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Undergraduate Research Symposium

UMSL Undergraduate Works

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2021

## 2021 Program

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UNIVERSITY OF MISSOURI  
ST. LOUIS

**URS**

**UNDERGRADUATE  
RESEARCH SYMPOSIUM**

APRIL 30, 2021  
SAINT LOUIS, MISSOURI

# Undergraduate Research Symposium 2021

*A few words, regarding the 2021 UMSL Undergraduate Research Symposium  
April 29th, 2021*

There's not much that I could say about this past year that you have not personally experienced. It's been strange, unexpected, disruptive, and isolating. However, I can not help but be optimistic as I see, like daffodils in spring, some evidence that we may be on our way back to some, very welcome, "precedented times" soon. I started the 2020 lockdown scrambling to adapt a cherished and complicated in-person campus event into a digital equivalent, in the early months when we had little technical experience and even less emotional bandwidth to make such a drastic change. And yet, I think, with a lot of effort from the URS team, we created a really nice program to collectively celebrate the achievements of our students before breaking for the most surreal summer. Now, a year later, I hope it is not too presumptuous to say that this feels like a way to ease out of our socially distanced times on a high note.

As the campus Undergraduate Research Coordinator, I am both exposed to and rather enjoy digging into basic statistics regarding our students. For example, did you know that every semester for the past few years, close to 150 different UMSL students enroll in some kind of "independent" or "directed" studies course with about 80 different faculty mentors? And these numbers do not capture the additional students and faculty who are, in fact, working on scholarship "off the clock" as volunteers or unofficial mentors. Traditionally, UMSL hosts several conference-style symposiums dedicated solely to sharing and celebrating these undergraduate studies and experiences, such as the College of Education's annual "School Adventure into Learning" (aka SAIL) event and the College of Nursing's "Undergraduate Research Day."

But this year, everything looked a lot different. Opportunities to physically meet and/or collect data were minimal. Sharing of information was limited to Zoom sessions and every communication took about twice as long as we waited for e-mails to be returned. Enrollment dropped, resilience was tested, and burnout was high. Accordingly, I was committed to trying to recreate some of the positives from URS 2020 for this academic year's scholars, but frankly expected participation to be limited and (understandably) halfhearted. It turns out I was very mistaken in those assumptions.

I was honestly shocked when the final application date had passed and there were 52 submissions. To put that in perspective, there were 62 in 2019 (a year with especially high independent studies credit hours enrollment) and 36 last year. As evidence-based scholars yourself, you know that quantitative data is only one part of the whole story though. Not only were there nearly an equal number of participants as in years past, but I think you will find the quality of participation and lessons-learned from our faculty and students to be as impressive as ever. Flip through this program and you will see a collection of authentic and advanced experiences from a variety of disciplines including anthropology, biology, chemistry, criminology, education, english, history, psychology, sociology, and others. There are several interdisciplinary projects, as well as many projects completed as true student-led independent studies. You will see students from over 20 different degree programs, mostly in their senior year (although we have two very high-achieving freshmen represented in the mix), the majority of them transfer students, with an average age of 24, and nearly all of them working at least 10 hours per week.

This year, these students did much more at UMSL than just watch prerecorded lectures and study for exams (although I'm sure they did plenty of that as well). On top of balancing all of the "normal" demands of family, school, and work, they were also working one-on-one with experts in their fields, introduced to and interacting with advanced ideas, and creating a more nuanced and complicated understanding of the world around them. And they're here today to share those discoveries with you.

I hope you're all wearing sweatpants under your dressy tops today, because I sincerely hope that this will be the last URS from behind a webcam. Take advantage now, but save the date for a (hopefully very in-person) Undergraduate Symposium next year, Friday, April 29, 2022.



Kate Votaw, PhD  
UMSL Assistant Teaching Professor and  
Undergraduate Research Coordinator

Ps. If you see any of the following people today, please consider thanking them, as they are an integral part of pulling this event off. Truly, in no particular order; all of my colleagues in the Honors college, but particularly Dan Gerth, Kim Baldus, & Ann Torrusio who are especially quick to volunteer to help, Audri Adams who ~~practically~~ actually runs the Honors College, and Ed Munn Sanchez, who is technically our boss and always outrageously supportive of our students and this position; my student assistant, Morgan Myers, for all of the bazillion things that she is asked to do, usually harried and last-minute; Kathryn Walterschied who, almost 20 years ago, saw a need and created the URS for our campus; President Choi for taking the time out of an undoubtably packed schedule to "make the drive" from Columbia to take part in today's event; Chancellor Sobolik, for her sincere personal and administrative support for undergraduate research, especially this year, when resources are extremely scarce; faculty sponsors, for when it comes to mentoring students, you are criminally over-worked and under-recognized, and nothing that I could write here would do justice to the hours and emotions that you dedicate to our students and their work under your guidance; guests of the URS, for showing your support of our student body by attending today; and of course, students, for sharing with us today the evidence of your curiosity, creativity, cleverness, skill, and probably most of all, hard-work. We see you and are proud of you all.

## The Chemical Synthesis of Building Blocks of Sugars Found in Human Milk

Ikra Ahmad

Faculty Sponsor: Alexei Demchenko

Carbohydrates are one of the most abundant molecules on earth. Found in different types of foods and drinks, these molecules are also responsible for carrying out countless body functions ranging from joint lubrication to identifying foreign pathogens.

Human milk contains an abundance of carbohydrates that contribute to the development of the infant brain, promote healthy gut microbiota, and strengthen immune response. There are more than 250 different human milk oligosaccharides (HMO) found in human breast milk. Structures of 162 HMO have been elucidated, but our understanding of how individual HMO function is far from complete. The development of efficient and cost-effective methods for synthesizing carbohydrates in the lab will improve understanding of their roles and boost practical applications.

Much like puzzle pieces, there are a select group of identifiable disaccharides that comprise the building blocks of these human milk oligosaccharides. Chemical reaction called glycosylation along with selective protection and deprotection manipulations can be used to synthesize HMO. My research focuses on the total chemical synthesis of a selectively protected lactose (Gal1-->4Glc) building block that is found in practically all human milk oligosaccharide core structures.

## The Relationship Between Resilience, Stress & PTSD

Hadeal Al-hamdani, Adam Runyan, & Carissa Philipp

Faculty Sponsor: Carissa Philipp

Post-traumatic stress disorder (PTSD) is characterized by intrusive thoughts or memories of the traumatic event that hinder daily life activities of individuals with a PTSD diagnosis. Stress exposure has further been shown to exacerbate PTSD symptoms. Given that resilience has been shown to buffer levels of stress, the current study investigated whether resilience may moderate the relationship between stress and PTSD symptoms. Eighty-one participants over the age of 18 were recruited from the University of Missouri-Saint Louis and St. Louis community. Participants completed 3 self-report measures of resilience, exposure to stressful life events (e.g., Have you ever been in a car accident before?), and PTSD symptoms. In support of our first hypothesis, we found that stress exposure was associated with greater PTSD symptoms ( $b = 2.08$ ,  $t(77) = 5.02$ ,  $p < .001$ ). However, resilience did not moderate the relationship between stress exposure and PTSD symptoms ( $B = -0.01$ ,  $p = .68$ ). Future studies may examine the influence of medications on PTSD, chronic stress, and resilience.

## A Study Analysis of a New Vitiligo Treatment: Patent WO 20200588091A

Shaikha Al-Mousherji\*

Faculty Sponsor: Michael F. McMurray

Patent WO20200588091A in vitiligo treatment/methodology is a two-phase patent methodology and compositions for leukoderma treatment, patented by HSC researchers at Kuwait University-Kuwait. It is a day-and-night natural-based treatment that uses photosynthesizers followed by antioxidants and tyrosinase cofactors. The study aims to measure the effectiveness of the treatment.

Method: The data of this study was extracted from a hundred randomly selected patients through an online form of a questionnaire. The data covers the patient's demographics, awareness, previous vitiligo conventional treatments, and the patented treatment assessment.

Results: Data collection showed 52% of Females and 48% of Males were using the patented treatment. Patients were respectively divided into six groups based on their ages 15% (10-20 years), 30% (21-30 years), 30% (31-40 years), 18% (41-50 years), 6% (51-60 years), and 1% (>60 years). 28% were using only topical treatments (corticosteroids or/and tacrolimus), 10% were using UV radiation therapy only, 10% were using herbal medications only, 42% were using a combination of UV and conventional topical treatments, 10% were not

using any treatment. 3% have not followed the prescribed treatment. 96% had improved repigmentation whereas 4% had no repigmentation. 12% develop recurrence on the treated areas after abandoning the treatment.

Conclusion: Patent WO20200588091A showed to be responsive among all ages where 96% had depigmentation. On the other hand, 12% develop recurrence in the treated areas after abandoning the treatment. The treatment showed promising results on all types of vitiligo except segmental and acral vitiligo which showed to be more challenging to achieve full repigmentation.

\*This project was completed by students and faculty at the Gulf University for Science & Technology. UMSL has an established partnership with GUST in Kuwait and actively encourages their students to explore cross-campus experiences and opportunities.

