CURI FINAL SYMPOSIUM, FRIDAY, AUGUST 3, 2018

Symposium Session 1: Tomson Atrium Posters & Screens 8:20-9:20

Faculty	Student	Title	Department	Tomson Atrium #
Brown	Johannes Carlsen	**Online Archaeology: Sharing Archaeological Digs Through HiPerCiC**	CS	1
Abstract		In the field of archaeology, the practice of pooling resources acts as a catalyst for new discoveries. However, the three dimensional nature of archaeological artifacts tends to make this very difficult. Shipping fragile objects across the world is impractical and dangerous, whereas photographs are only capable of telling a fraction of the story. St. Olaf History Professor Dr. Timothy Howe had been encountering these challenges in the midst of his archaeological research when he heard about HiPerCiC, an interdisciplinary program that connects St. Olaf professors with Computer Science majors to build collaborative web applications that solve a research problem. Together we built a web application that enables Professor Howe to build and share advanced 3D Models and Rich Text Images of the artifacts his team unearths.		
Campbell & McClure	Jack Schoephoerster	**Teacher Education at St. Olaf: The Past and the Present**	Educ	3
Campbell & McClure	Erik Lepisto			
Abstract		Nationally, declining enrollments in teacher preparation programs are leading to shortages of qualified teachers. Additionally, there is a lack of teachers who share the backgrounds of an increasingly diverse student population. St. Olaf College's Education Department is experiencing these same trends. Because minimal information is known about historical trends in licensure or the efforts to diversify the teacher candidate pool at St. Olaf, the purpose of this research was to discover the history of the department in an effort to inform current practice. To determine previous challenges, contexts, and changes, we recorded oral histories of 25 past and current faculty, staff, and students and conducted archival research. This information was then organized into a documentary film, research paper, and digital database. We found that although the department has changed regarding enrollments, location, and accreditation, its commitment to educational equity and hiring of progressive faculty has remained steadfast. Future research and analysis are necessary to integrate our findings into the department's current practices. Overall, learning the department's history elicits a greater understanding of its own unique identity.		
Tegtmeyer Pak	Anna Melugin	**Visualizing Incorporation of Rural Immigrants**	PSCI	5
Abstract		Immigration to rural parts of the United States has increased dramatically over the past two decades. In order to understand how rural communities respond to this demographic change, I created data from publicly accessible information about organizations that contribute to rural immigrant contexts of reception by systematically sorting through reports published in the Cambio de Colores Proceedings and the Journal of Extension. Guided by public participatory and data visualization theories, I created an interactive, online map to share information about rural incorporation activities crafted from these sources and prior essays published on the Rural Immigration Network. The master map represents a first, essential step towards realizing future plans for crowd sourced responses and public dialogue about immigrant incorporation in rural areas. The master map makes incorporation information accessible, engaging, and interactive.		
Brown	Harrison Skalski	**Cluster Management Training and Supporting WebMapReduce**	CS	7
Brown	Anway De			
Abstract		A cluster is a network of computers that can communicate and work with each other to perform large computations. Here at St. Olaf, we have a unique opportunity to manage such systems as students. We have a training program run by current cluster managers. This program prepares students to manage live servers that support computing resources here on campus that are utilized across many disciplines. This poster talks about the unique Cluster Manager training experience at St. Olaf and the upgraded training documentation for the future. It will also cover WebMapReduce, a web program developed by former St. Olaf students used for accessible large scale computing, and the future of the WebMapReduce project.		
Adolph	Wes Brown	**Quantifying two-meter near-surface inversions at sites across the Greenland Ice Sheet**	Physics	9

Abstract		As our planet continues to warm, the effects of rapid temperature increase in the Arctic, including ice loss and sea level rise, necessitate the monitoring of temperature to better understand and predict future climate change. In Greenland, snow surface temperatures are often significantly lower than the atmosphere immediately above, a phenomenon known as an inversion. The presence of an inversion can alter polar systems' responses to climate conditions. Our study investigates the presence of inversions across Greenland by comparing 2-meter air temperature and snow surface temperature data from 2015 obtained by a series of 20 automatic weather stations. Our initial findings indicate inversions to be present 87% of the time with the percentage of cloud cover influencing the strength of the inversions. An increased understanding of the processes driving these inversions informs our ability to accurately model the climate system.		
Adolph	Karina Zikan	**Validating MODIS land surface temperatures using in-situ skin temperature data across Greenland**	Physics	11
Abstract		Rising temperatures in Greenland are contributing to global sea level rise necessitating the study of temperatures over the Greenland Ice Sheet. Temperature data from the satellite-based Moderate Resolution Imaging Spectroradiometer (MODIS) provides information from remote regions of Greenland. To combat the uncertainty inherent in satellite-based measurements, data must be validated using ground-based measurements. Previous validation studies have found that MODIS detects lower temperatures than ground-based measurements. This study compares MODIS temperatures to temperature data gathered by automatic weather stations across Greenland to investigate the presence and causes of this cold bias. We find MODIS temperature data to be lower than ground-based measurements and that this discrepancy becomes more pronounced at lower temperatures and humidity. We hope these findings will inform updates to the MODIS temperature measurements and future climate studies.		
Bernardin/Hodgson	Yanglu Pu	**Strategic Behavior of Patients, Hospitals, and Social Welfare in the Provision of Charity Care**	Econ	13
Bernardin/Hodgson	Dohyun Lee			
Abstract		Federal and state regulations established how to classify patients as qualifying for charity care, but hospitals are given freedom to set their own policy. However, there has been lack of investigation on what factors are vital in determining a hospital's willingness to provide financial support to low-income patients and the primary goal of the research is to figure out what factors are significant. We employed generalized linear multilevel models in this study and the results show that hospitals are more likely to offer financial assistance to patients of low income and low credit score. This implies that reimbursement policy and expected likelihood of patients' payment are correlated with the tendency of financial support. This result leads us to the discussion of equity-efficiency tradeoff of the financial assistance policy.		
Beussman	Andrew Sullivan	**Optimization of MS Source Methods: APCI, ESI, and Captive Spray**	Chem	15
Beussman	Xiaoping Zhang			
Abstract		A Time-of-Flight mass spectrometer (MS) is an instrument that can detect and analyze the mass-to-charge ratio of a substance. The MS source, which ionizes and nebulizes samples, must be optimized for each sample type. We examined yeast, tetrahymena, and BSA with the electrospray ionization (ESI) and captive spray sources, concentrating our efforts on increasing the number of proteins identified. Additionally, we employed the atmospheric pressure chemical ionization (APCI) source in conjunction with Solid Phase Microextraction (SPME) to detect caffeine and methamphetamine, with hopes of developing a fast identification procedure for methamphetamine for emergency room patients. In the near future, this SPME-APCI-MS method could be expanded to other controlled or medically important substances.		
Bowers	Thomas Lerdall	**Putative Heavy Metal Transporter Expression in Caulobacter crescentus**	Bio	17
Bowers	Jewel Lee			
Bowers	Jacy Jordahl			
Abstract		Caulobacter crescentus is a bacterium that lives in water everywhere. These cells thrive in nutrient-limited environments because they have a large set of cell surface proteins called TonB dependent receptors that actively transport sugars, vitamins, and essential metals into the cell. Little is known about these receptors in Caulobacter. We sought to identify TBDRs that transport essential metals. In particular, we looked at three TBDR genes from an mRNA sequencing experiment that showed a decrease in expression in metal excess compared to metal limited conditions. We first validated those results with a new technique, RT-qPCR. As expected, we found that the expression of these three genes decreased in the metal excess compared to metal limited conditions. We further explored which specific metal caused this difference in gene expression.		
Dickinson	Dmitriy Pelutis	**The Effects of Pre-exposure and Sex on Ethanol-Induced Place Aversion in Adolescent CFW Mice**	Psych	19
Dickinson	Kyle Krona			

