



STONEHILL COLLEGE

SURE Review Committee

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## 2025 Stonehill Undergraduate Research Experience (SURE) Summer Projects

Thirty Stonehill College students will work with 16 faculty mentors on a variety of research projects during the summer of 2025, the 29<sup>th</sup> year of the [Stonehill Undergraduate Research Experience](#) (SURE) program. SURE provides students with an opportunity to perform significant, publishable research under the guidance of an experienced faculty researcher. Research experience gives students a competitive advantage in graduate and professional school applications and in post-college employment opportunities, as well as offering assistance to faculty in research activities.

**Gustavo Lage '26** and **Samuel Stahl '27** will work with **Shahrokh Sani**, Associate Professor of Engineering, on a project entitled "Favorite Music Search Engine: Reality or Dream? Understanding the Patterns Behind Personal Music Preference." Understanding patterns influencing personal music preferences provides many benefits for individuals and the music industry. These patterns help artists know their audience better, improve customer satisfaction, provide deeper understanding of human auditory perception, and develop more relevant products and services. This research study aims to understand the hidden patterns that can influence an individual's music preferences. The research focuses on analyzing audio features of music using Digital Signal Processing techniques to uncover the hidden pattern of the listener's favorite and non-favorite music.

**Sophie Garcia '26** and **Audrey Sears '26** will work with **Anwar Mhajne**, Associate Professor of Political Science and International Politics, on a project entitled "Virtual Chains: Gender and the Disinformation Machine in the Middle East and North Africa." The project will begin by unraveling the concept of gendered disinformation. We will analyze its targets, examining the specific groups and individuals that fall victim to such disinformation campaigns. The project will explore the intricate link between gendered disinformation and digital authoritarianism within the region, comprehending how these phenomena are interwoven. It will help identify the diverse stakeholders responsible for both the propagation and counteraction of disinformation. Using case studies from Saudi Arabia, Egypt, UAE, and Iran, we will gain a nuanced understanding of how these issues manifest within distinct regional contexts. We hope to present the project at the American Political Science Association Annual Conference in September 2025.

**Alyssa Tyler '26** will work with **John McCoy**, Professor of Neuroscience & Psychology, on a project entitled “Neural Control of Sleep-Wake State, Part 2.” Continuing an ongoing project from last summer, Alyssa will utilize multiple research techniques (i.e., genetic, neuroanatomical and immunohistochemical) to identify novel cell types in the basal forebrain, a brain region critical for the control of sleep-wake state. Additionally, the developmental origin of known cell types will be probed by evaluating the expression of select transcription factors known to play a role in neural development. This research could allow for the development of targeted therapies aimed at the restoration of normal sleep in disorders such as insomnia as well as other medical conditions that have sleep disruption as a symptom. Results of this research will be presented next year at the annual conference of the Northeast Undergraduate/Graduate Research Organization for Neuroscience (NEURON).

**Gabriella Parisi '26, Emma Gray '27, and Ava Young '27** will work with **Nicole Cyr**, Professor of Biology, to continue previous research aimed at better understanding how obesity alters the brain. For her project titled “Effect of obesity on signaling pathways in the brain,” Neuroscience major Gabriella Parisi will examine how obesity alters physiologically relevant biochemical signaling pathways that regulate metabolism and appetite. Furthermore, her studies will explore how changes in these pathways lead to disease. Neuroscience major Emma Gray’s research on the “Effect of obesity on synapses” will investigate how obesity alters neuronal synapses which can change communication among brain regions and cause disease. Ava Young, a Biology major, will explore the “Effect of weight loss drugs on feeding and addiction circuits”. Popular weight-loss GLP1-RA drugs including examples like Ozempic® and Wegovy® enter the brain to help suppress appetite. However, their actions in the brain are not fully understood. Young’s summer research aims to determine how these drugs affect feeding and addiction pathways. Results of these studies will be presented at the Northeast Undergraduate/Graduate Research Organization for Neuroscience (NEURON) conference next year.

**Kylie Lindo '26 and Lia Casey '26** will work with **Rachel Monyak**, Assistant Professor of Neuroscience and Biology, on a project entitled “Examining genes involved in aggression in the fruit fly.” The overarching goal of this project is to better understand how behaviors such as aggression are encoded in the brain. This project will assess how mutations in the *doublesex*, *mahogany* and *late bloomer* genes affect aggression. These genes have previously been shown to affect aggression in male fruit flies but have not been tested in females. Since male and female fruit flies employ different strategies when fighting, it is anticipated that some genes that affect aggression in males will affect aggression in females differently. Kylie and Lia will test how these gene mutations affect both male and female aggression to determine if the effects on aggression are sex-specific. Kylie will also follow up on her previous findings that mutations in another gene, *rbfox1*, impair male but not female aggression. The powerful genetic tools available in flies will then be employed to identify where in the brain these genes act. The results of this research will be presented at the Northeast Undergraduate/Graduate Research Organization for Neuroscience (NEURON) conference next year.