## Cahokia Alive

Chauncy Artman, Cody Kuddes, & Scott Kriebaum

Faculty Sponsor: Susan Brownell

Cahokia Mounds is perhaps the most valuable source of information on Pre-Columbian Mississippian society. The site hosts a wealth of artifacts, remains, and features for modern anthropologists to study. Furthermore, the location is open to the public and provides an invaluable asset in educating the public on Pre-Columbian America. The pandemic has provided a unique opportunity for the site to capitalize on a "Living Village" that would enhance education on the site and bring more visitors to the site at a time when public attendance is strained. We are designing the Living Village for Cahokia Mounds in three distinct but connected stages to illustrate that Cahokia was ever evolving and changing; the reconstructions will showcase that process and timeline. This will also allow the potential client, as well as the team overseeing its completion, to complete the project in stages, making it more feasible.

We aim to utilize the wealth of expert analysis obtained at the site over the years, as well as our own expert interviews and participant observation from Cahokia to establish this plan and demonstrate supporting public interest in such a project. GIS systems will be used to assess locations that would allow authentic and accurate layouts. Botanical remains and palynological records will be assessed to ensure agricultural and wild flora are accurately portrayed. These data will culminate in an authentic and respectful recreation for visitors to explore and participate.

## Torches of Freedom & Gender Inequality

Anna Baghli\*

Faculty Sponsor: Tareq Al Rabei

This research paper focuses on how women are being controlled by society pressures and expectations from men, and how the phrase "torches of freedom," was challenging gender inequality. I have found while doing this research paper how the phrase torches of freedom was influenced from the roots of gender inequality. The first part of the research paper discusses how the history of the smoking campaigns were made in order for women to smoke publicly without fear from judgment. This demonstrates the necessary historical background of the smoking campaign that was designed. Also, how the smoking campaigns were planned out in detail to attract women to the idea of public smoking. The second part of this research paper talks about First Wave Feminism and how it had a huge effect on how the smoking campaigns were made. Laws and difficulties of women during these times were mentioned in the paper and how they had a difficult life. The third part of this paper mentions how women wanted to overcome the stigma of how smoking was seen as masculine. The male gaze was explained, and how men wanted to see women in a particular image that they wanted for them to always stay inferior. The idea of women wanting to have authoritative and dominant characteristics because they are symbolized with smoking was clear in this research.

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## LGBTQ+ Diversity Training for Corporations

Michaela Barnes, Melody Newberry, & Samantha Fairchild  
*Faculty Sponsor: Susan Brownell*

The LGBTQ+ community has engaged in a difficult quest for social acceptance and equality. This includes equality in the workplace where they have endured verbal insults, not being hired or promoted, and many other forms of discrimination. Working in an environment where they are considered different from everyone else creates a tremendous number of problems for the LGBTQ+ community as well as for the other people in the workforce. This leads us to our research question: What education and training will enable managers and leaders to better protect their LGBTQ+ employees? The project seeks to establish what kind of education for higher ups will lead to better treatment of LGBTQ+ employees, and better understanding of the LGBTQ+ clients/customers, a fiercely loyal minority group. In order to get a better understanding of how employees are treated and how to prevent certain situations, this project utilizes five research methods: semi-structured interviews, surveys administered to LGBTQ+ and heteronormative employees and management, participant observation amongst LGBTQ+ employees and upper management, and policy and symbolic analysis. The potential benefit of this study is that it will help create a safer workspace for employees. This is about creating a safe and understanding environment for everyone to feel comfortable and welcomed. To do this kind of research, it is important to have evidence from the employees and personally experience it as well.

## A Velvet Rope of Exclusion: The Delmar Divide\*

Madison Beirne

*Faculty Sponsor: Gerianne Friedline*

Many reports have been published about the complex topic of segregation in the Greater St. Louis area. However, the effect of years of systemic segregation on education has not been adequately discussed in a modern context. This report studies the root causes of the Delmar Divide in an attempt to understand the impact it produced in the educational community. St. Louis is a classically divided city and the public-school system has suffered as a result of educational inequities. This work focuses on how the Delmar Divide created pockets that continue to marginalize residents, particularly students. The effect that purposeful segregation had on this area and how it places students of color at a disadvantage to their white counterparts in other city neighborhoods is certainly visible through research. St. Louis is considered a historically segregated city. Location seems to be one of the most important factors in determining quality of education, health, housing, and access to jobs. Where people live has been molded by a long history of intentional systemic practices at both the governmental and societal levels. Black residents bear the brunt of this history and have been excluded from locations that could provide better opportunities. This report delves into the history that led to the division of the schools on both sides of the Delmar Divide, comparing their educational realities while attempting to understand why this happened and what can be done to directionally move forward as a community.

*\*This student presented a version of this project for at this year's "Undergraduate Day at the Capitol" (URDC), an annual event, designed to promote positive relationships and support between the UM-System and our elected state representatives.*

## The Portrayal of Jews in Nazi Propaganda and Art

Kaleb Bolen

*Faculty Sponsor: Christoph Schiessl*

Nazi Propaganda played a huge role in the anti-Semitic discourse that fueled the Holocaust. Many people believe that this only took place with posters and speeches, but in reality, Jewish depiction was seen throughout all forms of media, especially targeting everyone regardless of what age or demographic you are a part of. It played on age old stereotypes that many Europeans believed in. All of the media had one goal, and used similar imagery to convey the same message: Jews are a harmful part of German society. Giving them sinister attributes, it can

be seen all throughout Germany, as official propaganda efforts depicted Jews as ruling society and causing harm to the innocent German people. Jews were portrayed as working as a collective whole in order to take down Germany and claim it as their own. What stereotypes did Nazis give these eventual victims? And what imagery was used to convey these messages? Did these efforts play a role in the most memorable genocide in human history? Whenever we look at this issue, we can see how promoted conspiracies can alter history in ways like no other. My takeaway from my research is to show how these are still occurring, even in modern day, where anti-Semitic ideas are still present in modern times.

## The Forgotten Past of the Second Catholic Cemetery: An Ethical & Educational Exhibition

Jana Breaux, Katie Alsup, Bre Eldridge, & Shelly Saladin  
*Faculty Sponsor: Susan Brownell*

The Second Catholic Cemetery (SCC) collection at the University of Missouri St. Louis is irreplaceable and contains the remains of over 100 human beings from the nineteenth-century, who had a future and now have a historical past. Our anthropological team is developing ideas to preserve and display this collection. What actions should the UMSL Department of Anthropology and Archaeology take to create an ethical and educational exhibition of the human remains and other artifacts in its SCC collection? Our research methods include participant observation to observe the public response to the display at the Mummies of the World Exhibit at the St. Louis Science Center, semi-structured interviews on exhibitions containing human remains and museum collection management with four experts including Professor Anne Austin, Kristina Hampton, Professor Patti Wright, and Joe Harl, survey questionnaires on Facebook, library and archival research, and a skeletal analysis of the human remains that are part of the exhibition's reconstruction. Our results underline the opinions of the public and experts in this field surrounding exhibitions containing human remains and the current conditions of the collection. While few members of the public know about this collection's history and the procedures surrounding the preservation and exhibition of human remains, the majority of these individuals have viewed similar displays and find them to be acceptable. The Second Catholic Cemetery collection will possibly be returned to a final resting place after casts are constructed for a permanent museum display. This exhibition will be designed by visual artists and our anthropological team.

## Raising Red Flags in the Rainbow

Amanda Breese & Olivia Mikel

*Faculty Sponsor: Jennifer Siciliani*

It is imperative to study depression and anxiety in the population as a whole, and this importance increases in the LGBTQ+ community given the disproportionately higher rates at which these populations experience psychiatric symptoms (Borgogna et al., 2018; Meyer, 2003). Members of the LGBTQ+ community include individuals who identify as gay, lesbian, bisexual, gender non-binary, gender dysphoric, transgender, intersex, asexual, pansexual, queer, and/or questioning. This project is a review and coalescence of all the literature to date on anxiety and depression in these populations. As this review will demonstrate, although studies on the prevalence of these clinical syndromes in individuals who identify as gay or lesbian are increasing; studies employing other members of the LGBTQ+ community who do not identify as gay, lesbian, or bisexual are woefully scant – and at times, completely non-existent. This review will conclude with a discussion of the disparities in these studies, their implications, and considerations for future research in this important area.

## Sense of Belonging Increases Performance Expectations Among Women in STEM Fields\*

Anne Brown & Ariana Gaydon

*Faculty Sponsor: Bettina Casad*



This research examines threatening educational environments for women STEM (Science, Technology, Engineering, and Math) majors. Previous research found that underrepresented groups receive subtle and overt messages that they do not belong in science and academia which leads to lower science identity, lower grades, and switching to a non-STEM major (Ong et al. 2011; Robnett 2016; Rainey et al., 2018). This study used survey data from students ( $N = 213$ ) from a western university. The results indicate a 2-way interaction between sense of belonging (or the acceptance an individual feels regarding a specific group or environment) and science identity (how strongly a person identifies with their STEM field) on science performance expectations. Results showed that higher science identity predicted higher performance expectations; however, moderate to higher sense of belonging significantly strengthened this relationship. This result can better help us understand why women are underrepresented in STEM fields, and provide insight into possible interventions, such as improving sense of belonging for underrepresented groups within STEM.

