

Stonehill Undergraduate Research Experience (SURE) Summer 2014 Awards

Fifty Stonehill College students will work with twenty-three faculty members on a variety of research projects over the coming summer of 2014. The scholars and their faculty mentors are the nineteenth 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.

W. Jackson Reilly '16, Cara Seward '15, and Alex Tavares '15, will work with **Bronwyn Bleakley**, Assistant Professor of Biology, on *Variation in Indirect Genetic Effects in Guppies: Molecular mechanisms of responsiveness and influence among social partners*. Using inbred strains of guppies (*Poecilia reticulata*), Professor Bleakley's group will describe how genes in both focal individuals and their social partners interact to generate collective behavior in social groups. Tavares and Reilly, both biology majors, will investigate how gene expression regulating hormone receptors and lateral line sensory anatomy each influence a fish's responsiveness to its social partners, respectively. Seward, a biochemistry major, is investigating how excreted pheromones influence a fish's social partner. The results of this summer's research will build upon the results of previous years' work and will be compiled and submitted for publication.

Nicholas Berman '15 and Katherine Morelli '16 will also work with **Bronwyn Bleakley**, on *Indirect Genetic Effects on Parental Investment in Burying Beetles*. Burying Beetles (*Nicrophorus orbicollis*) engage in obligatory parental care of their offspring during early development. Previous research conducted in Professor Bleakley's lab suggests that parental care and subsequent offspring development is altered by glyphosate, a primary component of the pesticide, Roundup. During this summer, Berman, a biology major, will study how various dosages of the chemical affect larval development. Morelli, also a biology major, will study how glyphosate alters parental care. Both students will also contribute to better characterizing the diversity of burying beetles on the Stonehill campus. The group plans to submit the results of their research to a refereed journal.

Joseph D'Amore '16 will work with **Matthew Borushko**, Assistant Professor of English, on *Adorno: Art, Society and Critique*. The project will examine art, primarily literature and music, through the lens of the provocative and influential theoretical and critical writings of twentieth-century German philosopher Theodor Adorno. D'Amore, an English major, and Professor Borushko will be engaged in collaborative scholarly inquiry centering on an extended exegesis of Adorno's key writings on the relationship between art and society. At the end of the SURE program, D'Amore plans to submit an essay for consideration at the 2015 National Collegiate Research Conference at Harvard University, and Borushko will compose portions of the introductory section of his book project. In addition, the two will create a digital scholarly space to share their work with the broader community.

Olivia Osiecki '16 will work with **Nate DesRosiers**, Assistant Professor of Religious Studies, on *Women in the Greco World*. Osiecki, a marketing major, will assist Professor DesRosiers on the final editing, indexing and proofing of a new manuscript. In addition, the pair will focus on the continued development of the Religious Competition website, building on last year's SURE work. Osiecki will contribute to the development of this website directly, focusing on the role of women in ancient religions as a major field of interest within religious studies.

Matthew Attaya '15 will work with **Corey Dolgon**, Professor of Sociology and Director of the Center for Community Based Learning, will work on *Youth Leadership Development in Brockton*. This project will focus on questions related to youth development within the Coaching for Change program. The Coaching for Change program in Brockton strives to help urban youth overcome hurdles in education and employment by providing them with learning and workforce skills. Professor Dolgon and Attaya, a psychology major, aim to determine how leadership development can be implemented within the mission of Coaching for Change and organizations like it in the city of Brockton. They aspire to make the program a more effective organization and empower Brockton youth to make real structural social change within their city. Attaya will also serve as a SURE Leader during this summer.

Laura Patriarca '16 and **Jasmin Volpe '15** will work with **Justin Dore**, Faculty Fellow of Biology, on *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 for patients with spinal cord injuries. In order to do this, Patriarca, a neuroscience major, and Volpe, a biology major, will explore cell-to-cell interactions, cell division, gene and protein expression and carefully document how substrates and surrounding connective tissues contribute to neural and glial functionality in injury. Their preliminary experiences will be presented within the context of Life Science Research at "Defining, Discussing, Defending Progress" at Augustana University in Alberta, Canada in 2014. They also hope to present their findings at the Neuroscience Undergraduate Northeast Research Organization for Neuroscience in 2014.

Fiona Carroll '16, **Hayley Conklin '15**, **Sara Morris '16**, **Rebecca Lessard '15** and **Michelle Wozniak '15** will work with **William Ewell**, Assistant Professor of Political Science, on *A Political History of the Appropriations Process*. During the summer, the project team, all political science majors, will explore the historical development of the appropriations process from the initial establishment of the modern committee system in 1946, to the 1974 establishment of the Budget Committees, and to the appropriations subcommittee reorganizations in 2003, 2005 and 2007. The research will aim to answer three conjoined questions at the center of contemporary American politics: How did the appropriations process evolve from what political scientist Richard Fenno famously described in 1966 as the most nonpartisan Committee in the U.S Congress to the epicenter of partisan politics in the 21st century? How does policy context across various appropriations bills influence partisan polarization and policy outputs? What insight can the historical political development of the appropriations process provide us about potential methods for fixing the broken institution?

