



University of Detroit Mercy
Undergraduate & Graduate Student
7th Annual
Research Symposium

ABSTRACT BOOKLET

Friday, Oct 18, 2019 9:30am-1pm
Student Union, University Ballroom



ABSTRACT #1

1. The impact of acid rain on plant allocation dynamics in urban environments

Science

Farhan Rahman, Biology
Macallan Kizy, Biology
Sami El-Nachef, Biology
Jayanth Nalluri, Biology
Victor Carmona-Galindo, Biology

Acid rain is formed when atmospheric pollutants react with atmospheric water, resulting in precipitation with pH 5.0 or lower that can also become more acidic in urbanized cities due to an increase in the post-combustion gases released into the atmosphere. Our objective was to characterize the impact of acid rain on the environmental sustainability of urban agriculture as a tool for improving food security. We hypothesized that the plant root dynamics would be impacted by both simulated urban acid rain levels as well as natural acid rain from urban point-sources. We cultivated shallot onions in growth chambers and exposed plants to different concentrations of nitric and sulfuric acid, as well as rainwater and groundwater. We found that simulated treatments of nitric and sulfuric acid rain as well as natural acid rain had parallel impacts on the growth and development of onion roots. We also detected that low-to-high concentrations of simulated acid rain composed with sulfuric acid as well as natural rainwater induced root growth in onion plants. We apply ecological theory, specifically the principle of allocation, to discuss how the chemical induction of plant growth by acid rain may result in a life-history trade-off that reduces investment in plant-defense. Our predicted plant defense trade-off suggests that crop species in urban environments would be more susceptible to herbivory and as such would need to rely more heavily on agricultural pesticides to sustain food security. We further propose studies to evaluate applications of plant defense theory in an urban context.

ABSTRACT #2

2. Anatomical Relationships of the Gastro-Intestinal Tract of Madagascar Hissing Roach:
Gromphadorhina portentosa
Science

A'Tearea Boggan, Biology
Jolani Perez, Biology
Gregory Grabowski, Biology

Using Di-I, all lipophilic structures were stained and examined within the roach gastrointestinal (GI) tract. Based on previous results, and new data obtained from fluorescence stereo-dissecting microscopy used to stain the GI tract, three hypothetical models were inferred about pH regulation in the Madagascar hissing roach. Systemic regulation appears to be driven by carbonic anhydrase (CAH) in the intertwining trachea and Malpighian tubules that makes up an Inter Loop Mass (ILM), whereas these structures close association with the ceca and lower GI regions may provide the acidifying protons and alkalinizing bicarbonate, respectively, for pH regulation within these regions.

ABSTRACT #3

3. Click-style Sonogashira Deprotection and Coupling Reactions Involving Silyl-protected Alkynes at Room Temperature

Science

Humza Ali, Chemistry & Biochemistry

Laial Baltaji, Chemistry & Biochemistry

Parth Bhagat, Chemistry & Biochemistry

Salar Brikho, Chemistry & Biochemistry

Tala Mahjoub, Chemistry & Biochemistry

A modified Click-style Sonogashira coupling reaction has been developed which can deprotect silyl-protected aromatic alkynes and couple aromatic iodides through trimethylsilyl acetylene and bistrimethylsilyl acetylene at room temperature. Good yields are possible, the transformation is tolerant of electron-deficient and rich aryl halide systems, and minimum homocoupling products are observed. The transformation protocol involves Pd(dba)₂ catalyst, sodium ascorbate, copper (II) sulfate, and 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU) as the base. The solvent system makes use of an acetonitrile/water mixture and it is likely the combination of the water and Cu²⁺ which allows for in situ silyl protecting group removal and consequent Sonogashira coupling.

ABSTRACT #4

4. An Analysis of Mechanical Failures in Public Bus Systems of United States Other

Wiley Dressell, Mechanical Engineering

Ahmad Chalhoub, Mechanical Engineering

Ashley Casey, Civil, Architectural & Environmental Engineering

Pierre Francioni, Electrical and Computer Engineering

Janasia Johnson, Mechanical Engineering

Public busing may have a seemingly low cost to the passenger, but may have high operating costs to the owners. Operating costs can include wages for drivers, routine bus maintenance, bus cleaning, accident costs, and mechanical failure repairs. Buses are one of the oldest and one of the most common modes of public transit (1), so there is a significant amount of data collected regarding this form of public transportation. For 2016 the total operating costs were just over \$20 billion for the busing systems as a whole for the United States(2). There may be a relationship between higher operating costs, mechanical failures, and total amount of passengers.

The objective of this study is to investigate if there is a correlation between the number of mechanical failures and the operating expenses. Using the National Transit Database, data on Mode Buses of the year 2016 was collected and analysed.

The ANOVA table of a linear regression model produces a very small P value (2.3E-06), which shows that a linear regression model would be significant. Through the use of linear regression the model was created (Operating Expenses = 8350.5*Mechanical Failures + 1E06). There was a trend that shows with every mechanical failure an average increase of \$8350 in operating expenses. The trend shows a very high cost to cities with every mechanical failure. With this cost in mind, cities should be more concerned with the maintenance of their vehicles to reduce on a large loss of revenue due to mechanical failures. However, linear regression gave an R² value of 0.5894. This value shows that there is moderate variance in the data. We identified a possible issue that may be interfering with the results of our analysis. This issue was with the size of the different agencies. The operating expenses varied from the thousands to millions of dollars, giving large variation. In future studies, the outlying data will be removed to give a more accurate representation of the cost.

ABSTRACT #5

5. The role of mollies in the biocontrol of mosquitos and the recovery of ecosystem services in urban rivers of El Salvador
Science

Dahlia E. Carmona-Valdivieso, International Academy East
Tizziana V. Carmona, Titian Consulting
Victor Carmona, Ph.D., Biology

Anthropogenic impacts on biodiversity can alter the ability of natural environments to sustain ecosystem services and function. The objective of our study was to evaluate the impact of mollies (*Poeciliopsis gracilis*), a native freshwater fish species common to El Salvador, on mosquito larvae in urban aquatic systems. We placed mollies in artificial and control habitats under field conditions for one month and characterized changes in the abundance of mosquito larvae. We detected that mollies significantly reduced the abundance of mosquito larvae in standing water relative to control treatments. Our study shows that native molly populations serve as a biocontrol agent for mitigating diseases transmitted by mosquitos in El Salvador and further suggests that the recovery of polluted urban rivers and streams is paramount for preserving of ecosystem services.

ABSTRACT #6

6. The impact of acid rain on plant allocation dynamics in urban environments

Science

Farhan Rahman, Biology

Sami El-Nachef, Biology

Macallan Kizy, Biology

Jayanth Nalluri, Biology

Victor D. Carmona, Biology

Acid rain is formed when atmospheric pollutants react with atmospheric water, resulting in precipitation with pH 5.0 or lower that can also become more acidic in urbanized cities due to an increase in the post-combustion gases released into the atmosphere. Our objective was to characterize the impact of acid rain on the environmental sustainability of urban agriculture as a tool for improving food security. We hypothesized that the plant root dynamics would be impacted by both simulated urban acid rain levels as well as natural acid rain from urban point-sources. We cultivated shallot onions in growth chambers and exposed plants to different concentrations of nitric and sulfuric acid, as well as rainwater and groundwater. We found that simulated treatments of nitric and sulfuric acid rain as well as natural acid rain had parallel impacts on the growth and development of onion roots. We also detected that low-to-high concentrations of simulated acid rain composed with sulfuric acid as well as natural rainwater induced root growth in onion plants. We apply ecological theory, specifically the principle of allocation, to discuss how the chemical induction of plant growth by acid rain may result in a life history trade-off that reduces investment in plant-defense. Our predicted plant defense trade-off suggests that crop species in urban environments would be more susceptible to herbivory and as such would need to rely more heavily on agricultural pesticides to sustain food security. We further propose studies to evaluate applications of plant defense theory in an urban context.

ABSTRACT #7

7. *Allium cepa* as a study-model for the role of biological complexity in urban water sustainability
Science

Selena Hindi, Biology
Amar Kurjakovic, Biology
Alina Jafaar, Biology
Emilee Hang, Biology
Victor Carmona-Galindo, Biology

Cities such as Flint, Michigan and Milwaukee, Wisconsin serve as contemporary examples of how a lack of understanding of the environmental chemistry of freshwater reservoirs can render potable water engineering systems unsustainable for local residents. In many cities, green engineering functions to increase aesthetic appeal without a broader consideration for recovering ecosystem processes. Our objective was to evaluate the role of biodiversity in the environmental quality of freshwater by using an aquaponic system with *Allium cepa* as a model system. We hypothesized that plant growth and development, macroinvertebrate behavior, and water quality would be affected by changes in biological complexity. We further characterize how biological complexity in an aquaponic systems has broad impacts on plant dynamics, macroinvertebrate behavior, and water quality. Our findings demonstrate how aquatic organisms can modify plant systems as well as water quality, and further suggest that biological complexity and diversity have the ability to ameliorate polluted water systems. We propose that green engineering infrastructure has the capacity to integrate and sustain ecosystem function recovery in urban contexts.

ABSTRACT #8

8. Evaluating the Sustainability of Urban Green-Spaces using Google Maps Science

Jamiley Cheikh, Biology

Malak Elmokadam, Biology

Victor Carmona, Biology

Trees in urban environments are expected to grow at an accelerated rate due to climate change. However, while studies on urban green-space have largely focused on characterizing biotic interactions (e.g. pathogens, ecosystem services, etc.), more studies are needed evaluating how abiotic factors can be sustained in urban environments (e.g. nutrient cycling, storm water infiltration, etc.). We used Google Maps to count the number of trees, measure percent green-space adjacent to the roads, and quantify percent road-damage of 16 images from across the Metro Detroit area in Michigan. We hypothesized that improvements in urban green-space would be associated with lower levels of road-damage due to better infiltration of storm water runoff. We found that while roadside green-space did not correlate significantly with road-damage, the number of roadside trees correlated positively with road-surface damage. Our study suggests that urban planners need to better consider tree-species selection for city green-spaces and that the root systems of urban trees may play a role in the observed variation of road damage in Detroit. We propose that future studies on urban trees further evaluate the role of below-ground dynamics.

ABSTRACT #9

9. Methodologies for Evaluating Pollinator Deserts in Detroit Science

Yarnise Hines, Biology

The diverse green-infrastructure across the Detroit area is estimated to be comprised of more than 1,500 gardens to larger-scale farms that are operated at the individual, school, and community levels. However, in the exploration of urban agricultural systems, it is also important to consider the habitat requirements of the pollinator communities needed to sustain food sovereignty. Our working hypothesis is that the pollen baskets located on the hind legs of honeybees can be used to characterize the diversity of floral resources in urban habitats by means of geographic information systems. We identified and outline three different methodologies for evaluating pollen morphology using optical and molecular techniques. Scanning electron microscopy would allow for the visual inspection of individual pollen grains. Fluorescent microscopy would allow for the use of software-assisted Z-stacking to construct visuals of pollen grains in small batches. Barcoding would use molecular techniques to identify all pollen species sampled, including hybridized plant species. We characterize the workflow for each technique and discuss the short-term and long-term tradeoffs for the experimental procedures. The characterization of pollinator deserts offers an opportunity to evaluate urban green-infrastructure in its ability to integrate ecological functions as well as broaden the scope of sustainability initiatives.

ABSTRACT #10

10. The role of maternal age on the variability of Michigan birth weights Science

Cassidy Masserant, Biology
Cross Orow, Biology
Olivia Shaw, Biology
Victor Carmona, Biology

Low birth weight in infancy causes numerous life-long health issues following the initial neonatal period. The cause of low birth weights is multifactorial and has been attributed to factors such as tobacco and drug use, maternal stress, socioeconomic status, education of mother, and age of mother at time of birth. Across the United States, many states are beginning to see an increase in the number of births yearly that fall into low birth weight (LB) and very low birth weight (VLB) categories. The state of Michigan is one state that has experienced a surge in LB and VLB infants within the past five years. The objective of this study was to determine the effect of one known factor, maternal age, on LB and VLB infants in the state of Michigan. We hypothesized that the number of LB and VLB infants would be highest in the maternal age category of 15-20 years. Our data showed the highest number of live births with the birth weight category VLB and LB were mothers in the age group 20-24 and 25-29. The number of live births has decreased between 1989 and 2017. Further studies are required to evaluate the potential causes of the LB and VLB in the aforementioned age categories such as socioeconomic and/or minority status factors. Subsequent research into the social implications of a decrease in live births from 1989-2017 is required.

ABSTRACT #11

11. Modeling the Environmental Toxicity of Road Salts on Plant Root Dynamics Science

Keerti Kurapati, Biology
Jackson Stachelek, Biology
Taylor Gauthier, Biology
Hannah Thomas, Biology
Victor D. Carmona, Biology

Although critical for the deicing of roads and bridges throughout the winter season in North America, road salts continue to have yearlong negative impacts on both anthropogenic and biological systems. Our objective was to measure the impact of four commonly used road salts on the dynamics of plant growth and development. Using onions as a model system, we hypothesized that exposing plants to different concentrations of sodium chloride, calcium chloride, potassium chloride, and magnesium chloride treatments would allow us to calculate the environmental concentration at which root development is halted by each road salt. We found that root growth decreased with sodium chloride, calcium chloride, and potassium chloride treatments, but increased with magnesium chloride. We used a linear model of root growth rates and concentrations to calculate the level at which each road salt becomes toxic to plants in the surrounding environment. We also apply the ecological theory of the principle of allocation to discuss how the chemical induction of root growth by magnesium chloride road salts may result in a life history trade-off that reduces investment toward plant-defense. The predicted trade-off in plant defense suggests that crop species in urban environments would be more susceptible to herbivory and as such would rely more on agricultural pesticides to sustain food security. We propose further studies to evaluate applications of plant defense theory in an urban context.