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## Statistical Analysis of Birth Control Counseling Recipients

Aman Chishti

*Faculty Sponsor: Jean-Germain Gros*

**Objectives:** Birth control counseling and management are incredibly important for women's health. However, women often report that they do not receive adequate birth control counseling. This study characterized demographic factors associated with receiving birth control counseling.

**Methods:** The population for this study included women aged 18–50 in the Medical Expenditure Panel Survey 2018, a nationally representative database. The predictors analyzed in this study were age, race, insurance status, and poverty status. Multivariable logistic regression was used to assess the effect of these predictors on receiving birth control counseling in the last 12 months.

**Results:** The study population included 5054 women aged 18–50, with 1175 women receiving recent birth control counseling. Factors associated with reduced odds of receiving birth control counseling were increased age (OR: 0.94 [95% CI: 0.93, 0.95],  $p < 0.001$ ), Black race (OR: 0.71 [95% CI: 0.55, 0.92],  $p = 0.010$ ), Asian/Pacific American race (OR: 0.40 [95% CI: 0.28, 0.57],  $p < 0.001$ ), and being uninsured (OR: 0.40 [95% CI: 0.29, 0.58],  $p < 0.001$ ). High income status was associated with increased odds of receiving birth control (OR: 1.48 [95% CI: 1.12, 1.95],  $p = 0.007$ ).

**Conclusions:** Demographic factors were found to be significantly associated with rates of recent birth control counseling. This study may suggest that healthcare providers should ensure that they provide high-quality birth control counseling to interested women who are older, Black, Asian/Pacific American, or uninsured. This study may also suggest that these populations are less likely to seek birth control counseling.

## Stress, Resilience, and Impulsivity

Kendra Clark, Adam Runyan, & Carissa Philippi

*Faculty Sponsor: Carissa Philippi*

Stress is a phenomenon that everyone will experience. Stress that is unmanageable can become chronic, which is linked to various negative psychological effects (Le Fevre, Matheny, & Kolt, 2003). Although stress research often focuses on the negative long-term effects, there are times where individuals develop a trait known as resilience. Resilient individuals eventually learn how to buffer the negative effects of stress (Cicchetti, 2010), and researchers have begun investigating the positive effects of resilience on stress (Cicchetti, 2010; Kermott, Johnson, Sood, R., Jenkins, & Sood, A., 2019). Currently, few studies have been conducted to identify any additional traits that may impact the relationship between stress and resilience. However, there is some evidence that impulsivity may be a prevalent trait that affects the dynamic between stress and resilience. Typically, stressed individuals

exhibit higher levels of impulsivity (Moustafa, Tindle, Frydecka, & Misiak, 2017). In turn, this may affect one's level of resilience. The present study aims to focus on the relationship between stress (current and chronic) and resilience, as well as the moderating effect of impulsivity on that relationship. It was predicted that there would be a relationship between stress and resilience and that impulsivity would have a moderating effect on the relationship. UMSL students ( $n=81$ ) completed various questionnaires to determine their stress, resilience, and impulsivity levels. We found that chronic stress was not a significant predictor of resilience ( $R^2 = .52$ ,  $F(1,79) = .40$ ,  $p > .05$ ), but that current stress was a significant predictor ( $R^2 = .15$ ,  $F(1,79) = 13.4$ ,  $p < .001$ ). For this presentation, we decided to only run one moderation with the significant results. We found that impulsivity was not a significant moderator between current stress and resilience ( $B = -.02$ ,  $p > .05$ ). Although we did not find a significant relationship within the moderation, there is still some value in investigating traits that influence stress and resilience. Understanding potential factors that may impact resilience may help researchers identify appropriate methods for increasing resilience in vulnerable populations.

## A Computational Study of Genotype-Phenotype Mutation Patterns

Kamaludin Dingle, Omar Tawfik, & Ahmed Aldabagh\*

*Faculty Sponsor: Dr. Kamaludine Dingle*

Understanding properties of genotype-phenotype maps is important for understanding biology and evolution. In this project we make a computational study of the statistical effects of genetic mutations, in particular computing the probabilities of each phenotype transitioning to any other phenotype. We also investigate the importance of the local phenotypic environment of a single genotype, and its role in determining mutation transition probabilities. We use HP protein folding, RNA structure, and a simplified GRN matrix model to study these questions.

*\*This project was completed by students and faculty at the Gulf University for Science & Technology. UMSL has an established partnership with GUST in Kuwait and actively encourages their students to explore cross-campus experiences and opportunities.*

## The White Rose: German Resistance During the Third Reich

Kelli Dockery

*Faculty Sponsor: Christoph Schiessl*

From 1942 to 1943, a small group of university students in Munich produced and distributed a series of leaflets criticizing the Nazi regime and demanding passive resistance from German citizens. These leaflets would later lead to the capture and execution of all six core members as well as several of their associates. The purpose of this presentation is to answer questions that still linger about the White Rose. How were they able to distribute so many leaflets when the Nazi Party controlled every aspect of daily life? Why were they so passionate about resistance when they were not members of a targeted group? How did they differ from other resistance groups in Nazi Germany? Finally, I will analyze how Germans reacted to their story during and immediately after the war and what lessons we can learn from the White Rose today.

## Curcumin: An Agent to Fight Sepsis\*

Jessica Doshi

*Faculty Sponsor: Eike Bauer*

Turmeric has been historically known to have medicinal capabilities. It has properties which have proven to be useful in Ayurvedic medicine and have been historically used to treat ailment in Chinese and Indian cultures. Curcumin, which is an active ingredient of turmeric has proven to have anti-inflammatory, anti-oxidant, anti-fungal, anti-viral properties, but cannot be directly used because of its poor bio-availability, insolubility, and instability in the human body. Therefore, by modifying the structure of the curcumin by attaching carbohydrates, changing the functional groups on the aromatic ring, or attaching substituents on the carbon located in between ketone and hydroxyl group

I hope to achieve an increased level of solubility and stability in the modified curcumin derivative. Previously, we performed glycosylation reactions by utilizing ferrocenium salts as promoters. I started synthesizing carbohydrates and also curcumin derivatives. I performed various glycosylation reactions with sugars and various primary and secondary alcohols. After getting a sufficient yield through NMR data I will now use the same technique to attach carbohydrates onto a curcumin molecule. Now the aim is to perform glycosylation reactions in between carbohydrates and hydroxyl functionality on the aromatic ring of curcumin.<sup>7</sup> The ultimate goal is to use the curcumin derivatives to fight inflammatory diseases such as sepsis.

*\*This student presented a version of this project for at this year's "Undergraduate Day at the Capitol" (URDC), an annual event, designed to promote positive relationships and support between the UM-System and our elected state representatives.*

### **Ethical Dilemma: Police Access to Private Internet Data: An Analysis of the ECPA of 1986, Its Effects on the St. Louis Area, and the Proposed Solutions to Remedy This Outdated Document**

Amber Essary

*Faculty Sponsor: Scott Peterson*

My research was focused on the ethical dilemma of police access to private internet data and how it pertains to the outdated Electronic Communications Privacy Act (ECPA) of 1986. This work contains a case study of serial killer Maury Travis, an overview of the history of the ECPA, an argument for why police should have access to private data, an ethical analysis of the two solutions to this dilemma, and an argument for what solution I believe to be the best one. My research concluded that the two possible solutions to this dilemma were to revise the ECPA or to replace it. I thoroughly analyze the lawmaking process as well as the possible consequences of each solution before concluding that revision is the most beneficial solution for all parties involved. My findings are significant as they define how out of date the ECPA truly is, and how precarious the position of the courts and police officers are when determining what is and what is not allowable when accessing private data.

### **Synthesis of Glycopharmaceuticals for the Treatment of Microbial Sepsis**

Nicholas Forsythe, Alexei Demchenko, & Catherine Alex

*Faculty Sponsor: Alexei Demchenko*

Carbohydrates (glycans) form the basis of all living organisms and, consequently, are ubiquitous both in nature as biologically active compounds and in medicine as pharmaceuticals. One important application of carbohydrate-based drugs (glycopharmaceuticals) is the treatment of microbial sepsis, an acute illness that causes 100,000+ human deaths annually in the US alone. Exposure of the patient's blood system to *E. coli* bacteria causes a massive, and often fatal, immune response. One important cellular receptor that senses the bacterium and is critically involved in triggering the immune response is CD14. Significant efforts by our team and others have been made to develop carbohydrate-based drugs called anti-microbial antagonists that target and block the CD14 receptor, thus terminating the infection/immune response cascade. Nevertheless, microbial sepsis remains a long-standing, difficult-to-solve problem that requires innovative approaches since progress in this unmet medical need has been difficult to achieve.

