This year the annual Developing Scholars Program (DSP) Research Symposium will be held as part of the university-wide 2021 Undergraduate Research Showcase.

DSP students have worked alongside faculty and staff mentors to ask questions and investigate answers. COVID-19 has presented many challenges to the process of conducting research and creative inquiry, but students, faculty and staff have persisted.

This abstract booklet, along with the materials presented at the research showcase, are a testament to the resiliency of our K-State community and specifically our DSP community.

Thank you to the DSP faculty mentors, staff and graduate students who helped guide our DSP students through their experiences this year. We could not have done this without you!

Thank you to the DSP students for working hard, staying focused and bringing your projects to the finish line. You did it!


--DSP Staff
Drs. Brenee King and Jeremy Marshall, Carly Davis, Megan Clark and Saya Kakim
Table of Contents

<table>
<thead>
<tr>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ana Herrera</td>
<td>32</td>
</tr>
<tr>
<td>Vanessa Hernandez</td>
<td>31</td>
</tr>
<tr>
<td>Kaitlyn He</td>
<td>30</td>
</tr>
<tr>
<td>Jesus Gonzalez</td>
<td>29</td>
</tr>
<tr>
<td>Joanne Kellie Gomendoza</td>
<td>28</td>
</tr>
<tr>
<td>Leonardo Garrido Alvarez</td>
<td>27</td>
</tr>
<tr>
<td>Melissa Gaona</td>
<td>26</td>
</tr>
<tr>
<td>Brian Garcia</td>
<td>25</td>
</tr>
<tr>
<td>Emily Gibson</td>
<td>24</td>
</tr>
<tr>
<td>Joanne Kellie Gomendoza</td>
<td>23</td>
</tr>
<tr>
<td>Jesus Gonzalez-Morales</td>
<td>22</td>
</tr>
<tr>
<td>Kaitlyn Headlee</td>
<td>21</td>
</tr>
<tr>
<td>Vanessa Hernandez</td>
<td>20</td>
</tr>
<tr>
<td>Ana Herrera</td>
<td>19</td>
</tr>
<tr>
<td>Maria Herrera</td>
<td>18</td>
</tr>
<tr>
<td>Tommy Herrera</td>
<td>17</td>
</tr>
<tr>
<td>Kierra Holloman</td>
<td>16</td>
</tr>
<tr>
<td>Maria Izquierdo</td>
<td>15</td>
</tr>
<tr>
<td>Daijah Jones</td>
<td>14</td>
</tr>
<tr>
<td>Jared Medina</td>
<td>13</td>
</tr>
<tr>
<td>Ruth Mekuria</td>
<td>12</td>
</tr>
<tr>
<td>Natalie Melendez-Velador</td>
<td>11</td>
</tr>
<tr>
<td>Emireth Monarrez-Carreon</td>
<td>10</td>
</tr>
<tr>
<td>Aaron Moore</td>
<td>9</td>
</tr>
<tr>
<td>Diana Najera</td>
<td>8</td>
</tr>
<tr>
<td>Juliet Nava-Chavez</td>
<td>7</td>
</tr>
<tr>
<td>Jared Newell</td>
<td>6</td>
</tr>
<tr>
<td>Citlally Orozco Aldaz</td>
<td>5</td>
</tr>
<tr>
<td>Miguel Perez</td>
<td>4</td>
</tr>
<tr>
<td>Carolina Reyes</td>
<td>3</td>
</tr>
<tr>
<td>Gina Reyes</td>
<td>2</td>
</tr>
<tr>
<td>Kaitlyn Rhine</td>
<td>1</td>
</tr>
<tr>
<td>Dallas Rice</td>
<td>0</td>
</tr>
<tr>
<td>Bradley Richards</td>
<td>51</td>
</tr>
<tr>
<td>Jacob Rico</td>
<td>50</td>
</tr>
<tr>
<td>Citlali Rocha-Ruiz</td>
<td>49</td>
</tr>
<tr>
<td>Michaela Ross</td>
<td>48</td>
</tr>
<tr>
<td>Esvin Ruiz</td>
<td>47</td>
</tr>
<tr>
<td>Laura Soto</td>
<td>46</td>
</tr>
<tr>
<td>McKenzie Stevens</td>
<td>45</td>
</tr>
<tr>
<td>Eric Terrazas</td>
<td>44</td>
</tr>
<tr>
<td>Briana Thompson</td>
<td>43</td>
</tr>
<tr>
<td>Glorianna Tokgozoglu</td>
<td>42</td>
</tr>
<tr>
<td>Derrius Washington</td>
<td>41</td>
</tr>
<tr>
<td>Sarah Weekes</td>
<td>40</td>
</tr>
<tr>
<td>Agel Yor</td>
<td>39</td>
</tr>
</tbody>
</table>
This case study is a follow-up to a study that explored the perspectives of parents of bilingual children on dual language programs. The study utilized a survey in order to assess parents’ understandings of dual language programs in which their children participated. This study found the following: (a) 56% percent of the candidate children grew up learning two languages, (b) most of these children were introduced to a second language at the age of three years, and (c) over half of those surveyed considered their family to be bicultural. A subsequent study assessed the perspectives of educators who participated in a 9-week Dual Language pilot program conducted in a Midwest early childhood center. Four themes emerged from data collected from key stakeholders and teachers in the study. The findings of this study acknowledged teacher hesitations, assumptions, and anecdotes. The findings indicate that educators within the case study struggled to make sense of their positionality within the program.

Merida Acosta will be available for “DSP dialogues” on April 21, 2021, 4-6 pm
Landfills play a pivotal role in the total integrated waste management system of the United States, and the treatment of the wastes is essential for the foreseeable future. Greenhouse gases (GHG) such as methane (CH4) and carbon dioxide (CO2) are produced by the decomposition of organic wastes in landfills. Methane can be oxidized by methanotrophs, a group of bacteria that utilize CH4 as their sole carbon and energy source. Nitrogen-based fertilizers have demonstrated promising results for stimulating CH4 oxidation in soils as the nitrogenous fertilizers are used as nitrogen sources by the soil microorganisms. However, nitrogen can lead to increased nitrous oxide (N2O) production by stimulating other microbial groups. Therefore, any amendment strategy should not only attempt to increase methanotrophic activity, but also control the biogenic production of N2O. Certain plant species produce and release biochemicals from roots to suppress nitrifying microorganisms (also known as biological nitrification inhibitors: BNIs).

The overall goal is to develop plant-assisted microbially driven strategy to mitigate GHG emissions from landfill cover soils using BNI-producing plants. Plant species and nitrogen availability were examined in laboratory column experiments using landfill cover soils collected from the Salina Municipal Solid Waste Landfill to stimulate methanotrophic activity while minimizing N2O production. Artificial landfill gases were applied to the base of the column, and soil amendments consisted of (1) control (no amendment), (2) nitrogen-only, and (3) nitrogen- and plant. Two different plants: Soybean and Brachiaria mulato were used to reveal the BNIs, and two doses of ammonia-releasing compounds were evaluated for net GHG emission reduction. DNA and RNA were extracted from the soil samples and subjected to microbial community analysis. Direct quantification of gene abundances and transcripts was examined using quantitative PCR (qPCR) and reverse transcriptase quantitative PCR (RT-qPCR). It is hypothesized the amendment of nitrogen fertilizer with BNI-producing plants will maximize microbial consumption of CH4, while repressing biogenic N2O production.

Manuel Aguero will be available for “DSP dialogues” on April 20, 2021, 3-5 pm
An inductor is an electrical component that consists of a coil of wires. It is one of the main building blocks of electronic devices. As in the modern days, compact and multifunctional electronic devices present greater appeal to the public community, which implies that smaller size inductors are desired. However, the currently available fabrication process for inductors relies on a 2D planar design or turn-by-turn windings process on 3D inductors, which suffers from low fabrication efficiency and large space consumption. Another challenge associated with a small 3D inductor comes to the degradation of inductance as the size of the inductor decreases. To overcome this, we propose a fabrication process for small power inductors using 3D printing, selective electroless plating, and electroplating. To boost up its inductance, a highly laminated ferromagnetic core composed of 50 stacks of thin nickel film was constructed. The inductor frame was designed like a rectangular tube with 10 turns of solenoid trench and ridge on it. The fabrication process starts by 3D printing the inductor frame using a stereolithography (SLA) based 3D printer. The ridge of the inductor frame was coated with novolac resin, which prevents copper deposition in the next step. Next, the coated inductor frame was selectively electroless copper plated on the trench to form the solenoid wire coil. Lastly, the solenoid wire coil was copper electroplated to thicken the wire size to reduce the resistance. An average inductance of 195 [nH] was measured and it was boosted to 283 [nH] with the ferromagnetic core.

Abdulfeta Ahmed will be available for “DSP dialogues” on April 20, 2021, 3-5 pm
Utilizing engineered processes is becoming more common in solving/reducing the issues created by environmental anomalies. Specifically, when observing the development of rain gardens and their maximized potential when it comes to treating stormwater runoff, it is easy to recognize the need for green infrastructure. For this project, the testing of infiltration rates in different soil mixtures are utilized to understand the proper way to manage excess runoff in residential areas, schools and other infrastructures that experience water excess. The factors that are considered for engineered soil(s) that will be utilized for the rain garden are soil aeration and the particle size analysis that play a part in the infiltration rate and the consistency of the soil once saturated. These parameters that are recorded and analyzed through methods like the hydrometer method are used to determine the specific gravity and give the density of the soil suspension in a liquid. The results are projected to help clarify the importance of rain gardens and the way soil makeup can affect the functionality of green infrastructures by either making rain gardens susceptible to capture and properly dispose excess runoff, or cause water build up and improper conditions for vegetation to thrive and microorganisms to live in a symbiotic relationship with plants in the rain garden.

*Keyword(s): Infiltration rate, soil aeration, particle size analysis, hydrometer method, specific gravity, rain garden.*

Melina Alferoff will be available for “DSP dialogues” on April 21, 2021, 3-5 pm
Moises Alvarez

“It’s the Racism for Me:” Third-Party Perceptions of Disparaging vs. Subversive Racial Humor
Moises S. Alvarez, Abigail B. Crawford, Tiffany J. Lawless, Stuart Miller, and Donald Saucier
Department of Psychological Sciences
College of Arts and Sciences

Racial humor often functions in an antisocial, disparaging fashion, but racial humor may also be used subversively (Rappoport, 2005; Saucier, O’Dea, & Strain, 2016). Subversive racial humor is a type of humor that confronts prejudice by making racism itself the butt of the joke. However, many people incorrectly interpret subversive humor as attacking the racial group directly and as being disparaging (Miller et. al., 2019). This research explores third-party perceptions of disparaging and subversive humor in varying social contexts. Study 1 will be a mixed design in which we will manipulate the race of the person listening to a joke (a White/Black person), the target racial group of the joke (joke about White/Black people), and what reaction the listener has to the joke (laughing/not reacting). Study 2 will use mock social media posts and manipulate the race of the person who posted the joke (a White/Black person), the type of humor used (subversive/disparaging), and reactions to the post (likes/no reactions/angry faces). These studies are among the first to illustrate the influence receivers’ reactions have on third-parties’ judgments of racial humor as disparaging or subversive.

