

Stonehill Undergraduate Research Experience (SURE) Summer 2012 Awards

Fifty Stonehill College students will work with twenty-eight faculty members on a variety of research projects over the coming summer of 2012. The scholars and their faculty mentors are the seventeenth group to work under 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.

Johnny Joseph '14, Jamie Lenz '13, Kyle Ryan '14, and Nichole Rota '14 will work with **Bronwyn Bleakley**, Assistant Professor of Biology, on *Indirect Genetic Effects on Behavior*. Both wild and inbred guppies, *Poecilia reticulata*, cooperate in social networks to perform many behaviors in response to predatory threats. The research group will use inbred strains of guppies to control the genes (carried in individuals) present in different social groups to continue research that took place during the 2011 SURE program. Kyle will build on a previous experiment by introducing a new observer strain of fish to four previous demonstrator strains exhibiting the ability to teach a spatial task, in order to determine if specific strains are consistently good teachers. Nicole will test 1-strain and 2-strain groups that are familiar or unfamiliar with each other to assess the role social experience plays in learning among diverse groups. Johnny will further manipulate the composition of social groups and observe associations between group members to determine how the formation of social networks facilitates cooperative behavior. Jamie will initiate a new project looking at variation in filial cannibalism. All four of the students are biology majors. These new studies will be combined with findings from 2011 in a paper that will be submitted for publication.

Nicholas Howard '13 will work with **Matthew Borushko**, Assistant Professor of English on *Romanticism and Beauty*. This project will research the aesthetic category of beauty in the literature of the Romantic Age in Britain (approximately 1780-1840) for Professor Borushko's new book, *Romanticism and Beauty*. Nicholas, an English major, will assist with reading Romantic era texts to identify, classify and compile a database of instances where authors turn to beauty in the literature studied. By compiling this information, they hope to determine why the authors are focusing on beauty and what is the ultimate outcome of doing so; how does it affect the aesthetic legacy of the piece and Romantic literature in general? In addition to Professor Borushko's book, the pair hopes to submit a paper for consideration at an upcoming academic conference.

Julia Crane '13 will work with **Kenneth Branco**, Professor of Sociology, on *Religiousness and Staff Conflict among Nursing Home Residents*. Crane, an English and Sociology double major, will be investigating the possible existence of a pattern that connect religiousness, cognitive impairment and conflict between residents and staff. Theoretically this research is located within a tradition that extends back to one of sociology's founders, Emile Durkheim, who argued that moral constraint is effective only in as much as it becomes part of consciousness. Crane's research extends that tradition to the study of those that may have lost awareness of religious moral restraint. The goal of the research is to produce and submit a journal article to *the Journal of Religion, Spirituality, and Aging* for publication. This article will be based on the elaboration of research that was done as part of an earlier SURE project on aspects of religiousness and several aspects of conflict among nursing home residents. Crane will be focusing on resident conflict with staff in her paper.

Sean Dwyer '14 will work with **Maria Curtin**, Professor of Chemistry, on *Intermediates in the Reaction of Chlorite with Ascorbate*. This research is a continuation on the study of the mechanism by which chlorine dioxide is produced from the reaction of ascorbate with chlorite. Sean, a chemical engineering major, will be working towards isolating the ascorbate intermediates and analyzing and identifying them using Ultra Performance Liquid Chromatography/Mass Spectrometry.

Cameron Hill '13 will work with **Deno Del Sesto**, Visiting Assistant Professor of Chemistry on the *Determination of the Reactivity of the Vibrational Ground State of Methane on Ni(111)*. Hydrogen gas can be produced through the steam-reforming reaction, in which natural gas and steam react over a nickel catalyst to produce hydrogen and carbon monoxide gas. This process is inefficient and must take place at very high temperatures and pressures. The rate-limiting, or slow, step in this reaction is the cleavage of a C-H bond in the methane. By studying the dynamics of this reaction, it may be possible to develop a more economical and efficient method of producing hydrogen gas, which can then be used in fuel cells as well as in the synthesis of ammonia. Cameron, a chemistry and physics major, will be working with Professor Del Sesto and Professor Arthur Utz from Tufts University to determine the reactivity of the vibrational ground state of methane using a molecular beam apparatus. The results of their experiments may be submitted to a peer-reviewed journal and presented at a national meeting.

