



# SCHOLARS AT THE CAPITOL

JANUARY 23, 2019

9:45 - 11:45 AM

CAPITOL ROTUNDA





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# Recognizing Undergraduate Research

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

The 2019 Minnesota Private College ***Scholars at the Capitol*** celebrates the scholarship of 42 students and the efforts of their faculty advisors. From psychology to art history, communication studies to biochemistry, 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.*

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

LEGAL STUDIES

ENGLISH

HISTORY

BIOLOGY

EXERCISE SCIENCE  
AND SPORTS STUDIES

PSYCHOLOGY

CHINESE

CHEMISTRY

SOCIOLOGY

PSYCHOLOGY

BIOCHEMISTRY

ECONOMICS AND  
POLITICAL SCIENCE

ART AND  
ART HISTORY

ECONOMICS AND  
MANAGEMENT

COMMUNICATION  
STUDIES

FURNITURE DESIGN

**Breanne Sande-Martin**

AUGSBURG UNIVERSITY, DEPARTMENT OF PSYCHOLOGY  
FACULTY ADVISOR: DR. BEN DENKINGER

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# *The Impact of Smartphone Notifications on Proofreading Accuracy*

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The reliance on smartphones for navigation, reminders, and interpersonal communication has changed the way we communicate and function. As the demand and reliance on smartphones increases, how does dependence and attachment to these devices affect our ability to think and function with or without them? We induced smartphone anxiety in participants to determine if restricting access would predict poorer performance on a proofreading task. Using an eye-tracker, participants' eye movements were monitored to determine whether smartphone anxiety increased clock-watching behavior.

Researchers found that participants who received a text message looked at the clock more and for a longer duration than those who did not receive a text message. Participants also looked at the clock longer and more times if the clock was a random timer than if the clock was a countdown timer. Lastly, proofreading accuracy was not affected by the notification or timer condition.

## Andy Thao

AUGSBURG UNIVERSITY, DEPARTMENT OF OF BIOLOGY  
FACULTY ADVISOR: DR. DAVID CROWE

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### *Exploration of Local Field Potentials and Spiking Activity in a Genetic Model of Schizophrenia*

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The causes of schizophrenia, a disorder affecting millions of individuals' mental stability, are unknown. However, numerous studies have shown disconnections between brain cells and brain regions in this disorder. We studied mice with a mutation in the *Dgcr8* gene, a genetic locus found within the 22q11.2 chromosomal region, whose deletion in humans confers a high risk of schizophrenia. Analysis of neural data in these mice showed a disruption in the timing of electrical activity compared to the wild-type mice, supporting a hypothesis that the disconnections seen in schizophrenia arise from abnormalities in the timing of neuronal activity.

## Brett Norling

BETHEL UNIVERSITY, DEPARTMENT OF CHEMISTRY  
FACULTY ADVISOR: ANGELA STOECKMAN

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### *Bacterial Adhesion to Heart Valve Biomaterials*

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The use of exogenous tissues to reconcile failing heart valves within humans presents the opportunity for the medical field to improve longevity and quality of life for patients. However, these unique therapeutic strategies, such as Medtronic's Melody Valve or the Edwards Centra Valve, give rise to novel challenges for the medical field. When bacteria adhere to the exogenous heart valve and colonize, a systemic, often terminal, infection called infective endocarditis (IE) arises. IE primarily occurs due to bacterial adhesion of *S aureus*, *S epidermidis*, or *S sanguinis*. Various tissues used for heart valve replacement (porcine pericardium, bovine pericardium, and bovine jugular vein) each possess distinctive surface properties that affect their propensity towards bacterial adhesion. Half of the tissues tested were exposed to pressure crimping which aimed at mimicking the surgical stenting process while the other half was left uncrimped. Tissues were then exposed to the *S aureus* and *S epidermidis* under physiological conditions and adherent bacteria were quantified after enzymatic and mechanical removal. Qualitative observations were made by scanning electron microscopy (SEM).