Among new promising developments is antagonist AM-12 that is an attractive drug candidate due to its relatively simple structure, stability, potent activity, and lack of toxicity, discovered by Drs. Demchenko and Nichols (UMSL). To capitalize on this discovery of this promising anti-microbial receptor antagonist and extend this development to new therapeutic avenues, my project aims to develop a range of novel carbohydrate-derived drugs. At the completion of this projects, my synthetic compounds with superior pharmaceutical properties will help to accelerate discovery in many scientific disciplines with significant public health impact.

### **Phenotype Bias Determines How Natural RNA Structures Occupy the Morphospace of All Possible Shapes**

Fatme Ghaddar, Kamaludin Dingle, Petr Sulc (School of Molecular Sciences and Center for Molecular Design and Biomimetics at the Biodesign Institute), & Ard A. Louis (University of Oxford)\*

*Faculty Sponsor: Kamaludin Dingle*

The relative prominence of developmental bias versus natural selection is a long standing controversy in evolutionary biology. Here we demonstrate quantitatively that developmental bias is the primary explanation for the occupation of the morphospace of RNA secondary structure (SS) shapes. By using the RNASHapes method to define coarse-grained SS classes, we can measure the frequencies that non-coding RNA SS shapes appear in nature. Our main findings are firstly that only the most frequent structures appear in nature; the vast majority of possible structures in the morphospace have not yet been explored. Secondly, and perhaps more surprisingly, these frequencies are accurately predicted by the likelihood that structures appear upon uniform random sampling of sequences. The ultimate cause of these patterns is not natural selection, but rather strong phenotype bias in the RNA genotype-phenotype (GP) map, a type of developmental bias which tightly constrains evolutionary dynamics to only act within a reduced subset of structures that are easy to "find".

*\*This project was completed by students and faculty at the Gulf University for Science & Technology. UMSL has an established partnership with GUST in Kuwait and actively encourages their students to explore cross-campus experiences and opportunities.*

### **From Ridicule to Reform: Potential Solutions to the Domestic Violence Crisis**

Kelly Gordon

*Faculty Sponsor: Scott Peterson*

During the grassroots campaigns of the 1970s, American citizens saw a rise of concern for victims of domestic violence. The knowledge gathered over the past half-century has explained the detrimental effects intimate partner violence has on victims, the potential reasons partners become violent, and the most effective approaches to ending this epidemic. To curbe the high rates of recidivation seen among domestic violence offenders, current rehabilitation programs must change to mirror the needs of the abuser. A new approach, Achieving Change Through Values-Based Behavior (ACTV), works to address comorbidities that potentially prevent offenders from shaking off their violent pasts. This project attempts to explain the benefits, and potential drawbacks, of the implementation of ACTV therapy.

### **The Allies and the Holocaust**

Mark Granicke

*Faculty Sponsor: Christoph Schiessl*

During World War II, Nazi Germany carried out one of the most atrocious crimes in human history, the Holocaust. This systematic extermination of approximately 6 million Jews, along with other groups between 1941-1945, has become a focal point of modern human history. It is difficult to grasp the sheer magnitude of the undertaking by the Nazis. One question often asked is why the Allies did not do more to prevent this massacre. Were they simply ignorant of the entire event during the war? Knowing today the sheer magnitude of the Holocaust, it is difficult to believe knowledge of it would not have reached the Allies. Were the extermination camps deemed a low priority? One could argue that winning the entire war was vital to stopping any further suffering. Did those in command of Allied armies share some anti-Semitic beliefs? Perhaps leaders viewed the plight of the Jews differently than we do today. In any case, this project will examine exactly what the Allies, specifically the United States and the United Kingdom, knew of the Holocaust during World War II and what they did with the information, both on the home front and the battlefield.

## Sounds of the Reich: Nazi Party Radio and Speeches

Katelyn Hanners

*Faculty Sponsor: Christoph Schiessl*

Radio broadcasts and speeches were key aspects of Nazi regime propaganda. From March 1927 to when the Nazi party won power in March 1933, Hitler made 455 public appearances, reaching close to 4.5 million people. Radio was the leading medium during the Great Depression and during all of WWII. Nazi propaganda focused on the effectiveness of the message, not the means through which it was relayed. Nazis liked simplistic and straightforward ideas with no underlying interpretations. Studies have shown that campaigns do not change the opinions of the masses. Rather, they confirm what the people already believe. In the case of the German Third Reich, Nazi propaganda was centered around the conspiracy theory of superior Germans who were wrongfully tormented by supposedly lesser Jews and non-Aryans. Antisemitic propaganda was sprinkled into radio listening, beginning with Volk-style broadcasts in the 1920's. These enforced an ideology of a united people and memories of a time when Germany was strong, feelings that the Nazi party would later hijack and use to explain their own racist ideas. Nazis adopted the term *Volksgemeinschaft* in 1920 to pull people towards the idea of living space and German culture, both of which were heavily emphasized in Volk broadcasts. Hitler's speeches were less vague than broadcasts, clearly stating that if a war broke out, it would be the result of the Jews and that they would be annihilated as a result.

## Mutations in Several Auxin Biosynthesis Genes and Their Effects on Plant Phenotypes in Arabidopsis

Gabriela Hernandez, Lauren Huebner, & Bethany Karlin Zolman

*Faculty Sponsor: Bethany Karlin Zolman*

Auxins are important hormones in plants that regulate growth and development. Disruptions in the auxin biosynthesis pathway result in morphological changes in phenotypes in the model plant *Arabidopsis thaliana*, including differences in root and leaf formation. Mutations in the Tryptophan Aminotransferase of *Arabidopsis* (TAA1) and YUCCA (YUC4) genes interfere with the plant's ability to synthesize Indole-3-acetic acid (IAA), the primary auxin involved in plant development. *IBR1* and *IBR3* act in the multistep conversion of indole-3-butyric acid (IBA) to IAA. *ILL2*, *IAR3*, and *ILR1* hydrolyze IAA-amino acid conjugates into free IAA. The goal of our study was to determine the phenotypic effects of combination mutations disrupting these genes on plant growth and development.

Mutant lines with disruptions in auxin pathways were crossed to generate combination lines. Genotyping of segregating plant lines was performed via polymerase chain reaction (PCR) and gel electrophoresis to identify homozygous mutations in genes of interest. For this study, we used wild-type *Arabidopsis* (Columbia), parental lines, and double and quadruple-mutant combinations of the various genes. To determine the effects of these mutations and their combinations on plant growth and development, we focused on phenotypes associated with auxins such as root elongation, lateral root formation, hypocotyl elongation, and germination. The results of these assays demonstrate how the studied genes impact auxin-response pathways. By examining phenotypic data in wild-type and mutant plants we are able to determine the relationship between pathways in auxin-responsive growth. Because these genes play a key role in the growth and development of crop species as well, studying their effects on auxin-associated pathways in *Arabidopsis* may be informative for agricultural settings.

## Communicating Sustainability: Pollinators and North St. Louis Home Owners

Sarah Kelly, Tori Thoele, and Dr. Lara Zwarun

*Faculty Sponsor: Lara Zwarun*

When talking about sustainability, lawncare may not be the first thing

that comes to mind. However, the way we take care of our lawns affects the pollinators in the area. If we want to get people to behave in environmentally friendly ways, we need to find a way to reach them with messages that resonate. That means meeting them where they are and understanding their thoughts and opinions on lawncare. We did this by conducting three focus groups via Zoom with 4-6 participants in each group. We asked them questions about how they take care of their lawns, the pressure they felt to maintain their lawn, and then their opinion on a few different pictures of lawns. The lawns we showed them varied from very manicured to more pollinator friendly. We found that participants value the look of a tidy lawn but don't love the work it takes to upkeep it. They base their planting decisions on convenience instead of what is native to the area. Participants said they notice other people's lawns and feel a pressure to mow their grass before it gets long. They prefer manicured lawns with the patterned stripes and any flowers or greenery to not block the porch or windows. Not surprisingly, people knew very little about pollinators. In conclusion, we learned more about what people think about when taking care of their lawn and the pressure they perceive to keep their lawn short. Pollinators and sustainability aren't top of mind for many homeowners, which is valuable information for those designing messages to communicate about environmental issues.

## MarA Repression of Virulence Gene *hilA* in *Salmonella*

Alexandra King, Lauren Daugherty, & Lon Chubiz

*Faculty Sponsor: Lon Chubiz*

*Salmonella* is a bacteria most commonly known for causing the eponymous food-related illness. Due to their rapid reproduction rate and their ability to be propagated and maintained in a lab setting, they are commonly used in lab studies so that we can better understand how *Salmonella* causes disease in organisms that are more difficult to study. One area of interest is analyzing how *Salmonella* controls expression of the mechanisms that actually cause disease, called virulence traits, in response to the environment. In this study, antibiotic stress was used to analyze virulence gene expression. *MarA* is a gene that regulates ampicillin resistance. My goal is to determine if *MarA* directly represses an important virulence gene, *hilA*. To test this, a *Salmonella* strain that overexpresses *MarA* and contains a *hilA* expression reporter was mutagenized with a mini-Tn5 transposon. I am currently screening bacterial colonies of these mutants to determine if there are any observable effects that *MarA* repression has on *hilA* expression. If all colonies are white, then *MarA* likely represses *hilA* directly. If some colonies are blue, then *MarA* may repress *hilA* through an intermediate.