Moises S. Alvarez will be available for “DSP dialogues” on April 21, 2021, 3-5 pm
With medical cyber-physical systems, we need to maintain or increase access to resources in the event of an emergency. This can expose private patient data. In past work, the SyNeSec Lab has addressed this by implementing “controlled Break The Glass” (BTG). We experimentally demonstrated that BTG can allow emergency access to most resources while maintaining most of the original authorization policy, maximizing patient privacy. During emergency access, BTG generates detailed access logs which may require manual audit. The current goal is to minimize or eliminate the need for a manual audits by using machine learning. Long Short-Term Memory (LSTM) are neural networks effective at finding patterns in data and predicting future events.

We use LSTM to model clinician behavior using “detectors” to find anomalies in usage patterns, e.g., unique patient records viewed, devices per session, and length of active session. Each detector calculates an anomalous score from the logs for each session. If the score gets higher than a threshold, it is flagged as anomalous. Each detector has real-time and long-term components detecting anomalies as they happen and after sessions' ending respectively; overall effectiveness is calculated based on the results of the both detectors. With three detectors, our system had a precision of 88% when the anomalous threshold was at 3. We are now comparing those results against a four-detector system. Our main limitation is lack of access to real hospital data; we are currently using synthetic data and searching for public data sets.

Nhicolas Aponte will be available for “DSP dialogues” on April 21, 2021, 2-4 pm
Leslie Armendariz

**Evaluation of Substrate: Buffer Ratios for In Vitro Cultures Inoculated with Equine Cecal Contents**

Leslie Armendariz, Clarissa C. Conrad, James S. Drouillard, Ching Kang, Patricia Ochonski, Vanessa Veloso, and James M. Lattimer

Department of Animal Sciences and Industry, Equine Nutrition
College of Agriculture

*In vitro* methods have been proven to be cheaper and less expensive to conduct nutritional studies. The *in vitro* fermentation method is used to study the digestibility in animals. The objective of this project was to evaluate fermentation parameters of the cecum with different levels of substrate to determine the impact of comparing different substrates and levels using the ANKOM RF (ANKOM Technology; Macedon, NY) System on the production of pH, gas pressure, dry matter disappearance, neutral detergent fiber, and volatile fatty acids. Four cecally cannulated Quarter horses were used as inoculum donors. The samples were randomized between two different substrates consisting of brome and corn, with 7 different treatment levels per substrate: 0, 0.5, 1, 1.5, 2, 3, and 4 grams (g) per flask. The flasks were equipped with gas pressure monitors and placed in a 39°C shaking incubator for 48 hours. The data was analyzed using a mixed model with fixed effects of treatment, time and treatment by time interaction, and random effect of run by horse within run. Gas production, terminal pH, and VFA production increased in the amounts of 2 grams or less; however, decreased 3 and 4 grams of substrate during linear and quadratic changes ($P<0.0001$). Suggesting that cultures containing less than 2 grams of substrate were limited in microbial activity. In conclusion, samples used *in vitro* systems, should be limited to no more than 2 grams of substrate for optimum fermentation productivity.

Leslie Armendariz will be available for “DSP dialogues” on April 21, 2021, 3-5 pm
Soil can be hydrophobic as well as hydrophilic. If the soil is hydrophobic, water can be repelled at the surface and evaporate after the soil is irrigated, thus affecting soil viability and putting higher demands on irrigation. Based on this need, the goal of this research is to test the water holding capacity and evaporation rates of various agricultural soil textures across Kansas, and to investigate the use of a surfactant additive to lower the evaporation rate and increase water retention. After confirming that the water retention is increased in soil samples where the surfactant was added, the experiment is repeated using when treating the soil with a soil bacterium, Bacillus subtilis capable of producing the surfactant, rather than adding the surfactant mechanically. To conduct these experiments, different types of soils were collected. The samples were kept at refrigeration temperature, and sterilized with the Tyndallization method, which required raising and lowering the temperature at different time intervals. Samples were sterilized to kill endogenous microbes that could affect outcomes while retaining other soil properties. To measure the evaporation rate, water was added to the samples in an experimental setup consists of an oven with two scales. One scale contains a control (soil with no surfactant) and other contains soil with the surfactant added. We then capture the data or weight change. The water is added periodically to stimulate irrigation cycles. This experiment is ongoing, and though it is not completed yet, the expectations are that the bacteria would produce biosurfactants that can help the water retention of water in the soil.

Yuriana Arroyo-Bocanegra will be available for “DSP dialogues” on April 20, 2021, 3-4 pm and April 22, 2021, 3-4 pm.
Production and Purification of Aromatase for Co-Crystallization with Potent Inhibitors AR11 and AR13
Bryant Avila, Raul Leyva-Montes, and Ho-Leung Ng
Department of Biochemistry and Molecular Biophysics
College of Arts and Sciences

Aromatase (CYP19) is a cytochrome P450 enzyme responsible for catalyzing the conversion of androgens to estrogens. Inhibiting this enzyme is one current approach to treating breast cancer. Current antineoplastic therapeutics commonly produce unwanted side effects, thus creating a need for more efficacious drugs. In an attempt to stabilize aromatase, we have created some mutants, A419S, L240S, G156A, and V80S. These mutants will be co-crystallized with two of our lab’s potent inhibitors: AR11 and AR13. We anticipate these mutants will increase the likelihood of producing protein-inhibitor crystals. The 3D structure produced from a crystal structure of aromatase is a crucial step in rationally designing novel drugs for the treatment of hormone dependent breast cancer.

Bryant Avila will be available for “DSP dialogues” on April 20, 2021, 3-5 pm
Thermal therapies are minimally invasive interventions used for treating localized cancer and benign disease. For example, thermal ablation, heating ~50-60°C, is used for stand-alone treatment of tissue. Another example is mild hyperthermia, heating ~40-44°C for ~30-60 mins, is used as adjuvant treatment. To identify thermal dose targets for treatment of pancreatic cancer, we are interested in evaluating cell survival and stress protein release in pancreatic cancer cells following thermal exposure. In cell culture, one may use frozen cells to conduct research, to do this they must be heated and thawed for use. However, above certain temperatures cells collapse and die; for research purposes this poses a problem. How does one heat up cells without killing them? Currently there are techniques such as using a water bath. Our technique includes submerging sealed cell-culture well-plates within a water bath, and using lab-constructed thermocouples to monitor the temperature profiles during heating. This is achieved by placing thermocouples in some dummy wells that do not contain cells. This aspect of our research contributes to our overall research objective of developing an in vitro instrumentation platform for assessing bio-effects of heating in the temperature range 40 – 60 °C; using heat as a therapeutic modality. While this remains our future goal, our current focus is a literature review regarding different techniques and methods for heating cells. We searched PubMed and Google Scholar databases using a set of keywords to determine which articles were suitable for review, and a detailed literature review is in progress.

India Barnett will be available for “DSP dialogues” on April 20, 2021, 3-5 pm
In the first hours of life, colostrum ingestion is essential for calves to access maternal antibodies and other concentrated nutrients to improve resilience. A calf’s motivation to stand, seek, and suckle just after birth typically depend on their birthweight and the amount of internal and external cues. Twin calves generally have lighter birth weights than singletons. The objectives of this observational study were to compare behavioral responses after birth and measures of passive transfer of immunoglobulins (Ig) among twin (n=29) and single (n=10) beef calves. Cows and calves were monitored during the perinatal period (labor, parturition, and first meal behaviors). One day after birth, weights and blood (for serum) were collected. Passive transfer of colostrum was determined by measuring total serum protein (TSP) using a BRIX-refractometer. Serum IgG1 and IgM were determined using ELISA. As expected, singletons weighed more than twins (P < 0.01), but twins spent less time finding the first teat just after birth (P = 0.03). Serum TSP was similar among all calves (P > 0.10), IgG1 concentrations were greatest among singletons (P < 0.01). These findings indicated that although a sibling improves suckling motivation, singletons still have the advantage because they have complete access to all of the dam’s available resources in utero and after the first meal.

Camille Bradshaw will be available for “DSP dialogues” on April 20, 2021, 3-4 pm and April 22, 2021, 5-6 pm.
It's estimated that 78 million dogs and 85.8 million cats are owned in the United States. Pet food companies use many traditional ingredients. Grain Distillers Yeast (GDDY) is a high yeast containing variation to Distillers Dried Grains and Soluble (DDGS). New ingredients must be distinguished for how they will benefit the animal and the owner regarding health and acceptance. The objectives of this study were to: 1) determine the level of Grain Distillers Yeast (GDDY) that is best liked by pet owners, and 2) To determine the contribution of GDDY on the sensory profile of cat and dog foods. Four treatments each of dry dog and cat food were extruded and included: Treatment 1 (control, 20% corn gluten and soybean meal), Treatment 2 (10% corn gluten meal and soybean meal + 3.5% brewers dried yeast), Treatment 3 (17.5% standard distillers dried grains and soluble (DDGS) + 2.5% brewers dried yeast and Treatment 4 (17.5% (GDDY) + 2.5% corn starch). Dog and cat owners (n=105) were asked to evaluate the treatments and to fill-out a survey during a consumer study. In addition, descriptive sensory analysis was conducted by trained panelists in order to understand the sensory profiles (appearance, aroma, flavor, and texture) of the cat and dog food samples. Overall, few differences were detected in liking of the samples by the consumer panel. Treatments 2, 3, and 4 performed similarly when compared to the control (Treatment 1). Cat and dog owners showed about the same liking for each treatment. The sensory profiles of the dog food samples varied. Treatment 3 had a darker brown color, less firmness and had a strong vitamin flavor. Treatment 2 was the lowest in oxidized oil aroma, highest in grain flavor and had a barnyard aftertaste. The sensory profiles of the cat food samples were similar. Overall, the treatments performed similarly, suggesting that these treatments may be used as alternate ingredients. Future research should identify the potential benefits these ingredients may have for pet health and palatability.

Nyah Brandon will be available for “DSP dialogues” on April 20, 2021, 3-5 pm
Phlebotomy-Induced Reductions in Hematocrit and Hemoglobin: A Quasi-Experimental Study

Elena A Carlos, Trevor J Steele, Catherine C Steele, Anna Biggins, Alissa Towsley, Armin Ezzati, and Sara Rosenkranz
Department of Food, Nutrition, Dietetics & Health
College of Health and Human Sciences

Background: Phlebotomy-induced anemia is common within hospital settings. There are ethical concerns regarding a similar potential for phlebotomy-induced reductions in iron status within research settings. Therefore, the purpose of this study is to utilize two ongoing clinical studies involving serial blood sampling, to determine whether hematocrit and hemoglobin levels decrease over the study durations.

Methods: We undertook a secondary analysis of two ongoing randomized controlled crossover clinical studies that involve serial phlebotomy. These preliminary analyses include 20 participants enrolled in one of the two studies (6M/14F; ages 18–65 yrs.; BMI >23–34.9 kg/m2). Hematocrit and hemoglobin were determined at baseline and post-test using whole blood samples. Paired t-tests were used to determine changes in hematocrit and hemoglobin levels.