ABSTRACT #12

12. Hedgehog pathway components Patched and Costal-2 are conditional growth regulators that demonstrate differences in overgrowth autonomy in *Drosophila melanogaster*
Science

Shyra Northington, Biology
Shannon Moore, Biology
Jacob D. Kagey, Biology

The Hedgehog pathway is a widely conserved developmental signaling pathway that has also been implicated in human diseases, such as cancer. Here we are using the classical model system, *Drosophila melanogaster*, to analyze the phenotypic and molecular changes that occur with the de-regulation of patched and costal mutants in *Drosophila* wing disc. Both, patched and costal act as negative regulators of the hedgehog pathway, which in humans, leads to tumor formations on the skin, as well as on the brain in infants. Despite both being negative regulators of the same pathway, we observe distinct phenotypic differences between the two mutations. Understanding how these two negative regulators of the same biological pathway can result in differences in the physical formation of tumor-like structures, may result in a better understanding of subtle differences in Hh driven tumors in humans. Tissue that is homozygous mutant costal has overgrowth that occurs in both autonomous and non-autonomous. Conversely, patched mutant overgrowth is only non-autonomous. We hypothesize that there is a signaling pathway is not disrupted autonomously in the patched mutant cells. Here we present the data suggesting this pathway is the Notch signaling pathway that is differentially disrupted between costal and patched. Additionally, we ran a Polymerase Chain Reaction (PCR) to amplify the costal mutant, and the control DNA, with the intention of isolating a single-strand of each sample of DNA for sequencing. costal has been sequenced genome wide, and a missense mutation was detected when compared to the control DNA. We hypothesize that can confirm this finding with single-sequence DNA sequencing of the same region.

ABSTRACT #13

13. *Allium cepa* L. as a Model to Study the Impacts of Cultural Eutrophication Science

Carlie Castiglione, Biology
Victor Carmona, Biology

Cultural eutrophication is the excessive amount of nutrients found in a body of water often due to runoff from land. The study evaluated excess nitrate inputs from eutrophication and the effect it had on the development of the *Allium cepa* L. We hypothesized the development of onion growth will change with the concentration of nitrate. We used garden variety fertilizer for the stock solution and placed the onions in the incubator to measure the root length, number of roots, and the root cell density of the onions. The higher concentration of nitrate had the most amount of roots, the longest root length, and the highest root cell density of the other in comparison to the other concentration and control groups. The study concluded the higher nitrate concentration had the longest root length, the lower concentration had the shortest root length, and the control had the intermediate length. The control group had the most number of roots, the lower concentration had the least number of roots, and the higher concentration was intermediate. The higher concentration had the highest root cell density, and the lower concentration had the lowest root cell density. While generally, nutrients are beneficial to plants, our findings suggest excess nutrients can negatively impact the growth and development of root dynamics

ABSTRACT #14

14. Ecologically relevant atrazine exposures affect the cells of the hepatopancreas of crayfish (*Faxonius virilis*)

Science

Karen G. Crile, Biology
Sara A. Abdulelah, Biology
Abdrhman Almouseli, Biology
Vanessa J. Manzo, Biology
Mohammad N. Hadeed, Biology
Ali Fard, Biology
Tehreem Iqbal, Biology
Rachelle M. Belanger, Biology

The hepatopancreas of crayfish is responsible for filtering and detoxifying the body following xenobiotic exposure. The herbicide atrazine is heavily applied in the Midwestern United States and concentrations in streams and rivers surrounding agricultural areas can reach >300 ppb for upwards of three weeks. We exposed crayfish (*Faxonius virilis*) to environmentally relevant concentrations of atrazine (0, 10, 40, 80, 100, and 300 ppb) for seven days and examined the effects of atrazine on the cells of the hepatopancreas. We used hematoxylin and eosin staining in addition to TdT mediated dUTP nick-end labelling (TUNEL) to determine if atrazine exposure causes changes in morphology and DNA damage following exposure. We hypothesize that as atrazine exposure concentrations increase; there is an increase in both DNA damage and vacuolization in cells of the hepatopancreas. We expect to see an increase in TUNEL-positive cells as atrazine exposure concentrations increase. Further, we predict that there will be a disintegration of tubular epithelia, dilation of the tubules, and an increase in the number of vacuoles per lobule. Understanding the effects of atrazine and correlating these with accumulation and recovery from exposure to herbicides like atrazine will allow us to assess the long-term effects of atrazine on aquatic organisms. Because detoxification of xenobiotics is energetically demanding, responses to and recovery from atrazine exposures may subsequently impact growth, development, and reproduction.

ABSTRACT #15

15. DNA damage in the cells of lateral antennules of crayfish (*Faxonius virilis*) is increased following exposure to environmentally relevant concentrations of atrazine
Science

Sara A. Abdulelah, Biology
Karen G. Crile, Biology
Abdrhman Almouseli, Biology
Saamera Awali, Biology
Ameisha Y. Tutwiler, Biology
Emily A. Tien, Biology
Vanessa J. Manzo, Biology
Mohammad N. Hadeed, Biology
Rachelle M. Belanger, Biology

Atrazine (ATR) is an herbicide commonly applied in agricultural regions in the Midwestern United States. Excess ATR can enter nearby aquatic environments through run-off and seepage, causing ATR concentrations to increase and placing non-target aquatic organisms, like crayfish, at risk of ATR exposure. It has been shown that acute exposure to 80 ppb ($\hat{1}\frac{1}{4}$ g/L) ATR can cause chemosensory deficits in crayfish. Knowing that ATR causes impairments on olfactory-mediated behaviors, our aim for this study was to determine the effects of ATR in olfactory sensory neurons, located in the lateral antennules of crayfish. We exposed crayfish to environmentally relevant concentrations of ATR (0, 10, 40, 80, 100 and 300 ppb) for 10 days. Following exposures, the distal portion of the lateral antennule was cryosectioned, and a TdT mediated dUTP nick-end labelling (TUNEL) assay was done in order to determine if cells in the lateral antennules had DNA damage. We found a significant increase of TUNEL-positive cells as atrazine increased above 10 ppb. The data that we obtained showed that DNA damage is caused in the cells of lateral antennules, including olfactory sensory neurons, which ultimately compromises the chemosensory abilities of crayfish. This is concerning as crayfish rely heavily on chemosensory abilities for many aspects of their lives. This research study was published in the journal *Chemosphere*.

ABSTRACT #16

16. The role of cell death in Yki and its possible binding partners in *Drosophila Melanogaster* at distinctive stages of eye development
Science

Brooke Allen, Biology

Anthony Huffman, Biology

Leonardo Romero-Barajas, Biology

Tiffany Cook, Wayne State University

Jacob D. Kagey, Biology

In the United States, cancer is the second leading cause of death. A specific characteristic of cancer is the evasion of apoptosis, which allows cancer cells to bypass a key defense mechanism. It is for this reason that we are focusing on understanding key regulators of cell survival and cell death in the model system of the *Drosophila Melanogaster* eye. We are using the *Drosophila* eye as a model system because it is a well characterized developmental model that grows from a single layer of epithelial tissue. During development, the eye utilizes the morphogenetic furrow to facilitate a progressive pattern of differentiation during eye development. To understand how key signaling pathways result in not only furrow progression but also cell survival we are focusing on the time dependent knockdown of the transcription regulatory proteins Yki, Mad, and Sd. Yki has been shown to facilitate cell survival and cell fate specification at different stages of eye development. Though these different roles of Yki in eye development are well established, the mechanism is unknown. YAP1 is the human homolog of Yki, it's a transcription factor that has been found to be highly expressed and localized in the nucleus of several human cancers, this indicates that having a better understanding of the time and spatial role of Yki in eye development may help to better understand YAP1 up-regulation in human cancer. Here we show that Yki is essential for survival and results in increased cell death in larval discs and adult eyes with drastically smaller eye phenotypes. Sd, a known binding partner of Yki results phenocopies the increase in cell death. Future plans for the research project involves a specified focus on cell death. The FLP/FRT system will be utilized to investigate cell death occurring in Yki, ark, and Yki/ark. Combinatorial knockdown of multiple genes will also be evaluated.

ABSTRACT #17

17. The Correlation of Compensatory Apoptosis and Signaling Pathways with the Inclusion of the Mary Shelly (CG6191) Gene in Drosophila Science

Razan El Yaman, Biology

Ali Zamat, Biology

John Sherwood, Biology

Stephanie Conant, Biology

Jacob D. Kagey, Biology

Drosophila melanogaster, commonly known as fruit flies, are an ideal model organism to study the genetics of gene regulation during development. Additionally, *Drosophila* share a well-conserved genome with humans providing a simplified model to study the genetics of human tumor development. Here we are focusing on the gene CG6191, or Mary Shelley (MS), which is a previously uncharacterized gene, and its human homolog (Cables-1) is down regulated in several different human cancer types. Using the imaginal discs of the wing and eye we have identified the expression of pattern of MS during organ development. Further, we can utilize the UAS-Gal4 system to express RNAi targeted at MS (MSIR) to understand the phenotypic consequences of MS knockdown. When Mary Shelley (MS) is reduced in the posterior side of wing disc, we observe a strong increase in cell death, which is shown through the staining of DCP-1. Also, in addition cell death occurring in the posterior compartment, non-autonomous apoptosis results on the anterior compartment of the wing. In addition, the size and shape of a wing disc changes dramatically when MS is reduced via RNAi. The overall size of the wing decreases in size due to cell death or apoptosis. From this data we hypothesize that a certain signaling pathway between the apoptotic cells of one side of the wing disc tissue and the living cells of another compartment, is creating a long-distance cell death signal to eradicate such mutation.

ABSTRACT #18

18. The Down Regulation of the Developmental Transcription Factor Mad leads to eye and wing reduction in *Drosophila*
Science

Leonard Romero-Barajas, Biology
Brooke Allen, Biology
Anthony Huffman, Biology
Tiffany Cook, Wayne State University
Jacob D. Kagey, Biology

The use of model organisms in research is a vital tool that helps study complex processes that would otherwise be difficult and/or unethical to study in humans. The use of *Drosophila melanogaster* offers a means to study the effects that molecular alterations can have on fly and human development due to homology between the human and *Drosophila* genomes. These studies can help gain insight on how genetic pathways can affect the cellular growth and development of other organisms such as humans. The types of pathways studied here are like those that are often disrupted in human cancer, and thus the understanding of these processes can help to treat cancer patients. The developmental transcription factor Mad possesses known functions in the Dpp/BMP2 pathways, but little is known about the functions Mad serves as a potential DNA binding partner within the Fat-Hippo Pathway. Here we have studied the developmentally timed down regulation of Mad through the use of several genetic drivers and crosses to analyze phenotypic data on specific tissues such as the *Drosophila* eye and wing. A cumulative analysis of all data suggests that Mad has an essential role in eye development due to the complete loss of eye tissue upon down regulation. Further, down regulation of Mad in the developing wing has led to a pupal lethal phenotype that we are now exploring. Overall these data can provide insight on gene expression and regulation which in return effects organismal development and how the disruption of Mad may contribute to cancer development.

ABSTRACT #19

19. Convolution Neural Network based Transfer Learning for Classification of Flowers Engineering

Amna Mazen, Electrical and Computer Engineering
Mariam Faied, Electrical and Computer Engineering

Flower plays an extremely important role in our life, which has high research value and application value. The traditional methods of flower classification is mainly based on shape, color or texture features, and this methods needs people to select features for flower classification lead to poor accuracy of classification. This poster aims to use convolution neural network and transfer learning. In this paper, based on VGG-16, VGG-19, Inception v3 and ResNet50 models were used to compare the network initialization model with the transfer learning model. Compared with the traditional methods, the accuracy of flower recognition on Oxford flowers dataset is obviously improved.

ABSTRACT #20

20. The community structure and diversity of urban trees in Palmer Park, Detroit.
Science

Fadak Aljabery, Biology
Victor Carmona, Biology

Urban trees in Detroit have a long and complex history spanning root damage to infrastructure, constraints in management strategies as well as budget allocation, and losses to insect-infestations, which have contributed to the present ratio of 1 tree for every 3 people living in the metropolitan area. We were interested in characterizing the community of tree species in Palmer Park, which is floristically comprised of three distinct forest habitats (southern swamp, mesic southern forest, and dry-mesic southern forest) and is one of seven urban forests that persist in the Detroit area. Our objectives were: (1) to use static life-tables to evaluate the cohort structure of tree species via Gentry methods for plant surveys, and (2) to use rarefaction techniques to contrast the alpha- and beta-diversity of tree species found across the three forest habitats. We are currently conducting the tree species surveys (10 transects, each 100m x 2m) at Palmer Park and will use the transect information to conduct the diversity analyses using the software EstimateS. Characterizing the structure and diversity of urban trees is an important first step in the exploration of how ecosystem services (e.g. stormwater infiltration, nutrient cycling, etc.) can be recovered and sustained in urban environments.

ABSTRACT #21

21. EMOTION CLASSIFICATION

Engineering

Manisha Rawat, Electrical and Computer Engineering
Shadi Bani Taan, Electrical and Computer Engineering

Currently, Emotion analysis is a topic of great interest and development since it has many practical applications. Since publicly and privately available information over Internet is constantly growing, a large number of texts expressing opinions are available in review sites, forums, blogs, and social media.

With the help of Emotion analysis systems, this unstructured information could be automatically transformed into structured data of public opinions about products, services, brands, politics, or any topic that people can express opinions about. This data can be very useful for commercial applications like marketing analysis, public relations, product reviews, product feedback, and customer service.

In this project we had evaluated the utility of linguistic features for detecting the emotions of Twitter messages. We had also evaluated the usefulness of existing lexical resources as well as features that capture information about the language used in microblogging. We had worked on Naive Bayes and BayesNet algorithms to classify the data.

