

## Stonehill Undergraduate Research Experience (SURE) Summer 2015 Awards

Forty-eight Stonehill College students will work with twenty-five faculty members on a variety of research projects during the summer of 2015. This will mark the 20th year of the Stonehill Undergraduate Research Experience (SURE) program, whose purpose is to provide students with an opportunity to perform significant, publishable research under the guidance of an experienced faculty researcher. The research experience will help to provide students with a competitive advantage in graduate and professional school applications and in post-college employment opportunities, as well as to provide assistance to faculty in research activities.

**James Cheney '17, Amy Hanlon '16, Corey Mair '16 and W. Jackson Reilly '16** will work with **Bronwyn Bleakley**, Assistant Professor of Biology, on the *Influence of Social Environment on Guppies*. Cheney will look at the integration of social information across interactions in guppies and aims to evaluate which interactions are most important for generating social effects that strongly modulate guppy cooperative behavior. Hanlon will examine the influences of social environment on guppy endocrine physiology and link potential differences to responsiveness to social partners. Reilly and Mair will look at the influence of social environment on gene expression in guppies by measuring differences in gene expression for several hormone receptors in individuals that interact with different social environments. The group of biology majors hopes that the results of this summer's research will build upon previous years' work and will be compiled and submitted for publication in a peer reviewed journal.

**Jenna Fongemie '16 and Elizabeth Pisto '16** will work with **Nicholas Block**, Assistant Professor of Biology, on *A Resurvey of Odonata Diversity and Phenology in the Blue Hills*. The group will conduct a survey of odonata (dragonflies and damselflies) at Ponkapoag Pond and the surrounding area and compare these data to results of surveys conducted by Hal White during the period of 1966 to 1971. They hypothesize that the number of species has decreased due to development in the Blue Hills and that they may see the presence of new southerly species due to climate change. Fongemie and Pisto, both biology majors, will be responsible for designing and implementing a survey strategy and comparing the data collected to White's results. They plan to use the information obtained to create a dataset that could eventually lead to a science research journal publication.

**Brittany Frederick '16** will work with **Margaret Boyd**, Assistant Professor of Sociology, on *Teaching and Learning about Race in America*. This summer Frederick, an English and interdisciplinary studies major, will work with Boyd to draft a chapter submission for the book series, *Teaching Race and Ethnicity*. The literature on race pedagogy has overwhelmingly addressed the "teaching" of race and ethnicity but has often excluded the voices and experiences of students. Information about what students learned and their engagement with the course content is often determined by faculty designed assessments. Building on previous research, and using an interdisciplinary framework, they intend to survey and interview both faculty and students, inviting faculty to discuss their teaching and learning goals and students to share their engagement with the material both inside and beyond the classroom. In addition to the book submission, they aspire to submit their findings for consideration at a regional sociological conference.

**Ashleigh Burton '16** will work with **Nicole Cyr**, Assistant Professor of Biology and Neuroscience, on *The Role of Hypothalamic Sirtuin 1 in Obesity*. Sirtuin 1 is an enzyme in the hypothalamus section of the brain that has been shown to alter body weight. Increases in Sirtuin 1 levels have resulted in weight gain in rats, while decreased enzymatic activity caused significant weight loss. During this summer, Burton, a neuroscience major, will continue to work on experiments conducted during the academic year, in order to understand how Sirtuin 1 regulates an appetite-controlling hormone called CRH. The results of this project could contribute to the development of weight-loss drugs. Burton anticipates presenting her findings at future NEURON and Endocrine Society conferences.

**Steven Wheeler '17** and **Alyssa Whitney '17** will work with **Deno Del Sesto**, Assistant Professor of Chemistry, on *Adsorption, Ordering, and Interaction of Thioethers on a Au(111) Surface Using Scanning Tunneling Microscopy*. Self-assembled monolayers (SAMs) are often comprised of organic compounds that are adsorbed on a solid surface. This assembly takes place through interactions between the molecules and the surface. SAMs are of particular interest in the field of nanotechnology, specifically in the development of lower power electronics and faster processors. This summer's project seeks to build upon research conducted during the summer of 2014 to establish a reproducible method of characterizing SAMs produced and testing their purity. Wheeler, a biochemistry major, and Whitney, a chemistry major, will be responsible for refining and perfecting the solid methodology that the lab has developed over the years and characterize surfaces using X-ray photoelectron spectroscopy (XPS). The pair will also continue previous research in Del Sesto's lab by planning out experiments and further characterizing the SAMs. The group will strive to submit their findings to a peer-reviewed journal and present an ACS conference.