Abstract		Alcohol is one of the most widely abused substances in the world due to its pleasurable effects and availability. Using conditioned place aversion (CTA) protocol, mices' aversion to an ethanol paired floor can be measured and can help provide reasoning for repetitive drinking behaviors in humans. The lesser amount of avoidance to the ethanol paired floor is transferable to the perceived amount of tolerance the mice have developed to the negative effects of the drug. Results showed the development of aversion in all but one group but there were no other significant differences between the groups. Although there's no significant behavioral difference, neurological differences should not be ruled out. To measure these differences a qPCR machine will be used to measure genetic differences in glutamate N2BR and dopamine D1 & D2 receptors with the goal of explaining the neurological changes that may be attributed to the observed differences.		
Fitzgerald	Alyssa Moore	**The Pickens Family and the Reconstruction Ku Klux Klan**	History	21
Fitzgerald	Madison Duran			
Abstract		This research examines the Pickens family of Alabama, a rich, plantation household of Klan sympathizers and participants. The goal is to analyze their familial relations throughout the Civil War Era to understand why they became involved in the Ku Klux Klan. This has been done by examining the Pickens family correspondence, diaries, and newspapers. Assembling metadata has enabled quantitative investigation and presentation in graphic form. Interactions between the elder and younger siblings, as well as violently-inclined in-laws, led to Klan involvement of the younger Pickens boys, Willie and Icha. By highlighting the lack of male role models in Willie and Icha's lives, this research reveals a motivation for joining the Klan rooted in this family's dynamics and Southern masculinity.		
G. Muir	Arjun Ramachandran	**Affordable open-source micro-drive array for chronic in-vivo recording of rodent neural systems**	Psych	23
G. Muir	Atefeh Alavi			
Abstract		Among the many challenges of chronically recording neuronal activity from multiple cells is the cost of purchasing or producing microdrives that fit the functionality and spatial requirements for specific recording demands. These challenges are even greater when employing such technologies in the instruction of undergraduates or during research at under-funded institutions. Here, we have designed and built a customizable microdrive array that allows for individual driving of 8 tetrodes, each consisting of 4 wires twisted together (32 electrodes), with a drive body that is entirely 3D-printable using a standard 3D printer. This is assembled using cheap and easy to source materials. The quick turn-around time and cheap cost of our microdrive allows for basic in-vivo electrophysiology to be feasible for undergraduate or teaching laboratories.		
Gothmann	Henry Henson	**Mongolian Alkaline Lakes: A Window into Uranium Partitioning in Sediments**	Physics/ES	25
Abstract		The distribution of uranium in sediments is influenced by the abundance of both oxygen and carbon in the natural waters from which sediments form. Salt lakes in Mongolia vary significantly in oxygen, carbon, and uranium concentrations, and thus are useful to study the environmental parameters that control uranium incorporation in sediments. We tested a method to separate different uranium phases in our sediments. Then, we measured uranium and calcium concentrations in specific sedimentary phases from 16 salt lakes. Uranium concentrations in salt lake carbonate sediments were up to 10,000x greater than in modern marine carbonates. Future analyses will assess the effects of dissolved oxygen and the carbonate ion concentration on uranium distribution in sediments.		
Kalyani	Helen Larson	**Nickel-Catalyzed Coupling of Azoles and Aromatic Chlorides**	Chem	27
Abstract		My research involves the discovery of novel methods for the synthesis of compounds bearing architectures prevalent in pharmaceuticals. Literature precedents about the reactions at the center of my research use expensive starting materials. My research examines the effect of less expensive starting materials to arrive at the same products. Ultimately this research has the potential to provide to a more cost effective and sustainable synthesis of a subset of pharmaceutical compounds.		
Kalyani	Meredith Cook	**Mechanistic Study of Ni-Catalyzed Arylation of Oxazole with Aryl Mesylates**	Chem	29
Abstract		Our research focuses on formulating a detailed understanding of a pharmaceutically useful carbon-carbon bond forming reaction. By using environmentally friendly, inexpensive materials, we hope to make available new cost-effective and sustainable methods for producing a variety of pharmaceutical products.		