ABSTRACT #22

22. Defining the Mechanisms that Maintain a Quiescent Uterus During Pregnancy Science

Akhteyar Jaeran, Biology
Chandrashekara N Kyanthanhalli, Biology
Jennifer C Condon, Biology

The mechanisms involved in maintaining uterine quiescence are poorly understood therefore the cause of preterm birth remains unknown. During a normal pregnancy the uterus has to adapt to many stresses like inflammation and mechanical stretch. Our previous data has demonstrated that throughout pregnancy the uterus uses the endoplasmic reticulum unfolded protein response (UPR) to adapt to these gestational stresses in order to preserve uterine quiescence and an appropriate gestational length. We demonstrate that these gestational stresses trigger the secretion of a distinct set of proteins “secretome” from the uterine myocytes. We propose that this secretome communicates with other cells to protectively precondition against subsequent gestational stresses thereby prolonging gestational length. It has been previously shown that conditioned media from stressed uterine myocytes (muscle cells) can precondition uterine myocytes. In this current study, we examine whether a stressed monocyte (inflammatory cell) can also communicate with a uterine myocyte utilizing a monocyte-derived secretome. We isolated conditioned media from Tunicamycin and treated 1 and 5 g/mL of it for 1 hr on unstressed uterine myocytes and cultured for 47 hrs. Tunicamycin is an agent that stresses the cells and known to activate the unfolded protein response. We isolated proteins from these cells and performed western blot analysis utilizing GRP78, CHOP, and CASP-3 as markers of an activated UPR. The results showed that the “unstressed” uterine myocytes upregulated an adaptive UPR in response to exposure to the secretome present in the conditioned media isolated from Tunicamycin stressed monocytes. This demonstrates that the stressed monocyte can propagate a protective adaptive preconditioning secretome. In conclusion, this demonstrates that the stressed cells both monocytes and myocytes can propagate a protective adaptive preconditioning secretome. We promise that this is a very important protective property during pregnancy.

ABSTRACT #23

23. Protein Purification of *C. crescentus* Initiation Factors to conduct in vitro reconstituted translational assays
Science

Andrea Sandoval, Biology
Jared Schrader, Biology
Nisansala Muthunayake, Biology

Bacterial translation has been examined extensively in *E. coli*, leading to the discovery of the Shine-Dalgarno site, a sequence in mRNA that precedes the start codon to properly position the correct reading frame. However, through sequencing multiple bacterial genomes, it has been found that less than half of all bacterial protein coding genes are preceded by a Shine-Dalgarno site. In the bacterium *Caulobacter crescentus*, only 23.5% of translation initiation sites contain a Shine-Dalgarno site, yet most mRNA are translated efficiently, suggested it is well adapted to non-SD translation. Through examination of the translation initiation mechanism in *Caulobacter*, we hope to reveal the mechanism of non-Shine-Dalgarno translation initiation. To be able to successfully study and examine non-Shine-Dalgarno translation, we hope to reconstitute translation initiation in vitro. Accomplishing this requires protein purification of initiation factor proteins and ribosomal subunits. We are using *C. crescentus* initiation factors (IFs) recombinantly expressed in *E. coli* cells and *C. crescentus* ribosomal subunits and RNA to study *Caulobacter* translation initiation.

I have grown cultures of *E. coli* strains that contain replicative plasmids harboring the target proteins with an IPTG inducible promoter allowing the production of large amounts of the protein so I can purify them. All strains have been cloned by Nathan Nunez, a previous University of Detroit Mercy undergraduate researcher. Once each culture was grown, protein gels were run to check for proper induction of each IF proteins.

I verified that all three IF proteins (IF 1, 2, & 3) were properly induced and are ready for purification. To purify these proteins, a cell lysate will be made and run through a Ni²⁺-NTA column to purify and isolate our target IF proteins. An initial pilot purification of a YFP tagged target protein led to inconclusive results with the resulting gel being inconclusive. Bright yellow cells were expected after IPTG induction, but no color was seen suggesting they may not have been properly induced with IPTG.

We are now poised to purify the proteins, allowing us to further understand the mechanism of non-Shine-Dalgarno and be able to understand the factors that go into this type of translation initiation.

ABSTRACT #24

24. Compositional analysis of commercially available beauty supplements Science

Courtney Mather, Chemistry & Biochemistry
Hayden Cunningham, Chemistry & Biochemistry
Coryn Le, Chemistry & Biochemistry
Mark Benvenuto, Chemistry & Biochemistry

Beauty supplements are a global, multibillion-dollar industry consisting of ingestible materials in the forms of pills, powders, capsules, liquids, or gummies. These products are marketed to: promote health and wellbeing from within; smooth, firm, and brighten skin; achieve an improved and more youthful complexion; and even ignite creative energy, in a variety of settings. These supplements are no different than vitamins, minerals, probiotics, or collagen products on the market already, however, they are advertised to boost consumer interest. Like the rest of the food supplement industry, these products are not evaluated by the Food and Drug Administration (FDA). Using energy dispersive X-ray fluorescence (EDXRF) and nuclear magnetic resonance (NMR), twenty one beauty supplements were examined to determine their composition.

ABSTRACT #25

25. Analysis of A Series of Roman Imperial “Bronze” Coins via Energy Dispersive X-ray Fluorescence Spectrometry
Science

Courtney Mather, Chemistry & Biochemistry
Hayden Cunningham, Chemistry & Biochemistry
Mark Benvenuto, Chemistry & Biochemistry

The Roman Empire produced a large array of gold, silver, and bronze coinage for several centuries. The bronze coinage can be interesting to examine, because the term “bronze” did not always mean an elemental composition of only copper and tin. We have examined a series of Roman coins by energy dispersive X-ray fluorescence to determine their elemental composition. Findings will be presented and discussed.

ABSTRACT #26

26. Systematic Approach to Study the Parameters Affecting Powder Metallurgy (P/M) Processes Using Design of Experimental (DOE) Method
Engineering

AmirReza Radmanesh, Mechanical Engineering
Mostafa Mehrabi, Mechanical Engineering

The main objective of this study is to highlight the key aspects of the processes involved in powder metallurgy. The research attempted to find a systematic approach to study the parameters affecting powder metallurgy processes. Results are detailed descriptions and analysis of topics such as particle dimensions, forming process, and treatment options. This article researched credible sources in order to absorb, understand and relay accurate and proven information based on powder metallurgy. A design of experiment (DOE) was utilized to compare the effects of varying four factors: compaction pressure, compaction rate, sintering temperature, sintering time. This finding points to the pressure, compaction rate, temperature, and the interactions of the pressure and compaction rate, and the interaction of the compaction rate and the temperature were significant.

ABSTRACT #27

27. Three Dimensional Simulation of the Transient Flow of Different Gas Velocities and Flow Distribution in Catalytic Converter through a Porous Medium
Engineering

AmirReza Radmanesh, Mechanical Engineering
Nihad Dukhan, Mechanical Engineering

Transient catalytic converter performance is governed by a complex interaction between exhaust gas flow and the monolithic structure of the catalytic converter. Stringent emission regulations around the world necessitate the use of highly-efficient catalytic converters in vehicle exhaust systems. Computational fluid dynamics (CFD) is a powerful tool for calculating the flow field inside the catalytic converter. Radial velocity profiles, obtained by a commercial CFD code, present very good agreement with respective experimental results published in the literature. However, the applicability of CFD for transient simulations is limited due to high CPU demands. In present work, the geometric modeling of a ceramic monolith substrate is done with a square-shaped channel type of catalytic converter and is coated with platinum and palladium. This example illustrates the effect of flow distribution on the thermal response of a catalytic converter as well as different gas flow velocities during the critical phase of catalytic converter warm-up.

ABSTRACT #28

28. Analysis of Children's Pressure Points for Prevention of Pressure Ulcers Mechanical Engineering

Michael Avalos Jr., Biology
Jayla Anderson, Biology
Molly Laird, Mechanical Engineering
Ivy Razmus, Nursing
Megan Conrad, Mechanical Engineering

The purpose of this study is to identify the best mattress surface for children who require extended hospital stays. We hypothesized that pressure redistribution surfaces placed on top of a mattress will decrease pressure on a child's body and thereby reduce the risk of pressure injury. To test the hypothesis, mean pressure distribution and amplitude was found using a BodiTrak2 pressure mapping system which recorded the 10 children (mean age: 5.3 yrs, range=[2, 9 yrs]) lying on 5 different surfaces. Both average pressure and contact area are recorded in the 5 regions being studied. The three pressure redistribution surfaces (wool, 2" foam and 3" foam) resulted in the least amount of pressure. The sacrum region had the most contact area in all surfaces when compared to the other regions.

29. Abrasion of fossil bone fragments from Mesozoic Morocco and North Africa unaffected by paleoenvironment
Science

Noor Seba, Biology

Georgia Sheena, Biology

Victor D. Carmona-Galindo, Biology

Nizar Ibrahim, Biology

The extent to which fossils weather, abrade, and deteriorate is highly variable in the environment. The objective of our study was to evaluate the variability of abrasion, as a measure of fossil bone fragment deterioration, in Mesozoic era fossil bone fragments from North Africa with respect to their original paleoenvironmental and paleoecological domains. We hypothesized that abrasion index values would change with respect to the paleoenvironment, taxonomic classification, and specific type of bone fragment of the fossil specimen. We detected that average abrasion index values were homogeneous across aquatic and terrestrial paleoenvironments as well as between taxonomic contrasts of both diverse and specific fossil bone fragment types. Our findings suggest that abrasion index values may not reflect the paleoenvironment or paleoecology of the fossil specimen, but rather may reflect regional weathering patterns that contribute to the deterioration of fossils in North Africa. We propose that future studies consider regional chronospecies contrasts in evaluating the role of paleoenvironments in fossil abrasion variability.

ABSTRACT #30

30. Synthetic Building Blocks for Drug Development Science

Ana Lopez, Chemistry & Biochemistry
Adetoun Fagade, Chemistry & Biochemistry
Cross Orow, Chemistry & Biochemistrys

The link between traumatic brain injury (TBI), which can be the result of an accident, drug use or derailed metabolic processes, and inflammatory mechanisms is well established. Inflammation in the central nervous system drives pathological and consequently cognitive outcomes.

This project strives to develop druggable molecules that engage cell signaling cascades associated with TBI. The molecules are synthesized from building blocks in a pericyclic reaction; one fragment derived from sugars yielding furanones, the second dienes like sorbyl alcohol or furfuryl alcohol. This convergent synthetic approach makes it possible to introduce a wide range of pharmacophores into the scaffold we are developing.

ABSTRACT #31

31. Identifying Effect of Atrazine on Human Keratinocytes Science

Victoria Krajcz, Biology
Selena Cholak, Biology
Angelina Antonyan, Biology

Atrazine is the second most used herbicide in the United States and the most common chemical detected in American groundwater. Despite being banned from various European countries, the EPA has deemed concentrations below 3.0 parts per billion (ppb) to be safe for use. Atrazine can enter the body via inhalation, ingestion, or penetration where it is then converted into metabolites in the bloodstream. Many studies have labeled atrazine as a carcinogen due to the reproductive defects it causes in rats, fish, and amphibians at levels as low as 0.1 ppb. In 2009, the herbicide was observed as being a potential cause of birth defects and reproductive complications in humans (Pathak, Dikshit; 2011). Some reports have also shown that atrazine causes mitochondrial dysfunction in human liver cells (HepG2). While it is known that atrazine can have an impact on many organ systems, its effect on the skin remains understudied. The importance of this research is underscored by the fact that the skin is our first line of defense and primary means to combat toxins, ultraviolet radiation, and mechanical insults. The goal of this research is to identify whether exposure to atrazine could promote a cancerous phenotype in human keratinocytes. We hypothesize that higher levels of atrazine may act as a carcinogen, affecting cell cycle, adhesion, and morphology. To identify this effect, keratinocytes were exposed to varying concentrations of atrazine that exceeded the EPA's standards. Immunofluorescence was employed to visualize DNA double-stranded breaks with the marker [Symbol]H2AX, a version of the H2A protein that composes the histone octamer and gets phosphorylated upon DNA damage. Additional cell cycle markers and DNA damage pathways were investigated in keratinocytes treated with atrazine. Our preliminary data suggests that that keratinocytes treated with increasing atrazine concentrations induces DNA damage, alters cell morphology, and causes changes in cell adhesion. Knowledge gained from this work will provide new insights into a previously understudied area.

ABSTRACT #32

32. Understanding the role of suppressors of mutational effects of EGFR in *Drosophila melanogaster*
Science

Devin Mendez, Biology Department
Jacob Kagey, Biology Department,
Gnanada Joshi, Biology Department

EGFR is a transmembrane signaling protein that affects many downstream processes known to affect cell growth, division, survival, and differentiation of mammalian cells. Mutations and over-expressions of EGFR is known to cause defects in its downstream signaling pathways which are known to cause cancer; hence many cancer drugs are targeted towards EGFR and its signaling components. Thus, finding pathways that will suppress the EGFR mutations *in vivo* may enhance our understanding of these mutations and provide ways to the develop alternative therapies to cancer involving EGFR mutation. To accomplish this, we screened for known alleles EGFR to see if they could rescue the homozygous lethal phenotype observed in our EGFR mutant. We crossed our EGFR mutant flies to 11 other known alleles of EGFR, purchased from the Bloomington *Drosophila* Stock Center, we identified 2 mutants that rescued the homozygous lethality. Next, we plan to evaluate the similarities across DNA sequence in our EGFR mutant and compare it across species, thus further elucidating the downstream pathways affected and understanding a broader impact of EGFR mutation. Additionally, we plan to verify of specific pathways affected in the homozygous mutants by observing the genotypic expressions in wing imaginal discs using anti-bodies against EGFR and quantify the rescue using GFP in the mutants.