## Brain Stew

Cullen Landolt, Mya Horn, Kenneth Miller, & Aimee Pieper

*Faculty Sponsor: Daniel Gerth*

Brain Stew is an UMSL publication distributed bi-weekly in both digital and print formats. Its mission is to provide for the Pierre Laclède Honors College a forum for uncensored free thought, commentary, and creativity, as well as news and event listings from PLHCSA and other related campus organizations. The current Brain Stew staff consists of editors Cullen Landolt, Mya Horn, Kenny Miller and Aimee Pieper, with Dan Gerth serving as the faculty supervisor. During the semester, these people write their own content as well as garner submissions from Honors College students, faculty, staff, and alumni. The result is The Most Entertaining Team-edited Midwestern Satirical Collegiate Publication of April 2021, or least that's what they said in Time magazine! (Disclaimer: We are not in any way affiliated with Time magazine—please don't sue us. Also, Brain Stew features content that some readers may find offensive. Viewer discretion is advised, as they say).

## BOLD Signal Variability Patterns in Neural Correlates of Reflection and Brooding Components of Rumination

Katie Leutzinger & Carissa Philippi

*Faculty Sponsor: Carissa Philippi*



Researchers have established that rumination is a debilitating symptom that positively correlates with symptoms of depression. Rumination involves self-focused attention, often negative, as a means of coping with a depressed mood or sadness. The Ruminative Responses Scale (RRS) is a tool used to measure rumination severity that includes two subsets of rumination: brooding and reflection. Brooding rumination is related to passive and judgmental thoughts about one's circumstances and is therefore associated with higher levels of past and current depression. Although brooding is thought to be a maladaptive response to feelings of depression, past studies suggest that the reflection subtype may act in an adaptive way as it is a problem-solving mechanism and has shown to lead to a decrease in depression duration. The present study seeks to identify brain mechanisms associated with rumination and brooding subtypes to explore why some people exhibit one over the other. Specifically, this study will examine the blood-oxygen level dependent signal variability (BOLD-SV) patterns within brain regions thought to be associated with rumination subtypes in relation to depression, which has yet to be analyzed in the literature. A sample of 79 women were recruited to complete a resting-state fMRI scan, RRS, and a depression symptom measure. The first aim of this study was to identify BOLD-SV differences between regions of interest (ROIs) implicated in reflection and brooding, and we hypothesized that (1) reflection and brooding subtypes will show distinct correlations with BOLD-SV in neural ROIs implicated in rumination. The second aim of this study was to determine whether there are differences in BOLD-SV of the neural regions associated with reflection and brooding based on depression history. Consistent with this aim, we predicted that there would be (1) lower BOLD-SV in ROIs associated with brooding for the currently-depressed group and (2) higher BOLD-SV in ROIs associated with reflection for both the past depression and no depression group. In accordance with the first aim, this study found a significant effect of rumination subtype on BOLD-SV in the dlPFC, ( $F_{3,75} = 4.86, p = .005$ ). Specifically, greater levels of brooding were associated with lower BOLD-SV in the dlPFC, ( $t(78) = -2.612, p = .01$ ). In support of our first hypothesis under our second aim, significantly reduced BOLD-SV was found in the dlPFC for the currently-depressed group as compared with the no depression group ( $t(63) = -2.436, p = .018$ ). This study discusses the implications of these results and suggests directions for future studies to strengthen the findings of this foundational research.

## Radioactive Waste Management in St. Louis

Amanda Lopez

*Faculty Sponsor: Scott Peterson*

In St. Louis, MO, we face a nuclear waste dilemma due to the poorly disposed uranium ore materials in the West Lake and Bridgeton landfill areas. The ethical dilemma can be seen as nuclear waste's intergenerational implications and the search for sustainable development options. This research evaluates the most environmentally responsible radioactive waste management strategies and attempts to find an equitable solution to the St. Louis radioactive waste dilemma.

## Nazi Germany's Anti-Tobacco and Alcohol Policies

Elli McElhannon

*Faculty Sponsor: Christoph Schiessl*

This research analyzes the Third Reich's policies against tobacco and alcohol during their rule and whether or not their effectiveness had a large impact towards the Nazi's goal of purification of Germany.

## Skills for Living with Loss

Emily McNeil

*Faculty Sponsor: Ann Steffen*

Grief is a normative but highly life changing experience. Bereavement may disrupt one's life as well as alter the way in which one lives and takes care of oneself. By approaching an individual's grief as unique, specific skills and goals can be created to assist them in the midst of their new life. Specific skills and goals include engaging in self-care,

developing a routine, and staying connected to others. Through the development of specific skills, one can learn to live with the losses experienced as well as take care of their physical and mental well-being. This talk will focus on the presenter's experience during a directed study project conducted in the Fall of 2019. In this project, the presenter assisted with the revision of the "Living with Loss" module for a treatment workbook for later-life depression (to be published in Oxford University Press' Treatments that Work Series). This 2nd edition involves turning a traditional therapy protocol into a series of culturally responsive and accessible handouts and worksheets using behavioral, cognitive and emotional regulation strategies.

## The Impact of the COVID-19 Pandemic on Young Adults Regularly Using Alcohol & Opioids

Mimi Mead, Kylie Thorwardson, & Ryan Carpenter

*Faculty Sponsor: Ryan Carpenter*

The COVID-19 pandemic, via the need for social distancing, has had an enormous impact on how individuals use substances that we are only beginning to understand. Some factors (e.g., increased social isolation) may have led to increased substance use, while others (e.g., restrictions on access) may have made it harder to use. The impact of COVID-19 is particularly important to understand in individuals whose use puts them at high risk of overdose. Our study sought out how exactly substance use patterns changed due to the pandemic in young adults reporting regular use and co-use of alcohol and opioids. Participants were recruited as part of an internet survey advertised via Facebook and other social media sites. Results will explore whether participants perceived changes in their alcohol and opioid use and co-use, their desire to use, and their ability to access alcohol and opioids. Logistic regression will be used to examine whether feelings of isolation and loneliness were associated with increases in substance use. Findings will provide insight into the impact of the COVID-19 pandemic on a high-risk group of individuals.

## A Literature Review on the Issue of Comparing and Contrasting the FED's Actions in Response to Covid-19 & the Great Recession

Julian Meyerstrom

*Faculty Sponsor: Max Gillman*

As researchers and economists begin to evaluate and study the effect that the 2020 Covid-19 pandemic has had on the world and its financial institutions, many have focused exclusively on the pandemic and the unique impacts that a global shutdown has had. Economic events of this scale rarely occur, therefore when one does occur it is important to understand what happened and how the economic institutions reacted. The last great economic event to require direct involvement from the FED was the Great Recession in 2008. In most ways these two events are wholly distinct, happening for different reasons and impacting the world in dramatically different ways. Which markets are affected (housing in 2008 and medical in 2020) and how that effect manifested are clear examples of how these two events differ. Some of the ways in which the FED has responded to this crisis are similar to its actions in regard to the Great Recession, while other actions differ greatly. This literature review will go over the current academic opinion on the similarities and differences in the FED's response to the Covid-19 pandemic and the Great Recession in an effort to determine the validity in comparing these two economic events.

## The Role of the Reader is to Follow: Responding to the Negative Reception of Paul Verhoeven's Film Adaptation of Starship Troopers

Julian Meyerstrom

*Faculty Sponsor: Ann Torruiso*

Robert A. Keinlein's science fiction novel *Starship Troopers* (1959), and its film adaptation of the same title directed by Paul Verhoeven (1997), received mixed critical reactions. Both pieces came across as supporting fascistic ideals to most critics upon release, despite the two creators opposing political and moral beliefs. Using Louise Rosenblatt's reader response theory as a framework for analyzing both the novel and film adaptation, this paper postulates the film adaptation fails to deliver an accurate critique of the novel by placing the burden of moral knowledge on the audience. Keinlein's novel guides the reader into his moral sensibilities, whereas Verhoeven never pushes the audience into the mindset necessary to understanding his movie. Furthermore, the film also requires the viewer to disassociate with the main characters and their values, in stark contrast to traditional cinematic language. Ultimately, this presentation argues that the film's failure to communicate this disassociation between the audience and film's main characters helps us understand why the film was slammed by critics at release and in 2013 was labeled by *The Atlantic* as "One of the Most Misunderstood Movies Ever."