Althea Sylvia '15 will work with **Richard Finnegan**, Professor of Political Science and International Studies, on *Generational Attitudes toward Political Transformations in Ireland*. This project seeks to explain how the collapse of the "Celtic Tiger" in 2008, the disintegration of public deference to the Catholic Church following revelations of clerical abuse, and the settlement of the Northern Island conflict, changed three generations of Irish attitudes. Sylvia, a political science and English major, will prepare a paper which can be given at either the New England Conference for Irish studies convention in the spring of 2015 or the New England Political Science Conference in the spring of 2015. The paper will also be submitted to the Irish Studies journal; *Eire-Ireland: A Journal of Irish Studies*.

Kelly Sylvestri '15, **David VanValkenburgh '15** and **Emily Zygiel '16** will work with **Marilena Hall**, Associate Professor of Chemistry, on *Fast Propagating Mutants in M13 phage*. 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. During this academic year, a manuscript is being made to report 13 additional mutations in the same region of the M13 genome. This summer, Sylvestri, VanValkenburg and Zygiel, all biochemistry majors, and Hall will perform experiments to complete another manuscript to be submitted for publication next year.

Casey Cosetta '15 and **Jonathan Tripoli '15** will work with **Rachel Hirst**, Assistant Professor of Biology, on *Phenotypic and Biochemical Characterization of Potential New Species of Methylobacterium*. Previous lab research has provided strong evidence for a potential relationship between the white-rot fungus, *Armillaria gallica* and *Methylobacterium*. Tripoli, a neuroscience major, will focus on expanding genetic characterization of the *Methylobacterium* to determine whether it is one of the 44 known species of *Methylobacterium* or if it is a new species that has not previously been identified. Cosetta, a biology major, will compare various *Methylobacterium* strains and compare them using motility assays, pigment extraction and analysis, quinine composition and carbon source assimilation. Both students will present their results at the 2015 New England Biological Conference. In addition, Tripoli will prepare for genome announcement in the *Journal of Bacteriology*.

Anna Tallmadge '15 will also work with **Rachel Hirst** on *Transformation of Methylobacterium with a Green Fluorescent Protein (GFP) Plasmid*. Tallmadge, an interdisciplinary studies major, will attempt to transform *Methylobacterium* isolated from *Armillaria gallica* with a plasmid containing the gene encoding for GFP. She will then use these GFP-transformed cells to infect *A.gallica* fungal cultures to determine if the bacteria enter the fungal cells during infection. Tallmadge will prepare to present her findings at the 2015 New England Biological Conference.

Gabrielle Jaques '16 will work with **Ron Leone**, Professor of Communication, on *Scorsese's Score: Use of Music in Life Lessons*. Jaques, an English major, will begin with an overview discussion of Martin Scorsese's use of music in his work and will conclude with a focus on one of his overlooked and underappreciated films, *Life Lessons*. The ultimate goal for the project is to produce a chapter-length writing to be presented at a conference and then submitted for publication in a scholarly journal.

Diana Fager '15, **Claudia Korzeniecki '16** and **Steven Moura '16** will work with **Louis Liotta**, Professor and Chair of Chemistry, will work on various 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*.

Matthew Crawford '16 and **Nisha Khubchandani '16** will work with **Pamela Lombardi**, Assistant Professor of Chemistry, on *Enantioselective Cu-Catalyzed Allylic Oxidations Using Amino Acid Based Ligands* and *Synthesis of New Chiral N-Heterocyclic Carbene Ligands for Catalysis*. 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. Khubchandani, a chemistry major, will build on her research from last summer's SURE research by focusing on optimization of the allylic oxidation reaction to determine enantioselectivity and ligand synthesis. Crawford, a biochemistry major, will attempt to synthesize a new chiral N-Heterocyclic Carbene ligand and will then assess its reactivity in catalyzed reactions. They aspire to present their findings at a scientific conference. Khubchandani will as serve as a SURE Leader this summer.

Jacob Gillis '15 and **John P Walent '15** will work with **Gregory Maniero**, Associate Professor of Biology, on *Stimulation of Xenopus CD4 Cells with Exogenous IL-16*. Globally, amphibian populations have declined over the past 40 years. The recession can be attributed to several factors, including environmental changes and pathogens. During the summer, Gillis and Walent, both biology majors, will attempt to isolate T cells, detect CD4 mRNA and demonstrate the existence of a CD4-positive, CD8-negative T-cell subset. The group aspires to present their results at the Eastern New England Biological Conference and perhaps have their findings published in a peer-reviewed journal.