**Alicia McNally '16** and **Jillian Spinney '16** will work with **Justin Dore**, Teaching Fellow of Biology, on identifying *Cellular Determinants of Neural Plasticity and Repair*. This research project aims to provide novel insights into nerve injury by characterizing the cellular signals that prevent or positively impact the healing process in patients with spinal cord injuries. In order to do this, McNally and Spinney, both biochemistry majors, will build upon research conducted last summer by exploring cell-to-cell interactions, documenting changes in gene and protein expression and examining how the integrity of neurons and glia are influenced by surrounding connective tissues following injury. Their preliminary findings will be presented in July, 2015 at the European Meeting on Glial Cells in Health and Disease in Bilbao, Spain. They also hope to present their work at the Northeast Under/graduate Research Organization for Neuroscience (N.E.U.R.O.N) in 2016.

**Emma Lorusso '16** will work with **Jungyun Gill**, Assistant Professor of Sociology and Criminology, on *Stories of Asian Adoptees: Interviews and Letters to Birth Families*. Gill has begun work on a book investigating the disparity in the motherhoods experienced by the adoptive, birth, and foster mothers involved in South Korean and Chinese adoptions. Through the evaluation of letters and essays written by Korean birth mothers, she has found that birth mothers experience deep feelings of guilt, worry and longing for the children they have given up for adoption. This summer Lorusso, a psychology and sociology double major, and Gill plan to gather a large number of Korean and Chinese adoptees' letters to their birth parents, and later analyze and publish these in a book along with translations. They also hope to explore the adoptees' transitions into adulthood via in-depth interviews. They also plan to present their findings at the 2016 Eastern Sociological Society meeting and co-author a paper submitted to a peer-reviewed journal.

**Richard Aprile '16** and **Maria Cerezo '16** will work with **Marilena Hall**, Associate Professor of Chemistry, on *The Effect of Mutations on Protein Production and Phage Propagation in M13 Bacteriophage*. This project examines a mutation in the genome of an engineered version of M13 phage. Previous research has indicated that the mutation causes faster propagation than the non-mutated engineered phage. Over the years, the lab has characterized 14 different mutations and during this summer, aims to learn why the mutations happened and how to make the phage propagate faster. Aprile and Cerezo, both biochemistry majors, will work on developing an experiment that accurately reflects the amount of protein II by phages in order to determine if the mutant phage produces more than the non-mutant phage, which in turn would explain the faster propagation. The results of this research may be published in future articles.

**Christine Carroll '16** and **Emily Zygiel '16** will work with **Marilena Hall**, Associate Professor of Chemistry, on *Propensity of a Commercial M13 Bacteriophage to Pick up Mutations to Compensate for Virulence Compared to Wild-type Phage*. This project further examines the mutations outlined in the aforementioned Hall project to determine why the commercial phage propagates more slowly than the wild-type M13 phage. Carroll and Zygiel, both biochemistry majors, will conduct experiments to demonstrate that protein II is less active in the commercial phage than the natural one, thus explaining why it needs to pick up mutations in order to survive. The group anticipates publishing future articles outline their findings.

**Ashlyn Czapiga '17** and **Taylor Vigneault '17** will work with **Magdalena James-Pederson**, Associate Professor of Biology and Biochemistry, on *Isolation and Characterization of Methylobacteria Strains from *Armillaria gallica* Cultures*. Czapiga and Vigneault, both biology majors, will isolate live, pink *Methylobacteria* associated with three different hyphal-tip derived cell lines. This association between a bacterial methylotroph strain and a fungus is a novel type of association which has not been reported before. The three strains from Raynham, Bridgewater and Easton will be characterized and DNA sequences will analyzed to determine how closely related the strains are from one another. They plan to present their findings at the 2016 Eastern New England Biological Conference and to publish their research in a peer-reviewed journal.