33. Executive Functioning and Viral Loads in Youth Living with HIV (YLWH) Participating in Adherence and Health Interventions Science

Steven Taddei, Biology

Youth living with HIV accounts for 21% of new infections. Adherence among this group is imperative for viral suppression and positive health outcomes. Executive functioning is important in daily life, and deficits in inhibition, working memory, and planning and organizing skills (executive functions) can impact ART adherence. Thus, it is important to explore the relationship between executive functioning and viral load for YLWH participating in adherence interventions. YLWH (n=79) were randomized (MESA, intervention, n=41; System for Health (SH), control, n=38). Mean age was 19.8 and 20.0 for MESA and SH participants, respectively; 75.6% of MESA and 73.7% of SH participants self-identified as Black/African American, while 82.9% of the MESA and 76.3% of SH participants self-identified as male. Executive functioning did not significantly differ over time for the MESA or SH group, and was not significantly related to viral load (pre- or post-intervention). Viral loads for both the MESA and SH groups decreased significantly from baseline to 1-month ($p<.01$ and $p<.01$), respectively. However, only the MESA group significantly decreased in viral load from 1-month to 3-month ($p<.01$). Viral load decreased significantly overtime for the MESA group compared to the SH group. Although deficits were noted, executive functioning was not related to intervention response.

ABSTRACT #34

34. A Survey of Inter-Vehicle Communication: Methods for Securing Data Transfer
Electrical & Computer Engineering & Computer Science

Samar Bayan, Electrical & Computer Engineering & Computer Science
Utayba Mohammad, Electrical & Computer Engineering & Computer Science
Nizar Al-Holou, Electrical & Computer Engineering & Computer Science Department

Inter-vehicle communication represents exchange of data within vehicular ad-hoc network (VANET). It enhances safety through regular messages including vehicle's position, emergency messages, etc. However, injecting false data through forged nodes within or outside VANET causes severe problems that may result in accidents. This survey paper describes a focused literature survey of methods implemented for securing VANET. A short description of inter-vehicle communication and its techniques is provided. Papers representing each securing method are read, categorized and identified. The complexity of securing such type of communication and the challenges for implementing each method are discussed, and then recommendations for future technique improvement are provided.

ABSTRACT #35

35. Study of Spring-back Effects in Deep Drawing Engineering

Ramzi Said, Mechanical Engineering

M. G. Mehrabi, Mechanical Engineering

ABSTRACT

Deep drawing is a sheet metal forming process in which metal blank is radially drawn into a forming die by the mechanical action of the punch. Dimensional tolerances and their variations are important aspects of quality control issues in this forming operation. In this regard, the spring-back effect is an inherent phenomenon that directly affects the final dimensions of the part produced. This research work is focused on analysis and control of spring-back in deep drawing processes. It is mainly focused on design and implementation/simulation of control strategies to minimize that. In this regard, the impact of various process parameters such as lubrication, punch speed, punch and die nose radius, and blank holding force is studied through design of experiment methodology. In particular, this study is focused on the design and development of various control strategies to minimize spring back in this process. An experimental set up is designed and developed to facilitate this research. This paper presents some of the experimental results obtained from this study.

ABSTRACT #36

36. Traffic Signs Identification Using Deep Learning Engineering

Ratheesh Ravindran, Electrical and Computer Engineering

One of the most crucial enabling technologies for automated driving systems is the ability to reliably detect and classify a wide range of traffic signs in various driving conditions and at different distances. Due to the complexity and dynamic nature of a driving environment, it is difficult to reliably detect traffic signs with conventional image processing methods. The artificial intelligence in combination with the image processing has proven to be a great success in recent studies. This project focuses on the selection of Deep Neural Network (DNN) based on application-oriented performance by taking into consideration the mean Average Precision (mAP) and Frames Per Second (FPS) as the major evaluation criteria. Faster Region-Convolutional Neural Networks (Faster R-CNN) is a newly proposed DNN in the literature that has proven to exhibit a balanced trade-off between mAP and FPS performance measures. This research starts with a DNN transfer learning and then implements the Faster R-CNN for the real-time detection and classification of traffic sign using the Robot Operating System (ROS). The German Traffic Sign Benchmark database (GTSDb) is used in this project and additional data sets are created due to the non-availability of certain traffic signs in the GTSDb. Simulation using ROS-Gazebo and real-time trials using the Polaris Gem e2 and NVIDIA Drive PX2 is performed and proven efficient at detecting and classifying traffic signs.

37. Secondary Tumor Formation Following Treatment with DNA-Alkylating Agent Temozolomide for High-Grade Glioblastoma in Mice Science

Cherish Coleman, Biology

Temozolomide (TMZ) is a DNA-alkylating agent used for the treatment of glioblastoma (GBM) patients. Response to TMZ-inflicted DNA damage include DNA repair, cell death, or the accumulation of mutations, which could lead to cancer. GBM patient-derived xenografts (PDX) were developed by implanting tumor cells into the brains of immunocompromised mice to study TMZ sensitivity. GBM PDX lines that responded to 40 mg/kg/day in 21-day cycles of TMZ treatment survived longer, but surprisingly developed lung tumors 3-5 month after treatment. For confirmation, three mouse strains were treated with TMZ and observed for symptoms of tumor development. TMZ treatment led to lung tumors in nude mice, thymus and/or lung tumors in severe combined immunodeficiency (SCID) mice and in C57 immunocompetent mice. No tumors were observed in control treated mice. The goals of this study were to determine baseline expression of DNA repair genes in mouse tissues potentially exposed to TMZ and to characterize the tumors through the expression of tissue specific markers. Tissue was collected from mouse normal and cancerous lung and thymus, used for DNA and RNA extraction, and for culturing cells. Total RNA underwent reverse transcription. The resulting cDNA was used to determine gene expression qualitatively through endpoint polymerase chain reaction (PCR) and quantitatively through real time PCR (qPCR). Gene expression results support that all tumors in SCID mice originate in the thymus, and that DNA repair genes are upregulated in lung tumors relative to normal lung tissue in nude mice. TMZ-mediated tumorigenicity has implications for pre-clinical and clinical studies.

ABSTRACT #38

38. Imaging Perineuronal Nets in a Mouse Single-Prolonged Stress Model Science

Sarah Buhay, Biology
Veronica Piggott, Biology
Muhammad Abbas, Biology
Julia Malewicz, Biology
June Ruan, Biology

Stress, which is marked by physical, emotional, or psychological strain, is a common occurrence for every individual, and in severe or chronic cases can lead to impactful, negative effects on one's physiological health. Post-traumatic stress disorder (PTSD), which can manifest itself as behavioral avoidance, emotional numbing, and/or reliving of trauma, can be described as a crippling pathological condition that arises from experiencing a traumatic event. Among the general population of the United States, the lifetime prevalence of PTSD has been found to be 7.3% (Roberts et al.). Previous research has associated the condition with notable neurobiological changes such as reduced hippocampal volume and cortical thickness (Kim et al., Logue et al., Sadeh et al.). Additionally, PTSD is known to induce behavioral and psychological changes including impaired fear learning, memory, and extinction of conditioned fear (Acheson et al., Hylin et al.), all of which involve deviations in neuroplasticity. With the ability of PTSD to affect brain morphology and processes involving learning and memory, an emerging field of study in this regard focuses on the cellular level and possible effects on perineuronal nets (PNNs). PNNs have been implicated in stabilizing and protecting synaptic connections predominantly formed during critical periods of neural development, however, they are regulated throughout a lifetime and may change in response to various assaults on the brain. The effect of high-level stress events, such as those that induce PTSD, on the morphology, regulation, and associated effects of PNNs on neuroplasticity is presently unknown. The current project aimed to optimize methods of PNN identity, characterization, and quantification across brain regions of C57BL/6 mice exposed to mouse single prolonged stress (mSPS), a model for PTSD, as part of a larger study that will examine the effect of PTSD on expression patterns of PNNs and associated proteins. Studying such impacts will provide insights into the role of PNNs and PNN expression in the pathophysiological and cognition-related mechanisms relating to psychological and behavioral outcomes of PTSD. These initial studies were designed to locate, characterize, and quantify PNNs associated with parvalbumin-positive (PV+) interneurons in the nucleus accumbens (NAc), dorsal hippocampus (dHC), medial prefrontal cortex (mPFC), amygdala (AMYG), and anterior striatum (AST), as remodeling of PNNs in these areas has been implicated in cellular processes underlying reward pathways, emotion mediation, and in synaptic connections used for memory and cognitive flexibility in adults. To do so, Wisteria floribunda agglutinin (WFA) was used to identify aggrecan-containing PNNs and antibodies directed against PV distinguished PV+ interneurons. Mouse brains were also stained using a WFA concentration curve to determine what concentration of the antibody yields the images optimal for PNN quantification and with low background signal. Pictures were acquired using a confocal microscope and analyzed using Image J software to determine statistical differences between PNN presence in SPS-exposed and control mice. We determined that the best concentration for imaging PNNs is a WFA concentration of 1:50. Additionally, we found a colocalization of WFA in PV+ neurons in the mPFC, NAc, dHC, AMYG, and AST. The findings of colocalization in such areas identified unique populations of PNN-associated cells that may be relevant to mechanisms involved in cognitive function and fear learning relating to PTSD. Quantitative analysis showed no statistical differences in any measure between the two groups of mice, likely due to the study being statistically underpowered. Therefore, such results require more quantitative data in order to obtain a statistical difference. Future directions of this project include more image data collection, immunoblot analysis, and polymerase chain reaction experiments to further quantify molecular PNN components between SPS-exposed and control mice.

ABSTRACT #39

39. Synthesis of a series of multi-dentate ligands for use as potential water remediators
Science

Marianne Kajy, Chemistry & Biochemistry
Ahmed Al-Hilali, Chemistry & Biochemistry
Mark Benvenuto, Chemistry & Biochemistry

The search for molecules capable of removing ions from water, and thus cleaning polluted waters, is an ongoing one. The production of inexpensive ligands which have multiple Lewis base atoms in them is one possible way to remediate polluted water. This research is aimed at the production of multi-dentate ligands capable of complexing metal ions and removing them from solution. Synthetic methods and means of characterization will be presented.

ABSTRACT #40

40. Identification of the bacteriophage defense mechanisms utilized by the dental pathogen, *Streptococcus mutans*
Science

Leen Issa, Biology

Laura Young, Integrated Biomedical Sciences

Joshua J. Thomson, Integrated Biomedical Sciences

Streptococcus mutans, a bacterial pathogen found in the oral cavity, is highly correlated with the initiation of dental caries. Current therapeutics for dental disease target bacteria or dental plaque en masse, but several species of the oral microbial flora can be important in preventing other infections and promoting health. One alternative to conventional treatment could be to use bacteriophages (phage) that can specifically target and kill dental pathogens, including *S. mutans*. Phage have the capability to lyse and destroy a targeted cariogenic bacterial species, leaving all other commensal species believed to be essential for maintaining desirable oral health unbothered. *S. mutans* have been classified into four serotypes: c, e, f and k. The serotype-specific extracellular polysaccharides act as the specific receptor for *S. mutans* phage. Previous studies have demonstrated a potential for phage as therapeutic agents in the prevention and treatment of dental caries including the recent discovery of an *S. mutans* serotype e phage, ϕ APCM01. However, there is increasing evidence of widespread resistance against bacteriophage within *S. mutans*, thus complicating the possibility of an effective phage therapy. The aim of this study was to identify the bacteriophage resistance mechanism(s) employed by *S. mutans* using ϕ APCM01 sensitive and resistant strains isolated from saliva samples. We analyzed three different defense systems that may provide *S. mutans* with immunity against ϕ APCM01. First, we tested to see if the first step of infection, binding to cell receptors, was altered in phage-resistant strains. We then considered if phage resistance is a result of phage immunity provided by chromosomal prophage, using lysogen induction assays with the chemical, Mitomycin C. Lastly, we analyzed the CRISPR spacer sequences in the two CRISPR-Cas systems in *S. mutans* for identity with the ϕ APCM01 sequence. Multiple resistance mechanisms may play a role in *S. mutans* resistance to phage; however, elucidation of the mechanism may provide the key to successful bacteriophage therapy against the bacterium.

ABSTRACT #41

41. Variation of the Common Carotid Artery Diameter Related to Age Science

Atalie Garmo, Biology

Adrienne Chaney, Biology

Mary Tracy-Bee, Biology

Scott Barton, University of California – San Diego

In a multi-campus and multi-year study, we investigated the relationship of the size of the common carotid artery versus age of death. The common carotid artery is located bilaterally in the neck and is a common location for taking a pulse. The artery is vital in delivering blood to head and neck structures, including the brain. A significant and positive correlation was identified bilaterally in the diameter of the common carotid arteries in to age of death in human cadavers ranging from 24 to 104 years old ($p=0.001$) with a sample size of 162. Our data supports the observed relationship between the age of death to the diameter of the common carotid artery. This correlation may offer an insight into circulatory- related procedures in the cervical region or may be indicative of a related genetic predisposition to a higher vascular flow.

ABSTRACT #42

42. Omnidirectional Mecanum Wheel Robot Engineering

Nicholas Dimkovski, Electrical and Computer Engineering
Zachary Rizzo, Electrical and Computer Engineering

This project focuses on the development of a computer-controlled Nexus mecanum-wheeled omnidirectional robot. An NXP HS12 microcontroller is interfaced with position encoders and motor controllers to provide the robot with speed and direction control - technologies which are closely related to those associated with the development of autonomous vehicles. Embedded-C code is written to monitor motor speed and direction using digital encoders, and to vary the power delivered to each wheel using Pulse-Width-Modulation (PWM) and H-bridge FET amplifiers. To demonstrate the maneuverability of mecanum-wheeled vehicles, the code causes the robot to move in square, diamond, circle, and figure-8 patterns all while facing in the same direction. Furthermore, closed-loop speed control is demonstrated by instructing the robot to drive up a ramp while maintaining constant speed and orientation.