## Sydney Sybrant & Meg Thorison

BETHEL UNIVERSITY, DEPARTMENT OF PSYCHOLOGY  
FACULTY ADVISOR: GRETCHEN WROBEL



### *Adopted Mother's Religious Meaning Regarding Adoption*



The purpose of this qualitative study was to identify ways adoptive mothers described religiosity/spirituality in connection to the adoption of their child. Participants were 15 adoptive mothers who were interviewed as part of the Minnesota-Texas Adoption Research project, a national longitudinal study of adoptive families. Unique to the current study was the application of the Consensual Qualitative Research (Hill, 2012) approach to a sample of adoptive mother interviews. The intensive CQR approach includes audited, within and cross case analyses. Analysis of the adoptive mother interviews resulted in identifi-

cation of the following domains: Prayer, Influence of Religious Community, God's Plan, and Importance of Religion to the Family. Domain sub-categories will be described. The most prevalent category identified by the adoptive mothers was "God had an active role in the adoption process." Overlap of some religious terminology may have influenced the formation of the domains yet the identified domains are useful for understanding the adoptive mother experience.

## Adam Nijhawan & Brody Lynch

CARLETON COLLEGE, DEPARTMENT OF OF CHEMISTRY  
FACULTY ADVISOR: DANIELA KOHEN



### *Sodium Cation Behavior Within Zeolites Abstract*



Zeolites are microporous materials capable of selectively adsorbing CO<sub>2</sub>, suggesting applications for carbon capture and natural gas purification processes. Cations are present within aluminum-substituted zeolites. Within zeolite Na-RHO, CO<sub>2</sub> bypasses the thermally fluctuating cation, while gases such as CH<sub>4</sub> are blocked from entering the adsorption sites. We used Molecular Dynamics (MD) simulations to investigate the behavior of the sodium cations within zeolites RHO and MFI and the effect of aluminum substitutions on cation position. We used both classical MD simulations and more accurate

but more time consuming ab-initio MD simulations. Experimental data are used to validate our ab-initio MD results, and then both experimental and ab-initio MD data are used to evaluate our classical models' results. The classical potential CLAYFF produced results in agreement to those from the ab-initio simulation in far less computational time. We will continue to use this potential as well as ab-initio MD to further examine the behavior of sodium cations within zeolites RHO and MFI.

## Jacob Isaacs

CARLETON COLLEGE, DEPARTMENT OF OF CINEMA AND  
MEDIA STUDIES, FACULTY ADVISOR: LASKA JIMSEN



### *Frontier: The American West and the Development of Film*



Laska Jimsen's *Frontier* is a forthcoming 60-minute experimental nonfiction film inspired by the end of the American frontier and the beginning of the film medium in mid-1893. As an extension of the frontier myth, film and later digital media continue to reflect salient and often troubling changes in the American West, especially in California, a world capital of film production. This project documents the conflicts, tensions,

power consolidation, fictions, and questions that Western development, on screen and in reality, has brought to the region, with a particular focus on how expansion and development have disenfranchised communities and transformed the environment.

## Abigail Borgmeier

COLLEGE OF SAINT BENEDICT, DEPARTMENT OF OF BIOLOGY  
FACULTY ADVISOR: DR. STEPHEN SAUPE



### *The Effects of Cover Crops*



Cover crops grown after harvest of the primary crop help increase soil health. However, farmers are hesitant to grow cover crops because they may reduce the performance of subsequent crop. We wanted to investigate the effects of cover crops on the growth and development of the following corn crop. Cover crops (cereal rye, oats, and a mix of rye and oats) were planted following winter wheat on non-irrigated no-till plots at the University of Nebraska South Central Ag Laboratory (SCAL) in late summer 2017. Oats winter-killed and rye was terminated with glyphosate immediately after corn planting. Corn

height, stalk diameter, and developmental stage were measured weekly from June through July and were compared to corn grown without a previous cover crop. We expect to find differences in crop development and growth among the treatments. This research is important for farmers in rain-fed winter wheat and corn systems that are considering adding cover crops into their rotation.

## Rachel Nelson

COLLEGE OF SAINT BENEDICT, DEPARTMENT OF EXERCISE SCIENCE  
AND SPORTS STUDIES, FACULTY ADVISOR: DR. MARY STENSON

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### *Measuring Physiological Changes in Response to a Division III Collegiate Cross-Country Season*

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Human endurance performance is most commonly predicted from variables such as maximal oxygen consumption, lactate threshold, and running economy. Cross-country running success, specifically at the 6 km distance, depends on interactions of these physiological variables. Proper endurance training combines variations in running speed and distance with appropriate rest to stress the body and develop physiological adaptations. The purpose of this study was to assess how physiological variables change over a competitive cross-country season in Division III female athletes. Eleven female distance runners performed a series of physiological laboratory tests at the start and end of a 10-12 week cross-country season.