**Julia Murray '26** will collaborate with **Magda James-Pederson**, Associate Professor of Biology & Biochemistry, on a project entitled “Fine-resolution mapping of regulatory regions in the UL/b’

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locus of the HCMV genome.” Human Cytomegalovirus (HCMV) is a common virus that infects individuals of all ages. Once it infects an individual, it remains in the cells of the human body for life. Most people infected with HCMV do not experience any symptoms because their healthy immune system keeps the virus from causing illness. In immunodeficient individuals the virus may become active and cause serious health issues. People with HIV/AIDS, organ transplant recipients, and infected neonates are vulnerable to such viral reactivation. The genome of HCMV includes over 200 genes that are activated in a synchronized manner during the virus’s life cycle. The orderly expression of the HCMV genes is accomplished by a complex network of regulatory “on” and “off” gene switches and the proteins that act on them. Our plan is to contribute to the work started by Prof. Tracy Rosebrock’s research team, to map the exact location of some of these gene switches in the HCMV genome, specifically around a segment known as the L/b’ locus. The L/b’ locus is a critical region of the HCMV genome because it encodes proteins involved in helping the virus avoid detection by the immune system and by doing so, contributes to the virus’s ability to establish persistent infection.

**Jessica Finn ’26** and **Matthew King ’26** will work with **Rachel Hirst**, Professor of Biology, on a project entitled “Investigating the Gut-Brain Axis: Influences of microbiome diversity on social behavior in Trinidadian guppies.” The gut-brain axis is known to connect an animal’s gut microbiome and their behavior. Microbial effects on behavior might be produced by microbial metabolites influencing hormone levels and/or gene expression. However, the links between the microbiome and behavior are not well understood. Guppies, *Poecilia reticulata*, perform a suite of cooperative antipredator behaviors that require them to respond to their social partners as they coordinate to assess threats and dilute the risk of being attacked. Guppies vary both individually and among populations in their average level of cooperation and the degree to which their behavior changes in response to the behavior of different social partners, as well as in risk assessment and anxiety behavior. Along with many other morphological and physiological traits, the microbiome of guppies evolves in response to changes in diet and predation pressure. Finn and King will be investigating how microbial diversity in the microbiome correlates with risk assessment, investment in cooperative antipredator behavior, and social responsiveness in guppies.

**Colton Burkhart ’26** and **Arie Sousa ’26** will work with **Bronwyn Bleakley**, Professor of Biology, on the project “Are good leaders good teachers: Does leadership in cooperative antipredator behavior predict leadership in social learning in Trinidadian guppies?”. Animal personalities are identified by the consistent expression of behavior across different situations. Individuals may behave boldly, aggressively foraging and investigating a predator, while a shy individual approaches these situations timidly. Trinidadian guppies, *Poecilia reticulata*, observe and interact with social partners to socially learn to perform a wide range of behaviors. A guppy’s personality influences how quickly they learn, and the mix of personalities in a group affects how rapidly the entire group learns. Guppies also perform a suite of cooperative anti-predator behaviors. Demonstrators facilitate the learning of observers, and cooperative leaders or followers are defined by how much time they spend in the lead position closest to the predator. Both social learning and cooperative anti-predator behavior hinge on the combination of individuals in the group, but boldness does not directly equate with leadership in cooperation.

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We propose to investigate whether cooperative leaders are also learning demonstrators, to better understand what traits leaders share and how group behavior emerges from combinations of individuals.

**Bronwyn Bacon '26** and **Timothy Seaward '27** will work with **Cheryl Schnitzer**, Professor of Chemistry, on a project entitled “Pump-Probe Laser Experiments.” The purpose of our work is to continue examining transient oscillations in lithium niobate (LiNbO<sub>3</sub>) and gallium arsenide (GaAs) crystals with a pump-probe laser experiment. To do so, we will need to get the Ti:sapphire laser lasing again and realign the experiment on the optical table—relying on Second Harmonic Generation (SHG) to ensure that the pump and probe beams are perfectly overlapped in time and space. Applications of our findings are important and timely for understanding optical devices which are important for semiconductor technology. We will submit our methodology and results for publication, and present at the National American Chemical Society (ACS) meeting in Atlanta, GA, spring 2026.