ABSTRACT #43

43. DISEASE CAUSING *PSEUDOMONAS AERUGINOSA* BACTERIA AND A PHAGE UNDER DISTINCT CONDITIONS IN UNDERGRADUATE RESEARCH

Science

Ahmad Alnajar, Biology
Cameron Johns, Chemistry & Biochemistry
James Graves, Biology

This investigation sought to determine if study of *Pseudomonas aeruginosa* and a phage could reveal factors in affecting pathogenicity. The strain *P. aeruginosa* ATCC 13388 had been designated suitable for pathogen research. The phage was isolated from stream sediment. The effect of aeration on phage propagation in Bacto Brain Heart Infusion medium was examined by use of a bubble culture tube connected to a gas washing bottle and air pump. Bacterial growth was assessed by measurement of culture optical density (OD) with a Klett-Summerson colorimeter. Aeration produced a culture of bacteria alone with a high OD of 220 in contrast to a culture incubated statically with an OD of 30 in 8 h. Addition of phage inhibited growth of bacteria. Aeration improved growth of bacteria with phage, but yield of phage by routine test dilution (RTD) was not considerably changed. Fundamental biochemical characterization was performed by the Enteropluri-Test, which is a multiple biochemical test system made of 12 test "chambers" in a series. The test demonstrated that the strain of *P. aeruginosa* did breakdown citrate and urea but it may not have been sufficiently sensitive to detect any metabolic effects when inoculation included presence of the phage. Characterization by the Biolog, Inc. redox-based system used 95 carbon sources with tetrazolium violet dye in a microplate with 96 "wells." The carbon source array included citrate but not urea. The metabolic profile for cells with phage was similar to the bacteria alone but reactions appeared to be slightly inhibited with phage presence. Bacto Simmons Citrate Agar, and Bacto Urea Agar were used to provide a lawn of *P. aeruginosa* in a RTD of the phage in an attempt to detect metabolic effects on the "surface" in a biofilm. Low phage dilution zones prevented bacteria breakdown of citrate and urea respectively. Production of the enzyme urease is an important virulence factor in some diseases. Study of phage and the microbial environment may help to discover how to use phage as an antimicrobial agent.

ABSTRACT #44

44. The Immediate Physiological Effects of Vaping & Second-Hand Vapor Science

Channing Sesoko, CLAE
Dr. Molly McClelland, CHP

Vaping is a common activity where individuals inhale vaporized oils containing various chemicals such as nicotine, THC, and/or flavorings. There is a growing concern over the safety of vaping, as the CDC has reported 2 deaths linked to the activity. The fluid that is vaporized is known as E-liquid and is typically comprised of 4 ingredients: vegetable glycerin, propylene glycol, natural and/or artificial flavorings, and nicotine. In this study 2 ingredients were used in the lab's E-Liquid: Vegetable Glycerin and Propylene Glycol. Participants had physiological measures taken before and after 20 minutes of vaping the lab's E-liquid or being exposed to second-hand vapor. Statistical analyses were carried out via IBM's SPSS software to identify any differences in physiological measures between groups as well as any disparities that exist between pre- and post-exposure values.

ABSTRACT #45

45. A preliminary evaluation of Oral Microbiome Ecology with Age, Gender, Ethnicity, Smoking Habits, and History of Colorectal Cancer
Science

Monica Bean, Chemistry & Biochemistry

Juliana Jakubczak, Biology

Carmela Esteva, Biology

Victor Carmona, Biology

The equilibrium of oral microbiome is altered by age. Recent studies also suggest that oral pathogens causing periodontal disease are involved in pathogenesis of colorectal cancer. For this study oral DNA samples from 183 participants in a population-based case-control study for colorectal cancer were sequenced to determine different bacterial phyla present in the oral sample. Differences were found between the mean oral microbiome diversity, evenness, and richness of different age groups. We further discuss how observed differences can be used to cultivate positive changes in our oral ecosystem as well as oral health.

ABSTRACT #46

46. The Association of Psychosocial and Health Factors in Individuals with Serious Mental Illnesses Other

Camryn Chavis, Psychology
Aysha Young, Psychology
Kristen Abraham, Psychology
Kate Dykhuis, Psychology

Serious Mental Illnesses (SMI) leads to major functional impairment and it affects many U.S. adults (National Institute of Mental Health, 2019). Recovery from SMI can be known as an ongoing process, in which individuals find meaning in life and have life goals (Corrigan & Ralph, 2005). Social support is a major component of psychological health and has been identified as an aid to recovery (Hendryx et al., 2009). Patients with SMI are also more vulnerable to acquiring cardiovascular diseases and conditions. (Mathur et al., 2012; Chae et al., 2012). Many psychosocial factors such as racial discrimination have been determined to heighten the risk of these conditions in studies with general population samples (Udo & Grilo, 2017); however, this association has only briefly been evaluated in patients with SMI. This poster describes two research questions that will be answered with data generated from a larger study known as Check on Health Detroit. The first research question is whether the different sources of support, such as family, friends, and special persons are differentially associated with mental health recovery from SMI. The second question is whether the perception of racial discrimination is associated with the heightened risk of cardiovascular diseases (CVD) in African Americans patients with SMI. Participants in the Check on Health Detroit Study are individuals with SMI, who are at least 18 years of age, and have at least one chronic medical condition. Participants are recruited from community mental health centers in Detroit, MI. Established measures of mental health recovery, social support, experiences of racial discrimination, and health status were used to understand participants' experiences. Measures are administered as part of -baseline, 3-month, and 6-month evaluations. Only data from the baseline assessment will be used to address the research questions described here. The next steps in the process of getting results is to continue data entry and soon analyze the baseline data. Overall, the goal of this research is to help individuals with SMI increase their mental health and decrease the likelihood of health risks.

ABSTRACT #47

47. The Role of Organismal Density on Freshwater Quality and Bacterial Growth Science

Sang Yoon Ryu, Biology

Victor D. Carmona, Biology

The density of organisms may play a role in the environmental quality of the freshwater system. The objective of our study was to evaluate the effect of the density of organism on pH, total dissolved solids, conductivity, and bacterial growth. We hypothesized that water with a higher density of organism will maintain the constant qualities and yield diverse bacterial growth. In the experiment, two aquaponic tanks were used: One with a high density of Daphnia and the other with a low density of Daphnia. We evaluated changes in pH, conductivity, and TDS in two aquaponic tanks, one with a high density of Daphnia and the other with a low density of Daphnia over a period of 21 days. We took a sample of water from each water tank, put them on agar plates, and compared the diversity of bacterial colonies. Bacterial colonies were assessed by plating water samples from each aquaponic tank. The average pH value was higher in the water tank with a high-density Daphnia than the low-density Daphnia and showed a smaller 95% confidence interval. Conductivity was higher in a high density of Daphnia water tank, and its confidence interval was wider than the low-density Daphnia. Both water tanks showed an increasing trend of TDS. Bacterial growth in many Daphnia plates showed higher richness of bacterial morphologies. The qualities of water differed with the density of Daphnia with the exception of TDS. By observing the increasing trend of TDS from both tanks, we concluded that Daphnia was responsible for this change. TDS did not differ between water tank treatments, but both tanks showed a unison increase in TDS. Since water tank with a high density of Daphnia showed higher average TDS value than the other tank, we further concluded that TDS is proportional to the number of organisms in water. We also concluded that more organisms in water induce higher variability in the system and yields diverse bacterial growth. Our study also suggested that the presence of Daphnia in water may play a role in producing either organic or inorganic matters in water, resulting in an increased TDS level.

ABSTRACT #48

48. Evaluation of the Effects of Human Cytomegalovirus, Brazilian Red Propolis and Essential Oils in the Progression and Treatment of Periodontal Disease
Science

Racha Tiba, Biology
Sahiba Singh, Biology

Periodontal disease is a multifactorial disease of the gums triggered by plaque accumulation, bacterial colonization, and inflammatory immune responses. Recent studies have also linked human herpesviruses, including human cytomegalovirus (HCMV), with chronic and aggressive periodontitis. Currently, periodontal therapy involves scaling and root planning often followed with local or systemic antibiotic treatments. Our previous findings of HCMV in sub-gingival plaque samples, and the association of HCMV and periodontitis found by others emphasizes the need to evaluate antivirals, in addition to antibiotics for the treatment of periodontal disease, as antibiotics cannot kill viruses. Furthermore, a growing number of pathogens have developed antibiotic resistance, and current antibiotics cause a number of side effects. Additionally, approved anti-herpesviral medications may cost more than \$10 per dose, have limited oral bioavailability, cause toxicity with long-term use, and have the potential for viral resistance. Brazilian Red Propolis (BRP) is a complex, resinous mixture collected by bees from the secretions of plants, shoots, and leaves in Northeastern Brazil. BRP has been used in traditional medicine and has been shown to demonstrate antiviral activity and protect against tooth decay. Other studies have shown similar properties in multiple Essential Oils (Eos) including oregano and lavender. In this study, we tested BRP and essential oils to determine their protective and/or toxic effects in comparison to mouthwashes on oral fibroblasts in vitro. The results of this study will be used to select natural antimicrobials with low toxicity for further testing against HCMV and periodontal pathogens.

ABSTRACT #49

49. Compositional Approach to Abstraction for Planning Problems Engineering

Juliana Vilela, Electrical and Computer Engineering

Research in the field of planning seeks to determine the best distribution and ordering of tasks over a finite set of resources. Job-shop scheduling, tasking multiple cooperative robots, routing cars through traffic, and decision-making in artificial intelligence, for example, can be classified as planning problems. There are several methods to solve planning problems, including linear programming, heuristics, and graph search techniques. In this work, we first apply Supervisory Control Theory (SCT) to find the set of behaviors that can be achieved through control to keep the system safe and non-blocking. This set of controlled behaviors is then used as the search space to find the optimal plan from the initial state to some pre-identified goal state(s). However, SCT and planning techniques, in general, suffer an explosion in computational complexity when the systems become bigger and more complex. Efforts have been directed to improve the scalability of the application of SCT to larger planning problems. Modular or compositional algorithms have been applied when the system is separable into sub-systems. Hierarchical methods which employ abstraction are known in literature. In prior work, the notion of cost equivalence has been used to generate an abstraction of the supervisor that with additional conditions guarantees that an optimal plan found in the abstraction is also optimal in the underlying full supervisor. Here we go a step further, and develop a new notion of equivalence based on cost equivalence and weak bisimulation that we term priced-observation equivalence. This type of equivalence leads to the aggregation of states with the same observed futures events and costs. This equivalence is used to generate the abstraction of the supervisor. However, instead of synthesizing the full supervisor from which to create its abstraction, as done previously, we show that it is possible to create the abstraction compositionally.

ABSTRACT #50

50. Synthesis of ligands for platinum drugs
Science

Alyssa Hardy, Chemistry & Biochemistry
Oohyung Jang, Biology
Sheku Bangurah, E & S General
Tyiesha Head, Biology
Klaus Friedrich, Chemistry & Biochemistry

The overarching objective of this project is the improvement of treatment outcomes for cancer patients who require chemotherapy. An important class of chemotherapeutic agents is that of platinum-containing antineoplastic drugs. The treatment is typically associated with numerous side effects and the risk of malignancies that develop drug resistance.

Here the synthesis of new ligands for platinum complexes derived from amino acids is described. The complexes are designed to facilitate DNA-bending upon base crosslinking. The DNA-platinum adducts will be characterized to gain insight into the mechanisms of DNA-related cytotoxicity of these platinum compounds and to conduct cell-imaging studies.

The new ligands are obtained from amino acids through a synthetic pathway involving N-protection, amidation, deprotection and reduction steps leading to substituted ethylene diamine ligands. Variation of the amino acid side chains are designed to modify the lipophilicity of ligands and to contribute some steric hindrance and can be functionalized to attach reporter groups to determine the position of the adduct on the DNA strand as well as the location in the cell. Synthetic methodologies, procedures for the separation of enantiomeric products and analyses of platinum compounds are presented.

ABSTRACT #51

51. A Preliminary Report of GDP and Suicides in Developed and Developing Countries
Science

Kennedi Seals, Biology
Kayla Polisano, Biology
Kimberly Rorick, Biology
Victor Carmona-Galindo, Biology

Abstract: Suicide is a growing problem among developed and underdeveloped countries across the world. In the United States, young white males are especially at risk for committing suicide. In an effort to understand how this phenomenon affects countries across the world, we hypothesized that the average number of suicides per 100,000 people in different countries would correlate to their average GDP (Gross Domestic Product) per capita. We obtained demographic data from Kaggle on 101 developed and underdeveloped nations, which included the number of suicides for males and females. We also grouped nations into categories of developed and underdeveloped countries based on their respective GDP per capita. We found that no significant correlation between the number of suicides per 100,000 people and GDP per capita, in terms of the following comparisons: males and females of underdeveloped countries, males of underdeveloped countries, males and females of developed countries, males of developed countries, males and females of both country categories, or males of both country categories. Our findings support the conclusion that the variation observed in suicides per 100,000 people in developed and developing countries is not explained by national-scale changes in GDP per capita.

ABSTRACT #52

52. Intra-Vehicle Network Security Engineering

Mohamad Ali Mokhadder, Electrical and Computer Engineering
Uttayba Mohammad, Electrical and Computer Engineering
Nizar Al-Holou, Electrical and Computer Engineering

Current automotive vehicles generally include driver assistance and infotainment devices which are based on sensing physical measurements and controlling different actuators. This employs a number of different networking protocols to integrate these systems and attain an efficient intra-vehicle communication within different Electric Control Units (ECUs) implemented in the vehicle. To establish communication between relevant ECUs and the sharing of data, bus-based networks such as controller area network (CAN) or FlexRay are utilized.