Testing included maximal oxygen uptake (VO<sub>2</sub> Max), blood lactate threshold, running economy, and a maximal vertical jump test. Paired samples t-tests were used to analyze the differences in all variables from pre-season to post-season ( $p < 0.05$ ). The analyses revealed a significant change in lactate threshold as a percentage of VO<sub>2</sub> Max from pre-season ( $87.63 \pm 4.23$  %) to post-season ( $85.35 \pm 3.93$  %),  $t(10) = 2.436$ ,  $p = .035$ . A non-significant relationship was found between all other physiological measurements. Results suggest that a competitive cross-country season does not induce significant physiological improvements in previously trained distance runners, with the exception of blood lactate clearing ability.

## Donovan Blatz & Mera Petros

THE COLLEGE OF ST. SCHOLASTICA, DEPARTMENT OF CHEMISTRY  
AND BIOCHEMISTRY, FACULTY ADVISOR: JEN MAKI

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### *Mutation of Fathead Minnow Genes using CRISPR/Cas9*

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The application of the CRISPR/Cas9 system within *Pimephales promelas*, fathead minnow (FHM) fish, allows for mutation of specific genes, and assessment of the validity of adverse outcome pathways (AOPs), which explain visible phenotypes based upon biological reasoning. Initial CRISPR method development experiments in FHM targeted tyrosinase enzyme for the simply visualized decreased pigmentation phenotype that results. These methods were developed in collaboration with the Environmental Protection Agency research labs in Duluth, MN.

In this work, methods of mutation analysis were assessed, including T7 endonuclease I (T7EI) kit, TIDE analysis (Tracking of Indels by Decomposition; tide.nki.nl) and assessment via DNA Bioanalyzer using known tyrosinase mutant fish as the source of DNA. Results using TIDE were consistent, cost-effective, and easy to interpret. The only downside of TIDE analysis is that it is time consuming. Based on the data obtained, TIDE analysis will be the primary technique utilized for assessment of mutation efficiency in subsequent studies.

## Blessing Sambu

THE COLLEGE OF ST. SCHOLASTICA, DEPARTMENT OF PSYCHOLOGY  
FACULTY ADVISOR: KAREN PETERSEN



### *Do Probiotics Affect Perceived Stress in College Students?*



The role of the microbiome in stress-related conditions such as depression and anxiety has become an exciting area of research. In this study, a two-week double-blind, placebo-controlled design was used to examine the effect of probiotic supplements on perceived stress in 95 college students. The treatment group was given two daily capsules of over the counter probiotic (VSL#3), and the control group was given a placebo. Perceived stress was measured using the Perceived

Stress Scale before and after two weeks of probiotic or placebo supplementation. Results show that there was a decrease in stress levels for both groups from time point one to time point two. No significant difference was found between groups, suggesting probiotics had no effect on perceived stress in this group.

## Emma Chandler & Marley Lund

CONCORDIA COLLEGE, MOORHEAD, DEPARTMENT OF BIOLOGY  
FACULTY ADVISOR: ALTHEA ARCHMILLER



### *Using Small Studies to Answer Big Questions: Studying Carbon Dynamics at Concordia College's Field Station*



Concordia College's Long Lake Field Station in northern Minnesota has 135 acres of natural areas, including 1800 feet of shoreline, 70 acres of restored prairie, and 35 acres of woodland. In 2017, our research mentor initiated a long-term Carbon Census research project at Long Lake. The goals of the Carbon Census are to provide a deeper understanding of carbon dynamics on the prairie-woodland interface, to study the potential to mitigate rising global carbon dioxide levels, and to predict how future climate changes might impact Minnesota plant communities. For this independent research project, we used Carbon

Census data to look specifically at how prescribed burning moderated prairie carbon dynamics. We found that while a 2017 spring burn decreased aboveground biomass relative to unburned prairies, the burned prairies were also associated with higher flower diversity and lower invasive species abundance. We highlight how sustaining long-term research can provide immediate and impactful undergraduate research projects.