## Effects of Chronic Stress on Infant Memory

Theresa A. Moore & Hannah B. White

*Faculty Sponsor: Hannah White*

Chronically elevated baseline cortisol levels may be associated with memory impairment in infants. Studies have shown that acute elevated stress levels are linked to better overall cognitive performance and enhanced short-term memory, however, chronically elevated stress levels seem to have quite the opposite effect. Although infant data concerning chronic stress and memory is lacking, clinical research studies that have been conducted on adults suggest that chronically elevated cortisol levels may be associated with a plethora of cognitive deficits, including poorer episodic and spatial memory, disrupted learning ability, and difficulty with forming long-term memories. This study analyzed secondary data to examine 3-month-old infants' (N = 95) basal cortisol levels and data collected from a visual preference task, in order to determine whether there is a correlation between elevated baseline stress levels and infant visual recognition memory (indexed via habituation). The results of the study indicated no significant effect of cortisol on infant visual recognition memory. This could possibly reflect that the impact of stress exposure has not yet reached the threshold to disrupt memory processes for the infant. Alternatively, it may be due to the utilization of secondary data in the study, such that the brief nature of the task may not have been sensitive enough to detect memory deficits. Future studies with more extensive memory testing protocols (such as peak habituation) should be implemented in order to differentiate these alternatives. Further understanding how early exposure to stress impacts infant cognitive development will be critical for determining the conditions necessary in order to ensure optimal brain growth for learning, memory and other higher-order functioning.

## Paternal Parenting Stress During Middle Childhood: The Impact of COVID-19

Vanessa Newell, Kathryn E. Cherry & Emily D. Gerstein

*Faculty Sponsor: Emily D. Gerstein*

Background: Parenting stress is the unpleasant psychological reaction to the demands of parenthood, including perceptions of competence and knowledge of the day-to-day and long-term tasks of parenting (Deater-Deckard 2006). While most research has examined mothers, father parenting stress is also critical to children's development, predicting increased problem behaviors (Cabrera & Mitchell 2009) and poorer cognitive skills (Harwood, 2017). The COVID-19 pandemic may increase parental stress in multiple ways, as parents are at home more with their children while fulfilling occupational and personal responsibilities. Parents have reported increased stress due to job loss, school closures, and other stressors (van Tilburg et al., 2020), and COVID-19 stressors are associated with higher parental stress in mothers (Brown et al., 2020). This study aimed to examine: 1) how parenting stress in fathers relates to sociodemographics; 2) how COVID-19 may impact parenting stress, relative to sociodemographics. It was hypothesized that 1) fathers in families with less education or income, unmarried, or living in rural areas would report higher parenting stress, and 2) COVID

-19 would contribute to parenting stress over and above sociodemographics.

Methods: Participants were fathers (n=172) of children ages 6-10, living in the United States, and had at least regular visitation with their child. Fathers were surveyed once through Amazon's Mechanical Turk between November 2020 through February 2021. The sample was 58% White, 18.6% Black, 7.6% Hispanic, 7.6% Asian American/Pacific Islander, 8.1% All Other Races and Ethnicities, and 97.1% worked full-time. Measures included the Parent-Child Dysfunctional Interaction subscale of the Parenting Stress Index, 4th Edition Short Form (Abidin, 2012), the COVID-19 Impact Scale (Kaufman & Stoddard, 2020), and demographic factors (father age, household income, perceived social class, marital status, education, and urban/rural environment). Results: COVID-19 impact was positively associated with the parenting stress (parent-child dysfunction subscale;  $r=.50$ ,  $p<.001$ ). Greater parenting stress was also associated with higher perceived social class ( $r=.237$ ,  $p<.001$ ), more education ( $r=.24$ ,  $p<.001$ ), and being married ( $t(155)=-2.81$ ,  $p=.006$ ). Fathers in urban environments endorsed more parenting stress ( $t(170)=2.57$ ,  $p=.011$ ) than those in rural environments. There were no significant associations between father age or household income with parenting stress. Regressions indicated COVID-19 impact was associated with parenting stress ( $\beta=.446$ ,  $R^2=.318$ ,  $p<.001$ ) over and above the impact of marital status, perceived social class, urban/rural environment, and education level. Blocked regression indicated that COVID-19 impact was associated with parenting stress over and above sociodemographic factors. Block 1 explained 12% of the variance in parenting stress while adding COVID-19 impact to Block 2 explained 31% of the variance in parenting stress.

Discussion: COVID-19 and parenting stress were strongly associated with one another. However, contrary to hypotheses, fathers who were married, more educated, identified with higher social classes, or lived in urban environments reported more parenting stress. This may be due to the impact of COVID-19, such that married fathers may have more time with their children, fathers with higher education or perceived social class may be working from home more, and urban areas may have seen more dramatic changes to daily life. Fathers more impacted by COVID-19 may benefit from additional supports or services to reduce demands and parenting stress. Although a single timepoint and single-reporter measurement, findings suggest that interventions designed to reduce COVID-19 related stressors may, in turn, benefit other aspects of family well-being.

## The Relationship Between Infant-Family Routines, Number of Caregivers and Infant Basal Cortisol

Vanessa Newell & Hannah B. White

*Faculty Sponsor: Hannah White*

Background: Family routines have been found to be related to child adjustment, marital satisfaction, and parenting competence (Fiese, 2002). Persistent stress, and the resulting frequent activation of the body's stress responses, can result in excessive wear-and-tear on the body and brain known as allostatic load (McEwen, 2000). In infants, basal cortisol levels act as an instrument to measure allostatic load (White, 2020). To our knowledge, no existing work on the impact of routines on infant development has examined the role of family structure. In traditional and minority cultures it is common for caregiving responsibilities to be divided among multiple individuals. Similarly, cultural shifts in the rigidity of gender norms have led to an increase in father's taking on a major caregiving role. Thus, it is possible that the number of caregivers in the home could be a metric of home stability that infants are sensitive to such that caregiver inconsistency elevates their stress when accompanied with a low adherence to routines. Accordingly, this study examined whether adherence to household routines will moderate the relationship between number of caregivers and cortisol levels in a sample of 3.5-month-old infants.

Methods: Participants were 3.5-month-old infants (n=108; White, 2020) surveyed at the University of Kentucky Infant Memory Lab. Families were surveyed from November 2018- March 2020. Parents reported adherence to routines using an adapted version of the Daily Living Routine subscale of the Child Routine Inventory (Sytsma, Kelley, & Wymer, 2001), and cortisol levels were assessed using saliva samples.

Results: A linear regression where cortisol was predicted by routines, number of caregivers (one vs. multiple), and the interactions of routines and number of caregivers was conducted. There was a marginally significant effect of number of caregivers such that more than one primary caregiver was associated with lower infant cortisol levels and all other effects were non-significant.

Discussion: It was expected that adherence to family routines would act as a protective factor against adverse effects resulting from home instability in the form of the number of caregivers and elevated cortisol levels. Contrary to hypothesis, adherence to household routines does not moderate the relationship between the number of caregivers and cortisol levels in infants. Instead, the greater number of caregivers infants had the lower their cortisol levels were. Findings suggest that an increased number of caregivers may be a protective factor against infant stress.

## How Does Internet Delivered Dialectical Behavior Therapy Skills Training Reduce Suicide Risk? Examining the Granularity of Suicidal Ideation

Joseph Rameer & Chelsey Wilks

*Faculty Sponsor: Chelsey Wilks*

Background: The gap between treatment need and treatment availability is troubling, and for people who endorse suicidal ideation and present with other complex behavioral dysfunction have more treatment barriers. Dialectical behavior therapy (DBT) skills training, which effectively targets behaviors associated with emotion dysregulation such as suicidal behaviors, provides a fitting model amenable to computerization. While DBT has considerable evidence indicating that it is effective at ameliorating suicidal behavior, including thoughts, it is unclear how suicidality is reduced within this population. This study is a secondary data analysis of a pilot randomized control trial evaluating the feasibility and preliminary efficacy of a computerized version of DBT skills training (iDBT). Specifically, we will examine between condition changes in suicidal ideation frequency, intensity, and seriousness with the goal to better understand how iDBT functions to diminish suicide risk.

Methods: Participants (N = 59) were randomized to receive iDBT-ST immediately or after an 8-week waiting period. Participants were assessed weekly over the course of 8 weeks on suicidal ideation frequency, highest urge in the past week, seriousness of acting on urges (yes/no), and current urge. Data were analyzed using multilevel modeling for continuous variables (highest urge and SI frequency) and generalized linear mixed models (GLMM) with a binomial distribution for seriousness. Independent variables were time, condition, and the interaction between time and condition.

Results: Participants randomized to iDBT (n = 30) saw significantly faster reductions in highest urge (est = -0.14, 95% CI = -0.24 -0.05, p = .003) and current urge to die by suicide (est = -0.09, 95% CI = -0.18 -0.01, p = .03). However, there were no between group differences in the rates of change for suicidal ideation frequency (p = .13) or seriousness of acting on suicide (p = .24). Moreover, the effect of time for suicide ideation frequency was also not significant suggesting that, on average, all participants continued to think about suicide the same amount.

Discussion: DBT skills training is effective at reducing suicidal ideation, compared to individuals not receiving DBT. However, when investigating “suicidal ideation” in more depth, it was revealed that the reduction in suicidal ideation is due to a reduction of suicidal urges rather than frequency of suicidal thoughts. This could be a function of skills taught that are designed to reduce behavioral dysfunction. This aligns with previous research on DBT that indicates its clinical efficacy at reducing suicidal behavior compared to controls. Future treatment studies should examine the clinical utility of reducing frequency of suicidal thoughts.