Even though many studies have proven high performance and efficiency for CAN-based vehicular network, securing such network is still a challenge that most recent researchers are working on. This paper will go through different structures for vehicular networks focusing on CAN based ones, shedding the light on several attacks that such network can be susceptible to. After that, multiple available security systems for CAN buses will be discussed and describe how message authentication and confidentiality is established by applying these systems. Finally, different reverse engineering approaches and fuzzing tests are presented as efficient ways for detecting new types of attacks and implementing the corresponding security systems.

ABSTRACT #53

53. A Novel Desmosome-COP9 Signalosome Interaction Science

Selena Cholak, Biology
Victoria Krajcz, Biology
Angelina Antonyan, Biology
Rashid Baydoun, Biology
Nicole Najor, Biology

The epidermis, the outermost layer of skin, serves as a critical barrier against the outside environment. A common feature among epithelial tissues is the proper maintenance and formation of cell junctional protein complexes. Desmosomes are a type of cell-cell junctional protein complex that have been shown to interact with the COP9 signalosome (Constitutively Photomorphogenic). The desmosome-COP9 complex has been shown to downregulate epidermal growth factor receptor (EGFR), which is a known signaling player in cell growth. This subsequently causes the promotion of epidermal differentiation. The mechanism by which the desmosome-COP9 complex regulate EGFR is through the removal of a protein modification called Nedd8 (de-neddylation). Upon the removal of Nedd8, EGFR is destabilized, allowing for a dampening of the growth signaling transduction pathway. While the desmosome-COP9 signalosome super-complex functions have been well defined for the maintenance of skin homeostasis, its potential role in other cytosolic regulatory pathways has not yet been explored. Previous work has led us to question the extent to which the desmosome-COP9 signalosome can function in additional cytosolic regulator pathways. Through targeted protein analysis in a variety of epithelial cell lines, this research aims to identify and clarify the process by which the desmosome-COP9 Signalosome complex contributes to novel cell signaling.

ABSTRACT #54

54. The Effect of Autophagy on BHPI-induced Cell Death Science

Ahed Anbari, Chemistry & Biochemistry

Liselle Tungol, Biology

Monica Bean, Chemistry & Biochemistry

Mara Livezey, Chemistry & Biochemistry

BHPI is a bio-modulator of estrogen receptor alpha that induces necrotic cell death through ATP depletion and has shown promise as a preclinical anticancer drug. BHPI kills cancer cells through activating the anticipatory Unfolded Protein Response (UPR), but the effects of BHPI on autophagy were unknown. The time- and concentration-dependent effects of BHPI on T47D breast cancer cells were studied by looking at the autophagy markers, Beclin-1 and LC3-II, and by performing Trypan Blue death assays. The effects of further inhibiting autophagy on BHPI-induced necrotic cell death were also determined. This work is the first to connect the anticipatory UPR and autophagy to necrotic cell death.

ABSTRACT #55

55. Determination of the potential effectiveness of bacteriophage therapy against the dental pathogen, *Streptococcus mutans*

Science

Autumn Murry, Biology

Laura Young, Integrated Biomedical Sciences

Joshua Thomson, Integrated Biomedical Sciences

Early Childhood Caries (ECC), in which primary teeth are affected by caries, is a significant public health problem. ECC is highly correlated with the presence of the cariogenic bacterium, *Streptococcus mutans*, which is able to adhere to tooth surfaces and can initiate formation of a complex, acidogenic biofilm on enamel. Research efforts into bacteriophage therapy are increasing as these viruses that infect bacteria, do so through a highly specific process to target only the pathogen of interest. Previous studies have identified a bacteriophage, ϕ APCM01, that can infect and kill *S. mutans*, and also inhibit biofilm formation. However, bacteriophage therapies for ECC directed against *S. mutans* would need to first penetrate the matrix of dental plaque biofilms prior to infection. Therefore, our aim was to determine the therapeutic potential of *S. mutans*-specific bacteriophage by assessing the bactericidal effectiveness after delivery onto pre-developed *S. mutans* biofilms. Biofilms of *S. mutans* were grown for 4 or 24 hours, and then infected with ϕ APCM01. Bacteriophage were bactericidal in the immature 4 hour biofilm yet displayed no killing in the mature 24 hour biofilm. Therefore, we assessed if the mouth rinse Salivea[®], which contains glycosidic enzymes, mutanase and dextranase, intended to disrupt the polysaccharide matrix of biofilm, would allow better penetration of bacteriophage into the biofilm. Together, these in vitro models of biofilm infection will help establish parameters to examine bacteriophage ability to penetrate and specifically kill *S. mutans* within a polymicrobial biofilm, more representative of the dental plaque of children at high risk of caries.

ABSTRACT #56

56. GPS/IMU Sensor fusion and Localization for Segway RMP 220 Engineering

Ali Babolhavaeji, Electrical and Computer Engineering
Dr. Michael J. Santora, Electrical and Computer Engineering
Utayba Mohammad, Electrical and Computer Engineering

Robot Localization is the process of determining where a mobile robot is located in reference to a coordinate system. Typically, a robot will create a map of the navigated environment and it will try to find its way, through this map, to different target locations. Hence, having an accurate location is essential to generating accurate maps and performing successful navigation. Since localization sensors are noisy, integrating multiple sensor data is needed to reduce the noise in the location estimation. In this research, a multi-sensor fusion algorithm is employed for fusing the Global Position System (GPS), Inertial Measurement Unit (IMU), and odometry information using two Extended Kalman Filters (EKF). The Segway RMP-220 robot is used in this research with following sensors onboard: an external GPS Novatel Propack-6, two spartan AHRS-8, and an odometry measure provided by Segway internal processing unit. The standard robot localization package in the Robot Operation System (ROS) is configured to handle this task. The first Kalman filter estimates the local position of the robot based on IMU and Odometry then the output is fed to the second Kalman filter with GPS and a second IMU data to estimates the global position of the robot. The estimated position is shown to be much more accurate than all the individual sensor measurements and within reasonable accuracy to navigate urban environments.

ABSTRACT #57

57. Fast Pedestrian Detection Using Deep Convolutional Neural Network Engineering

Ali Babolhavaeji, Electrical and Computer Engineering

Mohammad Fanaei, Electrical and Computer Engineering

In self-driving vehicles, a real-time system is needed to reliably detect pedestrians, vehicles, traffic signs, and lane lines. The goal of this research is to design, implement, and test a real-time pedestrian detection system to be used in self-driving vehicles, where the prior knowledge obtained through the analysis of many images with labeled pedestrians (i.e., training set) will be used to recognize a pedestrian in a given unseen image. It is a non-trivial problem because of the wide range of human poses and the variety of complex backgrounds in the images of interest as well as the processing speed that this application demands. A typical object detector can locate an object in any location and scale in an image. The object detector must classify each object inside the image and determine its location. Generally, an object detector has two parts, namely feature extraction, and classification. There are many techniques to extract complex features from an image such as handcraft feature descriptors (e.g., SIFT, HOG, and LBP) or using a sliding window over the image and convolutional neural networks (CNN). The CNN-based feature extraction models have proven in recent research studies to be more promising than other competitors. In this research, the original YOLO model is reimplemented under Python on the Nvidia GPU by using CUDA and PyTorch. We have used a Microsoft Kinect camera to take an image and feed it to the YOLO network for real-time pedestrian detection. The results will be reported in the poster.

ABSTRACT #58

58. The Effect of Runoff Contaminants on Bacterial Communities in the Environment Science

Dante Candela, Biology
Victor Carmona, Biology

In a parking lot setting, contaminants like motor oil, radiator fluid, and transmission fluid are found in minuscule amounts naturally and can enter and pollute the water system via runoff water. Rain gardens filter runoff water to improve water quality, but little is known about how bacterial communities responsible for nutrient cycling in soils are impacted. The objective of the study was to evaluate the effect runoff contaminants on bacterial communities in the environment. We hypothesized that bacterial richness would be impacted negatively by diluted concentrations of motor oil, radiator fluid, and transmission fluid. We grew onions in three different contamination treatments (high, low, control) in a climate-controlled laboratory for ten days. Bacteria from each treatment solution was cultured in agar-containing Petri dishes and evaluated after 48 hours. We observed the highest bacterial richness in the control solution, and the lowest bacterial richness in both the high and low concentration treatments. Our study suggests that rain garden design and engineering should mitigate runoff contaminants to promote the sustainability of bacterial communities and the ecosystem services they provide.

ABSTRACT #59

59. The Effect of Soil Type on Plant Transpiration in an Urban Garden Science

Cynthia Gutierrez-Navarro, Biology
Olivia Allam, Biology
Rima Khattab, Biology
Ahmad Ali, Biology
Victor D. Carmona-Galindo, Biology

Water availability is expected to reduce food production in agricultural landscapes due to effect of climate change. Southwest Detroit Environmental Vision (SDEV) is an urban farm that produces organic food and advances food security to local residents. Our research objective was to evaluate the optimization of carbon dioxide uptake and minimization of water loss by measuring stomatal morphology of crop leaves growing under different conditions. It is important to address the relationship between soil type and water conservation. We hypothesized that soil type (mulch vs. sandy-soil) would explain differences in stomatal density and percentage of opened stomata of sunflower plants. We did not detect differences in stomatal density of sunflowers growing in either soil type. However, there were significantly higher percent of open stoma on sunflowers growing in the mulch. Our findings suggest that sunflowers growing in mulch may be at a higher risk for water loss via transpiration. Based on our findings we suggest to SDEV use the water efficient method and continue planting crops in sandy soil. We propose future studies to evaluate soil composition as an integrative strategy for enhancing plant water conservation at SDEV urban farms.

ABSTRACT #60

60. Fungal Pathogen *Candida albicans* Cell Wall Genes GAL10 and MNN45 are Imperative to Biofilm Formation
Science

Diana McMahon, Biology
Marcelio Shmmami, Biology
Kunal Desai, Biology
Tulsi Patel, Biology
Tania Anderson, Biology

Infections by the opportunistic fungal pathogen *Candida albicans* are a critical health issue due to their ~30% mortality rate and few available antifungal drugs for treatment. While *C. albicans* can be commensal in the human gut, it can become virulent, especially in immunocompromised individuals. This infection is intensified by the formation of a biofilm that can occur anywhere in the body including implanted devices such as artificial joints, catheters, and pacemakers. The cell wall is the outermost component of the fungal cell and is comprised of cell wall proteins along with chitin and glucans. Cell wall proteins are important for the survival of *C. albicans* as they are the first to encounter the cell's environment. The cell wall proteins can report the external environmental conditions including whether the location is an appropriate site for cellular adherence. Once the yeast cells have adhered, a biofilm can develop and eventually result in a systemic infection. In this study, we report the discovery that the mutants of *gal10* and *mnn45* disrupt biofilm formation. In addition, the mutants have increased sensitivities to different cell wall perturbing agents, which may be the underlying cause of the biofilm defects. Our results demonstrate that the genes *GAL10* and *MNN45* have essential roles in *C. albicans* biofilm formation, suggesting that their respective proteins are potential drug targets for the development of antifungal treatments against *C. albicans*.

ABSTRACT #61

61. In vivo Expression of Short Fragments of Antifreeze Peptides in E. coli Science

Laila Sareini, Chemistry & Biochemistry

Antifreeze proteins (AFP) are unique biomolecules produced by organisms living in arctic climates. AFPs help organisms to survive extremely cold temperatures by inhibiting the freezing process and allowing for necessary physiological functions to take place. Their ability to lower melting points in a non-colligative manner makes them great candidates for potential use in cryopreservation of cells, tissues, and organs. This project focuses on cloning and expression of short segments of type I AFP peptides known as HK-2 and HK-3 in E. coli. The AFP fragments HK-2 and HK-3 were cloned in an inducible expression vector, transformed into E. coli strain DH5 α , and confirmed using a colony polymerase chain reaction. Cloning of peptides into E. coli was repeated until desired growth of healthy colonies within 24 hours was achieved. An in vivo assay of antifreeze activity of HK-3 in E. coli was conducted by storing cultures of cloned HK-3 strains at -20 °C alongside controls. Preliminary results of assays revealed an inhibition of the freezing process at -20 °C for cultures of HK-3 with an inducer as opposed to controls which froze at the same temperature. These results demonstrate that the AFP segments HK-2 and HK-3 have promising potential for utilization in various cryopreservation techniques, which is being further investigated.

ABSTRACT #62

62. Objective and Subjective Sleep Measures in Older African American Adults Psychology

Edwin F Jurado, Psychology

Decreasing sleep quality has shown to be correlated with cognitive impairment, affecting older populations. Sleep is an important health behavior associated with a variety of psychological processes and clinical health endpoints. Sleep is one of the health components measured by Health among Older adults Living in Detroit (HOLD), a study that examines the interplay between environmental, psychological, and social stressors in regard to health and well-being in middle aged and older African American adults living in Detroit. Sleep can be measured by objective and subjective methods, which target different aspects of sleep. In the current study, the Pittsburgh Sleep Quality Index (PSQI) is a subjective method and Actigraphy is an objective method. Statistical analyses suggest that women report worse sleep quality compared to men ($t(61) = -2.19, p = .827$) and that individuals with a lower income also reports worse sleep quality compared to individuals with a greater income ($t(61) = 1.71, p = .093$). Subjective methods are often not as reliable among older adults since they rely on recalling past experiences. Employing a combination of objective and subjective methods may be beneficial to accurately capture the sleep quantity and quality of older adults.