Legler	Sarah Bond	**The County Development Index: Quantifying Human Development in a United States Context**	Stats	31
Legler	James Faillettaz			
Abstract		The Human Development Index (HDI) is a metric to holistically measure country development based on more than economic status. Education, health, and monetary variables provide a multidimensional understanding of a nation's development. More detail is necessary to understand the variation of development within a country. The County Development Index (CDI) serves to quantifiably report human development by county in the United States by contextualizing the HDI framework. The index value is a culmination of health, education, monetary, and community variables specific to life in the U.S. The CDI score is used to separate 3,088 counties into four stratums representing low, medium, high, and very high development. Demographic data and additional variables are used to analyze characteristics of each stratum. Results from the CDI rankings can be used to inform policy decisions that will ensure all U.S. residents the opportunity to achieve their life potential.		
Listenberger	Tenzin Pasang	**Protein Associations in Alcohol Fatty Liver Disease**	Bio/Chem	33
Abstract		My research focuses on the cell biology of alcoholic liver disease. Some people who drink too much alcohol experience scar tissue and go into liver failure and those people eventually need a transplant, but there is a middle step where the liver accumulates fats and enlarges. This is a reversible step and so we are looking at why does drinking alcohol cause fat to accumulate in your liver. Essentially, trying to understand how to prevent the liver failure piece. And so we are looking at different proteins that bind to these fat storage inside the cells and seeing if there is a difference in protein binding and what proteins bind in these cells and apply it to the whole liver.		
Loebach	Jake Ingalls	**Demographic Causes of Auditory Cognitive Variability**	Psych	35
Loebach	Jessica Ohaeri			
Abstract		There is known to be significant variability in the success cochlear implant (CI) users find with their implants (NIH, 1995). Although some of this variability is due to factors unique to CI users, similar variability also exists within the normal hearing population, indicating that there may be universal factors behind this variability. In this study, members of the normal hearing population completed a set of auditory cognitive assessments. Additionally, participants' pupil dilation was measured during these tasks as a way of measuring their cognitive effort during tasks. Our analyses focus on how demographic data, including both skills and life experiences, may predict success on the auditory cognitive tasks as well as the effort required to complete them.		
Mahr	Erika Malpas	**"Out of a Mountain of Despair, A Stone of Hope"**	Music	37
Abstract		For the fiftieth anniversary of the assassination of Martin Luther King, Jr., Mac Gimse, Emeritus Professor of Art, wrote a poem entitled Out of the Mountain of Despair, A Stone of Hope which calls for a continuation of King's efforts. I created the musical element of an interdisciplinary project, a response to Gimse that reflects the poem, appeals to the audience's emotions, and inspires positive change. I wanted to engage with the subject in an informed and sensitive way, while also balancing the poet's ideas with my personal interpretation. I studied notable band works, did research on King, and analyzed the poem, as well as improvising and sketching at the piano, developing musical ideas, and engraving the final score.		
Mohl	Bethany Tritz	**Investigating Local Adaptation in Milkweed: Assessing and Expanding Curriculum Involving Authentic Science**	Bio/Educ	39
Abstract		This study focuses on improving effective teaching methods of science principles through assessing the effectiveness and improving the accessibility of the Milkweed Adaptation Curriculum. The Milkweed Adaptation Curriculum teaches about evolution and the nature of science through investigation of local adaptation in milkweed plants. The curriculum promotes the use of scientific studies and data in the classroom to support learning goals. We evaluated the use and effectiveness of the curriculum. Because the current curriculum centers on a reciprocal transplant study that some educational facilities are not able to support, we developed a sister curriculum that focuses on phenology and herbivory of milkweed plants. This curriculum is more flexible for students and educators.		
Nelson	David Morrison	**Sculptural, Conceptual, & Installation Art**	Art	41
	Padraic (Paddy) Gilligan			