**James Aste '26** will collaborate with **Jennifer Dabrowski**, Associate Professor of Chemistry, on a project entitled “Development of Sustainable Alternatives to Preparing Medicines - Investigation of the Role of Silane Variations in the Mechanism of (Trispentafluorophenyl) borane-trimethylsilyl Cu-catalyzed Cyclization of Galactitol.” Construction of molecules found in pharmaceuticals traditionally follow a bottom-up approach from petroleum sources. This research will investigate a top-down approach utilizing earth-abundant catalysts to transform sugars into the same biologically active compounds. Understanding how these alterations and transformations occur is vital for the development of efficient, practical, and large-scale applications of biomass as a source of pharmaceuticals. Aste will apply the findings from this work to his senior capstone thesis and present at the National American Chemical Society (ACS) meeting next spring.

**Olivia Pham '26** will collaborate with **Jennifer Dabrowski**, Associate Professor of Chemistry, on the project entitled “Investigation of D-Arabitol Annulation Towards Sustainable Access to Medicinally Relevant Scaffolds.” Crude oil dominates as the primary feedstock used to make pharmaceutically active ingredients in medicines. This research will investigate a more sustainable approach to annulation of the five-carbon sugar, D-arabitol which has been recognized by the Department of Energy as one of top 30 biomass feedstocks for sustainable alternatives in biomedical applications. Pham will apply the findings from this work to her senior capstone thesis and present at the National American Chemical Society (ACS) meeting next spring.

**Allyson Petta '26** and **Jean-Marco Lima '26** will collaborate with **Jennifer Dabrowski**, Associate Professor of Chemistry, on the project entitled “Investigating the Impact of Cu (II), Zn (II), Fe (III), and Chloride ions on Alpha-Helicity in Model N-terminus and C-terminus Peptide Fragments of Tau Protein involved in Alzheimer’s Disease.” Alzheimer’s Disease is a debilitating brain disease thought to be caused by the aggregation of misfolded tau proteins in neuronal cells. This research will investigate the impact of metal ions, which are found in the plaques of patients, on alpha helical peptide fragments of the tau protein at both the N-terminus and the C-terminus. Exploration of variables that impact the helicity at these termini will offer insight into the proposed mechanism of tau protein in binding microtubules and the potential role of metals in Alzheimer’s Disease. Petta and Lima, will apply the findings from this work to their senior capstone thesis and/or present at the National American Chemical Society (ACS) meeting next spring.

**Molly O’Keefe '26** will collaborate with **Jennifer Dabrowski**, Associate Professor of Chemistry, on the project entitled “Investigating the Interaction of V(III)–L-cysteine on Alpha-Helicity and Binding in a Model Peptide Fragment of CEBP $\alpha$  Protein involved in Acute Myeloid Leukemia.” Acute myeloid leukemia is a fatal form of cancer believed to be caused by frameshift mutations in the CEBP $\alpha$  gene, which alter the structure of the CEBP $\alpha$  protein. However, not all patients have this mutation. This research will investigate what role metal ions, commonly found in the body, may play in structural changes to a CEBP $\alpha$  peptide fragment at the location where modifications occur due to the mutation. This will provide both further insight into the disease state and potential targets for the development of treatment therapies. O’Keefe will apply the findings from this work to her senior capstone thesis and present at the National American Chemical Society (ACS) meeting next spring.

**Martha Savage '27** will work with **Jungyun Gill**, Associate Professor of Sociology, and **Shane Savage-Rumbaugh**, Professor of Studio Arts, on a project entitled “Social Problems, Social Movements, and Arts.” Savage will assist in publishing the second edition of Professor Gill’s book *Social Problems and Social Movements*, a textbook for a Social Problems course that emphasizes the role of social movements in addressing social problems and improving society. Savage will review and provide feedback on the Engagement Activities boxes in each chapter, write two Special Topics boxes, and research diverse forms of art that contribute to social movements. In collaboration with Professor Savage-Rumbaugh, she will conduct interviews with artists to inform her research about the role of arts in social movements. Based on this research, Savage will write one Special Topics box discussing the role of art in social movements. For her second Special Topics box, she will study social problems related to the representation of gender and LGBTQ+ communities in pop culture, as well as the resistance challenging these social problems. Lastly, Savage will collaborate with Professor Savage-Rumbaugh to create graphic art related to the themes of art in social movements, potentially for the book cover.