Michael Travers '15 will work with **Juan Carlos Martin**, Associate Professor of Foreign Languages, on *Virtual Language Learning: Beyond the Classroom*. Professor Martin currently teaches two sections of intermediate Spanish. In one of the sections, with the assistance of Michael, he uses GoToMeeting, an online video platform which aims to bring foreign language learning to the 21st century. Some preliminary findings have found that GoToMeeting was more highly rated by the students than other virtual learning programs such as Second Life. This semester, Professor Martin and Michael, a foreign language major, will use GoToMeeting to introduce material before it is taught in class so class time is spent more effectively. This summer, the pair will do research on flipped instruction and use the data they obtained to see how it relates to success in foreign language instruction.

Christian Baglini '15 and **Abigail Hulverson '16** will work with **John McCoy**, Professor of Psychology and Neuroscience, on *Cortical Gamma Oscillations: Role in Cognition and Sleep* and *Brain Pathways Controlling Consciousness and Wakefulness*. Synchronous activity between groups of neurons in the brain generates electrical oscillations, which are visible by electroencephalography (EEG). One common goal among neuroscientists today is to understand how these electrical oscillations are generated and their function in the brain. Previously, the Neuroscience lab has identified a group of inhibitory neurons, which generate electrical oscillations in the cortex in the range of 40 seconds per second. These Gamma-aminobutyric acid (GABA) neurons are located in the area of the brain involved in controlling waking and sleep called the basal forebrain (BF). The overall goal of Baglini's project is to understand how gamma oscillations generated by GABA neurons in the BF mediate brain function. Hulverson will use neuroanatomical tract tracing methods to "map" certain GABAergic inputs into the thalamus, research which could lead to development of novel pharmacological or molecular biological strategies to enhance arousal and awareness in coma, vegetative state and minimally conscious state patients. Baglini and Hulverson, both neuroscience majors, will prepare and present posters based on their research findings at the regional NEURON conference.

Jamie Kaminski '15 and **Alexandra Trausch '15** will also work with **John McCoy** on *Social Cognition and Schizophrenia* and *Improving Cortical Function and Cognition in Schizophrenia*. Kaminski's research project proposes to investigate event related potential (ERP) indices of simultaneous face and voice processing in a group of twenty schizophrenia patients and a group of twenty age, gender and parental socioeconomic status matched healthy controls. She anticipates the correlation analyses will help her to understand which auditory and visual processes contribute to impaired processing of audiovisual, socially relevant information in schizophrenia sufferers. Trausch's project will utilize both brain slice (in vitro) and freely behaving (in vivo) specimen models of gamma band oscillations to determine if drugs targeting mGluR5, a type of glutamate receptor, can rescue schizophrenia-like abnormal gamma oscillations. In addition, Trausch will attempt to identify how mGluR5 affects the developmental maturation of the brain circuits responsible for generating gamma oscillation. This research could lead to the development of new classes of drugs for improved treatment of schizophrenia. Kaminski and Trausch, both neuroscience majors, will present their research findings at the regional NEURON conference.

Keara Lavallee '16 will work with **Edward McGushin**, Associate Professor of Philosophy, on *Cinematic Meditations*. Lavallee, a philosophy and psychology major, and McGushin will explore the idea that certain films can be understood as forms of spiritual exercises or meditational practice. This project will study the manner in which such films function as spiritual exercises or meditations by considering how they embody characteristics and intentions representative of the Western tradition of spiritual or meditational practice that goes back at least to ancient Greece. At the end of this summer the pair will produce a paper for submission to either the Society for the Philosophical Study of the Contemporary Visual Arts (SPSCVA) or to an equivalent scholarly association. In addition, Lavallee and McGushin will work with the Foucault Society of New York City to organize a one or two day workshop focused on Foucault and film theory.

Thomas Gumbley '16 and **Ryan O'Keefe '16** will work with **Sean Mulholland**, Associate Professor of Economics, on *Differences in Intergenerational Economic Mobility in the United States for Rich, Poor, Black and White from 1940-2000* and *The Effects of Educational Variation on State Income and Income Growth Rates*. During the summer, Gumbley, an economics and environmental studies major, and Mulholland will investigate whether economic mobility among children raised in the lower portion of the US income distribution differs for individuals of European and African descent. O'Keefe, an economics and finance major, and Mulholland will examine whether educational variation within states can account for the variation of income and the variation in the growth rates of income across US states over the last one hundred and fifty years. The resulting co-authored manuscripts will be presented at the 2015 Eastern Economic Association Meetings or 2015 Association of Private Enterprise Education Meetings.