Abstract		The purpose of our CURI project was to collaborate with Peter Nelson in two upcoming art exhibitions and one lifelong project. Our first project consisted of prepping a 1987 Dodge pickup truck for an audio installation. This entailed the removal of parts in order to decrease its total weight and any noxious smells, allowing it to be displayed in a gallery setting. Our second project revolved around "Intruder Man", a stop-motion animation film made by Peter Nelson about sexism, loss, and Alzheimer's. Specifically, our job was to share ideas and execute previously set goals pertaining to the exhibition at Truck Stop Gallery. The main goal was the design and construction of an interactive twelve-foot cake capturing an important concept in "Intruder Man". Our last project was filming Peter and his "Pacing myself, time" project, where he plans on running a mile every year for the next 50 years.		
Sanchez-Gonzalez	Thabiso Mabote	**An Experimental System to Measure the Temperature Dependence of the Emission Spectrum of Toluene**	Chem	43
Sanchez-Gonzalez	Benjamin Johnson			
Abstract		The study of fast-moving flows allows for the development of safe and reliable high-speed transportation and space travel. Understanding the behavior of these flows requires reliable methodologies to measure their velocities and temperatures. These measurements, however, cannot be performed in fast-moving flows using conventional velocity and temperature probes; therefore, we are interested in studying how certain molecules interact with laser radiation to make these measurements. This summer, we set up an experimental system that will allow us to study the properties of toluene following interaction with a laser to measure temperature in gaseous flows.		
Shea	Carly Challgren	**Species Composition and Succession in a Restored Maple-Basswood Forest**	Bio	45
Shea	Alexandra Raduege			
Abstract		The maple-basswood forest, which once covered much of Minnesota, has been reduced to small fragments by European settlement and the agricultural techniques they brought with them. Since 1990, St. Olaf College has attempted multiple seeding restoration projects, using direct seeding techniques or planting existing seedlings with maples, oaks, elms, and other native maple-basswood species. There are few long-term studies on how restoration projects function over time, however, this is an important area of study as these restoration zones are no longer isolated from the influences of humans and non-native species. This project focused on five directly seeded zones in different restoration years, 2002, 2003, 2005, 2009 and 2017, to monitor tree species, tree development and succession in the various restored zones.		
Wright	Nikesh Yadav	**Analyzing the behavior of spaces of natural images using persistent homology**	Math	47
Abstract		In this study, we analyze the structure of digital images using persistent homology, a method for computing topological features of a space. By the structure of the images, we mean identifying the topological features of the images such as connected components and holes. An interesting result obtained by Gunnar Carlsson and Vin de Silva was that the topology of a space with bunch of 3 by 3 patches resulting from natural images resembles a Klein bottle, which, in topology is a surface with interesting properties. The application of the result from this study are being used to develop a compression algorithm and in analysis of images in the field of neuroscience.		
Lee	Luis Almanza	**The role of body roll in hearing in the elevational plane in Ormia ochracea**	Bio	49
Lee	Mei Yi Chen			
Abstract		The acoustic parasitoid fly, Ormia ochracea, uses a pair of mechanically-coupled eardrums to locate singing crickets as host for their larvae. Previous studies have shown that O. ochracea can precisely localize sound sources in the horizontal plane. This is based on using bilaterally symmetric ears to measure time and intensity differences of sound arriving at each eardrum. For bilaterally symmetric ears, both cues are expected to vary as a function of sound location in the horizontal plane but should remain constant for sound to vary in elevation. Therefore, it is unknown as to how O. ochracea can determine the location of sound sources while in flight. In this study, we test the hypothesis that flies rely on body rotations to exploit directional cues for sounds that vary in elevation. We used a speaker array to present sounds at different angles of elevation and measured the mechanical response of the eardrums while varying the body 'roll'. Results show that O. ochracea eardrums are broadly sensitive to sound frequencies that include cricket songs and body rotations may generate sufficient directional cues to locate sound sources while in flight.		
Lee	Jiayun Hao	**Cricket Song Temporal Pattern Recognition in Two Populations of Ormia ochracea**	Bio	51
Lee	Alexander Kirtley			

Abstract		How can different populations of the acoustic parasitoid fly Ormia ochracea recognize species-specific cricket songs? The acoustic parasitoid fly Ormia ochracea relies on locating crickets to reproduce by homing in on cricket calling songs. Different field cricket species produce calling songs that mostly differ in the timing of sound pulses. There are a handful of separate populations of O. ochracea in the United States. Each of these groups, located in California, Florida, Texas and Hawaii, target a different cricket species. Our project aim to identify the temporal features of songs important for recognition. We used a fly treadmill to record walking responses of O. ochracea to song models that varied in temporal patterns and found that song recognition in Floridian O. ochracea is based on evaluating pulse rates while Californian O. ochracea is evaluating the duration of sound pulses. Together, these results indicate that different populations of flies are evaluating different song features for recognition.		
Markofski/Ocampo-Raeder	Jean LaFontaine	**Making Life Matter: Bio-coloniality, Neoliberalism, and the Gendered Politics of Indigeneity in Contemporary Perú**		53
Abstract		From 1996 to 2000, approximately 300,000 indigenous women were forcefully sterilized under the Peruvian government's National Population Program. As pertains to the historical and philosophical implications of this calamity, the objective of this project is twofold. First, this study proposes the hypothesis that the growth-at-at-all-costs rationality endemic to neoliberalism exacerbates inequalities that may result in the infliction of catastrophic harms upon those human beings whose bodies have been marked as racialized and hypersexualized (and yet in some ways concealed) as a part of national histories. Second, through an examination of two digital archives and the cultural artifacts contained therein, my research will aim to think with indigenous women's memories of suffering, but also of hope and justice, to elaborate a democratic discourse that envisions an inclusive and participatory democracy where the dignity of all human beings is respected and affirmed.		

First Intermission | 9:20-9:40

Lecture Hall Presentations in Tomson 280 | 9:45-10:35

Faculty	Student		Department	End
Zhou	Shan Chen Alison Curry	**Fluctuation of Willingness to Communicate in L2 Chinese Writing**	Asian Studies/Linguistics	9:53
Abstract		Second Language (L2) Willingness to Communicate (WTC) has been receiving increasing attention since the 1990s with the goal to enhance the L2 learning process (MacIntyre & Charos, 1996). Past studies have suggested pedagogical practices that help L2 learners enhance WTC throughout their learning process. Our research focuses on WTC through L2 writing over a 15-week formal instruction of Chinese as a foreign language. We hope to identify how learners' perceived competence, language anxiety, motivation, L2 WTC, and proficiency levels develop, and how the changes of these factors affect L2 WTC. The findings show an overall positive developing trend of all factors. Anxiety is the strongest predictor of L2 WTC change. Further, vocabulary is the aspect contributing most to learners' anxiety levels.		
Wong	Dorinda Stryker Hannah Sorenson	**Beyond the Concrete Jungle: City, Nature, and Environmentalism in Hong Kong**	Asian Studies	10:02
Abstract		Environmental protection and education is one of the most pressing, prevailing, and problematic challenges of the 21st century, especially for urban areas. This research project explores the intersectionality, interaction, and initiatives among organizational, economic, and cultural interests in combating environmental issues through an in-depth study of World Wide Fund for Nature-Hong Kong (WWF-HK). The sustainability of major cities like Hong Kong is inextricably bound to the conservation of nature and resources as well as the promotion of environmental awareness among their citizens. Established in 1981, WWF-HK has been an integral part of this effort, not only as an independent branch of a global NGO network but also a partner with the local Hong Kong government in managing nature reserves, conserving biodiversity, and advocating for environmental education. Following an ethnographic and cultural studies approach, this project examines the work of WWF-HK and identifies several key areas in which specific interests come into contact and conflict with one another. Interviews and participant observations explore the ways in which a leading local actant grapples with the complexities of a global city. Through literature review, interdisciplinary research, and digital documentation of both the natural and urban experiences of this metropolis in Southern China, this project investigates the role of human behavior, the interplay between development and urban sustainability, along with the future of environmental protection and education in Hong Kong.		
Walmsley	Jakob Hofstad	**Linear Factorization of Hypercyclic Functions for Differential Operators**	Math	10:08