**Alexander Crowley '17** will work with **Magdalena James-Pederson**, Associate Professor of Biology and Biochemistry, on *Enhancing Laccase Expression in Hyphal-tip Cell Lines of Armillaria gallica*. Laccases are enzymes of particular interest because they have the ability to digest lignin, a major component of wood, and they also are able to break down organic contaminants in water. Previous SURE work showed that cell-lines derived from *Armillaria*'s rhizomorph-derived cell lines expressed higher levels of laccase activity than cell lines derived from spores. This summer, Crowley, a biology major, will attempt to optimize the growth conditions of an *Armillaria* cell line derived from a Mansfield isolate to increase the expression of laccase genes. The laccase mRNA isolated from this cell line will be isolated and used to characterize the laccase sequences found in the genome of *Armillaria gallica*. They hope to present their findings at the 2016 Eastern New England Biological Conference.

**Samantha Drinan '16** will work with **Magdalena James-Pederson**, Associate Professor of Biology and Biochemistry, on *Characterization of Lignolytic Activity in a Novel Methylobacteria Strain Isolated from Armillaria gallica*. Drinan, a biology major, will characterize the lignolytic activity of the isolated *Methylobacteria* strain by testing the ability of this bacteria to grow in minimal media containing different types of lignin monomers as the sole carbon source. Their findings will be presented at the 2016 Eastern New England Biological Conference.

**Catherine Giannetti '17, Ruby Miller '17, and Michael Smith '16** will work with **Louis Liotta**, Professor and Chair of Chemistry, on various synthesis projects. During past summers, Professor Liotta's groups have developed a process for efficiently converting commercially-available sugars into iminosugars. Miller, a chemistry major, and Smith and Giannetti, both biochemistry majors, will be responsible for synthesizing, purifying and characterizing specific compounds as well as investigating the usefulness of a new synthetic approach. The students will be encouraged to present their findings at the national meeting of the American Chemical Society and will prepare a report that will serve as a basis for an article in the *Journal of Organic Chemistry*.

**Matthew Crawford '16 and Megan Golding '16** will work with **Pamela Lombardi**, Assistant Professor of Chemistry, on *Synthesis of New Chiral N-Heterocyclic Carbene Ligands for Catalysis and Investigation into the Reactivity of Chlorosilanes with N-Heterocyclic Carbenes*. Molecules are said to be chiral if they have a non-superimposable image. Reactions to produce these molecules often result in two mirror images, or enantiomers, which can be problematic if the biological activity of one is different the other. Therefore, producing one enantiomer is the preferred objective. Crawford, a biochemistry major, will build on his research from last summer by investigating new routes to a novel class of chiral ligands to produce enantiopure molecules. Golding, also a biochemistry major, will examine the ability of a similar class of ligands in reactions with chlorosilanes, which have the potential to promote new reactions.

**Love Boussiquot '16 and Courtney Grey '16** will work with **Wanjiru Mbure**, Assistant Professor of Communication, on *Learning about Race and Intersectionality in the Liberal Arts Classroom*. The goal of this project is to produce two chapters of a proposed volume entitled *Teaching Race & Ethnicity*. The summer's research will build upon preliminary data collected during the fall regarding attitudes of teaching and learning experiences of race and/or ethnicity. Boussiquot, a mediated communication major, and Grey, a psychology and gender and sexuality studies double major, will review existing literature, collect data from interviews and online surveys and perform data analysis. In addition to the aforementioned chapters, the group hopes to present their research at the Lilly Conferences on College and University Teaching and Learning or the Teaching Professor Conference.

**Alyssa Desruisseaux '17** will work with **John McCoy**, Professor of Psychology and Neuroscience, on *Neurocognitive Dysfunction in Patients with Schizophrenia*. Desruisseaux, a neuroscience and visual and performing arts double major, and McCoy will evaluate logical thinking using neuropsychological tests, and correlate these findings with recordings of event related potentials from patients with schizophrenia as well as from matched controls. The data will be recorded, compiled and analyzed, and findings will be presented at a scientific conference and potentially published in a peer-reviewed journal.