Megan Batson '15 and **Morgan Johnson '16** will work with **Irvin Pan**, Assistant Professor of Biology, on *Expression and Evolution of the TAGL1 gene in wild relatives of Tomato* and *Design of a Quantitative PCR Assay for Analysis of Gene Expression in Tomato and Wild Relatives*. The gene *TAGL1* has been shown to play a wide variety of roles in fruit ripening development in tomato plants. This summer, Batson and Pan will try to better understand some of the steps that tomatoes have undergone during domestication, and see what roles the ripening gene *TAGL1* may have played in this process. Batson will analyze the expression of *TAGL1* in two other plants, *S.pimpinellifolium* and *S.pennellii*, to provide insight into the conservation and diversification of function of this gene. Johnson will use quantitative PCR to accurately measure gene expression in *S.pimpinellifolium* and *S.pennellii*. Batson and Johnson, both biology majors, plan to present their findings at the Eastern New England Biological Conference in the spring of 2015.

James M. Goodrich '15 will also work with **Irvin Pan** by *Investigating the Role of the ESK1 Gene in Cold Tolerance in Crop Plants*. Historically, farmers in cold weather climates have utilized a range of techniques to allow them to grow and harvest fruit and vegetables year round, even in the coldest months of the winter. Goodrich, a biology major, will continue to analyze data collected during last summer's SURE research to further determine the measurable effect of cold-tolerant gene expression on the physical attributes of cold-tolerant crops. He will focus on trying to better understand the role of the gene *ESKIMO1* in cold tolerance. He also plans to present his findings at the Eastern New England Biological Conference and hopefully, work to help extend the growing season of the Farm at Stonehill.

Sean Davenport '15 will work with **David Sander**, Assistant Professor of History, on *Cinema, Islamic Reform and Popular Imagination in the Muslim World*. This project aims to shed light on how a diverse set of films generates, reflects, challenges and interprets themes related to reform of Muslim societies. It will offer a creative and thought-provoking challenge to easy stereotypes, conveying some of what artistic and creative intellectuals are saying about societies and ideals. Ultimately, this project will investigate the extent to which the films generate and shape historical consciousness through their depiction of themes that include authority, gender, piety and interpretation. Davenport, a history major, and Sander aspire to produce a piece of writing that would be published in a scholarly journal such as *Contemporary Islam*.

Alexis Johnson '16 and **Anthony Narin '16** will work with **Cheryl Schnitzer**, Associate Professor of Chemistry, on *Understanding Energy Transfer during Photosynthesis*. The research will focus on the Light Harvesting 2 antenna complex isolated from *Rhodobacter Sphaeroides 2.4.1*, a purple bacterium. In order to do this, Narin, a computer engineering major, and Johnson, an environmental science and mathematics major, will use a laser system to explore energy transfer between the bacteriochlorophylls B800 and B850. The results of the project will be presented at the Gordon Research Conference, *Atomic and Molecular Interactions* and published in the American Chemical Society Journal, *Environmental Science and Technology*.

Julia Afeltra '16, **Kraig Boates '15**, **Michael Dias '16**, **David Lawson '16**, and **Sarah Wilson '15** will work with **Hsin-hao Su**, Associate Professor of Mathematics and **Heiko Todt**, Assistant Professor of Mathematics, on *Mathematics Research Experience in for Undergraduates*. In this SURE project, the students will experience what they will encounter during a graduate school program in mathematics. The students will begin by studying introductory material and will then be allowed to choose from three different projects to work on under the supervision of the faculty mentors. The first problem is to find the edge-balance indexes of the L-product graph of a complete graph with a cycle graph. The second problem consists of finding all possible friendly indexes of the Barycentric subdivision of wheel graphs. The third problem is to determine which cubic graphs are edge-magic and which are not, where every vertex in a cubic graph has only three edges attached to it. Afeltra, a psychology major; Wilson, a mathematics major; and Boates, Dias and Lawson, all mathematics and computer science double majors, hope to present their work at a conference or in a paper suitable for publishing.

Prithak Chowdhury '15 will work with **Christopher Wetzel**, Associate Professor of Sociology and Criminology, on *Students in Action: Changing Forms and Foci of Engagement in an Era of Globalization*. Chowdhury, a communication and English major, and Wetzel will build on previous research done in SURE 2012, which highlighted three distinct cultures of activism at different types of college campuses. This summer, they will look at how spirituality informs and transforms cultures of activism. They aim to use the completed research to present a paper at the Eastern Sociological Society annual meeting in February 2015. They will also prepare an article on the connections between spirituality and student engagement for submission to a journal such as *Humanity and Society* and aim to organize an on-campus event to share the findings of their research with student groups.