Abstract		It is known that there exists a differentiable function f such that if one repeatedly differentiates f and creates a list out of the output functions, that any continuous function can be approximated by a function from this list to however small of an error that we desire. It is also known that similar results exist if the list is generated by other combinations of differentiation, which includes translation to the left or right by any distance. In our project, we construct such a function for each of the cases above as an infinite product of linear functions, which answers an open question posed by operator theory specialists.		
Roback	Jack Wolf Joshua Pelayo	**Textbook Development for Advanced Statistical Modeling**	Stats	10:17
Abstract		The basis of our project was to enhance Julie Legler and Paul Roback's "Broadening Your Statistical Horizons: Generalized Linear Models and Multilevel Models," a free and open–source text used by over 20 undergraduate statistics professors. Our primary projects included writing a chapter on probability distributions, developing a new case study highlighting Poisson regression, and increasing consistency between chapters. We then turned to smaller but vital projects such as writing sections on more advanced topics, creating new exercises and answer keys, and developing a functional bibliography. We inserted these updates—both written sections and R code for analysis—to a draft of the text via bookdown. These advancements will be significant features of a new edition of the book to be published online by January 2019.		
Kuxhausen	Maxim Efimov Sofiia Bikbaeva	**Voices of Marginalized**	History	10:26
Abstract		CURI Project 'Voices of Marginalized' was focused on collecting primary sources regarding gender and sexuality in Soviet Union. The scope of the project included last years of Russian Empire, the Revolutions, the Stalin's Era and following Destalinization and 'freedom' of speech and press during Gorbachev's rule, allowing us to take a deeper look into continuous change of attitudes towards the discriminated groups. The conducted research consisted of finding information on treatment of homosexuality, queer rights, women rights and governmental procedures connected within those. Another part of our project was focused on translating found sources into English and putting them up into one collection on the Elevator website.		
Edwards	Melanie Thomson	**Mapping the Minuscule: Using Animation and Projection Mapping to Tell a Story About Environmental Apathy**	Theater	10:32
Abstract		This creative project combines digital hand-drawn animation, projection mapping, and videography to create an original short film about environmental apathy. The purpose of this project was to develop a production pipeline for interactive media and animation to be used on full scale sets for theatrical performances. Using the technical software Qlab, environments and characters were mapped onto the various surfaces of a miniature physical set using four different projectors. The scenes were then filmed and edited to produce the final result. Although the film has not yet been completed, it provided an excellent test subject for combining a variety of digital media and projection methods. Through it we discovered new creative practices that can be implemented in future theatrical productions.		

Second Intermission | 10:35-10:45

Symposium Session 2: Tomson Atrium Posters & Screens 10:45-11:45

Faculty	Student		Department	Tomson Atrium #
Brown	Thong Vo	**HiPerCiC Project: Cochlear Implant and The Architecture**	CS	2
Abstract		The HiPerCiC (High Performance Computing in the Classroom) project promotes the development of applications that support professors' researches. This summer, I maintain, add features and tests to Cochlear Implant Learning App, then update the app framework to ensure the app quality. In collaboration with Cluster Manager Team, I also work with the underlying Kubernetes infrastructure to automate and isolate the process of deploying applications, which eases the process of upgrading old applications and ensure their security. Moreover, the new infrastructure will elaborate the idea of dividing one job into many parts and running them on different networked computers. This idea later will serve the purpose of deploying remotely in other institutions.		
Robinson	Mikhail Lysiuk	**Russian Theater Directors**	Russian Studies	4