**Joseph Carinci '27** will collaborate with **Leon Tilley**, Professor of Chemistry, on the project entitled "A Synthetic Journey from Bicyclobutanes to Tetrahydrofuranes." Bicyclobutanes are an unusual class of strained hydrocarbons which have gained increasing attention because of their potential use as valuable synthetic intermediates in pharmaceuticals. This research will build upon a novel methodology for preparing bicyclobutanes by gamma-silyl elimination of electron-withdrawing group substituted cyclobutyl systems. The scope of the electron-withdrawing groups capable of enabling this transformation will be expanded. Carinci will also investigate potential application of the reaction to preparation of the strained hydrocarbon, tetrahydrofuran.

**Matthew Hamilton '26** will collaborate with **Leon Tilley**, Professor of Chemistry, on the project entitled "Exploring Reductive Aminations with Trifluoroalkoxyborohydride Reagents." Reductive amination of ketones and aldehydes to the corresponding amines is a key transformation in organic chemistry and is used for preparing a multitude of compounds with potential uses in all areas of organic chemistry, including pharmaceutical and medicinal chemistry. Indeed, one of the synthetic steps in one of our research group's other projects requires a reductive amination that has been rather challenging to accomplish, as we wished to avoid the use of toxic reagents and other pathways have led to incomplete reaction or difficult work-up conditions. Hamilton will be working to develop a series of novel borohydride reagents containing trifluoroalkoxy substituents and will be testing their efficacy for enabling reductive amination of ketones and aldehydes.

**Chantelle Miranda '27** will collaborate with **Leon Tilley**, Professor of Chemistry, on the project entitled "Synthesis of EWG Substituted Nitroxyl Radicals and Oxoammonium Salts." Nitroxyl radicals and oxoammonium salts are emerging as important compounds with uses ranging from green oxidants to spin labels for tracing biological activity in vivo, and even dopants for solar cells. 4-Acetylamino-2, 2, 6, 6-tetramethylpiperidine-1-oxoammonium tetrafluoroborate, **1**, also known as "Bobbitt's salt", can be utilized for a variety of purposes including oxidation of alcohols (to aldehydes, ketones, and carboxylic acids, but, unfortunately, will not efficiently oxidize trifluoromethyl alcohols (TFMAs) to trifluoromethylketones (TFMKs). This transformation is desirable since TFMKs can be enzyme inhibitors and building blocks in the synthesis of pharmaceuticals. Miranda will continue a multi-step synthesis begun in our laboratory to prepare a series of novel electron-withdrawing (EW)-substituted versions of **1**. These compounds will also be green oxidants and have the potential to accomplish the desired oxidation in a much more facile manner than **1**.

**Adam Ammirata '26** will work with **Candence Wills de Jesus**, Assistant Professor of Criminology, on a project entitled "Indicators of Globally Reported Human Trafficking." This project aims to explore gaps in knowledge regarding the factors that may contribute to country-level human trafficking trends. To examine potential variables influencing human trafficking globally, the research team will expand an existing dataset that includes economic variables, the Gender Inequality Index, the Human Development Index, and institutional responses to human trafficking by governments. This summer, additional data on country-level mental health indicators will be incorporated into the global dataset. The data will be analyzed using quantitative methods to examine the relationships between various global indicators and

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human trafficking trends. By the end of the summer session, the project is expected to produce a draft literature review and a full outline of an academic journal article.

**Christian Gurney '27** will work with **Eduardo Fontes**, Professor of Practice in Health Science, to “Understand How Digital and Movement Behaviors Interact with Mental Health in College Students.” The project will initially explore if daily changes in smartphone usage (e.g., screen time and app usage) and physical activity (e.g., steps) are associated with mood, affective states, and social interactions throughout the day. Then, in collaboration with researchers from Yale University and Rutgers University, artificial intelligence models will be applied to integrate these parameters and verify the predictability of mental health disorders, such as depression, anxiety, and stress. Results will be presented at the New England Chapter of the Annual Conference of the American College of Sports Medicine 2026, as well as produce preliminary data to support larger grant applications.

**Ellin Prophett '26** and **Julia Wedge '26** will work with **Oltiana Muharremi**, Associate Professor of Accounting and Taxation, on a project entitled “Targeted Trends: Unlocking the Power of Social Media Marketing.” Given how drastically social media has changed our culture, Ellin and Julia will examine how focused social media techniques affect a variety of demographics, such as age groups, geographic areas, and interests, to determine which advertising campaigns have an impact. Businesses must comprehend all the subtleties of social media to maximize customer interaction and establish the most meaningful connections with their clientele. The project is anticipated to result in a complete outline of an academic journal article by the end of the summer and participation in a conference during the Spring 2026 semester.