisor: Rick Cote
Abstract: Photoreceptor phosphodiesterase (PDE6) is the central enzyme in the visual signaling pathway. The activity of PDE6 is strictly regulated by its inhibitory subunit (Pγ) (inactive state) and interaction with transducin (Tα*) (activated state). Dysfunction of PDE6 causes retinitis pigmentosa, an inherited retinal degenerative disease, which affects approximately one in 2000 individuals worldwide and 100,000 people in the United States. Although extensive biochemical studies have been conducted to elucidate the regulatory mechanism of PDE6, no detailed structural information is available except two low-resolution EM structures. In addition, the topology of PDE6-Tα* complex is yet to be known. My project focuses on characterizing the regulatory mechanism of PDE6 in its inactive and activated states to provide new insights and strategies for therapeutic intervention of retinal diseases.

9. Name (Last, First): Furnagiev, Steven
Program/Dept: Economics
Dissertation Chair/Advisor: Michael Goldberg
Abstract: The foreign exchange (FX) market is at the heart of the global economy; it plays the vital role of setting the price of a nation's currency, which has direct economic and political consequences. It is no surprise that many governments actively intervene in FX markets to influence their currency. The real puzzle is to reconcile the pervasive use of intervention policy with the economics literature that deems it ineffective. My dissertation will argue this conclusion is premature: the existing literature is essentially asking the wrong question. Using innovations from two recent sub-fields of international finance, I develop a theoretical and empirical rationale that explains the efficacy of government intervention. Using a series of statistical techniques, I then show that intervention does in fact influence the price of currency – reversing a long-standing fallacy and allowing for further discussion in economics on the role of government in FX markets.

10. Name (Last, First): Edmunson, Shelley
Program/Dept: Zoology
Dissertation Chair/Advisor: Elizabeth Fairchild
Abstract: Commercial fishing on Martha's Vineyard, MA has changed over the years due to declining stocks, regulatory shifts, and new market demands. Currently, the channeled whelk fishery is the island's largest commercial fishery, valued at $5.6 million. However, little is known about the biology of these marine snails, making it extremely difficult to regulate this fishery effectively. These biological gaps, combined with an increase in fishing effort, place the whelk fishery at risk of collapsing. The main objective of this dissertation is to investigate various aspects of whelk biology in order to understand how to protect this species, while managing the local fishery. The outcome from this project will be much needed information useful to resource managers for developing a sustainable fishery management plan for channeled whelk.

11. Name (Last, First): Ebadi, Alireza
Program/Dept: Mechanical Engineering
Dissertation Chair/Advisor: Christopher White
Abstract: Fluid-structure interactions are omnipresent: from the flow of cooling air over computer chips to the delivery of fluids through pipes to consumers. Consequently, understanding the dynamics of these interactions are crucial for engineering purposes. These dynamical interactions, however, are very complex and require some form of modeling that reduces the complexity but maintains the important physics of the problem. Most engineering models assume simple (which we will call equilibrium) flow behaviors, however, most engineering systems have much more complex flows than the simple flows from which the models have been built. We call them non-equilibrium flows. Owing to these complexities, engineering models fail to predict important flow parameters. This lack of prediction translates to the over-engineering of systems at substantial economic cost and the slow development of advanced engineering designs. My research aims to formulate the foundations for robust engineering models that accurately capture the flow physics in non-equilibrium flows.

12. Name (Last, First): Dillon, Marcus
Program/Dept: Microbiology
Dissertation Chair/Advisor: Vaughn Cooper
Abstract: When a cell incorrectly replicates its DNA it generates mutations, which are the underlying cause of several diseases, including cancer. Unfortunately, although we are now equipped with a rich genetic database for human disorders, our ability to discriminate disease-driving mutations remains limited. Most of this uncertainty derives from a lack of understanding of mutational processes. My dissertation research focuses on how the rates and effects of mutations vary depending on their location within the DNA. Specifically, I focus on the impacts of replication timing on mutation. I have found that the rates and types of mutations that are generated near the origins of DNA replication are distinct from those in later replicated regions, and am now characterizing their relative impacts on cellular fitness. By directly quantifying these central parameters of mutations, we are developing more complete models of the mutational landscape of cells and enabling enhanced analyses of disease-driving mutations.

13. Name (Last, First): Dewhurst, Tobias
Program/Dept: Mechanical Engineering
Dissertation Chair/Advisor: Swift Robinson
Abstract: As American ground fisheries (cod, haddock, etc.) are subjected to increasingly restrictive management measures, mussel farming could provide an environmentally friendly alternative for the growing number of underemployed fishers. However, sustainable farming—particularly growing the shellfish on ropes suspended from rafts—requires a precise combination of water quality and currents. Sheltered sites with the right conditions are scarce, limiting the industry. Expanding into less sheltered sites could increase production capacity, but rafts would be subject to considerable wave action, resulting in structural damage, interrupted feeding, and mussel drop-off. I have partnered with a local mussel farmer to develop a raft that can be submerged below the ocean surface so that it (and the mussels growing beneath it) can survive severe storms. The success of this project will allow the American shellfish industry to expand significantly and provide new opportunities for many who have spent their lives working with the sea.

14. Name (Last, First): Demeke, Eyob
Program/Dept: Mathematics
Dissertation Chair/Advisor: Karen Graham
Abstract: Proofs are ubiquitous in advanced mathematics. Mathematicians obtain conviction and communicate their mathematical knowledge via proofs. Indeed, in undergraduate mathematics, professors spend significant class time proving claims, theorems, and propositions to their students. Consequently, students are expected to spend extensive time reading and writing proofs. However, little is known regarding how students benefit from this experience of reading and writing proofs. My dissertation study mainly seeks to explore (1) to what extent do students comprehend proofs and what strategies they use to facilitate their understanding of a proof, and (2) what do students gain from reading or seeing proofs presented during lectures. An additional goal of this study is to investigate how proficient mathematics learners such as beginning graduate students read proofs. Ultimately, the aim of my work is to explore and communicate to undergraduate students effective techniques and approaches employed by proficient mathematics learners

15. Name (Last, First): Bennett, Sidney
Program/Dept: Psychology
Dissertation Chair/Advisor: Victoria Banyard
Abstract: Interpersonal violence (e.g., sexual violence) is a widespread community problem, however much is still unknown about the process in which victims reveal their victimization to others. Indeed, although recent policies are built on the assumption that revealing victimization is an important goal for communities (e.g., revealing can help apprehend the perpetrator), little research has explored why victims reveal their experiences and the consequences associated with pressuring victims to reveal. Thus, the purpose of the proposed project is to better understand the process of revealing interpersonal trauma, including the reasons why victims choose to reveal and the potential health consequences of revealing. The findings of this study may be beneficial for informing future policy, which is increasingly focused on mandated reporting, despite our limited understanding of how these policies may impact victims. In addition, understanding victim motivations for revealing may ultimately assist communities in better matching resources to victims.