Robinson	Jack Hanson			
Robinson	Ahmed AbdulMageed			
Abstract		The purpose of our research is to provide knowledge about experimentation in Russian theater among the English-speaking world. We achieve our goal by creating a database using the Elevator platform that captures information about six unique theater directors. Besides containing information about the directors themselves, our database has information about the productions they have staged, the theaters they work with, the actors involved and other supporting data. The database also has multimedia data such as photos and clips of the productions, along with analysis tools like timelines and maps. Our methodology to collect data and necessary permissions included personal meetings and interviews with the directors and people in the area of our interest, as well as collecting web information. In addition, we have added a WordPress entry portal to ensure that the site is easily-navigable. Future plans include adding more information about audience demographics, expanding to include other directors, the addition of ArcGIS data tools and other useful sections. In addition, we will gradually work to translate all Russian documents into English so that supporting documents will be available to a wide, international audience.		
Shih	James Sandberg	**Agricultural Memories of Yilan: An Excavation of Local Literature and Personal Narratives**	Asian Studies	6
Shih	Sofia Reed			
Shih	Hana Anderson			
Abstract		Since 2007 when the Hsuehshan tunnel was built between Taipei and Yilan in Taiwan, a new wave of urbanization has spread to the farming communities of Yilan County. Thousands of vacation houses were built, labelled as 'farmhouses,' robbing farmland and damaging surrounding farmland. Simultaneously, the tunnel has brought in new farmers to the Yilan plain, also allowing them to sell products more effectively. Recently a community of new farmers has taken up a cause of nong di nong yong, "farm land for farm use", that concerns diminishing farmland and sustainable farming. Our efforts are to conclude how the landscape has changed and adapted in the last decade, while retaining strong roots in it's own agricultural heritage.		
Brown	Kristofer Rye	**Beowulf Unbound: A Fluid, Forward-Looking Platform for PDC Education and Research**	CS	8
Abstract		Parallel and distributed computing is a field of computing concerning distributed systems, systems whose components are located on more than one device and who then pass networked messages to each other in order to coordinate the completion of a common task. Historically, a mix of virtual machines (simulated computers) and physical machines have been used. However, a third, emerging technology called containerization shows promise in high performance computing because it offers many of the isolation benefits of virtualized computing while offering native performance. We evaluate the efficacy of setting up distributed systems with containerization, and explore the possibility of containerization in both an educational and high performance computing setting.		
Brown	Nathan Chin	**A Hands-on-Learning approach with Raspberry Pi for Hardware Design and Parallel and Distributed Computing**	CS	10
Abstract		Using the Raspberry Pi(RPi), a more hands-on-approach is being applied to two Computer Science courses to assist students, and to promote equity and inclusion in the classroom. The RPi is a credit card sized computer which is a useful tool for learning about abstract concepts in computer science. These concepts can become even increasingly difficult in the Hardware Design course, so together with Dr. Brown, the Hardware Design course has been changed to a hands-on-learning group activities approach with a focus on the RPi. New labs were curated for groups in a hands-on setting, as well as exercises to effectively introduce the RPi for Hardware Design and select topics in Parallel and Distributed Computing.		
Amugongo	Jiaping Pan	**Effect of Prenatal Nicotine Exposure on Rat Dental Health**	Bio	12
Amugongo	Wei Wang			
Abstract		In the modern history of public health, the passive smoking (second-hand smoking) has become a serious issue progressively. Expectant mothers and their infants amongst the people most significantly impacted by nicotine. Even though some smokers preferred to employ cigarette filter or smoke electronic cigarettes, a substantial amount of nicotine could still be inhaled and causes health issues. Through the ages, general public usually pay attention on diseases of respiratory system but rarely notice dental issues which were caused by nicotine. In this research, pregnant female Long-Evan rats will be treated with nicotine with multiple doses, and the dental development of offsprings will be observed and analyzed. The similar dental structure across mammals will allow researchers better understand human dental development.		

Beussman	Lydia Kostuch	**Human Scent Differentiation via Gas Chromatography-Mass Spectrometry**	Chem	14
Abstract		Limited understanding of how tracking canines differentiate scents means scent evidence fails to meet legal standards for admissible evidence. To better understand how these canines differentiate people and to corroborate the evidence, we employed a lab-based method to ascertain whether individuals have unique scent profiles. As canines sniff, they are believed to be picking up volatile organic compounds (VOCs) produced by decomposing cells. Therefore, to collect skin cells our participants rubbed their arms with sterile gauze pads, which were placed in vials. After the VOCs accumulated in the headspace, the samples were analyzed using gas chromatography-mass spectrometry. The data shows that everyone has a distinct scent profile, implying that canines can differentiate individuals based on their VOC scent profile alone.		
Beussman	Samantha Sierakowski	**Forensic Analysis Via Isotope Ratio Mass Spectrometry**	Chem	16
Beussman	Tim Kelly			
Abstract		Trace evidence, such as cloth fiber and IED (Improvised Explosive Device) wire, is often found at crime scenes and can play an important role in criminal court. With no current method to determine the specific origins of fibers and wire insulation, samples can rarely be associated with a particular suspect. The Isotope Ratio Mass Spectrometer can solve this problem by measuring the carbon, nitrogen, hydrogen, and oxygen isotope ratios, which may be unique, in a given sample. This project analyzed the carbon, hydrogen, and oxygen isotope ratios present in fibers and wire insulations and determined if there is a statistical difference in the samples' isotopic signatures. Assuming differences are found, this methodology can help forensic scientists associate a given fiber or wire insulation with a suspect.		
Chapp	My Khe Nguyen	**Extremity in Campaign Discourse: Examining the Role of Partisan Gerrymandering**	PSCI	18
Chapp	Caroline Pippert			
Chapp	Addison Tryon			
Abstract		Few topics in American politics have garnered more interest than the consequences of gerrymandering (redrawing district lines for political advantage). However, little research has examined whether heavily gerrymandered districts influence the tone and tenor of political rhetoric. This gap is surprising, because there are theoretic reasons to suspect that more homogenous constituencies will incentivize partisan extremity in rhetoric. We test this expectation by scoring extremity on U.S. House candidates' campaign websites, examining over 32,000 unique issue-positions from 2008 – 2016. We find that gerrymandering is related to partisan extremity, but results are nuanced. The relationship between gerrymandering and partisan extremity depends on the redistricting rules of a given state, partisan legislative control in a state, and how, exactly, gerrymandering is defined.		
Freedberg	Haocheng Wang	**Does Eavesdropping Prevent the Evolution of Altruism?**	Bio	20
Abstract		Altruism occurs when organisms decrease their own survival or reproduction to help other members of their species. Eavesdropping refers to efforts by other species to reap the benefits of altruism without paying the associated costs and thus is expected to provide a major obstacle to the evolution of altruism. Our research uses computer simulation models to explore the conditions leading to the evolution of altruism and the effect of competing eavesdropping species. We found that altruism spread when migration is limited or competition occurs after migration. Surprisingly, a competing eavesdropping species does not affect the spread of altruism and is often outcompeted by the altruistic species. Our work provides valuable new insight into the evolutionary forces shaping behavior in natural systems.		
Gothmann	Huy Nguyen	**Identifying well-preserved coral skeletons by image analysis**	Physics/ES	22
Abstract		Coral skeletons provide records of past climate that can broaden our understanding of climate change in recent decades. However, in order to obtain sufficient climate data and assemble accurate climate reconstructions, it is essential to identify and utilize well-preserved coral skeletons. For this project, we examined coral skeletal mineral structure to see if there exist any structural similarities among the crystals that compose well-preserved coral samples. We hypothesize that different grain size distributions among samples may help characterize their preservation. The project was conducted with 22 samples sent from the Smithsonian National Museum of Natural History, 14 of which were chosen for final analysis based on visual inspection of hand samples. To prepare samples for imaging using microscopy techniques, we cleaned and polished each sample so that attain the finest surface were attained for high quality imaging. Afterwards, we processed and analyzed our images using Fiji, an image analysis application. Results of image analysis reveal similar grain shapes in most fossil coral samples; however, grain size and the distribution of crystal major axis length to minor axis length differ between well-preserved and poorly preserved specimens. Our study may benefit from more complex segmentation methods, or additional mineralogical analysis techniques.		