Results: Differences from baseline to post-test for hematocrit and hemoglobin were not statistically significant. Hematocrit (n=7, Mean±SD) was 43.4±2.06% at baseline, and 45.0±3.34% at post-test (p=0.17). Hemoglobin (n=8) was 14.68 ± 0.70 g/dL at baseline, and 16.01±2.27 g/dL at post-test (p=0.18). Data indicated increases from baseline to post-test for five of seven participants for hematocrit, and six out of eight participants for hemoglobin, with small decreases in one participant for both hematocrit and hemoglobin.

Conclusion: Following completion of data collection, results will contribute to understanding best practices for research studies where repeated phlebotomy is necessary, in order to reduce potential risk for phlebotomy-induced anemia. Future studies should examine whether there are cut-points for total blood sample volume, given study duration, that could put participants at risk for phlebotomy-induced anemia.

Elena A Carlos will be available for “DSP dialogues” on April 20, 2021, 3-5 pm
The goal of this research is to extract textual content from PDF scientific literature. The number of digital scientific publications is growing rapidly and containing enormous valuable information. To extract textual content from these digital scientific publications is a necessary step to process the information by computer. Although the existing text extraction tools or methods can help to extract text from digital publications, they also bring noisy data to the extraction results. For example, some unnecessary textual contents in the graphs or tables are also extracted into the result. These noises will generate errors for further analytical work. To address this issue, I propose a strategy by identifying the keywords which can help to filter out the noisy textual contents from extracted raw text which is generated by different open-source tools such as metadata extractor, open-source text extraction tool. Specifically, these noisy elements that are not necessary typically contain terms that are easy to identify, for example, Figure 1, Table 1. As ongoing work, my strategy has been able to filter out a reasonable amount of non-relevant text and the current rate of success is 35%.

Richard Carmona Andrade will be available for “DSP dialogues” on April 20, 2021, 4-6 pm
There are many air contaminants that can cause an issue such as sulfur oxides, nitrogen oxides, halogenated organics, and volatile organic compounds. These can be harmful for not just an individual, but for the environment as well. One of the best ways to approach this issue is through photocatalytic oxidation using semiconductors as the catalyst. Titanium oxide is the most promising catalyst as it has many advantages, yet it still has its limitations. Carbon nanotubes may be the solution to these limitations and improve the performance of titanium oxide.

German Castillo will be available for “DSP dialogues” on April 20, 2021, 4-6 pm and April 22, 2021, 4-6 pm.
Heat pipes can be used to cool electronics in NASA shuttles, yet the heat pipes can still manage to freeze in space and cease functionality. Heat pipes can be found in a variety of electronics. We, however, are examining the mechanism of the heat pipes as well as the wick structure. Our goal is to understand and mitigate the effects that cause the freezing that occurs within the heat pipe itself. By doing this, we hope that they can run a lot more efficiently. We are doing this by first setting up a controlled environment of 20 degrees Celsius, 60% relative humidity and setting the peltier cooler to -5 degree Celsius then we proceed to put the heat pipe under a confocal microscope, then simulating the freezing temperatures of space by using a peltier cooler (which is a temperature-controlled mount). We look at the images from the microscope and determine how long it takes for freezing to occur. Then we repeat the process to see if the result we get can be repeated. We have had 3 test types: sintered wick, grooved wick, and plain copper. Each type has multiple pieces that we test.

Adan Cernas will be available for “DSP dialogues” on April 21, 2021, 4-6 pm
Hydrophobins are amphiphilic proteins that are naturally found in filamentous fungi. Their properties have been studied, and they have shown potential to be useful in the food industry regarding foams and in the medical industry regarding slow-releasing drug delivery mechanisms. While the benefits of hydrophobins are actively explored, the production of hydrophobins remains a challenge for rapid economic production. There are different approaches for improved production, and genetic cloning for expression and production of hydrophobins in different organisms is a promising approach. Recombinant DNA technology provides a way to artificially construct DNA that express proteins in other organisms. By using the recombinant DNA technology, a DNA fragment that encodes hydrophobin can be inserted and the recombinant DNA plasmids will express the protein. Here, I present a research about cloning of the gene for a specific hydrophobin, HFBI, for expression in Escherichia coli. To begin, DNA fragment insert was synthesized, amplified by PCR, digested, and ligated into a bacterial vector plasmid. After transformation, the E. coli bacteria were cultured on agar plates with ampicillin, which selected the bacteria colonies that contained the transformed plasmids. After isolation of the DNA plasmids and digestion by restriction enzymes, a gel electrophoresis was run with a sample size of plasmids to determine if the correct sequence was inserted into the plasmid template. The samples with correct insert sizes were confirmed by sequencing. Further steps to produce hydrophobins will be to express and analyze expression profiles in E. coli. Optimization of the production of hydrophobins using recombinant DNA will bring out the full potential of hydrophobins.

Luz Isabel Cobian Lepe will be available for “DSP dialogues” on April 20, 2021, 5-5:30 pm, April 21, 3-4 pm, April 22, 4:45 – 5:15 pm.
The rates of suicides in the U.S. is on the rise. According to the National Institute of Mental Health, suicide is the second leading cause of death for people in between the ages of 10 and 34. There is a need for more effective treatments for suicidality. This study compares the efficacy of a widely used cognitive-based treatment, Cognitive Behavioral Therapy (CBT) and a trauma-based treatment, Eye Movement Desensitization and Reprocessing Therapy (EMDR). Results indicate that while the decrease in suicidality from pre- to post-test was significant (at the .05 level) in both groups, only in the EMDR group was this reduction in suicidality sustained at the 1-month follow-up. These results indicate that while both cognitive- and trauma-based treatments may be equally efficacious in treating suicidality, the latter may provide more sustained outcomes.

Sergio DePena will be available for “DSP dialogues” on April 20, 2021, 3-3:40 pm, April 21, 3:00-3:40 pm, April 22, 3:00-3:40 pm.
Cells can migrate collectively in groups during development and disease such as organ formation and tumor metastases, respectively. However, we still do not understand how cells stay together while moving inside tissues. *Drosophila* border cells are a genetically accessible model of collective cell migration. During ovarian development, the border cell cluster, made up of 6-8 cells, migrates as a cohesive group. Inhibition of Protein Phosphatase 1 (PP1) activity, through overexpressing an endogenous (and specific) inhibitor, nuclear inhibitor of PP1 (NiPP1), triggers the border cell cluster to separate into single cells and limits their ability to migrate correctly. This finding suggests that PP1 normally helps border cells migrate as a group and keeps the cells together in a cluster. To identify the molecular targets of PP1, as well as genetic pathway members, we performed a genetic modifier screen of NiPP1-induced border cell phenotypes. We screened mutant lines from the Bloomington Deficiency Kit, which together delete large chromosomal regions throughout the genome. This screen allowed us to test if altered gene dosage either enhanced or suppressed the effects of NiPP1 on border cell cohesion or migration. We are currently focused on identifying one genetic enhancer from a strong interacting deficiency we identified on the third chromosome. Through multiple genetic tests, we have narrowed down the larger interacting region (~200kb) into multiple smaller regions that enhance migration. Current experiments are focused on confirming the location of the interacting region through genetic tests, with the goal to identify the gene that interacts with PP1. Since many *Drosophila* genes are conserved in humans, our studies in *Drosophila* border cells have implications for collective cell migration in human development and cancer.

Carmen Del Real will be available for “DSP dialogues” on April 20, 2021, 3:00-4:00 pm, April 21, 5:00-6:00 pm.
Performance of a Refrigeration System Using R-134a Alternatives Refrigerants
Carlos Espino-Mendez, Jordan Morrow, and Melanie Derby
Department of Mechanical and Nuclear Engineering
Carl R. Ice College of Engineering

Refrigerants are working fluids used in a refrigeration cycle, such as an air conditioner or a refrigerator. Refrigerants impact of global warming, which is why the United Nations Industrial Development Organization (UNIDO) has developed agreements that will reduce the effects of global warming and climate change. Most recently the Kigali Agreement will reduce the production and consumption of Hydrofluorocarbon (HFCs) refrigerants. HFCs have zero Ozone Depletion Potential but high GWPs (>1000). Hydrofluoroolefin (HFOs)/HFCs mixture refrigerants are one promising option for replacing HFCs because they can offset the higher costs and lower performances found in pure HFOs. Our research used HFC R134a and HFO/HFC mix R513A in a small-scale refrigeration system to compare the performance of the refrigerants. The refrigerant flows through a compressor leaving as a high-pressure superheated vapor, condenses to a high-pressure liquid in the condenser, and flows through an expansion valve becoming a low-pressure liquid-vapor mixture. Next, the refrigerant flows through the evaporator where it becomes a low-pressure superheated vapor, where it returns to the compressor to repeat the cycle. The cycle runs at condenser temperatures of 40-60 °C and evaporator temperatures of 15-30 °C. Research is still undergoing and results will have a comparison of the Coefficient of Performance (COP) and Cooling Capacity (CC) of both refrigerants to conclude the advantages and disadvantages of both refrigerants.

Carlos Espino-Mendez will be available for “DSP dialogues” on April 20, 2021, 4-6 pm.
When people witness a traumatic crime, the stress they experience may affect how they attend to and later remember the event. Past research has found that memory is better for central compared to peripheral details, specifically during an emotional event. However, there isn’t a clear definition for central and peripheral details. Some research studies define central as the center and peripheral as what surrounds the center. While other studies define central as the plot and peripheral as an object present in the scene but irrelevant to the plot. The current study was an opportunity for participants to choose what they deem as central and peripheral information in a traumatic real-world crime. 60 participants from Kansas State University Psychological Sciences subject pool completed the study and received course credit for their introductory psychology course. 30 participants were put into a neutral condition where they watched 5 mundane videos while the other 30 participants in the emotional condition watched 5 traumatic videos. Participants in both conditions were instructed to select at least 3 central objects and 3 peripheral objects in each video. We generated heat maps based on the participants’ selections. Participants in both conditions selected people as their main central object and for peripheral objects they clicked on less relevant objects in the scene. Data from this study will be used to help future studies create memory questions for different populations (e.g., Post Traumatic Stress Disorder).

Estefani Fernandez-Patlán will be available for “DSP dialogues” on April 21, 2021, 3-4 pm and April 21, 2021, 2-3 pm.
Kids Chat with Cats: Exploring children’s perceptions of physical activity

Evangelina Gallardo, Jerica Garcia, Miriam Avila, Alissa Towsley, Anna Biggins, Carlean Sanders, Mia Talley, Sydney Stephens, and Emily Mailey
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Research suggests that young children tend to engage in physical activity for enjoyment, while most adults report exercising for extrinsic reasons, such as weight loss or appearance. Understanding when and how physical activity perceptions develop and shift could help inform communication strategies for adults who interact with youth, therefore increasing physical activity, motivation, and self-efficacy among children. The purpose of this study was to examine how perceptions of physical activity differ among children of various ages from grades K-12. Children (N=143) responded to questions about physical activity during a 10–15-minute interview. All interview responses were transcribed and categorized by different age groups and gender. Only 2% of participants gave reasons related to weight/appearance for kids to be active. The top reason for kids to be active was to be healthy (44%). Participants reported doing sports activities (21%) with their parents most often, followed by walking/hiking (17%). Elementary children were most likely to say they like physical activity because they get to move and play (38%), middle school students liked seeing physical improvements (32%), and high school students said it makes them feel good (43%). Middle (42%) and high school students (43%) were more likely to say their friends preferred to do other non-active activities than elementary students (15%). High school students reported more school barriers (excessive sitting, limited PE opportunities, too much homework) than elementary or middle school students. Overall, 67% of kids said their parents do not create any physical activity barriers. These results provide insight regarding future strategies to promote physical activity among children.