## Vy Tat, Brett Erickson & Leah Mork

CONCORDIA COLLEGE, MOORHEAD, DEPARTMENT OF CHEMISTRY,  
FACULTY ADVISOR: DARIN J. ULNESS

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### *Raman Study of Halogen Bonding in Iodo-perfluoroalkane Solutions*

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Raman spectroscopy was used to investigate frequency shifts due to halogen bonding of two normal modes of three iodo-perfluoroalkanes: 1-iodo-perfluorobutane (C<sub>4</sub>F<sub>9</sub>I), 1-iodo-perfluorohexane (C<sub>6</sub>F<sub>13</sub>I), and 2-iodo-perfluoropropane (C<sub>3</sub>F<sub>7</sub>I). Each iodo-perfluoroalkane was mixed with a variety of different cosolvents representing a range of Lewis basicities. Data showed frequency shifts to be correlated with the strength of the Lewis base cosolvent. The normal modes responded differently to the basicity of the cosolvent, which provides some interesting insight into the halogen bond.

## Heather Vande Kieft

CONCORDIA UNIVERSITY, ST. PAUL, DEPARTMENT OF SCIENCE  
FACULTY ADVISORS: DR. MANDY BROSNAHAN & DR. TAYLOR MACH

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### *Methicillin Resistant Staphylococcus Aureus*

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A team of 53 Concordia University - St. Paul students has studied the nasal carriage rate of *Staphylococcus aureus* since 2016. During this time samples have been obtained from the anterior nares of 1294 consenting adults. Of these 789 have been culture tested, resulting in 194 *S. aureus* isolates. Each positive isolate is tested for antibiotic resistance using a Kirby-Bauer assay. The most common form of antibiotic resistance in *staphylococci* is methicillin-resistance. Methicillin-resistant *S. aureus* (MRSA) infections are common complications in hospital and long-term care settings and thus relevant from a public health standpoint.

Colton Baumler, Nicholas Ziebell & Brooke Salo

COLLEGE CONCORDIA UNIVERSITY, ST. PAUL, DEPARTMENT OF  
SCIENCE, FACULTY ADVISOR: MONG-LIN YANG



*Effect of Ethanol Exposure  
on ex ovo Chick Development:  
A Model for Understanding  
Fetal Alcohol Syndrome*



In the process of creating a novel ex ovo culture vessel for monitoring the development of a chicken embryo, an advantageous opportunity to examine the effects of Fetal Alcohol Syndrome (FAS) presented itself. FAS is defined as the teratogenic effects resulting from early alcohol exposure of a developing embryo. Phenotypically, some ex ovo cultured chicks were observed to acquired omphalocele (organs growing outside of chest cavity) during development within our novel culture vessel. We hypothesize that the observed omphalocele is due to residual ethanol left over from the vessel sterilization process.

This project aims to test whether the omphalocele observed in ex ovo cultured chick embryos can be induced through the mixing of specified concentrations of ethanol with albumin at 55-56 hours into development. Our preliminary results suggest that early ethanol exposure induces the omphalocele phenotype in the ex ovo cultured chick embryo. Since the sonic hedgehog pathway has been highly studied in reference to omphalocele development, this novel finding could become a useful technique for creating a model which allows further dissection of the role of sonic hedgehog pathway in the etiology of FAS.

Shaun Gilyard

GUSTAVUS ADOLPHUS COLLEGE, DEPARTMENT OF ECONOMICS AND  
MANAGEMENT, FACULTY ADVISOR: MARTA PODEMSKA-MIKLUCH



*Minimum Wage  
and Employment  
Growth*



Over the last 15 years, local municipalities have been implementing minimum wage ordinances at an accelerated rate. This research examines the consequences of the local, state, and federal minimum wage increases on employment growth for teenagers within the food services and drinking places subsectors. Existing literature shows that minimum wage affects these two demographics the greatest, though findings on the resulting impact tend to be mixed. By examining the employment growth for this combined demographic, it is possible to measure minimum wage effects on the individuals these regulations are in-

tended to impact. Applying a distributed lag model, we find that a 10% increase in the minimum wage negatively effects employment growth by 1.25% for teenagers within this subsector. Our findings suggest that the effects of minimum wages within this demographic are most strongly felt over a period of three years.

