



SCHOLARS AT THE CAPITOL

MARCH 11, 2020

9:45 - 11:45 AM

CAPITOL ROTUNDA



Recognizing Undergraduate Research



Undergraduate research provides opportunities for students to explore the kinds of projects they will pursue later in their educational paths and careers. Minnesota private colleges have a lasting emphasis on undergraduate research, which provides students with experiential learning opportunities and offers our communities better prepared graduates.

The 2020 Minnesota Private College ***Scholars at the Capitol*** celebrates 46 students' research and the efforts of their faculty advisors. From psychology to history, cancer biology to creative writing, the breadth of the subject matter presented here represents the wide range of student learning that occurs every day at Minnesota private colleges.



This abstract booklet is
organized alphabetically by
institution.



The research projects
are from a wide range of
disciplines including:

History

Applied Health Sciences

Marine Ecology

Political Science

Cancer Biology

Chemistry

Psychology

Biology

Creative Writing

Physics

Financial Planning

Geology

Quentin A. Smith Jr.

FACULTY ADVISOR: LEON VAN ECK
AUGSBURG UNIVERSITY, DEPARTMENT OF BIOLOGY

*Characterizing aphid resistance in *Hordeum spontaneum*, a wild relative of cultivated barley*

The bird cherry-oat aphid (BCOA) is an important pest of cereals, with prolonged infestation increasing the risk for plant virus transmission. Understanding the molecular mechanisms of plant resistance to aphids and the potential of crop wild relatives as sources of genetic resistance will aid the development of pest-resistant cultivars. Since barley is particularly susceptible to BCOA, we evaluated the reproduction of BCOA on three accessions of the wild barley relative, *Hordeum spontaneum*. Isolated foundresses in custom clip cages were de-

ployed to collect data on BCOA intrinsic rate of increase while feeding on each of these accessions. Fecundity estimates indicated that accessions WBDC053 and WBDC117 exhibit the strongest antibiosis compared to commercial barley. This corresponded to improved plant defense. Differential expression of a suite of plant biotic stress pathway genes were detected using qPCR: wild barley resisted aphid-induced downregulation of *HvSOD1* and *HvHSP70*. The wild alleles of these stress genes warrant further investigation.

Catherine LeBrun

FACULTY ADVISOR: RYAN MACPHERSON
BETHANY LUTHERAN COLLEGE, DEPARTMENT OF HISTORY

King Henry VIII: Doubly Sacred and Doubly a Tyrant

In 1534, the English Parliament passed both the Act of Supremacy and the Treasons Act. The first declared King Henry VIII (1491–1547) the supreme head of the Church of England and the second expanded the definition of high treason to include wishing or willing harm on the royal personage. Taken together, the Supremacy Act and the Treasons Act invite a provoking question: To what degree was Henry VIII a tyrant; and if he was, why was he

tolerated with seemingly little resistance from either Parliament or the people? Looking to Thomas Aquinas (1225–1274) and the Magdeburg Confession (1550) for clarification as to the nature of tyranny, it appears that while King Henry VIII was indeed a tyrant he may have been considered a tolerable tyrant. At least in the eyes of Parliament, it seemed better to preserve its long-term existence than to take a daring and perhaps deadly stand against a tyrant king.

David Evans

FACULTY ADVISOR: DAVID REAGLES
BETHANY LUTHERAN COLLEGE, DEPARTMENT OF HISTORY

Groen Van Prinsterer and the Consequences of Enlightenment

Counter-Enlightenment studies is devoted to understanding the 18th-century opponents of Enlightenment, yet it has been too often mired in endless conflicts over its nature, key figures, and lasting influence. This study seeks to demonstrate the Counter-Enlightenment's ongoing influence in the 1800s through an analysis of the major works of Groen van Prinsterer (1801–1876), an important yet underappreciated 19th-century Dutch historian and statesman. To that end, this study will address: (1) where Prinsterer fits in historical narratives

concerning reactions against the French Revolution and the Enlightenment (2) how he built upon the Counter-Enlightenment tradition in a 19th-century context, and finally, (3) what is his relevance for politics today? In answer, this study demonstrates how Prinsterer's theory of Enlightenment and its inevitable consequences in chaos and tyranny constitutes a critical contribution to our understanding of Counter-Enlightenment, its impact on 19th-century conservatism, and the ongoing influence of the Enlightenment.