Laura Dzgoeva '14 will work with **Corey Dolgon**, Professor of Sociology and Director of Community Based Learning, on *Justice at Home: The Feasibility of Veterans Courts in Plymouth County*. Laura, a double major in psychology and sociology, will be researching the issues related to a new type of court known as the veterans treatment court. The research will consist of two components: an examination of the statistics of veterans who find themselves in the justice system and the gathering of data from the local District Attorney's and Veteran's Affairs offices. The results of the research will be finalized in a report that will be presented to local officials and veterans groups. In addition, the findings may be presented at either the Annual Restorative Justice Conference or the Association for Humanist Sociology Conference.

Katherine Dempsey '13 will work with **Brian Glibkowski**, Assistant Professor of Business, on *From the Theatre to the Management Stage: How Can Narrative Discourse in Theatre Inform Management Theory?* This project is a continuation of last summer's SURE project that studied the intersection of dramatic literature and organizational behavior. This summer's project will focus on empirical data versus theoretical information and it will have a more narrow focus on the role of narrative discourse to provide depth to the inquiry. Katie, a communication studies major will be conducting research that includes semi-structured interviews with professionals involved in a dramatic production, non-obtrusive observation by the researchers of rehearsals and performances, and path modeling working sessions where the dramatic plot will be diagrammed. Essentially, the focus of the research is to generalize the findings from dramatic performances to broader organizational contexts in the hopes of potentially producing information that can be transformational in the creation of audience and customer connection in arts and marketing organizations.

Joseph Vuto '13 will work with **Mevan Gunawardena**, Assistant Professor of Physics and Engineering, on *Detection of Weak Atomic Transitions with Entangled Photons*. The project is a continuation of last year's SURE project which aims to understand and control quantum coherences of atomic and molecular states by using entangled photons. The goal is to develop a spectroscopic scheme that will surpass the limits of traditional schemes by exploiting the correlations of entangled photons. Joe, a physics and engineering major, will be developing several subcomponents required for the overall project. This includes developing a photon coincidence counter and setting up a scheme for generating entangled photon by parametric down-conversion among other things.

Adelle Dagher '13 and **Caitlyn Taveira '13** will work with **Marilena Hall**, Associate Professor of Chemistry, on *Creation and Characterization of Fast-propagating Mutants in M13 Bacteriophage*. This summer's project is a continuation of several past SURE projects which have focused on the discovery of a mutation in the genome of an engineered version of M13 phage. The M13 has a tendency to mutate, while the natural M13 does not. Past SURE researchers have been able to demonstrate that this mutation causes faster propagation than the non-mutated engineered phage. This work has already been published, but this summer's research will go towards a new publication. Adelle, a biology major, will be incorporating novel mutations into the engineered M13 phage while Caitlyn, a biochemistry major, will be exploring why mutations spontaneously occur in the engineered version of M13, while the wild-type form of M13 is stable.

Madeline Elias '14, Stephen Leonard '14 and Nicholas Palen '14 will work with **Rachel Hirst**, Assistant Professor of Biology on *Investigation of a Potential Relationship Between the White-Rot Fungus *Armillaria gallica* and the Facultative Methylophilic *Methylobacterium**. *Armillaria gallica* degrades the roots of compromised trees by producing a series of enzymes, which breakdown the major components of wood. During a previous study of the genes encoding these enzymes, DNA sequences similar to bacteria from the genus *Methylobacterium* were isolated. This result suggests a potential relationship between *Armillaria gallica* and *Methylobacterium*. During this project, the students will verify the identity of *Methylobacterium* and determine the ideal parameters for culturing the bacterium. Madeline will lead the research to visualize *Methylobacterium* within *A. gallica*. Nick will determine the ideal parameters for culturing the bacterium and perform biochemical tests for further characterization. Stephen will optimize the original protocol for isolating the bacteria from *A. gallica* hyphae. The results of this research will be presented at the 2013 Eastern New England Biological Conference.