## Emily Dzieweczynski

GUSTAVUS ADOLPHUS COLLEGE, DEPARTMENT OF ART AND  
ART HISTORY, FACULTY ADVISOR: BETSY BYERS



### *Experiencing the Receding Rhöne Glacier through Immersive & Sensory Spaces*



The collaborative research of Associate Professor Betsy Byers and Emily Dzieweczynski works to promote empathy between living beings by creating artistic immersive and sensory spaces. The current research tests these ideas by using data from the receding Rhöne Glacier in Oberwald, Switzerland. This glaciological data paired with neurobiological research on empathy demonstrates that creating 1.) an immersive environment and 2.) a sensory experience of the glacier could produce the strongest empathetic response. An immersive environment is created using virtual reality, selected because of its studied

success rate in provoking empathy. The team studies both the sensory qualia of the glacier and our neurobiological processing of the stimuli to create sensory spaces. Through these immersive environments, education, and community outreach, the work aims to bring attention to climate change and to create altruistic attitude through empathy with the natural environment. This research has been made possible by the Presidential Student/Faculty Collaboration Grant through Gustavus Adolphus College.

## Conner Suddick

HAMLIN UNIVERSITY, DEPARTMENT OF LEGAL STUDIES  
FACULTY ADVISOR: LEONDRAN HANSON



### *Experiential Access to Justice: Formulating Clinical Legal Education for Paralegal Programs*



Law schools use clinics as a vehicle to provide legal services to low-income clients. Incorporating experiential learning into clinics allows students to apply the skills they obtained in their curriculum in a legal environment. While the legal community often recognizes the availability of clinics in law school settings, many professionals are unaware of the clinical work that also occurs in undergraduate and paralegal programs that provides the same benefits - both for the community and the students. This research project specifically examines the value of paralegal clinics and how paralegal educators can formu-

late them. I interviewed paralegal educators across the country who have clinics, conducted a literature review on clinical legal education, and analyzed a survey of paralegal clinics across the country. The final report was published in the 2018 edition of a national publication—The Paralegal Educator. This research is important because the role of paralegals, and their education programs, are underutilized in the access to justice movement. To propel the legal profession forward, there needs to be more experiential education for paralegals so they may also help bridge the justice gap while also preparing for successful careers.

## Charles Parker Bertel

HAMLIN UNIVERSITY, DEPARTMENT OF HISTORY,  
FACULTY ADVISOR: NURITH ZMORA

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### *The Battle over the Canal: The Dispute between Sister Cities that Shaped the Future of the Twin Ports*

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In 1870 two towns emerged on the northwestern head of Lake Superior. Both sought to take advantage of the only sandy and protected bay on the great northern lake. Superior WI, on the southern end of the bay, was situated at the only natural entrance to the harbor. In the fall of 1870 the residents of Duluth, MN, located on the northern Minnesota shore, began digging a canal to rival Superior's entrance. The result was a dispute between the two towns that lasted several years. Both towns fought tirelessly to fulfill what they saw as their destiny to become the region's major port. The goal of this research is to investigate how Duluth, lacking all the natural advantages of its rival, managed to wrestle its destiny from Superior to become the world's largest inland port. The dis-

pute has been detailed by local historians' numerous times, but mostly as a regional curiosity. By examining government documents, including Congressional transcripts and court cases, as well as the writings of influential businessmen and politicians, this research places the dispute in the larger context of the post-Civil War Reconstruction Era. These documents show that the digging of the canal was more than just the triumph of frontier pioneers, it was an event bolstered by the radical faction of the Republican Party in an attempt to meet their long-term geo-political goals. This is significant in that the radical faction of the Republican Party has long been viewed as corruption free. By examining the Duluth Canal dispute, this research challenges that perception.

## Hannah Hoffman

MACALESTER COLLEGE, DEPARTMENT OF ENVIRONMENTAL STUDIES  
FACULTY ADVISOR: CHRISTIE MANNING

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### *The Impact of Political Party Affiliation on Climate Change Policy Support*

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Despite the broad and deep consensus in the scientific community that climate change demands urgent action, the American public tends to view climate change as a far-off problem. This is particularly prevalent among conservative and/or Republican-identifying Americans, resulting in a partisan worry-gap. We have conducted several studies to examine the influence of political party affiliation on people's response to climate change; and across our studies, we consistently find evidence for the partisan worry-gap. In the current study, we explored two questions. First: do self-identified Republicans and Democrats differ in their response to

events that are explicitly labeled as "climate change" vs. events that are not explicitly climate-related? Second: If a political figure takes action on climate change, does political affiliation influence whether people think that action is valid or important? In the current study we found that, regardless of personal political affiliation, explicit mention of climate change resulted in lower support for climate-friendly policy. These findings suggest that the partisan worry-gap is only one element we must consider in building support for climate-friendly policy, for reluctance to take climate change seriously is a problem regardless of party affiliation.