Liz Olson, Austin Kelly and Willy Issa

FACULTY ADVISOR: KELLY GIBAS • BETHEL UNIVERSITY, DEPARTMENT OF HUMAN KINETICS AND APPLIED HEALTH SCIENCE

Utilizing Patient Centered Care to Reverse Insulin Resistance and Diabetes

Physiological research has highlighted 3 biomarkers that are crucial for long term health. They are Waist to Height Ratio (WtHR), Triglyceride/HDL ratio (TRI/HDL), and HOMA-IR. Elevations in these biomarkers is linked to cardiovascular diseases, diabetes, and higher rates of mortality. As the prevalence of these metabolic conditions continues to rise, American healthcare must strive to deliver the most effective patient centered care. Understanding the physiology behind insulin resistance and diabetes is crucial to understanding modifications to the standard of care. This study highlights a 6-week nutritional and exercise protocol for a pre-diabetic male (A1c @ 5.9). The intervention included carefully con-

structed meal plans based on his risk stratification, body composition and goal weight; his macronutrient selections achieved dietary ketosis as measured by his blood ketones @ .5-2mmols/L. Metabolic biomarkers were recorded weekly; each week, the patient received short physiology lessons and guided workouts in the wellness center. The patient made tremendous progress with significant improvements in all risk biomarkers including a 59% drop in his HOMA-IR score (insulin resistance marker), a 70% drop in his Triglyceride/HDL cholesterol ratio (cardiovascular risk marker). His fasting insulin and fasting glucose normalized into a healthy and sustainable range.

Anna Swensen

FACULTY ADVISOR: DONNA LEGRAND • BETHEL UNIVERSITY,
DEPARTMENT OF LANGUAGES, CULTURES, AND RECONCILIATION STUDIES

The Value of Traditional Medicine in Latin America

Latin America has a rich history of diverse traditional practices of the indigenous peoples which play an important role in the attitude toward health and its treatment. In recent years with the introduction of modern medicine, the dilemma of integrating the two types of medicine and allowing them to complement each other has threatened the cultural identity associated with traditional medicine, as well as the physical well-being of some groups of people. This study first describes the history of indigenous med-

icine in Latin America and explains the practices and values associated with it. Further, it analyzes the challenges of its integration and finally provides examples of various Latin American countries that have integrated indigenous practices in their healthcare systems. This study argues for the value of traditional medicine and the importance of integrating it with modern medicine for both physical well-being and to promote cultural respect of Latin Americans.

Jorge Banuelos

FACULTY ADVISOR: CHARISSE BURDEN-STELLY
CARLETON COLLEGE, DEPARTMENT OF POLITICAL SCIENCE

At the Crossroads: Doxey Wilkerson and the Jefferson School of Social Science

Anti-Communism shaped the growth, expansion, and practice of American federal surveillance in the 20th century. Allegedly responding to fears of foreign espionage stemming from the World Wars, American federal surveillance targeted persons, organizations, and ideas deemed “seditious” or “un-American.” While the rhetorical justification of this expansion of federal power into civil liberties rested on a shared anxiety regarding the spread of Communism, more often than not federal surveillance targeted communities en-

gaging in race or labor radicalism thought to be the result of foreign intervention. The pretense of legality allowed Black radicals to be punished for the “crime” of engaging in racial organizing from a Marxist perspective. After outlining decisive moments in the history of federal surveillance, I will demonstrate how federal anti-communism surveillance tactics were effectively weaponized against Doxey Wilkerson and the Jefferson School of Social Science (JSSS) from the early 1940s to the school’s end in 1957.

Maya Powell, Alex Whitis and Maggy Osha

FACULTY ADVISOR: MIKE NISHIZAKI
CARLETON COLLEGE, DEPARTMENT OF BIOLOGY

Effects of Flow and Temperature on Feeding and Respiration Rates in Marine Mussels

The goal of this project was to investigate how the marine mussel, *Mytilus trossulus*, responds to environmental changes. We explored the effects of temperature and flow using two metrics: respiration and feeding rates. Individual mussels were placed in a closed-loop circulation tank. Respiration was recorded via ruthenium-based fluorescence for two hours, while feeding rates were analyzed using spectrophotometry.