Alicia Carreiro '13 will work with **Magdalena James-Pederson**, Assistant Professor of Biology, on *Mapping the Manganese Peroxidase gene of *Armillaria gallica**. Alicia, a biochemistry major, will be working towards cloning and characterizing a complete manganese peroxidase gene from the honey mushroom *A. gallica*. She will be cloning both a genomic version as well as a cDNA version of the gene. Sequence analysis of these two versions will be performed to identify the coding and noncoding regions present in the genomic version. In addition, the cDNA version of the gene will be used for the expression of manganese peroxidase enzyme in transformed yeast cells. The results from this project will be presented by Alicia as a poster in the 2012 SURE Poster Presentation and also in the 2013 Eastern New England Biological Conference.

Georgia Winters '13 will work with **Bonnie Klentz**, Professor of Psychology on *The CSI Effect: The Jury is Still Out*. In the years since *CSI: Crime Scene Investigation* began airing on television, concerns have been raised about a possible CSI Effect. Much of the evidence for this effect is based on surveys of attorneys and jurors' self-reports of the type of evidence they would find reliable and necessary to reach a particular verdict. The few experimental studies examining a possible CSI Effect lacked the deliberation phase of jury decision making, thus limiting their applicability to actual juries. However, these experiments generally point to either no CSI Effect, or a very weak one. Professor Klentz has collected data in an experiment over the past four semesters examining the presence or absence of forensic DNA evidence and its influence on jurors' verdicts as a function of the jurors' level of *CSI* viewing. In addition, jurors deliberated in groups of 12 and their deliberations were video and audio-taped. Georgia, a psychology and criminology major, will assist in analyzing individual juror responses, verify transcriptions of the deliberations, and develop a system of coding the deliberations to examine the impact of *CSI*-viewing jurors on the deliberation and eventual verdict of the jury. The results will be submitted for presentation at the American Psychology-Law Society Conference and submitted for publication in the journal *Law and Human Behavior*.

Gabrielle Cole '14, Alicia DiColli '13, Timothy Ferreira '13, Alexandra Massa '14, Kelly McCarthy '13, Katie Polakowski '14, and Andreia Vieira '13 will all be working with **Louis Liotta**, Professor and Chair of Chemistry, on assorted synthesis projects. During past summers, Professor Liotta's groups have developed a process for efficiently converting commercially-available sugars into iminosugars. Now, the project is ready to proceed to the synthesis of specific compounds which, as indicated by computer modeling, have the potential of having high biologic activities. Each student will be adapting the previously developed procedure as necessary to synthesize these specific compounds. The students will be encouraged to present their findings at a national meeting of the American Chemical Society. In addition, their final reports will serve as a starting point for a future article submission to the *Journal of Organic Chemistry*.

Courtney Birchall '14 will work with **John McCoy**, Director of the Neuroscience Program, on *Modeling Schizophrenia Abnormalities in Mice*. Postmortem findings in the brains of schizophrenia patients indicate a reduction of glutamic acid decarboxylase (GAD67), an enzyme that synthesizes gamma-aminobutyric acid (GABA), a major inhibitory neurotransmitter in the brain. Courtney, a neuroscience major, will assist Professor McCoy in studying these processes in a murine model of the disease. The resulting work will be presented as a poster at the New England Undergraduate Research on Neuroscience (NEURON) conference.

Rachael Donnelly '13 will work with **John McCoy**, Director of the Neuroscience Program, on *Effects of Caffeine Consumption on Recovery Sleep Following Chronic Sleep Restriction*. People often try to combat sleepiness resulting from sleep restriction with caffeine. Rachael, a neuroscience major, will assess the effects of chronic caffeine consumption and/or chronic sleep restriction on sleepiness and sleep homeostasis in an experimental model of OSA. The completed data resulting from this project will be presented at the New England Undergraduate Research on Neuroscience (NEURON) conference next year.