## Margaret Hinson

MACALESTER COLLEGE, DEPARTMENT OF SOCIOLOGY  
FACULTY ADVISOR: ERIK LARSON



# *The Unrecognized Role of Parental Incarceration on In-School Suspension Rates*



Due to the rise of mass incarceration in the United States, a large number of children now have incarcerated parents. Scholars have devoted significant attention to the consequences of zero-tolerance discipline in schools that motivate the school-to-prison pipeline. But does that pipeline also flow in the other direction? While research shows an array of compounding disadvantages of parental incarceration that reverberate through children's lives, little discussion has gone into how the incarceration of a parent might feedback to how students experience school discipline. My research addresses this gap analyzing a statewide Minnesota

student survey to examine possible explanations for why students who experience parental incarceration also experience higher rates of in-school suspension. High in-school suspension rates persist through expected controls and intervention techniques, showing a unique effect of parental incarceration. Supplemental analysis through interviews with school administrators shows that they are unaware of the existence of this student population, let alone what their needs are. The invisibility of this population of students may stem from anticipated stigma, which would also motivate the punishable behavior indicated by the in-school suspension rate.

## Mad Radtke

MINNEAPOLIS COLLEGE OF ART AND DESIGN, DEPARTMENT OF  
LIBERAL ARTS, FACULTY ADVISOR: GEORGE HOAGLAND



# *Queering Design through Object*



Western design is currently rooted heavily in marketing and minimalism. Overactive ownership and heavy consumption rate combined with a heteronormative capitalist marketplace has made most accessible products impersonal and easily discarded, a fleeting way of surrounding one's self with material possessions that serve little emotional function in context to the overabundance of waste around the globe. In order to combat wasteful practices, there must be not only a change in each design itself, but a queering within the design process that created it. Through queering design and design practices as pro-

test and reform to the current heteronormative capitalist notions, a designer can consider all forms of sustainability and accessibility, making individual and exciting objects than can subvert the current state of ownership. This paper analyses modes of queer visualization and queer creation through queer aesthetics and empathic design process research and asks, how can queering design offer a sustainable alternative to current design modes?

## Nathan Williams

SAINT JOHN'S UNIVERSITY, DEPARTMENT OF ECONOMICS  
FACULTY ADVISOR: DR. LOUIS JOHNSTON

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### *Factor Biases in the Lumber Milling Industry, 1850–1870*

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Lumber milling contributed greatly to the growth of both the economy of both Minnesota and America in the nineteenth century. Scholars have done very little research with regard to the sources of the industry's growth, especially the relative importance of capital inputs versus labor inputs. The aim of this project is to determine whether nineteenth-century lumber milling technology had a bias towards using relatively more capital or labor over time. The data to analyze this industry was drawn from the Census of Manufactures for 1850, 1860, and 1870, a period of rapid technological and demographic change. A transcendental

logarithmic production function was used in estimating the factor biases of capital and labor. It was found that there was a significant capital-using bias and a labor-using bias during this period but using both inputs in concert on a large scale was inefficient. These results indicate there was a bifurcation of the sawmilling industry from 1850 to 1870, with some companies choosing capital-intensive processes, whereas others used labor-intensive processes.

## Michael McGill

SAINT JOHN'S UNIVERSITY, DEPARTMENT OF BIOLOGY  
FACULTY ADVISOR: DR. KATHERINE LEEHY

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### *Plant Genome Editing Using CRISPR/ Cas9: Investigating the Role of TEN1 in the Maintenance and Protection of Telomeres in Arabidopsis thaliana*

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Telomeres are highly regulated complexes composed of tandemly-repeated DNA sequences and associated proteins that are located the ends of linear chromosomes. Telomeres are essential for the maintenance and protection of chromosomes due to telomere shortening over successive cell divisions. Short telomeres have previously been associated with age-related disease phenotypes in many models. Telomerase is an enzyme capable of maintaining telomere length, however, it is highly suppressed in somatic cells. The CST complex is a heterotrimeric protein complex (CTC1/STN1/TEN1) that is as-

sociated with telomeres and telomerase and is conserved across all eukaryotes. The role of the CTC1 and STN1 proteins in the maintenance and protection of telomeres are well understood, but the role of TEN1 has yet to be fully characterized. This study describes the creation of a CRISPR/Cas9 construct to generate a TEN1 knockout in the model plant, *Arabidopsis thaliana*. Future research will reveal the role of the TEN1 protein at telomeres.