Computational analysis was performed with the RespR package (v. 1.0.5.1). Response patterns of respiration and feeding to temperature and flow differed, suggesting that predictions regarding future climate change are more complex than current models reflect. Future studies should aim to monitor these metrics under fluctuating conditions, as in situ temperatures and flow rates are constantly changing.

Nicole Newman

FACULTY ADVISOR: CLAIRE HAEG AND WHITNEY COURT
COLLEGE OF SAINT BENEDICT, DEPARTMENT OF POLITICAL SCIENCE

Partisanship and Perceptions of Sexual Misconduct

Individuals' party affiliation often raises a "perceptual screen" which biases the way partisans view, interpret, and evaluate political information that favors their partisan orientation. Although research shows that individuals engage in partisan motivated reasoning with regard to presidential nominees and legislation, there is a lack of empirical evidence that investigates whether partisan affiliation affects individual's perceptions of sexual misconduct. The 1991 and 2018 allegations against Supreme Court nominee Clarence Thomas and Brett Kavanaugh provides this

opportunity. I used the polling data from The CBS News/ New York Times Clarence Thomas Nomination Poll from September 1991 and ANES Panel study from 2018 to draw inferences to how partisan motivated reasoning affected the Senate confirmation of Brett Kavanaugh and Clarence Thomas amidst allegations against them of sexual misconduct by Christine Blasey Ford and Anita Hill. These findings suggest that partisanship played a pivotal factor in perceptions of sexual misconduct when it is involving a political figure such as a Supreme Court nominee.

Allison Grodnick

FACULTY ADVISOR: DAVE MITCHELL
COLLEGE OF SAINT BENEDICT, DEPARTMENT OF BIOLOGY

The Overuse of Antibiotics

As an unintentional result of the overuse of antibiotics in healthcare and agriculture, antibiotics have become an increasingly prevalent selective pressure on bacteria. This overuse forces bacteria to evolve antibiotic resistance to survive. If a bacterial strain acquires resistance to 3 or more antibiotics, it is deemed multidrug resistant (MDR). This study aims to evaluate the acquisition of MDR by an initially susceptible isolated *Pseudomonas* bacterium from a Minnesota forest environment. Three antibiotics, each from a different

drug class, were selected: neomycin, ciprofloxacin, and imipenem. The strain developed MDR to the antibiotics through a series of sequential exposures to increasing concentrations of each drug. The genome of the bacterial strain will be sequenced at major points in the study: the original isolate, the neomycin resistant strain, the neomycin and ciprofloxacin resistant strain, and the MDR strain. These genomes will then be compared to look for explanations for the mechanisms of acquisition of MDR.

Bre Cole and Eric Jeffords

FACULTY ADVISOR: GLENN SIMMONS, JR. (UNIVERSITY OF MINNESOTA MEDICAL SCHOOL DULUTH) • COLLEGE OF ST. SCHOLASTICA, DEPARTMENT OF BIOLOGY

Using HMGB1 Protein as a Surrogate Biomarker for Lung Cancer in High-Risk Populations

Lung cancer is the leading cause of cancer-related death, independent of gender or ethnicity. Although screening protocols for early detection exist, lung cancer is often diagnosed at an advanced stage. This is due, in part, to many patients experiencing barriers to healthcare access which contribute to delays in diagnosis. Supra-normal biosynthesis of saturated (SFA) and unsaturated fatty (UFA) acids is a hallmark of cancer. In fact, several lines of evidence demonstrate that increased lipid desaturation by stearoyl-CoA desaturase (SCD1)

promotes lung cancer growth. We hypothesize that increased intracellular UFA, such as oleate (OA), promotes cancer cell growth by reducing cancer associated inflammation. To test this hypothesis we evaluated the effect of OA and inhibition of OA synthesis on proinflammatory High Mobility Group Box Protein 1 (HMGB1). Decreasing OA synthesis reduced intracellular HMGB1 expression, but increased its release from cells. Given our data, alterations in OA levels appear to have a substantial effect on localization of HMGB1.