Evangelina Gallardo will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
Pet Foods are commonly formulated with vitamin and mineral premixes, which typically require carriers to ensure proper dispersal across the ration. The objective here was to evaluate various Miscanthus grass preparations relative to standard carriers. Four preparations of Miscanthus grass (M11, M13, M14, and M33) were evaluated and compared to rice hulls (RH), pea fiber (PF), and soybean hulls (SH) based on particle size distribution, mixer efficacy, critical orifice diameter (COD), and angle of repose. The Miscanthus treatments all had smaller mean particle sizes (139.84-295.29µm) compared to RH, SH, and PF (339.35, 802.46, and 458.42µm, respectively). During the mixing analysis, M13 had the smallest coefficient of variation (CV), followed by M33, SH, M11, RH, M14 and largest for PF (3.61, 4.63, 5.36, 5.97, 6.02, 9.21, and 17.08%, respectively). The M33 treatment was the only Miscanthus preparation to pass through an available disc size (32mm) of the COD test. Soy hulls had the smallest COD followed by PF, RH, and finally M33 (12, 18, 20, and 32mm diameter openings, respectively). Among the Miscanthus treatments, angle of repose was smallest for M33 (46.49º) and largest for M11 (53.54º). For the standard carriers, angle of repose was smallest for SH followed by RH, and largest for PF (35.28, 40.24, and 41.00º, respectively). In conclusion, the conventional carriers (RH, SH, and PF) had larger particle size and better flow indicators than Miscanthus treatments; among the latter M33 performed the best.

Melissa Gaona will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
Valproic acid female rats have decreased purkinje cells in crus I of the cerebellum
Brian Garcia, Zach E McKinnell, Taylor Davison, Tessa Maze, Cole King, Brandon Challans, and Bethany Plakke
Department of Psychological Sciences
College of Arts and Sciences

Children diagnosed with autism spectrum disorder (ASD) display repetitive and restrictive behaviors that are often associated with an abnormal cerebellum. To further understand the effects ASD can have within the brain the valproic acid (VPA) model was utilized. VPA rodents display similar symptoms as observed in people with ASD. People with ASD also have executive function deficits, therefore the attentional set-shifting task was used to examine cognitive flexibility in rats. After collecting the behavioral results, the rats were euthanized, and immunohistochemistry was performed to tag Purkinje neurons. Cells in crus I of the cerebellum were counted, which is an area that sends projections to the frontal cortex. The hypothesis of this experiment states that if female VPA rats perform worse in the set-shifting task, then this would correlate with a smaller number of Purkinje cells compared to saline-treated female rats. Preliminary results demonstrate that female VPA rats have significantly fewer Purkinje neurons of crus I compared to control female rats. In addition, female VPA rats were impaired on the set-shifting task. Additional analysis is ongoing to assess the relationship between crus I and the behavioral performance of the rats. The results of the study provide evidence that alterations of the cerebellum in female VPA rodents may impact cognitive performance.

Brian Garcia will be available for “DSP dialogues” on April 20, 2021, 2-5 pm and April 22, 2021, 2-5 pm.
This project deals with autonomous mobile robots trained using reinforcement learning, a branch of machine learning (the science of improving problem-solving performance based on experience) based on choosing actions to maximize rewards from various environments. This is a form of behavioral learning that is observed in nature and thus more biologically plausible than cognitive models based on labeled data provided by a teacher (supervised learning). We developed an experimental test bed by implementing Deep Q-Networks (DQN), a form of reinforcement learning, for goal-oriented navigation and obstacle avoidance tasks using a TurtleBot3 Burger robot and the GAZEBO simulation environment for behavior learning in autonomous agents. To achieve the goal of avoiding obstacles, the DQN Agent provides a positive reward to the robot whenever it gets closer to its goal and a negative reward when it is farther from its goal. The TurtleBot3 Burger requires a large number of training iterations before it achieves the goal and successfully avoids obstacles. Future work involves extending the reward functions so that DQN can be used to learn to solve fully autonomous exploration and mapping tasks, where the robot does not know the exact location of the goal.

Leonardo Garrido Alvarez will be available for “DSP dialogues” on April 22, 2021, 3-6 pm.
Listeriosis is a disease, caused by *Listeria monocytogenes*, which is a Gram-positive intracellular bacterial pathogen that is found in contaminated food. *L. monocytogenes* is not able to replicate in the vacuole of a host cell, because of this *L. monocytogenes* makes an enzyme called Listeriolysin O, which breaks open the vacuole allowing replication to occur in the host cell cytoplasm. Legionella pneumophila is being used as a model to understand ways to restrict diverse bacterial pathogens. The effector protein LegC4 comes directly from *L. pneumophila* which is an accidental human pathogen that naturally parasitizes freshwater protozoa but can also replicate within mammalian macrophages. LegC4 inhibits *L. pneumophila* replication in cytokine-activated macrophages. We hypothesized that LegC4 will inhibit replication in other pathogens. To test this hypothesis, we have done a series of growth curves and infections using wild-type and Δhlx strains of *L. monocytogenes*, which do not produce Listeriolysin O, to determine whether LegC4 is restrictive. The reason we use two types is because the wild-type does not grow in the vacuole it only replicates in the cytosol, while Δhlx is a control for the lack of growth and perhaps enhanced killing mediated by LegC4. Our infections took place in RAW cells, stable RAW cells which expressed LegC4, and bone-marrow derived macrophages. We also treated the cells with either interferon (IFN)-γ or tumor necrosis factor (TNF) because LegC4 enhances clearance of *L. pneumophila* macrophages activated with these cytokines. From all the data we collected we found that LegC4 is showing signs of being restrictive towards the replication of *L. monocytogenes* but further experimentation is required. We also evaluated the role of sorghum polyphenols on *L. monocytogenes* since they restrict *L. pneumophila* intracellular replication. We used different combinations of extracts (HP) or vehicle control (Veh). In contrast to *L. pneumophila*, sorghum polyphenols do not restrict *L. monocytogenes*. In the future we will be working towards evaluating the impact of LegC4 on *L. monocytogenes* infections of mice to test our hypothesis.

Emily Gibson will be available for “DSP dialogues” on April 21, 2021, 11 am – 1 pm.
The Effects of Altering Mu Opioid Functioning on Taste Reactivity for Differentially Reared Rats
Joanne Kellie Gomendoza, Dylan A. Laux, Theodore J. Moser, Miki C. Azuma, and Mary E. Cain
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College of Arts and Sciences

Research suggests that environmentally isolated rats show increased salience to drug reinforcers than enriched rats. Using the taste reactivity paradigm, we have observed that isolated rats show less hedonic “liking” responses to sucrose, which suggests that isolation may result in a dysregulation in the hedonic set point. Mu opioid receptors (MOR) are critical for determining hedonic value. While some studies suggest that MOR function is altered by differential rearing, the MOR function during hedonic responding has yet to be investigated in differentially reared rats. In the current experiment, we examine changes in hedonic responding for sucrose in differentially reared rats while enhancing MOR function with morphine. Long-Evans rats arrived on postnatal day 21 and were randomly assigned to rear in isolated (IC) or enriched (EC) conditions for 30 days. Post-weaning, rats were implanted with intraoral fistulas. Following recovery, rats underwent taste reactivity trials for sucrose, utilizing a within-subjects design with a counterbalanced order for morphine injections (saline, 2 and 4 mg/kg; sc) and sucrose concentrations (0, 0.2M and 0.4M). Taste reactivity data collected was analyzed frame by frame to quantify hedonic and aversive responses. Preliminary data suggest that the higher dose of morphine increases hedonic responding for sucrose only in EC rats. These data indicate that activation of MORs does not increase liking in isolated rats. These results suggest that isolation rearing may alter MOR function to change their incentive salience for reinforcers.

Joanne Kellie Gomendoza will be available for “DSP dialogues” on April 21, 2021, 3 – 5 pm.
Gram-negative bacteria can cause a multitude of infections that can develop into diseases. Common infections from the gram-negative bacteria are pneumonia, meningitis, and bloodstream infections. Gram-negative bacteria have shown to play a role in cancer progression. When compared to Gram positive bacteria, gram-negative bacteria have one major distinction. The gram-negative bacteria have an extra lipopolysaccharide membrane which makes them resistant to most antibiotics and drugs. The main opening for small molecules and drugs to enter gram-negative bacteria is through their porin membrane channels. These channels are located on the outer most membrane. The effect of spatial orientation of charge has shown promising results in the penetration of gram-negative bacteria using a Balgacyclamide scaffold. Therefore, showing that the same molecule with similar chemical properties have a prominent difference in penetration that depends on the spatial orientation of the charge.

Jesus Gonzalez-Morales will be available for “DSP dialogues” on April 20, 2021, 3 – 5 pm.
Pathogenic fungi are a threat to crops that feed mankind. Like any other organism, fungal genomes contain DNA, the building blocks that make that organism itself. Fungal genomes have genes that code for effectors, which are the proteins (i.e. tools) a fungus uses to infect a plant. Plants have an immune system to defend against infection, including from fungi, with a main component termed Resistance genes. These Resistance genes can detect the presence of effectors and stop fungal infection. In this study, we sequenced the genome of Magnaporthe oryzae, an important pathogen of rice and other monocots. We sequenced a strain named Y34 because previous studies found that Y34 has three effectors, but somehow it can still infect rice that has resistance genes for these effectors. Therefore, our project’s focus was to determine if Y34 contains ‘normal’ DNA coding for these effectors (e.g. the sequence is present, the sequence is intact). We sequenced the DNA from Y34 using Nanopore long-read sequencing technology to ensure high-quality genome assembly. This is important because we are looking for specific genes and it is critical for the assembly to be accurate. We used a series of bioinformatic programs to assemble the Y34 genome and identify the three effector genes. Understanding if Y34 has these effectors can lead to further investigations, such as looking for the resistance genes in rice or diving deeper into the transcription and translation of these important determinants of disease.