## Austin Kleman

SAINT MARY'S UNIVERSITY OF MINNESOTA, DEPARTMENT OF  
PSYCHOLOGY, FACULTY ADVISOR: DR. MOLLY O'CONNOR



### *Alcohol Consequences and Aristotelian Subjective Well-Being*



In psychology, there has been plenty of research done on alcohol and happiness - high Subjective Well-Being (SWB) - but what about philosophical SWB and alcohol research? A scale designed to test for philosophical SWB, the Philosopher's Index (PI), was created using Aristotle's Ethics and Politics. The PI was written to assess Aristotle's philosophical perspective on SWB - living a life of virtue or eudaimonia. The study consisted of an alcohol severity index, two existing SWB scales, and the PI and was given on an online

platform to 149 participants. The primary hypothesis was not supported, but when split by gender, females showed a significant inverse correlation between their alcohol severity and SWB. Results for the PI also differed by age, with participants over 21 scoring higher than those under 21.

## Mark Leonard

SAINT MARY'S UNIVERSITY OF MINNESOTA, DEPARTMENT OF BIOLOGY  
FACULTY ADVISOR: BENJAMIN PAULI



### *Red-bellied Woodpeckers (*Melanerpes carolinus*) Scavenging: A Possible Alternate Dietary Substrate*



Red-bellied Woodpeckers (*Melanerpes carolinus*) are insectivores that consume insects found within trees but also feed on seeds and small vertebrates. On rare occasions, they opportunistically scavenge carrion. We document the first recorded instances of repeated and sustained visits by Red-bellied Woodpeckers to a deer carcass presumably for supplementation of diet via scavenging. Between December 2016 and March 2017, a motion sensor trail camera directed towards a deer carcass, in Winona, Minnesota, captured 1815 photos of Red-bellied Woodpeckers from 381 separate visits. We analyzed the photos to deter-

mine if time of day or month affected the frequency of pictures of Red-bellied Woodpeckers at the carcass. The timing of Red-bellied Woodpecker visits was not uniformly distributed in time with more pictures being taken during the middle of the day; the frequency of photographs did not differ by survey month. Results are useful for expanding our understanding of Red-bellied Woodpecker diets and the role scavenging may play in diet supplementation during winter months

**Lani Kazel**

ST. CATHERINE UNIVERSITY, DEPARTMENT OF COMMUNICATION  
STUDIES, FACULTY ADVISOR: DR. MARGRET MCCUE-ENSER



*Native American  
Female Leaders:  
Intersectional Challenges  
and Rhetorical Styles*



The field of Communication Studies lacks significant scholarship on female Native American leadership. Our goal in this research project was to examine the complex problems faced by female Native American leaders, determine how these leaders work within and between their tribal nations and western state and federal institutions for the sovereignty and sustainability of their tribal nations, and identify the rhetorical styles and strategies they use to negotiate them. Native American female leaders, Minnesota State Supreme Court Justice Anne McKeig (Ojibwe), Wounded Knee and Lakota Law Project Orga-

nizer Phyllis Young (Lakota), and Duluth Minnesota City Council Representative Renee Van Nett (Ojibwe) were interviewed. We identified many examples of Patricia Hill Collins definition of motherwork, the idea “that individual survival, empowerment, and identity require group survival, empowerment, and identity” throughout the transcripts. In addition to motherwork, the values of Native American tribal cultures influence how these Native American female leaders understand and do their judicial, tribal and community work.

**Maakwe Cumanzala, Khadidja Ngom**

(Macalester College) & Elizabeth Kula

ST. CATHERINE UNIVERSITY, DEPARTMENT OF ECONOMICS AND  
POLITICAL SCIENCE, FACULTY ADVISOR: DR. KRISTINE WEST



*Gaming the System:  
Matching Mechanisms and  
Enrollment in a Large  
Midwestern School District*



In districts with open enrollment, the assignment of students to schools is important for families and children’s well-being. We explore how economic matching mechanisms link consumers (students) to producers (schools) and study the implications for a large urban district. We find that, on average, 80% of students are matched to their first-choice school. Of those students, an average of 74% enrolls at their matched first-choice school, suggesting room for improvement in parental satisfaction and retention. Further, we find the system is susceptible to well-informed parents’ strategic gaming. For ex-

ample, even wanting a popular school, A, a parent might rank school B first to avoid “wasting” their choice. Parents concealing true preferences makes measuring the demand for schools impossible. Better data on parents’ preferences will enable the district to gauge interest in factors like travel time and programmatic offerings. Our study of matching mechanisms’ implications leads us to recommend the district switch to a strategy-proof mechanism.