Ingrid Jacobson and Faith James

FACULTY ADVISOR: JENNIFER SWEATMAN
CONCORDIA COLLEGE, MOORHEAD, DEPARTMENT OF BIOLOGY

Small Crustaceans, Big Implications: Anthropogenic Impacts of Propeller Scars on Floridian Seagrass Ecosystems

Florida's seagrass meadows provide habitats for many keystone species, but are vulnerable to propeller scarring, which fragments meadows and disrupt species movements. Long-term impacts of fragmentation are monitored via seagrass nutrient content analyses, reflecting nutrient availability in ecosystems. Amphipod community analysis demonstrates effects of habitat fragmentation on higher trophic levels. Previous studies investigated effects of scarring on crustaceans, but none have examined the effects on amphipod communities. We are investigating long-term effects of propeller scars on seagrass nutrient content and amphipod communities.

Samples were collected from three propeller scars in Lignumvitae State Park, Florida. Amphipod species' frequencies were identified, and will be calculated across sampling plots for univariate statistical analysis. A multivariate analysis across sampling plots will identify community-level changes. Seagrass samples are being analyzed for total nutrient content. Data from our preliminary analysis don't indicate strong impact of propeller scarring on seagrass nutrient content or amphipod abundance. Data will be reported to Florida's State Parks department, contributing to conservation management practices.

Sofia Palme and Andrew Johnson

FACULTY ADVISOR: GRAEME R. A. WYLLIE
CONCORDIA COLLEGE, MOORHEAD, DEPARTMENT OF CHEMISTRY

Candy, Chromatography, and Improving Student Understanding of Polarity

One of the challenges in chemical education research is to create new materials which embrace the required complex topic and at the same time engage students through utilization of real world examples. At Concordia College in Moorhead Minnesota, we have recently worked on improving student understanding of polarity and chromatography in the general chemistry lab through a series of new course-based activities. Our project incorporated commercially available colored materials, such as marker pens and

food dyes, which possess different polarities. Their colorful nature and minimal hazardous waste generation make them ideal as the basis for these brand new, engaging labs. Our research initially looked at developing and optimizing new pedagogy for the general chemistry teaching lab which was then successfully implemented at Concordia College in the fall of 2019. This poster will share details of not only the experiments, but also results from this past implementation and how this is being refined for future use.

Skye Martin and Jeenu Vang

FACULTY ADVISOR: MANDY BROSNAHAN AND TAYLOR MACH
CONCORDIA UNIVERSITY, ST. PAUL, DEPARTMENT OF SCIENCE

Characterization of Nasal Isolates of Staphylococcus Aureus from Concordia's Campus

Students on the campus of Concordia University, St. Paul collected over 1,000 nasal swabs over the past 5 years in an attempt to characterize nasal isolates of *Staphylococcus aureus* from healthy individuals. *S. aureus* is a bacterium found on the skin, in the nares, or in the vaginal tract of approximately 30% of individuals. While *S. aureus* is typically harmless when it is growing in those areas, it also poses a public health risk because it can act as an opportunistic pathogen to cause

a variety of infections. The ability to cause severe infections is tied to the toxins created. Additionally, *S. aureus* infections are often exacerbated by antibiotic resistance, usually due to the presence of a specific gene conferring methicillin resistance (MRSA). In this ongoing study, students perform culture tests to identify *S. aureus* from collected nasal swabs and then characterize the strains for antibiotic resistance and toxin production.

**Katrina Vang, Hannah Gustafson,
Tim Vogt and Sara Stickler**

FACULTY ADVISOR: MARY ANN YANG • CONCORDIA
UNIVERSITY, ST. PAUL, DEPARTMENT OF SCIENCE

Analysis of Cyclin E in Fibrolamellar Hepatocellular Carcinoma

Fibrolamellar Hepatocellular Carcinoma (FL-HCC), a rare primary liver cancer, differs from the most common liver cancer, hepatocellular carcinoma, as FL-HCC is not correlated with chronic liver diseases. Mayo Clinic conducted a proteomic screening and found the proline biosynthetic pathway to be dysregulated in FL-HCC patients. In liver cells, free proline has been shown to induce the mTOR pathway, which stimulates cell proliferation through upregulation of full-length Cyclin E (FL-E). In addition, FL-E can be partially cleaved by an enzyme called serine protease neutrophil

elastase, creating low molecular weight cyclin E (LMW-E) that has been linked to tumorigenesis. To further investigate the expression of FL-E and LMW-E; we performed western blot and densitometry analysis in FL-HCC and normal liver samples. Preliminary results found significant differences between the expression of Cyclin E. LMW-E was seen in a higher expression level than the FL-E when comparing FL-HCC samples to the normal liver samples. More experiments are currently underway to further investigate this disparity.