Kaitlyn Headlee will be available for “DSP dialogues” on April 20, 2021, 3-4 pm and April 22, 2021, 3-4 pm.
Cancer occurs when a mutated single cell continues to divide uncontrollably, developing into one of the more than 200 different cancer types. Currently, cancer is the second leading cause of death worldwide, resulting in 8.2 million deaths. For 2020 in the US only, approximately 750,000 new cancer cases will arise. Current cancer treatments are very costly and cause severe side effects. These treatments include, surgery, chemotherapy, and radiation. This project focuses on the development of an improved therapeutic peptide by combining an effective nucleus penetrating peptide and a highly toxic anticancer peptide, called W\text{TAS-}S\text{A-D-K6L9-AS}. This peptide was synthesized and labeled with Rhodamine B, a fluorescent dye used for tracking purposes. HPLC and mass spectroscopy were used for characterization. Cell studies demonstrated that properties of each peptide individually remained after combining both peptides, which include, high toxicity, cell nucleus penetration, and mitochondria targeting. Also, studies demonstrated that the killing mechanism used by this new anticancer peptide occurs via the necrosis pathway only. Overall, this study demonstrated the development of a promising and advanced therapeutic peptide, which could potentially be more efficient than current cancer treatments.

Vanessa Hernandez will be available for “DSP dialogues” on April 21, 2021, 3-5 pm and April 22, 2021, 3-5 pm.
Why do snakes and spiders freak us out so? Error management theory says that the costs of ignoring a venomous animal are so much greater than avoiding non-venomous species, that it makes sense to favor more of the avoidance errors. This account also helps to explain snake and spider phobias. As a specific case of signal detection theory, however, this should be true for all people, not just those with phobias. The objective of the current research is to better understand how human perception is biased in detecting spiders and snakes. Participants were briefly shown various images (snakes, trees, spiders, and flowers) in varying degrees of degradation. After viewing each image, they were asked to identify whether the image contained a snake or a spider. A set of two experiments contained equal distributions of image type. These experiments found a significant bias for perceiving snakes, but not for perceiving spiders, and very high sensitivity (accuracy in image identification) for both types of pictures. The results of Experiment 1 indicate that spider/snake detection is typically very sensitive (accurate) and only slightly biased when there exists equal distributions of noise and stimuli. A second set of experiments uses a more realistic distribution of only a few snakes/spiders among many trees/flowers, and we expect those result will clarify sensitivity and bias when unequal distributions of stimuli and targets are presented. Understanding the cognitive mechanisms underlying selective perception and attention to snakes and spiders will help to design more effective treatments for those specific phobias.

Ana Karen Herrera Bustillos will be available for “DSP dialogues” on April 21, 2021, 3-4 pm and April 22, 2021, 3-4 pm.
Streambank erosion has become a big problem in Kansas over the years, so the state is heavily investing in streambank stabilization to reduce sediment input in reservoirs. This sediment buildup endangers community water availability by reducing reservoir capacity, which can lead to water shortages or flooding. This research examines streambank erosion patterns of two reaches of the Cottonwood River, which drain into the John Redmond Reservoir in eastern Kansas. The objective of this research is to determine whether the streambanks are unstable and require stabilization or if they are just shifting in a natural pattern. The results of this research will provide insight to streambank erosion processes in an alluvial stream and are intended to help the state make more strategic investments in streambank stabilization projects. To conduct this study, a geographical analysis tool, QGIS, was used to digitize images of the streambanks over a 16-year period. The images were already georeferenced and to reduce file size, images were cut into polygons prior to digitization. The images were inserted as raster files and a spatialite layer was created for each image by tracing the position of streambanks. Measurement tools will be used to analyze changes in streambank position and channel area, which will indicate if the stream is widening significantly. We expect results to show changes in streambank position, but we hypothesize that the area between the streambanks remained relatively stable over the 16-year period, indicating the river has shifted by natural geomorphic processes.

Maria Herrera will be available for “DSP dialogues” on April 21, 2021, 4-5 pm and April 22, 2021, 4-5 pm.
Spatial congruence of small mammal transition zones: How historic climate change shaped biodiversity across the Great Plains

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Division of Biology
College of Arts and Sciences

The Great Plains of North America is a biome largely defined by a lack of physical geography, and instead, separates regional biodiversity across strong gradients of climate from southern savannas and central prairies, to northern boreal forests isolating eastern deciduous and western communities. Additionally, the Great Plains has experienced severe fragmentation and ecological disturbance from anthropogenic impact, including changes to both landscape and climate, but understanding the precise orientation of significant ecological and genetic transition zones offers an opportunity for predicting future geographic shifts in biodiversity as the land and climate continue to change. This study seeks delineation of Great Plains small mammal lineages as part of continent-wide assessment defining regional transition zones and assessing regional biodiversity responses to environmental change. Seven representative species have been selected, from samples collected over three years’ worth of field surveys across the Great Plains, to undergo genetic barcode sequencing of mitochondrial DNA to test the taxonomic validity of previous regional subspecies designations. Bayesian coalescence analyses of the collected samples, and existing comparative data from GenBank, will allow me to diagnose the regional phylogenetic diversity of each species, and using GIS software I will compare the geography of genetic transitions across each species to identify significant ecological and evolutionary transitions zones. Anthropocene environmental trends reveal a global, human-mediated biodiversity crisis possibly mitigable through modern scientific methods, and small mammal communities may play a vital role in revealing evolutionary processes of change across ecological time scales.

Tommy Herrera will be available for “DSP dialogues” on April 20, 2021, 3-6 pm and April 21, 3-4 pm, and April 22, 4:30-6 pm.
Investigating RNA interference in *Manduca sexta* using Branched Amphiphilic Protein Capsules (BAPCs)

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RNAi is a useful method for interfering with a gene’s expression and observing what effect this has on an organism. Double stranded RNA (dsRNA) is not natural to a cell and is targeted for degradation. Messenger RNA (mRNA) that is a match to the dsRNA is also targeted; this is how we can interfere with the expression of a gene. However, this technique has not been very successful in butterflies and moths. Branched Amphiphilic Peptide Capsules (BAPCs) are small protein nanocapsules that have been used successfully to deliver dsRNA. We want to test if BAPCs will be helpful to deliver dsRNA in the caterpillar of the tobacco hornworm, *Manduca sexta*. To test this technique, we targeted the two genes that encode for insecticyanin, a protein that is responsible for the green color of the caterpillar’s cuticle and hemolymph (insect blood). If successful, the color of the caterpillars should be lighter green or white. The method we decided to try was injecting the solutions into the caterpillars. We injected the caterpillars when they were small (4 days old) so that when they get larger if the knockdown is successful they should be paler in color. The controls were caterpillars treated with dsRNA only, BAPC only, or water. We observed the caterpillars for 7 days and observed the color of their cuticle and hemolymph. In preliminary experiments, the caterpillars that were treated looked similar to the control caterpillars, with no difference in cuticle color, insecticyanin levels in the hemolymph, or insecticyanin mRNA levels. These results suggest that the BAPCs were not effective in delivering dsRNA into the cells that produce insecticyanin.

Kierra Holloman will be available for “DSP dialogues” on April 21, 3-5 pm.
Bicultural Identity’s effect on Secondary Education
Maria Izquierdo and Jennifer Francois
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College of Health and Human Sciences

In a world that is so diverse, we are seeing more bicultural individuals in our communities every day. Bicultural individuals are defined by experiencing different cultures and self-identify as having 2 or more cultural identities. In this field, there have been many studies stating that a person’s experiences being bicultural has been linked to: mental health status, familial impacts, and learning obstacles. However, a gap in the literature exists when it comes to studying the effects of biculturalism in education. This study addresses this gap by investigating the relationship between biculturalism and an individual’s perspective plans for higher education. This information would strongly impact how we plan education programs for bicultural students in the future. Currently, this informative study is still in the developing stages, that being said we hope and expect to see a positive correlation between these biculturalism and prospective plans for higher education.

Maria Izquierdo will be available for “DSP dialogues” on April 21, 4-6 pm.
Disclaimers such as “I’m not sexist but…”, acknowledge that the statement could be perceived as offensive, even if is not the speaker’s intent to offend. Previous research has demonstrated that disclaimers can increase perceptions of speakers as prejudiced (Jones et al., 2020). For individuals with higher tendencies to perceive prejudice, the speaker’s inclusion of a disclaimer may be viewed as a sign that the speaker is being prejudiced, even when the following statement is benign. We examine how propensities to make attributions to sexism (PMAS; Miller & Saucier, 2018) and disclaimers interact to predict perceptions of sexist statements. In a 2 (disclaimer/none) x 3 (statement: prejudiced/ambiguous/benign) x continuous (PMAS) design, participants rate the prejudice of the speaker, their statements, and their prejudicial intent. We hypothesize that disclaimers may ironically increase perceptions of the speaker and their statement as prejudiced, especially for individuals who expect to see prejudice. Future research can examine perceptions of disclaimed statements when manipulating the speaker's identities (e.g. race/gender).

Daijah Jones will be available for “DSP dialogues” on April 20, 2021, 3-4 pm and April 21, 2021, 3-4 pm.
Detection of Oil and Hydraulic Fluid in Bleed Air Using Particulates
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Bleed air is the air that is extracted from turbine engine compressors in aircrafts. This air is used for a variety of things, including pressurization and ventilation of the cabin. Thus, the quality of the bleed air is important for the safety of passengers and pilots. In this project, particulates were used as a marker to measure the amount contamination in the bleed air from both oil and hydraulic fluid. The bleed air was sent through multiple sensors to test for both the chemical composition and size distribution of the particulates. This presentation will focus on the size distribution. It was found that both oil and hydraulic fluid contamination could be detected based on the particles they generate. The oil generated ultrafine particulates up to three orders of magnitude greater than baseline. The contamination was less at larger sizes of particulates. The hydraulic fluid generated fine particulates about one order of magnitude greater than baseline.
Sneaking into Enemy Territory: “Trojan Horse”
Antibiotic Susceptibility of \textit{E. coli} Mutants
Ruth Mekuria, Gloriana Tokgozoglu, Ashish Kumar, Taihao Yang, Salete Newton, and Philip E. Klebba
Department of Biochemistry and Molecular Biophysics
College of Arts and Sciences

The purpose of our research was to determine the efficiency of a “Trojan horse” antibiotic (Antibiotic A) against three mutants of the \textit{E.coli} BN1071 strain: OKN3, OKN359, OKN13. The efficiency of these antibiotics was determined through disk diffusion tests, where we dropped antibiotic disks on LB agar plates with the bacteria and observed the zones of inhibition. The zone of inhibition is a clear halo in the agar where the bacterial colony was killed. The size of these halos indicate how efficiently the antibiotic worked against the bacteria; the larger the halo, the more efficient it worked against the specific strain.

Ruth Mekuria will be available for “DSP dialogues” on April 21, 2021, 3-5 pm.
Interference Competition Among Biovar 1 Agrobacteria from Healthy Helianthus annuus Roots
Natalie Melendez-Velador and Thomas G. Platt
Division of Biology
College of Arts and Sciences

Many agrobacteria are plant pathogens that cause crown gall disease in a wide-range of dicotyledonous plants, including several economically important crops. Plants with crown gall disease develop tumors due to the misregulation of key growth hormones and also produce opines, specialized nutrients broken down by pathogenic agrobacteria that are unavailable to most other bacteria. Pathogenic agrobacteria carry a tumor-inducing (Ti) plasmid that encodes functions needed for plant infection and the ability to catabolize the opines produced by infected plants. Some related bacteria carry plasmids that encoded opine catabolism functions but not pathogenesis functions. These cheater strains outcompete pathogenic strains in the presence of infected plants. The best characterized cheater is Rhizobium rhizogenes strain K84, a biovar 2 agrobacteria, which carries a cheater plasmid and produces a bacteriocin that inhibits the growth of pathogenic agrobacteria carrying some Ti plasmids. In this study, we aimed to determine whether a sample of biovar 1 agrobacteria produces bacteriocins that inhibit the growth of several pathogenic strains, including strains with whom they co-occur. We used an inhibition assay to determine if agrobacterial isolates produce bacteriocins interfering with the growth of strain C58, strain 15955, and a recent isolate K203. Experiments are ongoing but preliminary results indicate that several of the environmental isolates inhibit the growth of C58 but not 15955 or K203. This work has the potential to lead to the discovery of novel biocontrol agents for crown gall disease.