Sofia Reed, Sandy Faure,  
James Sandberg & Hana Anderson

ST. OLAF COLLEGE, DEPARTMENT OF CHINESE  
FACULTY ADVISOR: HSIANG-LIN SHIH

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*Memories of  
Agricultural  
Yilan, Taiwan*

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This project aims to showcase different perspectives about suburbanization in Yilan, Taiwan. Our team did fieldwork in Yilan by conducting interviews, living in a local farmhouse, farming first-hand, and visiting various historical landmarks. The culmination of this research is a website, curated through ThingLink. This unique tool allowed us to incorporate 360 degree photos and pair these with inforamatory texts and interview clips. Yilan, an agricultural city, has recently been transformed to accommodate destination homes and tourist sites. However, this development has come at the cost of farmland and many of the locals'

livelihood. In this way, farmers, government officials, and local citizens all have varying interests regarding the use of this farmland. The current political tension surrounding the suburbanization of rural Yilan has led to not only a weakening agricultural industry, but also a less flexible economy. However, Yilan farmers continue to resist through political involvement, scholarly engagement, and co-marketing. They also continue to share agricultural memories through social media, TED talks, publications, and by inviting people from near and afar to farm firsthand with them.

Sarah Shadle

UNIVERSITY OF ST. THOMAS, DEPARTMENT OF BIOLOGY  
FACULTY ADVISOR: DALMA MARTINOVIC-WEIGELT

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*Evaluation of Potential of  
UV Disinfection to Eliminate  
Tonalide and Associated  
Biological Activity*

❖

The polycyclic musk tonalide (AHTN) is a synthetic fragrance commonly used in consumer products. Due to poor removal during the wastewater treatment process, AHTN is detected in 84% of MN wastewater treatment plant effluents. This is of concern because AHTN can mimic hormones, and inhibit molecules (efflux transporters) that serve as the first line of defense against foreign chemicals. We established that use of commonly deployed wastewater treatment technology (UV disinfection) can help eliminate AHTN. We assessed toxicity of AHTN and its degradation product (AHTN-UV) on human and native fresh-

water mussel tissues. Ability of the freshwater mussel to efflux foreign chemicals was reduced by 10 uM AHTN, but not by 10 uM AHTN-UV. Both AHTN and its photoproduct activated retinoic acid receptor alpha and beta, estrogen receptor alpha, and pregnane X receptor. The data presented herein indicates that AHTN-PHOTO formed by UV photolysis affects receptors associated with the endocrine disruption and developmental deformities, but that it is less toxic than AHTN.

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## Erin Robb

UNIVERSITY OF ST. THOMAS, DEPARTMENT OF BIOMEDICAL  
ENGINEERING, ADVISOR: CYNTHIA FRACTION, FACULTY ADVISOR:  
DR. ZHI YANG (UNIVERSITY OF MINNESOTA)



# *EMG Signal Decoding using Random Forest Regression for Prosthetic Hand Control*



Classification-based decoding algorithms are used to predict hand movements from electromyography (EMG) signal data for use in prosthetic hands. While high decoding performance has been achieved using these methods, natural hand control has not yet been achieved due to these methods only allowing for the control of a limited number of degrees of freedom at a time. Regression-based decoding algorithms allow for the control of multiple degrees of freedom at the same time and have better generalization capabilities to novel movements (Krasoulis, Vijayakumar, & Nazarpour, 2015). For this reason, we propose to further study

regression-based decoding algorithms. In this study, we evaluate the ability of a regressive random forest algorithm to predict the hand movement trajectories from EMG signals. Seven hand movements are individually decoded and evaluated using the mean square error and correlation coefficient metrics. The results show unsatisfactory performance of the random forest regression algorithm in predicting hand movements from EMG signals. One potential reason is that features extracted from the raw EMG signals are not representative of the intended motion, thus leading to poor correlation of the features with the hand movement data.

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