Jordan Schwakopf and Kjorte Harra

FACULTY ADVISOR: MARIE WALKER • GUSTAVUS ADOLPHUS
COLLEGE, DEPARTMENT OF PSYCHOLOGICAL SCIENCE

*Identity Development and Social
Justice Orientation as Predictors
of Emerging Adult Political
Attitudes and Behaviors in the
2016 Presidential Election*

Emerging adulthood (EA, Arnett, 2014) is a stage of life between 18 and 29 years of age. Emerging adults explore different life domains, such as political views, as they seek a strong identity. (Walker & Iverson, 2016). This study attempted to determine if aspects of identity development could predict an individual's political information seeking, political attitude strength, and political ideology. We investigated if measures of social equality orientation could predict candidate inclination in the 2016 election among emerging adults. 150 participants were

surveyed 2 weeks prior to and after the 2016 Presidential Election. Surprisingly, personality and social justice orientation variables were better predictors of political attitudes and behaviors in emerging adults than were identity development variables. Exploring one's identity in depth was the sole identity development variable related to political attitudes. Intrinsic religiosity and agreeableness were unexpectedly related to political attitudes and behaviors and social justice orientation predicted conservative political beliefs.

Vy H. Nyugen

FACULTY ADVISOR: KATHLEEN KELLER
GUSTAVUS ADOLPHUS COLLEGE, DEPARTMENT OF HISTORY

*Agent Orange,
Ecocide, and the
Vietnam War*

Despite its significance in war and environmental history, the topic of Agent Orange lacks attention among scholars and the public. The generational and ecological damages caused by Agent Orange during the Vietnam War are long lasting while the memory of the Vietnam War and this chemical warfare weapon in America is fading. This historiography of Agent Orange recounts the lasting damages of Agent Orange and the

journey in fighting for justice of the Vietnamese people. Injustices caused by the U.S. government and chemical corporations are amplified as the Agent Orange victims in Vietnam barely received any compensation and their lawsuits had been dismissed for years. Even until now, Vietnamese victims still fly to America once a year, not hoping to win the lawsuit, but hoping that the atrocities of Agent Orange shall never be forgotten.

Ash Robinson

FACULTY ADVISOR: BETSY MARTINEZ-VAZ
HAMLINE UNIVERSITY, DEPARTMENT OF BIOLOGY

Isolation and Characterization of a Bacterial Strain Capable of Growth on Guanidine

Guanidine is a chemical compound commonly found in biological molecules such as amino acids and nucleotides. Guanidine-based products are widely utilized in agriculture, industry, chemistry, and pharmaceutical applications. Though guanidine waste is not currently targeted in waste treatment processes, previous studies suggest the possibility of microbial guanidine degradation. Guanidine has demonstrated toxic effects on organisms, affecting metabolism, physiological activity and immune function. This study led to the isolation and characterization of a strain of bacteria which utilizes guanidine as a sole source of nitro-

gen. Bacteria were isolated from compost samples and growth was monitored by measuring turbidity at 600 nm. DNA was extracted for genome sequencing and species identification. This study led to the isolation of the bacterial strain "B1," a strain of *Rhodococcus erythropolis* bacterium. Microbial growth studies showed consistent growth in Guanidine, barbituric acid, uracil, and urea. The characterization of organisms capable of metabolizing guanidine-based compounds alludes to the possibility of future bioremediation of guanidyl compounds in waste-treatment facilities.

Paul Van Dyke

FACULTY ADVISOR: CAROLYN HOLBROOK
HAMLINE UNIVERSITY, DEPARTMENT OF CREATIVE WRITING

Sacred Soil: A Memoir of War and Suicide

This memoir follows the author's life during a four year period beginning shortly after graduating Army infantry basic training 2003 when his mother disappears after leaving work and after a weeks-long missing persons investigation, is found dead by suicide. The book explores the author's struggle to remain stoic during this devastating period in his life, and how that same stoicism is what has driven his mother and several other family members to take

their own lives rather than ask for help. The memoir continues with the author being deployed to Iraq from 2005–2007, and explores the effects of several new traumas (wounded by IED, handling dead bodies, members of his unit killed) and how they serve to compound the emotional wound. The book contains themes of masculinity, PTSD, stoicism, spiritual trauma, belonging, abandonment, and grief.