Natalie Melendez-Velador will be available for “DSP dialogues” on April 20, 2021, 5-6 pm and April 22, 2021, 3-4 pm.
Phylogenetics relationships among agrobacteria isolated from sunflowers
Emireth Monarrez-Carreon, Veronica Mateo, Ashlee Herken, and Thomas G. Platt
Division of Biology
College of Arts and Sciences

Agrobacteria are a diverse group of bacteria often found in plant root microbiomes. Many members of this group cause crown gall disease in an extensive range of plant species. Our goal is to examine the phylogenetic relationships among agrobacterial isolates collected from sunflower roots and known agrobacterial genomospecies. To accomplish this, we first collected *Helianthus annuus* root samples with three of these plants having growths indicative of crown gall disease. We then sampled biovar 1 agrobacterial isolates from these plants using a semi-selective media and a biochemical test for biovar 1 agrobacteria. We streak purified 360 agrobacteria isolates across the 20 plants to place these isolates into pure culture and preserve them at -80°C. The whole genome of several of these isolates was sequenced on an Illumina NextSeq platform and was assembled using SPAdes and annotated using Prokka. Phylogenetic analysis based on the *recA* sequences of our isolates and the previously characterized genomospecies can help determine how much these isolates vary, and to which known variants of agrobacteria they are most closely related. We will use these trees to determine the extent of agrobacterial diversity within individual plant rhizobiomes and across the rhizobiome of neighboring and distant plants.

Emireth Monarrez-Carreon will be available for “DSP dialogues” on April 20, 2021, 2-4 pm.
Wastewater as an Effective Growth Media for *Chlamydomonas reinhardtii* Biomass Production as part of a Biorefinery

Aaron Moore and Lisa R. Wilken
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Carl R. Ice College of Engineering

As the human population rises there is an increased need for protein rich dietary alternatives. Microalgae have been at the forefront of study to fulfill this need. Microalgae can be used for the manufacturing of biofuels as well as human and animal nutritional bioproducts such as protein and pharmaceuticals. One of the main drawbacks of this development however are the economic costs associated with cultivation. Thus, it has been proposed to consider the use of wastewater, which is readily available and contains supplemental nutrients, as a growth media to help cut down on costs. This project investigates the implications of using wastewater as a growth media for the algal species *Chlamydomonas reinhardtii*. *C. reinhardtii* is a freshwater algae species and is one of the most widely studied species because of its shared commonalities among other algae. This research observes the characteristics of *Chlamydomonas reinhardtii*, explores the effects of synthetic wastewater on biomass production and bioproduct recovery on a lab scale, and evaluates the potential applications for protein bioproducts in a biorefinery.

Aaron Moore will be available for “DSP dialogues” on April 22, 2021, 3-5 pm.
Iron is essential for all organisms including insects; however, at high levels it is toxic. Therefore, the transport and uptake of iron must be well-regulated, and in insects this process is poorly understood. In mammals, the most widely known mechanism of iron uptake is receptor-mediated endocytic uptake of Fe$^{3+}$-transferrin. In the acidified endosome, iron is released from transferrin, reduced by a ferric reductase to Fe$^{2+}$, and transported across the endosome membrane through divalent metal transporter 1 (DMT1). The goal of this project was to determine whether iron uptake by cultured Drosophila Sg4 cells (an isolate of embryonically derived S2 cells) requires endocytosis. To test this hypothesis, we blocked endocytosis and then measured cellular iron content. We performed RNAi-mediated knockdown of rab5, which is expected to block both clathrin-mediated and caveolar endocytic pathways, and we also treated cells with one of three chemical inhibitors: 200 nM bafilomycin-A1, which inhibits clathrin-mediated endocytosis in S2 cells, 5 mM methyl-beta-cyclodextrin, which blocks caveolae-mediated endocytosis, and 1 µM cytochalasin D, which blocks phagocytosis and macropinocytosis. The rab5 RNAi and chemical treatments caused a slight decrease in cell growth and viability, but they did not decrease iron content. The results of these experiments suggest that endocytosis is not required for iron uptake by Sg4 cells. To test our hypothesis using a different strategy, we are evaluating the role of an insect homolog of DMT1, Malvolio (Mvl), in iron uptake. Based on previous studies of Mvl, Mvl appears to be a divalent metal transporter that is present mainly in endosome membranes. We used RT-PCR to verify that Sg4 cells express Mvl, and we are currently performing RNAi to assess the effect of Mvl knockdown on cellular iron content. Given that blocking endocytosis had no effect on cellular iron content, if Mvl participates in endocytic uptake of protein-bound iron, we expect that knockdown of Mvl will also have no effect on cellular iron content.

Diana G. Najera will be available for “DSP dialogues” on April 21, 2021, 3-4 pm and April 22, 2021, 3-4 pm.
Covid-19 has claimed the life of more than 550,000 Americans and affected the public health of countless others across the globe. Current vaccines must be kept at very low temperatures to prevent degradation and maintain normal activity. My lab group had previously studied zinc oxide nanoparticles (ZnO) (NPs) and their interaction with RNA. This led us to hypothesize that ZnO NPs could temperature stabilize RNA. Zeta potential measurements were used to demonstrate changes in the surface charge as a function RNA and protein binding to NP. RNA bound onto ZnO NPs were placed in temperature stability chambers (4, 20, 30, 40, 50 degree C), eluted from the nanoparticle, and analyzed by RNA gel and imaged. Protamine (Pro) coating was used to improve the RNA payload on ZnO NP as shown by UV nanodrop experiments suggesting 95% efficiency. Zeta potential showed 13.38 (ZnO), 15.36 (ZnO+ Pro L), 15.98 (ZnO+ Pro M), 21.32 (ZnO+ Pro H), -21.62 (ZnO+ Pro L+ RNA), -21.86 (ZnO+ Pro M+ RNA), -22.36 (ZnO+ Pro H+ RNA). Intact RNA was found at 4, 20, 30, 40, 50 degree C as seen by gel electrophoresis analysis at 1 and 2 weeks after temperature exposure. My data suggests that this approach will concentrate and stabilize RNA onto zinc oxide nanoparticles for enhanced delivery, immunological or biological activity and may extend beyond mRNA vaccines to other therapeutic RNAs.

Juliet Nava-Chavez will be available for “DSP dialogues” on April 20, 2021, 4-5 pm and April 22, 2021, 3-4 pm.
Zebrafish is an increasingly important, genetically tractable vertebrate model system for human neurological disorders. To enhance its potential for studying the neural mechanism of drug-seeking and addictive behaviors, this interdisciplinary project’s goal is to develop the computational infrastructure, software, and behavioral protocols for a modified automated behavioral paradigm. In order to track, visualize and analyze movement of adult zebrafish in behavioral paradigms of positive reinforcement (reward-driven) learning, our collaborative team is currently combining and modifying existing software and computational tools. Here, we present our computational and behavioral setup, that allows to simultaneously track single fish in a group of ten to twelve zebrafish. Two opposite corners in the testing chamber are isolated from the rest of the tank, and only accessible through a restricted passageway. The movement of zebrafish through these passageways is monitored by infrared sensors, which control the automatic administration of a food incentive via a peristaltic pump. Movement in one of the tank’s corners active platform will result in reward delivery, while an inactive duplicate on the opposite corner serves as control for the test subjects. Movement data will be collected for both the active and inactive corners of the tank. The tracking software easily enables the user to collect data on the subject’s behavior during the duration of the testing. This data can then be directly converted into a heatmap showing the density of where the subject spent time. The next steps of this project include fine tuning the computational infrastructure created as well as additional tests pertaining to associative learning.

Jared Newell will be available for “DSP dialogues” on April 21, 2021, 4-6 pm.
Citlally Orozco Aldaz

Seeking release from Detention & Applying for asylum: Anarduousprocess for Asylum Seekers
Citlally Orozco Aldaz and Alisa Garni
Department of Sociology, Anthropology, and Social Work
College of Arts and Sciences

Thousands of asylum seekers from around the world are held in detention facilities as they search for safety in the United States. In my study, I investigate the complex process that asylum seekers must navigate to seek release from detention and apply for asylum. My study was divided into three parts; in the first part, I analyzed scholarly literature and secondary sources to compare immigration policy and practice across the Obama and Trump administrations. In the second part, I explored shifts in immigration policy and practice by conducting in-depth interviews with professionals consisting of immigration attorneys, detention facility volunteers, an asylum seeker, and legal scholars. By analyzing various perspectives from people who engage with asylum policies, I was able to further understand how changing asylum policies impact asylum seekers, and particularly those who are being held in U.S. detention facilities. The third part of my study consisted of volunteering for a consortium of legal service providers on the U.S.-Mexico border that assists detained asylum seekers in the United States. I assisted in gathering information from asylum seekers and, in this way, facilitated the process of collecting facts for bond and asylum cases. My findings suggest that changing policies affect asylum seekers directly by wearing them out, delaying asylum, making it harder to win an asylum case, and increasing the chances that people will be deported to deadly situations. I also learned how changing asylum policies and practices make day-to-day survival harder for asylum seekers, and how new rules ensure that as few people as possible are granted asylum. In my report, I detail the many ways in which seeking asylum is becoming more arduous, leaving many asylum seekers feeling hopeless. Through this research, I hope to shed light on the difficulties many asylum seekers face and generate ideas about how to improve the process.

Citlally Orozco Aldaz will be available for “DSP dialogues” on April 22, 2021, 4-6 pm.
As the costs of heating and cooling rise with increasing energy costs, and as we seek innovative ways of insulating buildings, green roofs can play an important role. A desired benefit of a green roof is to provide added building insulation. This research examines the impact the Architecture, Planning & Design Experimental Green Roof (APD-EGR) has in insulating the studio below to explore the potential insulative contributions, and consider how buildings can function more efficiently. Our two central research questions were: 1) In what ways do the three APD-EGR green roof beds influence heat radiating from the building? 2) In what ways do these same green roof beds influence heat and cold going into the building? We used a FLIR thermal camera to understand heat transfer from the green roofs on a number of hot and cold days on the three different APD-EGR beds. Temperature measurements were taken inside the studio below each bed and on the surface of each bed. Sub-surface temperatures were recorded using sensors in each bed. We analyzed this data to see the influence of beds on temperatures. Surprisingly, our initial results show that the 4-inch green roof bed transfers less heat into the studio during warm periods than the 6-inch and 8-inch beds, while the 8-inch bed transfers more cold into the studio in cold periods than the 4-inch and 6-inch beds. More research is needed to analyze heat radiating from the building and how other factors (including heat flow) influence green roof insulating effects.