ABSTRACT #63

63. Is Racial Identity associated with Health Behaviors among Black Women?

Science

Taylor Bays, Biology

Dawn P Misra, Biology

Studies have examined whether neighborhood safety is related to the amount of physical activity residents engage in, but this has rarely been done in pregnancy. Using data from the LIFE study (2009-2012) of Black women (N=1410; 71% response), we examined associations between perceived neighborhood safety and physical activity during pregnancy. Neighborhood safety was measured using a 6 item scale with 5-point Likert responses. Physical activity was measured as: 1) minutes of exercise daily; 2) self-reported “walking for a purpose” minutes. Analyses compared the bottom quartile (least safe) to the upper 3 quartiles of the neighborhood safety scale using chi-square tests for proportions and t-tests for means. Women were significantly ($p=.03$) less likely to engage in any exercise in neighborhoods rated in the bottom quartile (32.0%) compared to the upper 3 quartiles (38.8%). Women had a slightly lower mean number of minutes of exercise per day in neighborhoods rated in the bottom quartile compared to the other three quartiles (10.0 v. 13.0 $p=.08$). Women reported a significantly higher number of minutes walking for a purpose per day in neighborhoods rated in the bottom quartile compared to the other three quartiles (106.6 v. 84.6, $p=.02$). Among women who reported any minutes walking for a purpose, those in a neighborhood in the bottom quartile for safety were more likely to walk 40 minutes daily compared to the other three quartiles (39.6% vs. 30.8%, $p=0.009$). Neighborhood safety has an impact on the amount of physical activity in pregnant Black women.

ABSTRACT #64

64. Analysis of Children's Pressure Points for Prevention of Pressure Ulcers Science

Jayla Anderson, Biology

Michael Avalos, Biology

Molly Laird, Mechanical Engineering

Megan O. Conrad, Mechanical Engineering

The purpose of this study is to identify the best mattress surface that prevents pressure ulcers from developing on children in the hospital for an extended period of time. We hypothesized that pressure on a child's body and the risk of pressure ulcers will be reduced when pressure redistribution surfaces are placed on top of a mattress. Using the BodiTrak2 Pro Pressure-Mapping System, we were able to measure pressure and contact area of 10 children, ranging from ages 2 to 9 years old, laying on five different surfaces: a standard mattress, a yoga mat, a wool mattress cover, a 2-inch memory foam, and a 3-inch memory foam. The average pressure and average contact area were studied based on five different body regions. The three pressure redistribution surfaces that resulted in the least amount of pressure were the wool cover, 2-inch foam, and 3-inch foam. The sacrum region possessed the most contact area in all surfaces compared to the other regions.

ABSTRACT #65

65. The Sub-Facets of Openness to Experience as Predictors of Cognitive Complexity Psychology

Giovanni Fernandez, Psychology

Cognitive complexity is defined as the ability of a person to perceive and respond to variables based on prior experience and prior developed personal constructs (Bieri, 1955). Someone who is more cognitively complex can understand concepts and ideas from differing perceptions, while someone who is less cognitively complex can have difficulty doing so. Openness to experience is a facet of the big five of personality, which is defined as is defined as an individual's capacity for imagination, intellectual flexibility, and creativity. (Costa & McCrae, 1992) While there is literature on the correlation of openness to experience and cognitive complexity, the correlation of cognitive complexity to the sub-facets of openness to experience are unknown (Woznyj, Banks, Dunn, Berka & Woehr, 2017). This literature review seeks to address that gap by exploring the possible correlation between cognitive complexity, and the six sub-facets of openness to experience, which include imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism. We proposed that each sub-facet could be unique predictors of cognitive complexity. This understanding can offer insight about when openness to experience will be most predictive of cognitive complexity.

ABSTRACT #66

66. Study of Spring-back Effects in Deep Drawing: Theory and Experiment
Engineering

R. Youssuf, Mechanical Engineering

M. G. Mehrabi, Mechanical Engineering

Deep drawing is a sheet metal forming process in which metal blank is radially drawn into a forming die by the mechanical action of the punch. Dimensional tolerances and their variations are an important aspects of quality control issues in this forming operation. In this regard, spring-back effect is an inherent phenomenon that directly affects the final dimensions of the part produced. This research work is focused on analysis and control of spring-back in deep drawing processes. It is mainly focused on design and implementation/simulation of control strategies to minimize that. In this regard, the impact of various process parameters such as lubrication, punch speed, punch and die nose radius, and blank holding force are studied through design of experiment methodology. In particular, this study is focused on design and development of various control strategies to minimize spring back in this process. An experimental set up is designed and developed to facilitate this research. This paper presents some of the experimental results obtained from this study.

ABSTRACT #67

67. Systematic Approach to Parametric Study of Powder Metallurgy Engineering

A.R. Radmanseh, Mechanical Engineering
M. G. Mehrabi, Mechanical Engineering

The main objective of this study is to highlight the key aspects of the processes involved in powder metallurgy. The research attempts to develop a systematic approach to study the parameters affecting powder metallurgy processes. Results are detailed descriptions and analysis of topics such as particle dimensions, forming process, and treatment options. This article researched credible sources in order to absorb and relay accurate and proven information based on previous research works in powder metallurgy. Based on this literature survey, a design of experiment is utilized to systematically study and compare the effect of variation of compaction pressure, compaction rate, sintering temperature, sintering time and their interactions on final quality of the part. Experimental results are analyzed and presented.

ABSTRACT #68

68. Anatomical Relationships of the Gastro-Intestinal Tract of Madagascar Hissing Roach:

Gromphadorhina portentosa

Science

ATearea Boggan, Biology

Jolani Perez, Biology

Using Di-I, all lipophilic pathways were stained and examined within the gastrointestinal (GI) tract. Based on previous results, and a new data from stereodissecting microscopy using stained GI tract, three hypothetical models were inferred about pH regulation in the Madagascar hissing cockroach. Overall, regulation was driven by carbonic anhydrase, CA, in the trachea and Malpighian tubules, as well as Acidic and Basic Regulation were initiated and driven by CA, with the help of a Cl⁻ transport ion.

ABSTRACT #69

69. How do Adults Maximize Their Memory Capacity Through Repeated Study in Comparison to Adolescents and Children?

Science

Mina Spryszak, Psychology

The ability to immediately recall a list of words improves with age, however, cognitive mechanisms underlying improvement from childhood to adulthood are not well understood. Immediate recall of words appears to be mediated by a chunk-based verbal working memory capacity, which maintains a few chunks worth of associated information processed as integrated units. We hypothesized that the growth in immediate recall could be due to one of three mechanisms: 1) adults may be able to hold more chunks within their working memory, 2) adults may be able to form larger chunks, or 3) both mechanisms co-occur. In this study, we investigated how adults, compared to children and adolescents, utilize chunking to maximize memory performance through repeated study of a list of words. Participants were given the California Verbal Learning Test- Children's Edition. The participants' responses to this task were analyzed to determine the number of chunks in their working memory. Furthermore, we assessed how a chunk in a previous trial evolved into a fragment of a chunk in a later trial. Adults utilized fewer, but larger chunks compared to their younger counterparts by merging pre-existing chunks. Additionally, the hypothesized measures of chunk-merging efficiency were found to be correlated with verbal processing tasks Word Classes, Backward Number Repetition, and Verbal Standard Score, lending support for the validity of the chunking measures. We conclude that the growth in verbal memory may be attributed to a stronger chunking ability in forming larger and more sophisticated chunks as opposed to an increased chunk capacity.

ABSTRACT #70

70. Chimeric Bcl-2 promoter and Bax gene

Science

Hannah Cizauskas, Biology
Michelle Andrzejak, Biology

Cancer has become a wide spread and very prevalent disease in human populations. It embodies the idea of cells that no longer regulate cell growth and division properly leading to uncontrolled cell growth resulting in a tumor that, with time, can enter the bloodstream and migrate to other parts of the body. Because of the numerous regulation and signalling pathways, the term cancer embodies a wide variety of different genetic mutations that cause an array of different types of cancer. Because of the variety of pathways involved in cancers not treatments in the past have been highly generalized in order to treat any type of cancer with a single treatment plan. In recent years, there has been a push to find more specialized treatment for cancers and we begin to better understand the mechanisms behind cancers. One pathway that is very commonly found in cancers is the intrinsic apoptotic pathway that is regulated via an equilibrium between BCL-2 and BAX. BCL-2 is expressed in cells ready to undergo cell division whereas BAX is expressed heavily when there is a problem within the cell and it must undergo apoptosis, or programmed cell death. In many cancers the BCL-2 protein will be overexpressed and it will continuously and uncontrollably undergo cell division. With this researchers have proposed the possibility of a chimeric BCL-2/BAX gene in order to override the overexpression of BCL-2 in cancer cells. The chimeric gene would consist of the promoter to the BCL-2 gene spliced with the coding region of the BAX gene in an attempt to cause transcription factors that intend to express BCL-2 to actually express BAX which would lead to activation of the intrinsic apoptotic pathway. Most importantly, because healthy tissue express BCL-2 and BAX at normal levels they will not be affected by the chimeric gene enough to lead to unnecessary apoptosis. Not only does this study aim to find a more exclusive and specific cancer treatment but it also aims to find an option that is healthier for the surrounding tissue and the body as a whole

ABSTRACT #71

71. Determining Drug Targets in *Candida albicans* Biofilm Formation Science

Marcelio Shammami, Biology

Candida albicans is a naturally occurring fungus in the gut microflora that can become deadly through the formation of biofilms on medical implants in immunosuppressed patients. Biofilms form in four steps, adherence, where yeast cells adhere to a medical implant or device, initiation, where the yeast cells begin to clump and create larger colonies as well as begin to filament, maturation, where filamentation continues and an extra cellular matrix forms resulting in resistance to host defenses and antifungal treatment, and dispersal, where yeast cells break off from the hyphal cells and begin the cycle again. Our research is focused on finding specific cell wall mutations as possible targets for drugs, by assaying a library of insertion mutants of *C. albicans* for biofilm formation. Cell wall genes are used as drug target due to the fact that humans have no existing homologous genes, as well as the cell wall being vital for the fungus to survive. Here we report that orf19.5267, a gene of previously unknown function, is essential for biofilm formation in vitro, showing defects in adherence, filamentation, and growth.

ABSTRACT #72

72. Does sharing your medication matter
Science

K'Sha Braswell, Biology
Christine Joseph, Biology

Background: Asthma is a chronic, lung disease that inflames and narrows the airways. Asthma is treated with controller medication (anti-inflammatory) to prevent asthma attacks. Controller medication is taken daily to reduce inflammation in the airways. Adolescents reported sharing asthma medication for various reasons. Little is known about the association between sharing asthma medication and adherence to controller medications in adolescents.

Objective: Is sharing asthma medication associated with non-adherence to prescribed controller medication in adolescents with asthma?

Methods: Analysis used baseline data from a randomized controlled trial (RCT) of Puff City, a web-based asthma intervention targeting 9th-12th graders attending Detroit Public Schools. The RCT was conducted in 2007-2011. We used Odds Ratios (OR) to describe the relationship between sharing medication and prescribed controller medication adherence. An OR is a statistic that determines the likelihood of an association between two events.

Results: Of the 452 patients participating, 404 had data sufficient for analysis. 95.8% (n=92), were African American and 51% (n=49) were female, with a mean age of 15.8 (sd 1.3). Of the 404 students, 24% (n= 97) reported sharing their asthma medication with a friend/family member. Sharing medication was associated with taking controller meds < 1 day in the past 7 days when compared to taking controller medication 5-7 days, Odds Ratio (OR) = 3.24, 95% Confidence Interval (CI) =1.12-9.35; p=0.03. Medicaid enrollment was associated with sharing medication, but was not statistically significant, OR = 1.44, 95% CI = 0.56-3.70; p=0.445.

Conclusion: Results suggest teens who share their asthma medication are less likely to adhere to their controller medication. Future analysis is needed to determine the association between sharing asthma medication and adherence to controller medications.

ABSTRACT #73

73. The Health of My Baby: A Qualitative Exploration of Pregnant Low Income African American Women

Psychology

Shelbi Matlock, Developmental Psychology

Na'Tasha Evans, Developmental Psychology

Objective: African American and low-income women are three times less likely to receive prenatal care and are more likely to receive inadequate prenatal care when compared to white and higher income women. This qualitative research study aimed to gain a better understanding of factors that contribute to low-income African American women's adherence to prenatal care recommendations in hopes to decrease infant morbidity and mortality.

Design: The study used a thematic analysis to document the perspectives of low-income African American women in their second or third trimester of pregnancy. The sample included 18 African American women aged 18-45 years old.

Setting: All women (n =18) were recruited from health clinics, hospitals, health fairs, private practices, and the County Health Department in Cuyahoga County, Ohio by a convenience sample.

Results: Study findings indicate that pregnant low-income African American women receiving Medicaid adhere to prenatal care recommendations based on two overarching salient themes: (1) preventative measures for health of baby and self and (2) lack of trust of the prenatal care provider.

Conclusion: Study participants reported significant levels of mistrust which is congruent to recent studies that suggest that health care is less efficient and beneficial for low-income and minority populations. As a result, adherence to medical recommendations given by health care providers health of the babies was heavily dependent on the inter-personal characteristics that the health care provider displayed during care.