Genelle Goodhue '14 will work with **John McCoy**, Director of the Neuroscience Program, on *Apnea-Induced Cortical Arousals: Anatomical Studies of Neuronal Activation*. Obstructive sleep apnea (OSA) is the stoppage of breathing during sleep, which is caused by the upper airway collapsing. This study hypothesizes that the dorsal raphe nucleus will be stimulated by the cessation of breathing that characterizes OSA in humans. This activation will convey information to cortical arousal-related targets. Genelle, a neuroscience major, hopes to present a poster at the New England Undergraduate Research on Neuroscience (NEURON) conference next year.

Lauren Mahncke '14 will work with **Edward McGushin**, Associate Professor of Philosophy, on an *Interview for Foucault Studies with Dr. James Bernauer, Professor, Department of Philosophy, Boston College*. Michel Foucault (1926-1984) is one of the most influential philosophers of our time. Dr. Bernauer traveled to Paris to study with Foucault in 1979 and got to know him personally. Since then Bernauer has become a leading scholar working on and with Foucault's ideas in the fields of philosophy, holocaust studies, and religious studies. Given the importance and uniqueness of his work and his relation to Foucault, the editorial board of *Foucault Studies* has requested an interview with Bernauer. Lauren, an English major and philosophy minor, will assist Professor McGushin with drafting the interview questions, transcribing the video-taped interview and drafting footnotes for the piece. The article will be published in the journal in their February 2013 volume.

Brian Switzer '13 will work with **Constantinos Mekios**, Assistant Professor of Philosophy, on *The Aristotelian Final Cause and Potential Relevance of Teleological Explanations for Modern Biology: A Comparative Study*. Brian, a philosophy major, will be studying in detail Aristotle's account of teleology by tracing the references to this concept in three of his works. An emphasis will be placed on identifying and analyzing the sections of these texts which do not only help the reader understand the general role of final causes in Aristotelian philosophy but are also relevant to biological considerations. From such considerations, the focus of the project will then shift to the task of addressing the question regarding the potential relevance of teleological explanations for modern biology. Upon completion of the research, the two are planning to publish the results into an undergraduate philosophical journal and to attend a conference in which to present their findings.

Sean Moran '13 will work with **Sean Mulholland**, Assistant Professor of Economics on *How Hate Became a Crime: An Empirical Investigation of State Hate Crime Legislation*. Sean, an economics major, will be working with Professor Mulholland to empirically test the hypothesis that variations in state hate crime laws reflect the legal and social definitions of what is a hate crime and that these differences in policy are shaped by politics and social influence. They will do this by determining whether passage of state hate crime legislation is associated with the fraction of their citizens who are members of civil rights and victim rights organizations. The resulting co-authored manuscript will be presented at the 2013 Eastern Economic Association meeting or the 2013 Midwest Economics Association meeting.

Rachel Sederberg '13 will work with **Sean Mulholland**, Assistant Professor of Economics, on *Catholic Schools, Competition, and Public School Quality*. This project is a continuation of their project from SURE 2011. Rachel, an economics major, will be working with Professor Mulholland on verifying their findings from last summer as well as examining new data. This summer will be spent looking at the data from different grades, concentrating on the fifth, tenth and twelfth grades, to determine if competition from Catholic schools has similar effects on public school quality at other grade levels. A paper submission for publication in an economic journal, such as *Economics of Education Review*, *Education Economics*, or the *Journal of Private Enterprise Education*, is planned for the fall of 2012.