Miguel Perez will be available for “DSP dialogues” on April 20, 2021 3-4 pm and April 22, 2021, 3-4 pm.
Marine cyanobacteria genus *lyngbya* is a huge source for the discovery of new natural products. Studies into this have shown a discovery of the lagunamide family; that includes Lagunamide A, B and C. The metabolites in the genus have been found to possess biological activity across some health-related diseases. It has been found to have a low cytotoxicity towards cancer cell lines such as lymphoma, it also has cytotoxicity against lung, prostate, ileocecal colorectal adenocarcinoma and ovarian cancer. The difference between all of these comes down to a structural difference in the presence of an additional methylene carbon in C opposed to structures A and B. The methyl insertion difference in the structure, translates into a change in the target for cytotoxicity. To synthesize lagunamide C, the approach relies upon the esterification and macro lactonization of the polyketide to the pentapeptide. Previous methods developed have not given access to the polyketide for the construction of lagunamide C. Rather than using an Evan’s auxiliary, a Crimmins auxiliary was chosen to use a bidentate amine to favor the coordination of the titanium to the amines. This route allows for the assembly of the polyketide required to access lagunamide C as well as other analogs of it. With this route we hope to achieve the first synthesis of lagunamide C in the near future.

Carolina Reyes will be available for “DSP dialogues” on April 20, 2021 4-6 pm.
Does dietary quality moderate the effects of a ketogenic diet on cardio-metabolic and psychological outcomes?
Gina Reyes, Catherine Steele, and Sara Rosenkranz
Department of Food, Nutrition, Dietetics and Health
Physical Activity and Nutrition Clinical Research Consortium
College of Health and Human Sciences

Background: Previous research has shown the potential for a ketogenic diet (KD) to improve cardio-metabolic outcomes. Most KD research has examined performance and health effects in athletic populations, with limited research investigating the time course required for adaptation to a KD. Therefore, we planned to conduct a randomized controlled trial to determine the duration necessary for adaptation to a KD and the effectiveness of the KD (higher versus lower dietary quality, <50g carbohydrate/day) for improving cardio-metabolic outcomes.

Methods: A PubMed search was performed to identify peer-reviewed studies to determine the appropriate durations for our short-term and longer-term KD interventions. A priori inclusion criteria were determined, and research studies were identified using the MeSH term “diet, Ketogenic” combined using the Boolean operator “AND “with the keyword “adaptation.” Overall, we sought to determine what KD intervention durations had been previously reported. Relevant studies informed critical methodological decision making for designing and planning our randomized controlled trial.

Results: Our PubMed search yielded 73 records, of which 22 articles met inclusion criteria. Based on these studies, we determined that a 7–10 day period should be compared with a duration of approximately 4 weeks.

Conclusions: Our literature review informed the design of our planned randomized controlled trial regarding the duration of KD required for adaptation. Results from the future trial will further elucidate the time required for adaptation to a KD, as well the importance of dietary quality for moderating the effects of a KD on cardio-metabolic and psychological outcomes.

Gina Reyes will be available for “DSP dialogues” on April 20, 2021 2-4 pm.
Understanding Biofilm Formation on Different Surfaces Using a Center for Disease Control and Prevention (CDC) Biofilm Reactor

Kaitlyn Rhine, Erin Manville, Ellen Mendez, and Valentina Trinetta

KSU Food Science Institute

Several bacteria in the environment represent a threat to the food industry due to the ability to form biofilms and association with other resident strains from food premises. The prevalence and persistence of biofilms on food contact surfaces increase throughout time. After the biofilm formed, it becomes difficult to disrupt. Understanding biofilm formation and adhesion to different surfaces might offer better insight into removal treatment effectiveness. Purpose: The objective of this research was to assess the formation and growth of biofilms on different materials using a CDC Biofilm Reactor. Methods: A CDC biofilm reactor was used to grow 4-days-old biofilms. Different materials were evaluated for biofilms growth: polycarbonate, wood, and nylon. All biofilms were grown at 22 °C in Tryptic Soy Broth (TSB). Biofilm adhesion, growth, and development was observed overtime by enumeration and microscopy methods (Laser Scanning Confocal Microscopy, LSCM). Results: High cell counts (~ 10^6) were recovered on polycarbonate and wood, while low counts were obtained on nylon (~ 10^4) (P < 0.05). An interaction between material and biofilm cell count was observed (P < 0.05). When biofilms were characterized by LSCM, at day 0 cells appeared to spread throughout the surface uniformly across materials. Significant differences in forming clusters and big aggregate on wood surfaces as compared to the other materials. Aggregation and clustering were visible after 24 hours across coupons: larger colonies were present on wood. Significance: The results obtained in this research offer a preliminary understanding of biofilm growth, adhesion, and development on different surfaces commonly used in the food industry using a CDC Biofilm Reactor. This information could be used to develop effective treatments to remove and control biofilm in the food environment.

Kaitlyn Rhine will be available for “DSP dialogues” on April 20, 2021, 3-5 pm, April 21, 4-6 pm, and April 22, 3-5 pm.
In the past, classroom desks and tables were only occasionally sanitized. Likewise, stadium seats and benches were rarely cleaned. This effort addresses the use of unmanned aerial vehicles (UAVs) to disinfect large and small areas with ease. The UAV of choice is a custom-built quadcopter intended to maximize capability and minimize cost. This development has a number of facets, as it can be a challenge for flying objects to navigate indoors while also detecting and avoiding objects. Carrying a heavy fluid while autonomously flying and spraying means additional design constraints. Currently, we have setup a basic flight controller and have implemented time of flight sensors that will assist the drone in flying autonomously. Next, we will work on dispersing fluids, and continue flight testing.

Dallas Rice will be available for “DSP dialogues” on April 21, 2021, 3-6 pm.
Bradley Richards

Foreign Capital Inflows Influence on Economic Growth Sub-Saharan African Countries
Bradley Richards, Michael Flynn
Department of Political Science
College of Arts and Sciences

This study aims to understand the relationship between different foreign capital inflows (FCI) and economic growth measures in low income (n=22), lower-middle (n=18), and upper-middle income (n=7) Sub-Saharan African countries (SSA) from 2011 to 2019. SSA countries receive the most amount of official development aid to promote economic growth yet remain to be some of the least developed countries in the world. This is important to understand because the political and economic instability in African countries have negatively impacted economic development in these countries. There have been a variety of studies conducted to understand the relationship between FCI and economic growth in Sub-Saharan African countries. Previous research has concluded that there is a positive relationship between FCI and economic growth in SSA countries. In this study SSA countries are categorized by income classification to understand how different income levels are impacted by the relationship between FCI and economic growth measures. Foreign direct investment (FDI) and net official development aid (ODA) are the two forms of FCI measured in SSA countries with data provided by The World Bank Group. Gross domestic product (GDP) and gross national income (GNI) are measures of income, but we can use them to track economic growth. A multiple regression analysis was conducted to understand the relationship between the FCI and economic growth measures and for class of SSA countries. Our results indicate a positive relationship between ODA and economic growth in lower and low-middle income countries, and a negative relationship in high income countries. I discovered that there is a strong positive relationship between FDI and economic growth in high income SSA, a strong negative relationship in lower-middle income SSA, and no relationship in low income SSA. From our results we can conclude that in low and lower-middle income countries ODA promotes economic growth and that FDI promotes economic growth in high income SSA countries.

Bradley Richards will be available for “DSP dialogues” on April 21, 2021, 4-6 pm.
Using Machine learning to predict the “emotions”
Jacob Rico-Martinez and Dave Thomson
Department of Electrical Engineering
Carl R. Ice College of Engineering

In the past few years there has been a lot of investment in biomedical engineering and technology. One of the most used research systems is the EEG cap and a more innovating term called transfer learning. The EEG cap is an electroencephalogram test that detects electrical activity in the brain using electrodes attached to the scalp. Transfer learning is the process of having one machine or model to learn a specific task from a previous model. We combined this technique to speed up the process of detecting emotions. In this research we are learning what “emotions” the user experience throughout brain. Different parts of the brain are triggered by different stimulus such as pictures, sounds, and videos. The goal is to use machine learning to predict the emotions the user will feel in different parts of the brain. Through the collection and analysis of data using the EEG cap, we predict what the user feels in specific areas of the brain. Then, by using the data collected through images we can use transfer learning to have the computer predict what the user feels when put through other stimulus such as sounds and videos. This would reduce the amount of programming and preparations to detect certain emotions produced by different stimulus. In addition, we also research other types of EEG caps that would allow us to perform other types of cognitive research and allow for experiments to figure out more about the brain. This system would prove useful in different mental therapies or just simply in trying to learn more about the human brain. This would create a new and more effective way to detect emotions using different systems and learning processes.

Jacob Rico-Martinez will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
Corn, soybeans, and wheat are the major economic drivers of the state of Kansas and much of the U.S. Midwest region. Understanding soil health while optimizing crop productivity by applying the right amount of fertilizer at the right time (such as nitrogen fertilizer management during the cropping season) is a major challenge for Kansas farmers. The Kansas mesonet, a group of weather stations deployed Kansas-wide in agricultural land by K-State Research and Extension (KSRE) and co-located with the National Weather Service stations, serves as research and experimental facilities in the state of Kansas to study weather, atmosphere, and soil data. Although various sensors used are at the heart of these stations, the goal of this study is to know and research more on the type of sensors used for soil temperature and soil moisture data.

Citlali Rocha-Ruiz will be available for “DSP dialogues” on April 21, 2021, 3-5 pm.
An exploratory study of firefighting helmets design and fit for female firefighters

Michaela Ross and Yingying Wu
Department of Interior Design and Fashion Studies
College of Health and Human Sciences

The duties of a firefighter are highly demanding, strenuous, and unpredictable. For precautionary measures, firefighters have to use personal protective equipment (PPE) on duty. However, ill-designed and ill-fitted firefighting PPE can be a source of injuries. Comparing to male firefighters, female firefighters have more difficulty in finding suitable PPEs. Besides, among all PPE components, few studies have investigated the effectiveness of firefighting helmets. Therefore, this study has two research questions. First, what are the female firefighters’ concerns on firefighting helmets? Second, what are the potential solutions to improve firefighting helmets to satisfy female firefighters’ needs? In this study, thirty female firefighters were interviewed. The author analyzed the interview transcriptions, mainly focused on headwear, using a qualitative analysis software Dedoose. One of the common themes that emerged was the difficulties and injuries caused when hair is confronted with helmets. Female firefighters, particularly those who have ethnic hair that varies in volume, thickness, and length with different styles, reported negative experiences such as headaches or broken interior lining of the helmet crank because of inadequate fit. Thus, the author proposed a creative design solution, which is to add a horizontal circular adjustment piece that secures around the circumference of the head. This allows hair to lay flat against the helmet inside until it reaches a heat-resistant sack. This sack would be attached to the helmet on the inside of the neck flap to secure any volume of hair while protecting it. Future research is required to evaluate this solution, though.