## Maternal Depression and Infant's Bias Towards Faces

Annie Ray & Hannah B. White

*Faculty Sponsor: Hannah White*

This study was conducted to examine the relationship between maternal depression and infant bias toward faces. Three-month-old infants were shown faces and objects and their looking times were recorded. The results showed that there was a significant correlation between maternal depression and infant face preference. Specifically, infants who had mothers with higher depression symptomology showed longer looking times to the faces versus the objects. This finding suggests that maternal depression may shape the development of social information processing skills very early in life.

## Teletherapy Among Dialectical Behavior Therapy Clinicians and Associations with Treatment of Patients at Risk for Suicide

Kevin Rebmann

*Faculty Sponsor: Chelsey Wilks*

Telemental health has emerged rapidly as a treatment delivery platform, although many clinicians who treat complex and high-risk suicidal patients have expressed concern in the implementation of this technological service. Despite this initial trepidation, the coronavirus pandemic of 2019 (COVID-19) upended the way that traditional evidence-based psychotherapy is being delivered, resulting in most outpatient treatment providers to deliver their treatment via telehealth. One such treatment which focuses on complex patient populations is Dialectical Behavior Therapy (DBT); DBT therapists target underlying skills deficits via weekly training and frequent practice. Both the diary card and homework are traditionally provided to clients via paper documents, and as DBT is quickly moving to telehealth, we know of no research on how therapists are organizing treatment or integrating technological tools in their therapy during this pandemic. Such insights will enable technology researchers and developers to better design and disseminate tools that can be most optimally used by DBT clinicians.

Method: DBT therapists were recruited via listservs to complete an online survey about their experiences integrating technology into therapy. In addition, clinicians were also asked to respond to their concerns regarding the treatment of suicidal patients. Data collection for this project is completed; as of April 18th, 2021, 99 responses have been recorded.

Results: Of the 99 current respondents, most were female (88.9%) and either licensed clinicians or working under a licensed clinician who implemented DBT to one or more clients each week (N = 92), with 67 using DBT as their primary treatment modality. Most respondents reported having a Masters or two-year certification following their Bachelors degrees (52.7%). Nearly all (87.6%) of respondents reported implementing some DBT through outpatient therapy. DBT therapists reported that nearly all (91-100%) of their sessions were being delivered via telehealth (61.0%), and most reported they would likely continue providing telehealth services following COVID-19 (91.36%). Many respondents reported agreement or strong agreement about being emotionally devastated if a client completed suicide (54.5%), would blame themselves if a client completed suicide (31.6%), that they would inadvertently reinforce suicidal behaviors (15.8%), or that they would make mistakes in treating a suicidal patient (37.7%). Moreover, item responses regarding clinician competency and degree of app implementation in treating suicidal clients both showed statistically significant correlations with whether telehealth would continue to be offered following COVID-19,  $r(74) = -.211$  and  $r(38) = .332$  respectively in a one-tailed analysis where  $p < .05$ .

Discussion: These findings indicate the possibility that clinician fears about their competency in treating suicidal individuals and the level of technology usage integrated in therapy may be factors for whether or not they continue to offer teletherapy following COVID-19. Though causation cannot be determined, these statistically significant correlations illuminate the need for further research into the topic. Limitations include a small n of 99 and low complete rate on the survey (76.7% completed fully). Further studies regarding technology implementation in therapy should attempt to collect data from a larger subject pool and implement strategies for increasing the completion rate.



## Drug Release and Binding Study of Bortezomib (BTZ) from a pH Responsive Polydopamine Coated Nanoporous Gold

Brittany Richardson, Palak Sondhi, Dharmendra Neupane, & Keith J. Stine

*Faculty Sponsor: Keith Stine*

Cancer nanodrugs are a developing treatment concerned with target drug delivery and diagnosis through the application of specific surface modification on the nanoscale (approximately 1-100 nm). Current chemotherapeutic drug treatments damage surrounding tissues due to the lack of selectivity in the drug delivery system, toxicity, and inability to completely address the cancer cells. Bortezomib (BTZ) is an anti-cancer drug used to treat mantle cell lymphoma and multiple myeloma through proteasome inhibition. The BTZ delivery system does not display optimal efficiency and could be improved upon through the application of surface modification by polydopamine (PDA). The fabrication of electropolymerized PDA (e-PDA) was conducted in neutral conditions by a 7.4 TRIS buffer and completed by multistep cyclic voltammetry (CV), and characterized by electrochemical impedance spectroscopy (EIS), scanning electron microscope (SEM)/energy-dispersive X-ray spectroscopy (EDX). The use of both bare gold electrode and nanoporous gold were considered for attachment. After characterization and optimization of electrochemical cycles, the BTZ will be electrochemically attached to the e-PDA and a drug binding constant will be calculated from varying the concentration of BTZ under three sets of pH environment (pH=5, 7.4, and 9). The drug release study will be conducted and monitored using UV-Visible spectrophotometer. The cis-diol and boronic acid complex formed by the binding of BTZ to e-PDA is projected to break in solution under acidic conditions. Further characterization and study are in the process of being performed and analyzed.

## Nazi Art

Jacob Riefesel

*Faculty Sponsor: Christoph Schiessl*

My research project will explore the different types of propaganda art and their effects and influences on different populations. The types of art that I will be discussing are paintings, posters, films, and photographs. While each of the artforms are very different from one another, their overall aim and goals are the same. They are to influence a population in such a way that furthers one's agenda. In this case, Adolf Hitler and the entirety of the Nazi Regime are aiming to influence the population of Germany to further their agenda. Most propaganda art is clear in what their message is and what audience they are targeting. Propaganda was created for every type of population inside of Germany, most were specified towards men, women, and even children.

## Addressing the Need for Regular Mental Health Screenings in Foster Care Youth

Abby Rothweiler

*Faculty Sponsor: Kate Votaw*

**Introduction:** Approximately 80% of foster children have significant mental health problems related to the multiple Adverse Childhood Events (ACEs) that they experienced in the foster care system. As a result, these individuals are at higher risk for severe health problems, decreased quality of life and even an earlier death.

**Purpose:** Currently, the foster care system cannot handle the financial burden required for all those in need to receive sufficient mental health services. The purpose of this project was to work to research how the FCS can work to better address psychological distress related to ACE exposure and decrease its lifelong impacts.

**Methods:** The information for this project was obtained from UMSL Summons as well as official government child welfare webpages.

**Results:** There is still a large number of foster children that have significant psychological distress. Using a screening tool to regularly assess foster children may allow for signs and symptoms to be discovered earlier. In addition, this tool may be used to refer children to the appropriate professionals so that current resources can be used more efficiently.

Implications: Additional research on the components of the screening tool and small pilot study would need to be done to ensure its accuracy and efficiency.

## Madness and Sanity: Wisdom of Madmen and the Wise Men Madness in the 19th Century

Norah Roudhan\*

*Faculty Sponsor: English Department at Gust University*

This research is based on a careful examination of the concept of insanity and reason. In addition to mentioning some examples from the nineteenth century in the literature to illustrate how each of them used the concept of insanity. Despite the different reason for describing each of the above names and personalities as insane, through analyses and questions posed it becomes clear that insanity in the end may have a different meaning from what today's concept represent. The research concludes with the main reason behind the presentation of literature to some famous figures of insanity in a manner that reflects their rationality, despite the approval of many writers of her madness despite their intelligence, cleverness. love ego? Or the punishment of the mighty?

\*This project was completed by students and faculty at the Gulf University for Science & Technology. UMSL has an established partnership with GUST in Kuwait and actively encourages their students to explore cross-campus experiences and opportunities.

## Human Trafficking in St. Louis

Tiffany Schultz

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Human trafficking is a major crime and a form of modern slavery which involves the recruitment, transportation, harboring, and obtaining of persons through the use of force, fraud, or coercion. St Louis is one of the activities across the world that has been negatively impacted by the human trafficking crime. The emergence of Covid 19, also resulted in a surge in human trafficking crime across the city. This research hence seeks to comprehensively analyze the challenge and identify factors that may be resulting in a surge in the crime rate. The human trafficking study entails a literature review section, an in-depth research methodology, findings, and conclusions of the study.

## Public Health Training for Law Enforcement Officers: Knowledge, Attitudes, and Behaviors Surrounding Syringe Safety

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The knowledge, attitudes, and behaviors of law enforcement officers (LEOs) with respect to needlestick injuries (NSIs) and syringe confiscation can have a substantial impact on public health and public safety. In collaboration with Safety and Health Integration in the Enforcement of Laws on Drugs (SHIELD), the Connecting the DOTS: Drug Overdose Trust and Safety (DOTS) project developed and is implementing evidence-based training to align public health and public safety practices amongst LEOs.