Michele Flannery '13 and **Kaitlin Daly '14** will work with **Irvin Pan**, Assistant Professor of Biology on *Expression, Function, and Evolution of the TAGL1 gene in Wild Relatives of Tomato*. The *Tomato AGAMOUS-Like1 (TAGL1)* gene has been shown to regulate many aspects of fruit ripening in tomato plants. This project seeks to determine whether this gene functions similarly in other species related to the tomato or if the gene's functions have changed. Kaitlin, a biology major, will analyze the expression of *TAGL1* in the flowers and fruit of *S. pennellii*, a tomato relative that produces small, green fruits, while Michele, also a biology major, will study the gene in *S. piminellifolium*, another relative that produces small, red fruits. The work resulting from these studies will be presented at the 2013 Eastern New England Biological Conference, as well as the ASPB Plant Biology 2013 Conference.

Lindsay Castonguay '13 will work with **Christopher Poirier**, Associate Professor of Psychology, on *Reducing the Own-Age Bias in Face Recognition Memory*. Professor Poirier's previous research has shown that people exhibit own-age bias when remembering faces. That is, they have more accurate facial recognition with people closest to their own age. In this project, Lindsay, a psychology and sociology double major will determine if an increase in the perceived level of power of a person improves facial recognition, regardless of own-age bias. The findings of this study will be submitted to a research conference for consideration.

Tara Cantwell '13 and **Bryana Killion '13** will work with **Ann Marie Rocheleau**, Assistant Professor of Sociology and Criminology, on *The Relationship between Prisoner's Activities and Serious Prison Misconduct and Testing Self-Control Theory on Prison Misbehavior and Violence*. These studies strive to determine whether prisoner misconduct and violence are related to other factors, namely participation in prison activities or level of self-control. Tara and Bryana, both psychology and criminology majors, will use data collected from prisoners and staff members during 2009 and 2010 in their analysis. The intended result of this study is the submission of research articles to a peer-reviewed journal in the field as well as the presentation of the findings at the New England Sociological Association or Northeastern Association of Criminal Justice Sciences conferences.

Jenna Walz '13 will work with **Cheryl Schnitzer**, Associate Professor of Chemistry on *Artificial Photosynthesis*. The goals of this project are to improve their understanding of how energy transfers during photosynthesis and to enhance the efficiency of the photosynthetic light harvesting complexes. Jenna, a chemistry major, will isolate and purify LH2 (Light Harvesting Complex 2) complex from *Rhodobacter spaeroides* 2.4.1, a type of purple bacteria. Two different types of lasers will be used to create artificial photosynthesis. The results of this experiment will be submitted for publication in the *Journal of Physical Chemistry B* and will be presented at the National American Chemical Society Meeting and the Bridgewater State Environmental Symposium.

Andrea Monterotti '14 and **Matt Tardiff '14** will work with **Hsin-hao Su**, Assistant Professor of Mathematics, on *The Edge Balance Index Set of the Halin Graph of the L-Product of Cycles by a Path*. Andrea, a mathematics major, and Matt, a mathematics major and a minor in psychology, will be working together in search of a solution to a special graph labeling problem, specifically, finding the edge-balance index set of a graph. This project is a continuation of previous projects where three L-product graphs were solved. If able to solve the remaining problem, Andrea and Matt will write a joint paper to present in the 26th Midwest Conference on Combinatorics, Cryptography and Computing at Southern Utah University in October 2012.

Megan Dumas '14 and **Rebecca Leising '14** will work with **Leon Tilley**, Associate Professor of Chemistry, on *Investigation of Electron-withdrawing Substituents in the Synthesis of Cyclopropanes, Bicyclobutanes, and Tetrahedranes*. The long-term goal of the research is to synthesize tetrahedrane, however each student will be responsible for a different component of accomplishing this goal. Rebecca, a chemistry major, will be working to synthesize and solvolyze cyclopropanes and bicyclobutanes, while Megan, also a chemistry major, will be focused on the the synthesis of the tetrahedrane. As a group, they plan to study the scope of the electron withdrawing effects; undertake kinetics studies, and apply this effect to the synthesis of these systems. They plan to present their findings at a future American Chemical Society national meeting.