Michaela Ross will be available for “DSP dialogues” on April 20, 2021, 3-4 pm and April 21, 2021, 3-4 pm.
Additive Manufacturing of Metal-Graphene Composites
Esvin Ruiz and Suprem Das
Department of Industrial and Manufacturing Systems Engineering
Carl R. Ice College of Engineering

Metals have widespread applications in our day-to-day life, starting from catalysis for renewable energy production to electronics for information processing. While metals have great properties such as high electrical conductivity and high thermal conductivity, most of the metals suffer from chemical and mechanical adversaries (such as atmospheric oxidation, leading to corrosion and mechanical failure). For example, silver and copper are used in numerous electronics, however, they are prone to form native oxides in air that become subsequently detrimental for their stability and reliability. In this project, we study the additive manufacturing of conducting silver lines and a hybrid silver/graphene composites printed lines on printed circuit board by using a computer aided design (CAD) and material printer. We study their microscopic structure as well as their atmospheric oxidation upon thermal heating in air and moisture. The microscopic structure of the additively manufactured metal and composite will be analyzed with an optical microscopy and electrical resistivity measurements. Similar lines will also be manufactured on polymer surface to study and comparison of their mechanical properties. This study will eventually enable us to design stable and reliable metal electrodes on additively manufactured energy devices such as supercapacitors.

Esvin Ruiz will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
Graphene is a layer of carbon atoms one atom-thick and a constituent for numerous materials such as graphite, carbon nanotubes, and fullerene. Graphene has many significant properties such as exceptional electrical and thermal conductivity and high surface-to-volume ratio. However, graphene is difficult to make and is not very cost effective, which makes it hard to take advantage of. Therefore, our goal is to make processable graphene by oxidizing it into a more stable form. This not only helps overcome the agglomeration issues that graphene possesses but also helps in the upscale production of processable graphene. In this work, we used two different methods of graphene oxide synthesis, which included the Hummers method and the Fenton oxidation method. The Fenton-oxidation method proved to be safer, and more economical than Hummer's method for oxidizing the outside layers of graphene. The Doehlert matrix was used to analyze and optimize the effects of two main process variables on oxygen content: concentration of iron sulfate and reaction temperature. Characterization of the Fenton-oxidized graphene demonstrated that it is nontoxic to cells, has great thermal stability, large surface area, and great absorption properties. The next step was to upscale and produce larger quantities of 200g. In the future we would like to explore the possibility of using graphene/graphene oxide as a nanoplatform for targeted drug delivery of cancer cells. Graphene contains unique properties that could allow for a better delivery system for cancer treatment with less toxic side effects.

Laura Soto will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
Evaluation of Substrate: Buffer Ratios for In Vitro Cultures Inoculated with Equine Cecal Contents

McKenzie Stevens, Clarissa C. Conrad, James S. Drouillard, Ching Kang, Patricia Ochonski, Vanessa Veloso, and James M. Lattimer
Department of Animal Sciences and Industry, Equine Nutrition
College of Agriculture

*In vitro* digestion methods model the equine hindgut providing information that is unavailable with traditional *in vivo* procedures. Offering quick and affordable data regarding the effect of feedstuffs on fermentation parameters. However, the substrate: buffer ratio within these systems has a profound impact on results. The objective of this research was to determine the effects of different levels of substrate on pH and volatile fatty acids (VFA) concentration using the ANKOM RF Gas Production System (ANKOM Technology; Macedon, NY). Cecal fluid was collected from 4 cecally cannulated Quarter horses and used to inoculate fermentation flasks containing buffer and substrate. Substrates were corn or brome at 0, 0.5, 1, 1.5, 2, 3, and 4 g/flask. Flasks were equipped with gas pressure monitors and placed in a 39°C shaking incubator for 48 h. Data were analyzed using mixed models with repeated measures with fixed effects of treatment, time, and treatment by time interaction, and random effect of run by horse within run. Linear and quadratic effects of substrate level (*P*<0.001) were observed for terminal pH, and VFA production. Given the quadratic effect of substrate level on terminal pH and total VFA concentration, these results indicate that 1.5 g of substrate/flask is most appropriate for ANKOM RF Gas Production System methodology. Substrate levels greater than 1.5 g/flask hinder fermentation as indicated by decreased VFA concentration.

Laura Soto will be available for “DSP dialogues” on April 22, 2021, 3-5 pm.
As resources for energy around the world are becoming fairly scarce, researchers are looking for energy that is far more sustainable and cleaner, such as fuel cells. These alternative sources of energy provide far more benefits and have demonstrated greater potential for future applications. Although fuel cells have a promising future, past studies have showed that cells will rapidly deteriorate over a certain period of time. This causes all the energy stored to be lost. The purpose of this research is to improve the long-term performance of fuel cells.

Eric Terrazas will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
Intrinsic Foot Muscles
Briana Thompson and Phillip Vardiman
Department of Food, Nutrition, Dietetics and Health
College of Health and Human Sciences

Intrinsic foot muscles (IFM) are critical in providing support to the ankle joint strengthening and stabilizing the foot. These muscles include abductor hallucis, flexor digitorum brevis, flexor hallucis brevis, and quadratus plantae. Exercises can be performed to stabilize the foot during the stance portion of the gait cycle and for controlling motion of the ankle and foot. A patient’s ability to learn these exercises or to not have optimal patient outcome can be based on the ability to effectively and efficiently learn these exercises and perform them correctly. The use of blood flow restriction (BFR) during rehabilitation has been associated with strength gains and healing. BFR applies pressure to the cuff of a limb and restricts blood flow during an exercise in efforts to strengthen the skeletal muscle. The purpose of this project is to evaluate the effect of BFR on IFM exercises. Subjects will be evaluated for changes in maximum vertical jump height, single leg balance, arch height index, and plantar pressures during walking gait. The lab will consist of three groups: control group that will not participate in IFM or BFR, an IFM training group, and an IFM and BFR training group. The control group will be assessed pre and post but will not participate in training. The IFM and IFM-BFR training groups will have 4 weeks of monitored training. We anticipate seeing significant improvement in the IFM and IFM-BFR groups compared to control. We anticipate a significant training effect with IFM-BFR group compared to IFM and control groups respectively. With this improvement, we hope to suggest using the cooperation of IFM-BFR training methods in rehabilitation programs.

Briana Thompson will be available for “DSP dialogues” on April 22, 2021, 4-6 pm.
Antibiotic Sensitivity Testing in *E. coli* Mutants
Gloriana Tokgozoglu, Ruth Mekuria, Ashish Kumar, Taihao Yang, Salete M. Newton, and Phillip E. Klebba
Department of Biochemistry and Molecular Biophysics
College of Arts and Sciences

The focus of my research is to perform antibiotic sensitivity tests on various *E. coli* mutants that have been created in our lab. The goal is to measure the “kill zone” radii of effective siderophore antibiotic transport in collaboration with a pharmaceutical company as well as determine which mutants are resistant to them and why. To do so, we have grown wild-type *E. coli* (BN1071), and subsequent mutants that have specific outer membrane transport proteins which intake siderophores into the cell knocked out (OKN3, OKN13, OKN359) in LB broth and MOPS minimal media. Then, we place disks which contain our specific antibiotics on the bacterial plates and measure the radius of the kill zone. This kill zone is the area that the bacteria have been killed due to uptake of the antibiotic and any later growth in these areas are bacteria that have become resistant to the transport.

Gloriana Tokgozoglu will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
On January 20th, 2021, on his first day in office, President Joe Biden signed an executive order “preventing and combating discrimination on the basis of gender identity and sexual orientation.” This Executive Order was heralded as being an important tidal shift for LGBTQ Americans who suffered under the repressive and persecutorial regime of the Trump Administration. In my research, I wanted to ask: what is at stake when these “protections” are an executive order? In what ways do anti-discrimination policies work to improve the lives of queer people? And, importantly, in what ways do anti-discrimination policies side-step the larger project of liberation? In this research, I engaged in (1) a legal analysis of the issues at play in an executive order, and (2) delved into a queer analysis of anti-discrimination policy. My research findings revealed that while this Executive Order states that Title VII’s prohibition on discrimination “because of … sex” includes discrimination based on gender identity and sexual orientation, this is just a position of the current presidential administration and could be overturned in the future. Additionally, I discovered anti-discrimination laws often sound better in theory than doing much in practice to improve the lives of queer people. Instead, laws aimed at preventing discrimination rarely allow us to win discrimination cases. Ultimately, inclusion should not be the goal for queer and trans folk. Our goal is liberation!

Derrius Washington will be available for “DSP dialogues” on April 21, 2021, 4-6 pm.
How does the impact of animal enrichment affect activity in different species?
Sarah Weekes and Cassandra Jones
Department of Animal Sciences and Industry
College of Agriculture

Studies show that enrichment objects to animals in captive space stimulate their brain and improve their welfare. The objective of this research was to observe tayra, goats, and cheetah to determine if enrichment objects impact their activity levels. Animals were observed during the early mornings and midafternoons and activity level rated from 1 (low activity) to 5 (high activity). All the selected species had enrichment objects in their enclosures, but activity levels differed based on the type of enrichment object. Goats has a high (5) activity level based on their interest in interacting with visitors, playing with one another, and use a brush frequently as an enrichment object. Tayras had a moderate (3) activity level because they were nearly always on their wooden jungle gym enrichment object. The sometimes displaying active play with one another by climbing or gnawing on the jungle gym, but they also frequently lounged on it to rest. Cheetahs has a low (1) activity level during observed times because they did not interact with any enrichment object located in their enclosure. They primarily sunbathed or slept and only occasionally walked around the enclosure. In conclusion, some species interact more with enrichment objects than others. Further observation is needed to see which objects most interest a given species.

Sarah Weekes will be available for “DSP dialogues” on April 20, 2021, 3-5 pm.
The second-largest pollution source in the world is from apparel and textiles, starting from the fiber source of an item to its afterlife (Planet Aid, 2018). Consumer consumption from fast fashion, which is an industry trend that involves producing products in a rapid timeframe and with new styles, has contributed to the disposal of apparel and thus the increase in landfill waste (Choi, 2013). Further, fast fashion contributes to detachment from garments, such as buying a new top after losing a button instead of repairing it. However, there are ways to keep used apparel and textiles in the reuse cycle through donations, recycling, and upcycling or repurposing. Through this research, we tracked what happens to garments and textiles left behind in student housing at Kansas State University to understand the sustainability and transparency of our management system in discarding textiles. Interviews were conducted with individuals involved with garment and textile management at K-State and the organizations that received the unwanted items. Interview questions focused on four main parts: categories of items/amounts received, how are they organized, where do they go next, and how they are transported. Our initial findings indicate there is little transparency for disposing of garments at Kansas State University. We did, however, learn that some garments are donated to a local Goodwill and towels to the local animal shelter and the veterinary school. We expect to find that most garments and textiles continue their use lifecycle through the organizations that Kansas State University sent items. The next step of this study will be to identify needs in the management, communication, awareness, and overall sustainability of left behind garments and textiles and provide recommendations.

Agel Yor will be available for “DSP dialogues” on April 20, 2021, 4-6 pm.