**Mackenzie Gamble '16** will work with **John McCoy**, Professor of Psychology and Neuroscience, on *Role of Glutamatergic Neurons of the Basal Forebrain*. Gamble, a neuroscience major, will utilize a transgenic mouse model to investigate properties of a subset of basal forebrain (BF) neurons that contain the excitatory neurotransmitter, glutamate. These BF neurons are critical in the regulation of the sleep-wake cycle. The findings will be presented at a scientific conference, and potentially published in a peer-reviewed journal.

**Zack Colclasure '16** will work with **Edward McGushin**, Associate Professor of Philosophy, on *The Politics of Desire*. Colclasure, a philosophy and political science double major, and McGushin will spend the summer examining how philosophers such as Herbert Marcuse, Gilles Deleuze, Jacques Derrida, Michel Foucault and Slavoj Zizek critique the politics of desire in contemporary society. Each in his own way raises important questions about the relations between desire, law, and freedom and each attempts to explain and challenge how modern, liberal, capitalist political economies reconfigure these terms in radical ways. They will present their results as part of a panel at the 2015 Psychology and Other Conference in Cambridge, MA and will submit an article to a scholarly journal such as *Philosophy and Social Criticism* or *Continental Philosophy Review*.

**David Gorey '16** will work with **Sean Mulholland**, Associate Professor of Economics, on *The Political Economy of Same Sex Marriage*. Gorey, an economics major, and Mulholland seek to answer three questions: Why have we seen such a large shift towards the legalization of same sex marriage over the last ten years? What are the current and historical reasons for why particular states legalized same sex marriage? How did these state-specific characteristics determine when and how states legally recognized same sex marriage. The pair plans to write a manuscript with their findings.

**Caroline Lambert '16** and **Michael Needle '16** will work with **Anna Ohanyan**, Associate Professor of Political Science and International Studies, on *Fractured Regions or Weak States?* This research will further explore prior research and fieldwork done by Ohanyan in Armenia, Georgia and Bosnia and Herzegovina. This summer Lambert, an interdisciplinary and global studies major, and Needle, a political science and international studies major, will have three goals. They will review the literature on regional integration worldwide to generate new empirical studies; investigate region building processes around the world; and produce a typology and framework of analysis of region-building processes for conflict areas. This research will build upon and hopefully support prior findings, namely that conflict areas are actually groupings of weak states rather than fractured regions, as they are often described. They will also study how the methods of conflict resolution differ between regions partly as a result of varied levels of integration these regions exhibit. The findings of this research will serve as the basis for a paper that will be presented at the Northeastern Political Science Association Conference.

**Justin Blanch '16** will work with **Irvin Pan**, Assistant Professor of Biology, on *Expression and Evolution of the TAGL1 gene in Wild Relatives of Tomatoes*. Blanch, a biology major, will aim to understand what roles the ripening gene *TAGL1* may have played in the process of domestication. The project will build on previous SURE research that began to analyze the expression of *TAGL1* in the flowers and fruits of tomato and other wild relatives of tomato through quantitative PCR. The findings of this summer's research will be presented at the Eastern New England Biological Conference.

**Benjamin Cote '16** and **Darius Haghghat '16** will work with **Irvin Pan**, Assistant Professor of Biology, on *Genetic Mapping of the e2814 ("Alien") Mutant in Tomato*. Cote, a biology and French double major and Haghghat, a biology and religious studies double major, will work to further characterize and map the e2814 mutation. The pair will attempt to create and make use of molecular markers identify the mutation using mapping lines. The findings of this summer's research will be presented at the Eastern New England Biological Conference.

**Samuel Agostini '16**, **Devan Kinsella '17**, **Elizabeth Thornton '16** and **Alexandra Zerillo '16**, will work with **Robert Rodgers**, Assistant Professor of Political Science, and **William Ewell**, Associate Professor of Political Science, on *The Conservative Advantage: Partisan Bias in the American Political System*. This project builds on the SURE 2013 project, which created a theoretical basis for the analysis of partisan bias with findings in two areas: campaign finance in the 2012 congressional elections and redistricting in the wake of the 2010 census. The summer's SURE project is a continuation of the data collected with a goal of drafting a book on the topic.