Grodzicki	Julie Yuldasheva	**A Shortcut for Constructing the Generalized Gelfand-Graev Representations of GL(n)**	Math	24
Abstract		Number theory is the study of arithmetic properties of integers. A special class of complex-valued functions called L-functions are important for answering many questions in number theory. L-functions have been a central object of study in number theory for over 150 years because of their connections to solving important problems such as Fermat's last theorem. In this project we study a family of matrix coefficients that appear in the integral realizations of automorphic L-functions. In particular, we developed a formula that predicts the structure of a subgroup that is needed to form generalized Gelfand-Graev representations which are the spaces where these matrix coefficients live.		
Hodgson/Bernardin	Tyler Radtke	**Developing a Patient-Level Measure of Medical Specialty Intensity for Use in Assessing Quality of Coordination in Healthcare**	Econ	26
Hodgson/Bernardin	Ella Hagopian			
Abstract		Multiple chronic condition patients are not only common but also expensive; they made up 40% of Americans and 71% of national healthcare expenditure in 2017. Although they are highly prevalent, patients with multiple chronic conditions are prone to more medical and coordination mistakes and are largely excluded from controlled medical studies. This research aims to improve healthcare delivery and costs of care for multiple chronic condition patients by creating an objective score of patient interdisciplinarity. To create our score, we used random forest machine learning algorithms and linear regression to predict how many types of physician specialties a patient is likely to need. Our results may be used to compare types of facilities, investigate the optimal number of physicians for a given condition, and examine socioeconomic determinants of health.		
Kalyani	Anna Howard	**Nickel-Catalyzed Decarboxylative Cross-Couplings of Alkynyl Carboxylates with Tosylates and Mesylates**	Chem	28
Kalyani	Katrina Little			
Kalyani	Samantha Klemann			
Abstract		The aim of this project is the creation of molecular architectures prevalent in many pharmaceutical compounds. In this project, we optimize time, temperature, and various starting materials to find ideal conditions for the creation of the desired products. Our results have the potential to lower the economic cost and enhance the environmental sustainability for the production of a subset of pharmaceutical targets.		
Leer	Emma Wortman	**Beliefs, Practices, and Perceived Challenges of Secondary English Teachers**	Educ	30
Leer	Chris Steene			
Abstract		This study explores the beliefs and practices of middle- and high-school English teachers who completed the St. Olaf education program. Before becoming teachers themselves, it is important for teacher candidates to have a clear vision of the theories and principles that will guide them in their practice and to reflect on how they intend to "be" as teachers in the classroom. These beliefs are crucial as teachers gain professional experience, developing the teaching personas, skills, and pedagogies they enact in the classroom. Teachers' beliefs and practices greatly impact students' learning experiences, therefore, understanding effective practices, barriers to implementing those practices, and ways to support teachers are essential for creating a healthy learning environment for all. This summer we focused our analysis specifically on beliefs related to the teaching of writing and teachers' perceptions of their preparedness for the challenges of the profession.		
Listenberger	Justin Furcich	**Protein Binding to Artificial Lipid Droplets: Development of A Model for Alcoholic Fatty Liver Disease**	Bio/Chem	32
Abstract		Alcoholic Fatty Liver Disease (AFLD) is characterized by the accumulation of fats in liver tissue and is caused by the intake of excess alcohol. The fatty tissue is composed of lipid droplets, which bind to proteins and cause the symptoms observed in AFLD. In order to better understand how these lipid droplets may contribute to AFLD, we produced a new model to study them. Our new model incorporates the isolation of protein from living tissue cultures and the synthesis of artificial model lipid droplets. These two fractions can be combined and protein binding to the lipid droplets can then be quantified, which can help to better understand how these fats accumulate in liver tissue.		
Loebach	Carolyn Kinney	**High Variability Online Training for Cochlear Implant Users: Increasing User Adherence Through Feedback and Motivation Strategies**	Psych	34
Loebach	Jessica Thao			