Jean Pengra

FACULTY ADVISOR: MARY HESKEL
MACALESTER COLLEGE, DEPARTMENT OF BIOLOGY

How Will Boreal Plants Respond to Future Climate Change? A Study of Lowbush Blueberry

With atmospheric carbon dioxide at an all-time high of 415 parts per million and global temperatures climbing year after year, what is the fate of plants in this changing climate? Carbon dioxide and temperature are key drivers of plant metabolism. By manipulating these environmental factors, we can better understand how plants will physically respond to climate change. The Spruce and Peatland Responses Under Changing Envi-

ronments (SPRUCE) experimental site in Northern Minnesota manages several 'whole-ecosystem' chambers that test the vulnerability of peatland species to increased soil and air temperature and elevated carbon dioxide levels. We utilized these chambers to assess several physiological changes in a common boreal understory species, lowbush blueberry, as an indicator for possible climate change adaptations.

Dane Kuhr

FACULTY ADVISOR: ADAM WHITTEN
SAINT JOHN'S UNIVERSITY, DEPARTMENT OF PHYSICS

Concentrating Solar Power Systems at the National Renewable Energy Laboratory

Concentrating Solar Power (CSP) systems have the potential to increase renewable energy production at geographical locations with viable solar resource. CSP tower systems reflect solar radiation using sun-tracking mirrors called heliostats towards a central receiver atop a tower in the center of the heliostat field where the solar energy is stored as thermal energy in molten salt and can generate electricity long after the sun has gone down. The solar radiation is attenuated between the heliostat and receiver due to the

effects of scattering and absorption occurring when photons interact with atmospheric aerosols, gaseous molecules and other particulate matter. To better quantify the atmospheric attenuation, common weather data is used to characterize atmospheric composition and an improved transmittance model is developed for a site in Daggett, CA. The same computational methods will be applied to sites around the globe and incorporated into the System Advisor Model (SAM) from the National Renewable Energy Laboratory.

John Colleran

FACULTY ADVISOR: MARY STENSON • SAINT JOHN'S UNIVERSITY,
DEPARTMENT OF EXERCISE SCIENCE AND SPORT STUDIES

The Effects of Acute Mental Imagery Training on Force Output in College-age Students

The effects of mental imagery on muscular force production, especially in the field of resistance training, are not well researched. Acute mental imagery training is also not well studied. The purpose of this study was to determine the effects of acute mental imagery training on handgrip strength in college-age men and women. A repeated measures design was utilized with 34 participants over two sessions, separated by 48 hours. Handgrip dynamometry was used to assess average force production over three consecutive trials fol-

lowing a control treatment (passive sitting) or a 10-minute mental imagery treatment. Mental imagery consisted of learning about imagery and practicing with a premade imagery script. Average force production was significantly higher overall ($p < 0.001$), for men ($p = 0.003$), and for women ($p = 0.030$) after acute mental imagery training. Acute mental imagery training improves handgrip force production. Mental imagery training may be effective in short term settings and for resistance training and strength and power athletes.

Solomon T. Liebl

FACULTY ADVISOR: ANDREW J. SCOTT • SAINT MARY'S
UNIVERSITY OF MINNESOTA, DEPARTMENT OF BUSINESS

The Effects of Financial Stress and Financial Education on College Student Success

This study investigated existing research surrounding college students' financial welfare and the effects of financial education. Financial characteristics and their impact on student success should be a crucial issue for universities and lawmakers, so they should want to know more about financial characteristics of college students. Previous research has shown that high levels of student loans contribute to student financial stress. There is also evidence that this financial stress nega-

tively affects students in many areas including academic performance and retention. Further research has indicated that implementing targeted financial education classes and offering financial counseling will help decrease students' financial stress. Considering these findings, universities may encounter positive benefits from investing in financial education programs, namely increased retention rates and academic performance among students.