Kelli Brodbreck '14 will work with **Erica Tucker**, Assistant Professor of Anthropology, Department of Sociology and Criminology, on *To Teach or Not Teach? A Cross-Cultural Examination of Museum Representations of Violence Designed to Educate Young Children*. Kelli, a sociology major, and Professor Tucker will conduct an anthropological study of how Polish and American museums convey the facts and meaning of difficult historical incidents such as oppression, slavery and violence to young visitors. Dr. Tucker has studied how the Museum of the Warsaw Rising in Warsaw, Poland approaches sensitive topics with elementary school-aged children. Kelli will assist with a similar study of Plimoth Plantation and the Mashantucket Pequot Museum. They plan to detail their findings in a research paper, which they hope to present at the New England Sociological Association conference or the New England Undergraduate Sociology Research conference and potentially at the Meetings for the American Anthropological Association. In addition, they would like to present their findings in Stonehill's sociology and criminology magazine, *Prints*.

Patrick Cabral '13 and **Lauren Dulieu '13** will work with **Maura Tyrrell**, Professor of Biology, on *Does Nuclear Sorting Take Place When Armillaria gallica Spores are Produced?* Lauren and Patrick, both biology majors, will be cloning several gene regions in spore and rhizomorph cell lines of the basidiomycete fungus *Armillaria gallica*, an important decomposer in temperate forests, including those of the northeastern United States. These clones will allow gene sequencing and analysis of allelic patterns. The goal of this project will be to produce evidence that alleles don't assort independently within spore cell lines as they do in rhizomorph cell lines, which will support a nuclear sorting hypothesis. Regions of DNA extracted from spore and rhizomorph cell lines will be selected for cloning following a multipage protocol developed by Pederson-Hirst lab. The results will be presented at the Eastern New England Biology Conference in April 2013 and a publication in a refereed journal as a test of John Cairns' "immortal strand hypothesis" is possible as well.

Joseph Gale '13 and **Daniel Gardiner '14** will work with **James Wadsworth**, Associate Professor of History on *A Circle of Hands*. The research will focus on the hypothesis that the indigenous populations of the Americas constructed a functioning and viable hemispheric economic system that experienced alternating periods of intense contact and fragmentation with the rise and fall of political, cultural, and economic centers--for, there was nothing inherent in their geography, environment, worldview, or politics that rendered them incapable of constructing such a system. The research required for this project is ample. Therefore, Joseph and Daniel, both history majors, will focus on two smaller pieces of the study during this summer. They will examine obsidian trade routes in North America and investigate how the Puritans in Plymouth colony interacted with existing native exchange networks during the beginning of colonization. A paper detailing their research will be written and presented at the New England Historical Association bi-annual conference.

Hailey Chalhoub '13 and **Domenique Ciavattone '13** will work with **Christopher Wetzel**, Assistant Professor of Sociology on *Students in Action: The Changing Forms and Focus of Engagement in an Era of Globalization*. In recent years, researchers have argued that increased educational demands and an unstable job market have resulted in a decline in student activism. Hailey and Domenique, both interdisciplinary majors will assist Professor Wetzel in determining if student activism has simply shifted its focus and form. The group will analyze this argument through interviews with students at various campuses across the Northeast. Hailey and Domenique will present the results of their research at the Eastern Sociological Society annual meeting in February 2013 and will submit an article on student engagement to the journal *Mobilization*. Finally, they plan to create a multi-media weblog during Spring 2013 to share their findings with student groups.

Briana Burke '13 will work with **Eunmi Yang**, Assistant Professor of Education, on two projects. Project I is entitled, *Investigating the Impact of Community Based Learning (CBL) STEM Education Courses on Preservice-Teacher Preparation for Diverse Classrooms*. This project is a continuation of several past SURE projects. Briana, an English and secondary education double major, will work with Professor Yang on collecting and analyzing new data that will allow them to examine the impacts of the CBL course on teacher preparation more closely. The second project, *Developing a Survey Instrument for Estimating Teachers' and Students' understandings of the Nature of Science*, is a continuation from last summer's SURE project. Based on the results from last summer, a new set of questions has been developed and administered. The new data will be analyzed during this summer and they are hoping to then finalize the instrument and write a draft for future publication to the field.