The Peace Officer Standards and Training Program-certified training is facilitated by a law enforcement trainer and a harm reduction specialist. Trainees are surveyed on their attitudes relating to LEO discretion, confiscation, and NSIs before and after the training using a validated instrument developed by DOTS and SHIELD. For the current study, we compared the pre- and post-training scores using paired t-tests for 35 LEOs who participated in the training and completed both surveys. The training improved trainee conceptual knowledge and attitudes related to syringe confiscation and NSIs, with a statistically significant improvement in intention to refer people who inject drugs to syringe service programs [t(32)=-9.403, p<.001]. There was no improvement



in LEO discretion to not arrest for syringe possession. These results indicate the effectiveness of training sessions, and demonstrate that a public health and public safety-based training improves LEO knowledge and attitudes. Wider adoption of the curriculum could result in improved health and safety of the community.

## Constraints on Art During the Nazi Era and the Shift to Modern Art After World War II

Aria Spencer

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Due to the severe anti-semitic beliefs expressed by the Nazi Regime both during and before World War II, the production of art was censored to fit the governments ideal perception of the regime. This caused forms of modern art and expressionism to be deemed dirty or unfit for Germans. The Nazis associated modern art with Judaism and destroyed both the art and the artists. Once the Nazis were removed from power, there was a surge in the creation of modern art. World War II and the defeat of the Nazis prompted a large expressionistic art movement throughout Germany. Through the exploration of the restraints and punishments of art from the end of World War II to the end of World War II, one can better understand the reasons behind the influx of modern art after 1945. Modern art influenced by the Nazi Regime dates to the early two thousands, and shows the rebellion of artists against the strict biddings of the Nazi leaders.

## Signing to Success: Developing Effective ASL Curricula in Secondary Public Education

Claire Sutterer

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This study aims to investigate the history of American Sign Language (ASL) in public schools, analyze where ASL education is today, and provide potential solutions to improving the quantity and quality of ASL classes within public high schools. A significant body of research focusing on preK-2nd grade students and research with primary concentration on students who are Deaf or hard of hearing has already been developed. However, developing effective methods for teaching ASL to hearing people is a relatively new and under researched area. ASL was not officially recognized as a language until the 1950s. It wasn't until 2011 that Missouri first permitted ASL to be used for foreign language credit in public high schools and postsecondary education. ASL in public education is quickly becoming a developing area of study and practice. Providing ASL class options increases inclusivity within schools and their surrounding communities. Learners also benefit from positive cognitive impacts gained when learning a signed language, and also prosper from becoming bilingual. Yet, there is unexplored value in aiming central research specifically at hearing students at a secondary level. Classes in high school for hearing students in addition to those who are Deaf and hard of hearing deserve more attention within educational research. Theoretically, cognitive acceleration seen in elementary students can be expected in secondary students and provide lifelong benefits such as improved literacy and mastery of the students spoken language as well as enhanced appreciation for diversity within academic communities comprised of Deaf, hard of hearing, and hearing individuals.

## The Effect of Barriers to Treatments, and the Attitudes and Beliefs Toward Medication Assisted Treatment (MAT) on the Readiness to Change Within Young Adults Engaging in Regular Alcohol and Opioid Use

Kylie Thorwardson, Ryan Carpenter, & Mimi Mead

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People who use substances vary in terms of the problems they experience and the degree to which they feel change is needed. Among

those who are interested in making changes, many have qualms and questions about doing so, despite the potential positive benefits of reducing use. Young adults who use substances are especially unlikely to receive substance-focused treatment. It is unclear to what extent this is due to limited access to treatment, a lack of desire to change, beliefs that existing treatments are unlikely to be beneficial, or a combination of factors. This study will examine the associations of perceived readiness to change, access to treatment, and attitudes toward medication assisted treatment (MAT) for opioid use disorder in an internet sample of young adults (18-24) who regularly use alcohol and opioids and are not currently in treatment. Results will shed light on why young adults engaging in regular substance use rarely receive substance use treatment, potentially informing future efforts to address this critical issue.

## Resilience and Grit: Foundations of Mindset Differences in Adult Children of Alcoholics and Adult Children of Non-Alcoholics\*

Christopher Vance

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Alcoholism is a destructive consequence of a combination of environmental, genetic, and social influences. While it is the choice of an individual to consume alcohol, their family is facing the consequences as well. Children of alcoholics (CoAs) face a unique set of challenges growing up with one (or two) alcoholic parents. This study seeks to investigate the presence of a difference in grit and resilience in adult children of alcoholics (ACoAs). Furthermore, the study aims to uncover the influence grit and resilience have on an individuals' mindset; whether they maintain a growth or fixed mindset. A survey containing four different aspects of measure was distributed. The first section collected demographic data. The participants were then to complete the Children of Alcoholics Screening Test (CAST) to determine which population they belonged to. The third section measured resilience using a 37-question questionnaire. Lastly, grit was measured using the Short Grit Scale. The study found that Non-ACoAs ( $M=3.24$ ,  $SD=0.72$ ) had significantly higher levels of grit than ACoA ( $M=2.97$ ,  $SD=0.60$ ) ( $t(165)=2.56$ ,  $p<.011$ ). Aspects of resilience, such as family coherence, were also higher in Non-ACoAs ( $M=56.48$ ,  $SD=24.85$ ) than in ACoA ( $M=38.75$ ,  $SD=22.45$ ), ( $t(165)=4.67$ ,  $p>.001$ ). This study brings forth data to support the idea that those who live with a parent with alcoholism have lower levels of grit and resilience, leading to a fixed mindset. Future investigation is needed to better grasp the influence that interactions with alcoholic parents have on the development of children in many aspects, including grit and resilience.

*\*This student presented a version of this project for at this year's "Undergraduate Day at the Capitol" (URDC), an annual event, designed to promote positive relationships and support between the UM-System and our elected state representatives.*

## Antonia Sentner's Fight Against Deportation: An Example of the Federal Government's Fight Against Communism

Claire Wehking

*Faculty Sponsor: Peter Acsay*

In the 20th century, the United States government used deportation as a tool to circumvent certain Constitutional protections in order to crack down on radicalism. This tactic was used in both the first and second "Red Scares." In the 1940 and 1950s, a St. Louis deportation case rose to national prominence as it progressed through the federal court system. Antonia Sentner was the wife of Communist Party U.S.A. member and local labor leader, William Sentner. Her requests for naturalization were denied, even though her husband and children were born in the United States and she had lived here since she was 8 years old. This denial was on the basis of a short time in the early 1930s when Antonia had briefly been a member of CPUSA. This case reached the Supreme Court where the decision to deport her was struck down. This study is based on previously uncited primary sources.

## Spectral Analysis of a New Electronic Transition of Platinum Fluoride, PtF\*

Carol Welch

*Faculty Sponsor: James O'Brien*

The electronic landscape of platinum containing molecules has been the focus of numerous spectroscopic studies in recent years, because of the difficulty in describing electronic structure theoretically due to electronic correlations and relativistic effects. A collective effort by spectroscopists and theoreticians to investigate the diatomic molecule platinum fluoride, PtF, has included research such as developing potential energy diagrams and performing analyses on rotational transitions with microwave spectroscopy. One group observed electronic transitions of PtF using laser vaporization/reaction with jet free expansion and laser induced spectroscopy. A highly effective method for observing and analyzing electronic transitions of small, metal-containing molecules like PtF is employing sensitive absorption techniques like Intracavity Laser Spectroscopy (ILS), with notable discoveries originating in the O'Brien lab. We employed an ILS technique to record the (0,0) vibrational band of the  $[15.3] \Omega=3/2 - X 2\Pi 3/2$  electronic transition of PtF. The PtF molecules were produced in a current regulated RF discharge operating at 0.30-0.80 A applied to a Pt-lined copper hollow cathode in 0.50-1.25 Torr of 1-5% SF<sub>6</sub> in an Ar/He sputter gas mixture. The hollow cathode was placed within the resonator cavity of a tunable DCM dye laser operating over the 14,500-16,500 cm<sup>-1</sup> range, and path lengths of 0.2-2.0 km were utilized with the ILS method. The spectrum includes qualities of the major isotopologues of PtF including 194PtF, 195PtF, 196PtF, and 198PtF. A rotational analysis the electronic transition was performed using the spectral simulation software, PGOPHER. Excited state molecular constants were determined and lambda doubling was observed. Results will be presented and compared to theoretical discoveries to illustrate the symbiosis of experimental and computational studies in disentangling the complex electronic nature of platinum fluoride.

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## The Injustices Behind America's Incarceration Boom

Jay Widlacki

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America's mass incarceration system functions as a tool to keep their black communities impoverished and powerless. Black people are locked away at disproportionate rates; moreover, statistics suggest that the criminal justice system is racially biased at every step. These two systems work together to keep an alarmingly high amount of black people behind bars so businesses can profit off of them. If ex-convicts leave the prison, they will find it hard to reintegrate into society because of the post-prison fees, parole requirements, discrimination, and disenfranchisement. Without rehabilitation available in most prisons, these barriers make the prison system akin to a revolving door. The incarceration system's impact on crime rates have been rapidly decreasing for decades. However, positive reforms have been discouraged by those invested in the system because they turn the best profit when prisons are full.