Samantha Chaffee, Huy Truong and Nayeli Hernandez Moctezuma

FACULTY ADVISOR: DANIEL BUCKNAM • SAINT MARY'S
UNIVERSITY OF MINNESOTA, DEPARTMENT OF PSYCHOLOGY

The Convenience of Modern Technology: The Relationship Between the Excessive Use of Technology and Psychological Well-Being

This study examined the perception of technology usage and its relationship with psychological well-being. A correlational study was conducted from a sample of students at a private Midwestern university who met the requirements and volunteered to participate in the study. The aspects of psychological well-being that we measured were stress, happiness, and depression. Stress was measured using the Perceived Stress Scale (Cohen, 1994), happiness using the Oxford Happiness Questionnaire (Argyle & Hills, 2002), and depression using the Beck's Depression Inventory (Beck, Ward, Mendelson, Mock,

& Erbaugh, 1961). Hours of screen time and perceived interference of screen time were also measured. We established significant correlations between screen time and stress, happiness, and depression. We found significant correlations between perceived interference and stress; perceived interference did not significantly correlate with happiness and depression. Our results support the established relationship between screen time and psychological well-being and provide insight into the relationship between the perceived interference of screen time and psychological outcomes.

Abbie Payne and Megan Ruppert

FACULTY ADVISOR: LANA PROKOP
ST. CATHERINE UNIVERSITY, DEPARTMENT OF EXERCISE SCIENCE

Novel Gait Training for Older Adults: Walking Poles vs. Vizziq™ Neuromuscular Trainer

Older adults have a relatively high incidence of falls, which come at several costs for the individual. The Vizziq™ Neuromuscular Trainer, new walking device capable of pivoting, is claimed to prevent age-related walking decline, decreasing fall risk. We investigated whether walking with the Vizziq™, walking poles, or no device was more effective in changing walking metrics and balance in older adults. Fourteen community-dwelling participants were randomized to one of the three walking groups. For the six-week intervention, all participants walked three times per week

for 30 minutes in their assigned walking group. Assessments were performed before and after the intervention, including subjective and physical measures of balance and objective measures of walking velocity and cadence. Although there were no statistically significant differences within or between walking groups across time, trends indicated a subset of lower-functioning subjects benefitted from the Vizziq™. Future studies may consider a larger, more diverse sample size or more challenging interventions for high-functioning seniors.

Alisha Wiedmeier, Melissa Graham
Judy Panmany, and Claire Weinzierl

FACULTY ADVISOR: ERICK AGRIMSON
ST. CATHERINE UNIVERSITY, DEPARTMENT OF PHYSICS

High Altitude Ballooning: Investigations of Cosmic Ray Showers

High Altitude Ballooning (HAB) is a way to develop a deeper understanding of Earth's atmosphere. Research related to HAB provides opportunities to introduce undergraduate women to collaborative work in physics. In specific cases, HAB can be used to monitor radioactive subatomic particles caused by Galactic Cosmic Ray Showers (GCRs). GCRs occur in the stratosphere above 15 km, also referred to as the Regener-Pfotzer (R-P) maximum. GCRs result from high-energy particles striking atmospheric nuclei, producing a cascade of both charged and non-charged secondary par-

ticles. One method of measuring charged subatomic particles is with Geiger-Mueller counters positioned in a quad configuration to quantify different directions of motion, which confirmed a lower R-P vertical maxima vs. horizontal. However, non-charged subatomic particles were quantified using a personal neutron dosimeter and a camera. It was determined that the highest amount of non-charged events occur below the R-P maximum. This research is important in creating a broader understanding of subatomic particles and their effects on humans.

Jessica Ohaeri

FACULTY ADVISOR: JEREMY LOEBACH
ST. OLAF COLLEGE, DEPARTMENT OF PSYCHOLOGY

Refining a Cochlear Implant Training Program

The cochlear implant (CI) can provide access to sound by electrically stimulating the auditory nerves, however implantees have to learn or relearn how to hear with the implant. This difficult process is exacerbated by a lack of standardized training. The High Variability Online Training for Cochlear Implant users (HiVOLT-CI) is a free rehabilitative program that allows CI users to train from the comfort of their own home. The web-based program is adaptive to each individual user and based

on scientific literature and empirical studies. Hi-VOLT-CI is a challenging training program as it focuses on improving auditory skills through perceptual learning and includes non-speech sound modules. Success with the program is dependent on adherence to the suggested training of 15 min a day, 5 days a week. The purpose of this research was to identify ways to foster compliance and develop new training modules that are more engaging to the target audience.