**Alexis Trabucchi '16** will work with **Robert Rosenthal**, Professor of Economics, on *Compensating the Exonerated: Inequality beyond Injustice*. Over the years, a number of wrongfully convicted have been exonerated based on new evidence, often DNA samples. Existing research has focused on why a defendant might have been wrongly convicted, as well as the struggles related to their ability to reverse their convictions. However, there is a lack of research addressing the evidence of wide-ranging disparities in how the exonerated are compensated. This project seeks to establish a database for all states linking compensation legislation with statewide characteristics, as well as the socio-economic characteristics of the 300 plus individuals who have been exonerated. Trabucchi, an economics and psychology double-major, will work to establish both databases, which will serve to form the basis of econometric analyses designed to predict the factors impacting the variation in compensation levels. Rosenthal and Trabucchi hope to present their results at a future meeting of the National Association of Forensic Economists or the Eastern Economics Association.

**Sarah Desmarais '17** and **Hiral Patel '17** will work with **Cheryl Schnitzer**, Associate Professor of Chemistry, on *Artificial Photosynthesis*. Desmarais and Patel, both biochemistry majors, have the goal to understand energy transfer during photosynthesis using a laser system. During the summer, the pair will further optimize and align the laser to improve data collection. The findings have implications in developing more efficient solar cells. The research will be submitted for publication in *Environmental Science and Technology* and presented at the 250<sup>th</sup> ACS National Meeting in Boston.

**Evan Wolstencroft '16** will work with **Bettina Scholz**, Assistant Professor of Political Science, on *Refugees: A Case for Language Rights?* From a local perspective, Professor Scholz and Wolstencroft, a political science and international studies double major, will use cosmopolitan theory to evaluate United States refugee policies in order to determine whether the unique humanitarian status granted to refugees ought to entail special language accommodations. In order draw a conclusion in this debate, Wolstencroft will review articles justifying language rights for particular groups, study international and domestic refugee regulations and evaluate cosmopolitan theories regarding the rights of refugees. They aspire to submit their findings to the New England and Midwestern Political Science conferences and to a professional journal such as *Global Society*.

**Praveen Kumar Jain '17** will work with **David Simon**, Associate Professor of Physics, on *Making Twisted Light Immune to Turbulence*. Quantum cryptography and quantum communication are conducted by encoding a single bit of information on a photon, or particle of light. Light with orbital angular momentum (OAM), also known as twisted light, is capable of transferring larger amounts of information per particle. However, due to disruptive atmospheric turbulence, this method cannot be used for long distances. This project seeks to propose a more robust variation of the OAM beam and demonstrate its sturdiness by numerically simulating its behavior when multiplying through turbulence. Jain, an engineering major, will complete analytical calculations and computer simulations and will analyze the results. The pair aspires to draft a scientific paper on this topic and come up with extensions of the project that could be used in future experiments.

**Andrew Hunt '17** will work with **Leon Tilley**, Professor of Chemistry, on *Investigation of Electron-Withdrawing Substituents in the Synthesis of Cyclopropanes, Bicyclobutanes and Tetrahedranes*. The long-term goal of this project is to synthesize tetrahedrane, which has proven to be very difficult. Tetrahedrane can be used as a high-energy fuel or as a feedstock for fuel cells. Hunt, a chemical engineering major, will work on the synthesis of part of the scheme that has been developed toward its preparation. The findings from this research project will be presented at the ACS national meeting and the SURE poster session and will ultimately be published in a peer-reviewed journal.

**Olivia Osiecki '16** will work with **Erica Tucker**, Associate Professor of Anthropology, on *Examining Readers' Interpretations of Historical Violence in Children's & Young Adult Literature*. Osiecki, a sociology and gender studies double major, and Tucker will study the presentation of historical fiction to children. The pair will examine how incidents of historical violence are portrayed in children's literature, what factors go into establishing age appropriateness and what draws children to these books. The results of this research will provide support for work conducted by Tucker in Poland. They also hope to present their work at a regional conference.