Abstract		Although a cochlear implant (CI) can provide access to social, educational, and other new opportunities in the hearing world, it does not fully restore the recipient's normal hearing. A CI user must learn to hear with their implant, a task that may be complicated by when and how they lost their hearing and for how long they were deaf. Consistent rehabilitative auditory training must take place post-operation.The purpose of the High Variability Online Training for Cochlear Implant users (HiVOlT-CI) is to provide CI recipients a resource to work with their prosthesis and foster the necessary cognitive auditory skills to perform well in real life situations. Our aims include providing effective feedback for CI users through a progress report of their performance, and utilizing motivation tactics like rewards to encourage consistent training.		
Marlier	Chris Seong	**Optimizing the Synthesis of a New Tetradentate Mixed Donor Ligand**	Chem	36
Marlier	Sam Brunclik			
Abstract		Many industrial processes use transition metal complexes as catalysts. These complexes frequently utilize rare and expensive metals such as palladium or platinum. Over the summer, the synthesis of a new family of ligands has been optimized to utilize 1st row transition metals as a cheaper and more abundant alternative in generating metal catalysts.		
Mohl	Diane (Dee Dee) Vargas	**Investigating Patterens of Local Adaptation in Milkweed Plants**	Bio/Educ	38
Abstract		Milkweed plants are essential for the life cycle of monarch butterflies, which lay their eggs on milkweed leaves. However, there has been a steady decline of monarchs which has to do in part with the decline of milkweed plants. Conservation biologists are attempting to encourage communities to plant milkweed as a way to aid endangered monarch populations, but there is a risk in encouraging mass releases of milkweed. This is because milkweed from distinct geographic locations may not perform well when planted in a foreign environment-they may not be locally adapted. This study observed whether common milkweed (Asclepias syriaca) displayed patterns that were consistent with local adaptation and found that local milkweed populations on average performed better than non-local populations.		
Porterfield	Rebecca Jirik	**Greenhouse gases and prairie grasses: Abundance and expression of microbial nitrogen cycling genes in remnant and restored prairie soils**	Bio	40
Porterfield	Carly Challgren			
Abstract		Tallgrass prairie was once a prominent habitat in what is now the central United States, but European settlement and subsequent farming practices have greatly reduced its area.		
S. Muir	Morgan May	**Developing Entrepreneurial Habits in Reflective Practices of International and Off-Campus Study Programs**	ManageSt	42
Abstract		Entrepreneurial education includes the development of knowledge, skills, and attitudes for new value creation. Existing literature reveals that intentional reflection is essential for effective learning in both entrepreneurial education and international/off-campus study (IOS) programs. This study examines the importance of reflective practices as a tool to facilitate learning in IOS programs and the potential for IOS programs to develop entrepreneurial skills in participating students. Data gathered from a survey of faculty and students indicate that reflective practices before and after an IOS program are of lower quality and lesser frequency than during a program. The findings also support that students develop entrepreneurial skills as a result of participation in an IOS program. Emphasis on entrepreneurial education in IOS programs is recommended to further assist students in their ability to creatively solve problems as globally aware citizens of the world.		
Schwinefus	Katie Stein	**Quantifying the stability of RNA using TMAO and Urea as solutes**	Chem	44
Schwinefus	Khalid Abdelkarim Mahmoud			
Abstract		Solutes have the potential to help predict biopolymer structural changes during a biochemical reaction and provide a general method to map out the steps in a reaction. This work looked at the interactions of the solutes trimethylamine N-oxide (TMAO) and urea with different surface areas of RNA double helices and in solutions of different salt concentrations. TMAO was found to stabilize the double helices and urea was found to destabilize those folded structures. TMAO slightly offsets the destabilizing effect of urea in a salt-dependent manner, and the extent of the stabilizing effect was dependent on the guanine-cytosine content of the RNA.		
Shea/StoGrow	Athena Stifter	**Sustainable Agriculture**	Bio	46
Shea/StoGrow	Rebecca DeBoer			

Abstract		St. Olaf Garden Research and Organic Works (STOGROW) is a program designed to connect students with the production of the food they consume by selling its produce to the college food service. As a student organization the program experienced difficulty establishing systematic memory and lost money. In 2018 we established resources for future student farmers such as a calendar, budget, farm manual, and daily task log. The farm increased production scale compared to past years and employed a local farm consultant. The combination of better advising, expecting project reports as part of the CURI summer research program, and hiring students to finish the harvest will improve learning opportunities for the student farmers as well as the larger St. Olaf community.		
Umbanhowar	Caitlin Croasdell	**Constructing an Ecological History of Fires in the Tallgrass Prairie of the Western Minnesota Region**	Bio/ES	48
Abstract		Relatively little is known about the long-term ecological history of the Great Plains in North America. Fire is thought to be important historically but our direct knowledge of fire history goes back only to the 19th century. We analyzed charcoal extracted from sediments of lakes near the Minnesota-South Dakota border dating back to ~7000 BC to reconstruct fire history. Based on changes in charcoal concentrations we documented a 2-3 fold increase in fire beginning approximately 4000 years ago. At this same time other records from the region indicate an increase in precipitation. More moisture encourages the growth of grasses which suggests that fuel limitation is a major determinant of fire severity.		
Wright	Xiaojun Zheng	**Topological Data Analysis on Simple English Wikipedia Articles**	Math	50
Abstract		In topological data analysis, we want to discern topological and geometric structure of data, and to understand whether or not certain features of data are significant as opposed to simply random noise. While progress has been made on statistical techniques for single-parameter persistence, the case of two-parameter persistence, which is highly desirable for real-world applications, has been less studied. In this poster, we use persistent homology to analyze the structure of a point cloud produced from a semantic analysis of Simple English Wikipedia articles. Specifically, the semantic algorithm converts each article to a 200-dimensional vector. The goal of this study was to determine a couple measures of statistical significance for the Wikipedia data from topological perspectives, and we used two statistical techniques to distinguish the Wikipedia vectors from the random vectors. In the first method, we used large scale hypothesis test to create a null distribution of random data sets, and the distribution of Wikipedia data sets. In the second method, we did the analysis of null-type distributions of matching distances computed from two-dimensional persistence modules. Calculations were performed with the two-parameter persistence homology software RIVET and the Hera software for algebraic distance calculations. These results will be useful in topological data analysis in many important applications, including the structure of various polymers, plant root systems, and image analysis.		
Loebach	Yadi Quintanilla	**Influence of speech and nonspeech on auditory rehabilitation for cochlear implant users**	Psych	52
Abstract		Normal hearing listeners (NHL) can converse with a coworker in a cafe while blocking out other sounds in the environment such as other conversations and the noise of the kitchen and espresso machine. Cochlear implant (CI) users often find it more difficult to identify speech and non-speech noises in different environments. Through the High Variability Online Training for Cochlear Implant Users (HiVOlT-CI), training is one way that could fill this gap in understanding why some CI users do well and others struggle. We examine differences in environmental sounds and speech tasks based on difficulty. Studying the use of environmental sounds and speech in NHL is of interest to better understand what listeners pay most attention to in the tasks compared to what listeners find as most difficult.		

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