Diana Chaidez

FACULTY ADVISOR: KATHERINE TEGTMEYER PAK
ST. OLAF COLLEGE, DEPARTMENT OF POLITICAL SCIENCE

Rural Immigration Network

Heated debates surrounding immigration in the U.S. overshadow community builders' efforts to incorporate newcomers in new immigrant destinations. The Rural Immigration Network (RIN) project, a digital platform started in 2015, connects community leaders who contribute to the context of reception across the U.S. The 2019 RIN team focused on four efforts. First, we applied insights from data visualization standards to present project findings via Tableau software, including the development of a map-based literature review that shows what

scholars know about rural immigrant incorporation. Second, we conducted semi-structured interviews with six organizations for new Recipes for Action. Third, we improved search functionality and home-page layout. Finally, we deepened our network via the Cambio de Colores Conference. Future priorities for RIN include establishing a community of practice that will plan a workshop at the 2020 Cambio meetings and deepening local leaders' involvement in the RIN Steering Committee.

Sameera Taylor

FACULTY ADVISOR: DEVAVANI CHATTERJEA (MACALESTER COLLEGE)
UNIVERSITY OF ST. THOMAS, DEPARTMENT OF BIOLOGY

Investigating the Role of Tetrahydrocannabinol (THC) in the Reduction of the Accumulation of Eosinophils and Neutrophils in Mouse Model of Vulvodynia

Vulvodynia is a chronic pain condition in women with no known cause. The condition is known to be associated with an increased amount of mast cells. Women with allergies also have an increased likelihood of developing the condition. It has been previously proven in the laboratory of Dr. Devavani Chatterjea at Macalester College that allergic responses to chemicals are linked to long lasting pain as well as the accumulation of mast cells. The chemical methylisothiazolinone

(MI) is a well-known and widely used preservative in household cleaning products. In the Chatterjea laboratory, the treatment of Δ^9 -tetrahydrocannabinol (THC) was tested and determined to reduce the accumulation of mast cells as well as the tactile sensitivity in the tissue of mice exposed to the chemical. From these findings, the present study is a continuation and aims to find more alterations within the cells by treating the mice with THC.

Ethan Lynch

FACULTY ADVISOR: KEVIN THEISSEN • UNIVERSITY OF ST. THOMAS, DEPARTMENT OF EARTH, ENVIRONMENT, AND SOCIETY

Bone Lake: Evaluating Past and Present Ecosystem Health

We collaborated with the St. Croix Watershed Research Station (SCWRS) to complete a historical nutrient record for Bone Lake in Washington County. This project was completed to determine the health of lakes of concern in the Comfort Lake Forest Lake Watershed District so that ecosystem rehabilitation efforts are efficiently allocated. We collected a sediment core from Bone Lake in February 2019 and completed elemental analysis at the University of St. Thomas. Age dating was completed at the SCWRS using Pb-210 techniques and historical aerial imagery was used to ex-

plore landscape changes around Bone Lake. Our core shows two significant sediment accumulation events since 1820. Between 1910–1930, organic and inorganic sedimentation rates dramatically increased likely due to land clearing and the development of agriculture. After recovering briefly, housing development between 1960–1990 likely caused the observed significant increase of inorganic accumulation and carbonate production. Currently, the lake shows triple pre-settlement sedimentation rates while increased nutrient loads are causing eutrophication.

THANK YOU to everyone who supported these projects and a special thanks to the entire Augsburg University team for their support of the Scholars at the Capitol event.



The Minnesota Private College Council represents private nonprofit higher education in Minnesota. The Council's mission is to serve members' shared needs and advocate for public policy that:



Meets the educational needs of students



Enhances private higher education



Strengthens Minnesota's economic and civic fabric

We also serve our members and the state through research, publications and outreach.

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BETHEL UNIVERSITY

CARLETON COLLEGE

COLLEGE OF SAINT BENEDICT

THE COLLEGE OF ST. SCHOLASTICA

CONCORDIA COLLEGE

CONCORDIA UNIVERSITY, ST. PAUL

GUSTAVUS ADOLPHUS COLLEGE

HAMLIN UNIVERSITY

MACALESTER COLLEGE

MINNEAPOLIS COLLEGE OF ART AND DESIGN

SAINT JOHN'S UNIVERSITY

SAINT MARY'S UNIVERSITY OF MINNESOTA

ST. CATHERINE UNIVERSITY

ST. OLAF COLLEGE

UNIVERSITY OF ST. THOMAS