ABSTRACT #74

74. ToxR of *Vibrio cholerae* Binds Multiple Sites Along the *toxT* and *ompU* promoters Based on Crystallographic and Biochemical Analyses
Science

Nour El Yaman, Biology

Eric Krukonis, Detroit Mercy Dental Division of Integrated Biochemical Sciences

Cholera, a diarrheal disease caused by *Vibrio cholerae*, is estimated to cause over 100,000 deaths each year. Cholera toxin and toxin co-regulated pilus, two key virulence factors, are directly regulated by ToxT, while the *toxT* promoter is activated by ToxR in conjunction with TcpP. ToxR also directly regulates *ompU*, encoding the outer membrane porin OmpU. We previously defined two ToxR-binding sites within the *toxT* promoter, but recent crystallographic studies of ToxR bound to the *toxT* promoter identified three other ToxR-binding sites. Based on these structural findings, ToxR mutants were generated based on their predicted impact on DNA binding activity. Six ToxR mutants ToxR-W64A, ToxR-D72P, ToxR-R84A, ToxR-T99A, ToxR-K102A, and ToxR-Y105A were unable to activate either *toxT* or *ompU* and all but one (ToxR-D72P) were completely defective for DNA binding. ToxR-D72P bound the *toxT* and *ompU* promoters similar to wild-type ToxR despite failing to activate both promoters. This suggests the D72P substitution alters presentation of the transactivation loop for interaction with RNA polymerase. One mutant, ToxR-R84A, when co-expressed from a plasmid along with wild-type ToxR from its normal locus resulted in a 50% decrease in the activity of wild-type ToxR. This “dominant negative” effect indicates that ToxR-R84A can interact with wild-type ToxR and poison the transcription activation complex required for *ompU* activation. Finally, mutation of two newly identified ToxR-binding sites in the *toxT* promoter (centered at -65 and -51) had only a modest (~30%) decrease in *toxT* activation. This result calls into question the role of ToxR binding to these sites within the *toxT* promoter. Based on a mobility shift assay testing the binding affinity of wild-type ToxR on four different mutated *toxT* -65 and -51 sites for cold competition, we show that mutation made to the -65 and -51 site had little to no effect on activating transcription of *toxT*. Since the combined mutation made on -65 and -51 sites did not compete as strong as wild-type, this indicates ToxR does not require those sites to activate and undergo *toxT* transcription. In addition, mutation made on the -51 site alone showed competition for ToxR, while ToxR loses inhibitory activity when binding a mutated region around the -65 site alone suggest that ToxR does not bind the -51 site during the process of initiating transcription of *toxT*. This suggests that TcpP might have more impactful role for binding the -51 site to assist with *toxT* activation. Future studies will more specifically define the DNA sequences required for ToxR and TcpP binding and regulation of *V. cholerae* virulence.

ABSTRACT #75

75. The Effects and Quantitation of Atrazine in Crayfish Tissue Post-Exposure Science

Abdrhman Almouseli, Biology

Vanessa J. Manzo, Biology

Mustafa Azam, Biology

Rachelle M. Belanger, Biology

Kendra R. Evans, Chemistry & Biochemistry

The herbicide atrazine (ATR) is heavily applied in agricultural areas in the Midwestern United States where its concentration can reach over 300 ppb. Previous studies have shown that 96-h exposures to 80 ppb ATR cause lasting deficiencies in the chemoreception of food and mate odors in the virile crayfish, *Faxonius virilis*. Consequently, to determine the effect of ATR on olfactory sensory neurons, we treated crayfish for 10 days with ecologically-relevant concentrations of 0, 10, 40, 80, 100 and 300 ppb ATR. Following treatments, the distal portion of the lateral antennules were cryosectioned. We used a TdT mediated dUTP nick-end labelling (TUNEL) to identify cells with DNA damage and thus may be undergoing apoptosis. We found that as ATR concentrations increase, the number of TUNEL-positive cells in the lateral antennules also increases. To correlate physiological and behavioral effects of ATR exposure with accumulation in the hepatopancreas and muscle tissue, we employed the QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) method for pesticide extraction from crayfish tissue. QuEChERS was coupled with liquid chromatography-mass spectrometry for quantitation of ATR and its metabolites in muscle and hepatopancreas tissue of crayfish. The developed method also includes the use of ATR-d5, an isotopic internal standard, to improve the accuracy and precision of the pesticide quantitation. Figures of merit including the detection limit, the limit of quantitation, and the dynamic range were determined. Additionally, spike recovery tests were performed. Recently, the QuEChERS method was modified to increase the purity of extracted pesticides and metabolites. The validated method will be used to quantitate the accumulation of ATR and its metabolites in crayfish tissue for comparison with physiological and behavioral changes observed in crayfish after ATR exposure.

ABSTRACT #76

76. The Role of Bean Plant Architecture on Water Stress in an Urban Garden Science

Tia Aziz, Biology

Charlotte Dale, Biology

Tasnim Daoud, Biology

Marina Sacco, Biology

Victor Carmona, Biology

Urban Gardens are a new method of cultivating produce through the use of abandoned spaces, philanthropic donations, recycled products, and a volunteer workforce to support neighborhood and cities that are food insecure. Our project objective was to evaluate how bean plant architecture would affect the plant water status and conservation. We hypothesized that the percent of stoma open, stomatal density, and stoma length would differ in the plants grown horizontally relative to plants growing vertically. We measured the stomatal density, and morphology on a total of 20 terminal leaflets collected from bean plants growing in both a horizontal and vertical position. We found no difference in the stomatal density or length, but detected significantly greater percent of open stoma in plants growing vertically relative to horizontally. Our findings suggest that bean plants growing vertically would sustain greater photosynthetic rates and that the resulting increase in net primary production (NPP) would be reflected in higher crop yields. As such, we recommend that Cadillac Urban Gardens favor a vertical plant architecture when cultivating beans.

ABSTRACT #77

77. Ail-Mediated Yop Delivery by *Yersinia pestis* is Enhanced by Pla's Protease Activity Science

Lizbeth Garcia-Leon, Biology
Sean Ojha, Biology
Eric Krukonis, Biology

Yersinia pestis, the causative agent of plague, must deliver cytotoxic Yop proteins to host cells to block phagocytosis and immune responses and establish a productive infection. Outer membrane proteins Ail and Pla, mediate binding to host cells (often via extracellular matrix proteins) to facilitate Yop delivery. Pla, plasminogen activator, serves as an adhesin and protease. In this study, we assessed the importance of the Pla protease activity on Ail-mediated Yop delivery utilizing the Pla non-proteolytic mutant Pla-S99A.

Yop delivery was measured using a fluorescence-based assay. After three hours of infection, cells expressing Ail + wild-type Pla had significantly higher Yop delivery (80%) than those expressing Ail + Pla-S99A (40%). By five hours, this difference diminished as the Pla-S99A mutant was able to reach similar levels of Yop delivery as wild-type Pla. Thus, at early timepoints, Pla protease activity is required for maximal Ail-mediated Yop delivery.

To assess whether changes in Yop delivery reflected decreased cell binding by strains expressing Pla-S99A compared to wild-type Pla, three-hour cell adhesion assays were conducted. The strain expressing Ail + Pla-S99A had similar levels of cell binding to wild-type Pla. This level of adhesion was comparable to a strain expressing Ail and no Pla, indicating adhesion was primarily mediated by Ail. Thus, the decrease in Ail-mediated Yop delivery by Pla-S99A at 3hrs post infection is not due to poor adhesion by the Ail+ strain expressing Pla-S99A, but may instead reflect differences in host cell signaling due to cleavage of extracellular matrix proteins that impact Yop delivery.

ABSTRACT #78

78. Marijuana and Alcohol Increase Crash Avoidance Reaction Time in a Driving Simulator Test at Blood Concentrations Below Commonly-Used Per Se Cut-offs for Intoxicated Driving Science

Tyiesha Head, Biology

The present study demonstrates marijuana- and alcohol-induced impairment of a driving-relevant measure in a driving simulator task at a blood alcohol concentration (BAC) and tetrahydrocannabinol (THC) concentrations that are below the per se cut-off for impaired driving (DUI; DUID) in several states. The subject was an adult male with a history of occasional alcohol use (2-3 times/week for the past 6 months) and past but very infrequent use of marijuana, i.e., less than once/month for the past 6 months. The procedure was a Crash Avoidance Reaction Time (CART) procedure using a fixed base driving simulator. While driving at 55 mph, the subject was required to make an "emergency" steering maneuver to avoid crashing into a "stalled car" that appeared on the roadway immediately (40 meters) ahead. Tested 14 days apart, alcohol (3 beers, then 3 more beers over 60 minutes) and marijuana (10-15 mg oral in a "candy") each significantly increased CART times from approximately 450-475 msec to > 550-575 msec. A BAC of 39 mg/dl was associated with impaired driving; this is significantly below the 80 mg/dl cut-off for drunk driving in most states. THC concentrations of 2.9 and 1.5 ng/ml were associated with impaired driving; these values are below the 5 ng/ml cut-off for marijuana-impaired driving in several states (e.g., Washington, Colorado). The CART procedure will be useful in further studies on the effects of marijuana, alcohol and other drugs on driving performance. (This study was approved by the Wayne State University Internal Review Board (WSU IRB #066716B3E).

ABSTRACT #79

79. The Effect of Sun Exposure on Bean Plant Stomatal Dynamics Science

Hadi Eid, Biology

Dana Hindi, Biology

Christina Varghese, Biology

Ayah Ismail, Biology

Victor Carmona, Biology

An urban garden forms part of the urban ecological systems, plays an important role in the urban environment, and contributes to urban food security. Our research objective of the experiment conducted was to evaluate the role of shade from trees on water conservation of food crops in an urban garden. In this experiment, we hypothesized that stomatal density, stomatal size, and percentage of open stomata would differ between the bean plants growing in direct sunlight relative to bean plants under the shade of a tree. We sampled a total of 20 leaflets from plants growing under two different sun exposure treatments: tree-shade and full sun. We found that stomatal density did not differ significantly between the shaded plants and full-sun plants while stoma size and the percentage of open stoma had changed significantly. Bean plants exposed to direct sunlight had smaller stomatal size, indicating they may not be receiving enough water to maintain optimal photosynthetic rates. Bean plants exposed to direct sunlight had high percentages for open stomata, indicating that they had a higher photosynthesis rate. Our findings suggest the plant water status of garden beans is unaffected by sun exposure and that both light environments did not contribute to differences in plant water stress.

ABSTRACT #80

80. Risk Cost Analysis of LPT in Solar Flares
Engineering

Algird Szumlas, Civil, Architectural & Environmental Engineering
Alan Hoback, Civil, Architectural & Environmental Engineering

Large power transformers (LPTs) are a vital component of the electrical grid system. Solar flares induce currents in long conductors such as transmission lines that connect LPTs with power plants. These currents have caused damage in the electrical grid in the past. Considering that the last major solar flare to hit the earth was pre-grid, the grid is unprepared. Therefore, the US economy is at risk from damage. LPTs can be replaced with newer units that can resist damage. The alternatives of LPT replacement versus the null case are compared to show the economic advantages of pro active planning.

ABSTRACT #81

81. The role of plant architecture on transpiration in an urban garden
Science

Caleb Scheys, Biology
Shirin Bhagwager, Biology
Chloe Waack, Biology
Leeza Jejeega, Biology
Victor Carmona-Galindo, Biology

Unused urban spaces are commonly being re-envisioned into gardens, with the primary purpose of providing produce to communities with poverty rates and food insecurity. Cadillac Urban Garden, in Southwest Detroit, was concerned about the water stress of their produce plants. Given that most of the water a plant has is lost through the stomata, water-use efficiency (the balance between CO₂ diffusing into the plant and by consequence H₂O diffusing out) can serve as a means to monitor plant water stress. Our research objective was to evaluate how plant architecture contributed to changes in plant water stress. We hypothesized the density, size, and percentage of open stomata would change on Tomatillo leaves exposed to different levels of radiative and direct heat. We detected the highest stomatal densities in Tomatillo plants that were rooted in soil but with leaves overhanging the asphalt. We detected the lowest stomatal densities in Tomatillo plants that were rooted in the asphalt as well as in plants rooted in the soil but with leaves at the top of the canopy. However, there were no differences in stoma size and or the percentage of open stomata in plants of different architecture. Our results suggest that water stress of the Tomatillo plants at the Cadillac urban gardens would improve with a shade-netting cover to reduce heat exposure reduces water stress. However, there is currently little research regarding stomatal densities and morphology in relationship to crop plants, such as Tomatillos. So, future studies would be required to test the stomatal densities and morphology of crop plants in regards to their productivity, primarily to develop ways asses our crops as our cities adapt to climate change.

ABSTRACT #82

82. The effect of recycled materials on plant water status in urban garden raised beds
Science

Caitlin Poota, Biology
Jonathan Yousif, Biology
Najah Roumayah, Biology
Magdeline Duke, Biology
Victor D. Carmona-Galindo, Biology

Urban Agriculture is the practice of cultivating and distributing food in or around urban areas, and is especially important in cities and neighborhoods affected by food insecurity. The Cadillac Community Urban Gardens provide fruits and vegetables for the surrounding neighborhoods of Southwest Detroit. Our research objective was to determine if potting with recycled materials had a role on plant water stress. We hypothesized that stomatal density, stoma size, and percent open stoma would differ between *Cornus mas* trees growing in two different types of raised beds made from recycled material: car tires or truck bed-liners. We picked 10 leaflets from the middle of 5 trees growing in each raised-bed treatment, and used nail polish and transparent-tape to mount dermal-peel slides of all the leaflets. After reviewing the slides, we found that stomatal morphology did not differ significantly between raised-bed treatments. Our findings suggest that water status for *C. mas* trees is unaffected by the recycled materials used in the construction of raised beds at Cadillac Urban Gardens.

ABSTRACT #83

83. Do Different Working-Memory-Related Measures Correlate with Each Other?

Psychology

Da'Jonae Foster, Psychology

David Chen, Psychology

Noa Ofen, Psychology

There are numerous psychometric measures of working memory, the mental system that supports high-level cognition. In the literature, there are two views regarding the psychometric property of working memory: the global cognitive resource view, predicting correlations among different working memory-related tasks, and the differentiation view, predicting no correlations among tasks measuring different facets of working memory. This study intends to test these views with working-memory-related measures widely used in neurocognitive research. In a sample of 71 participants (7-20 years), we administered three major working memory measures: Size Judgment Span (SJS), Number Repetition Backward (NRB), and the Working Memory Scale (WMS) from the Behavior Rating Inventory of Executive Function (BRIEF), as well as two other cognitive measures (i.e., Word List Memory Recall and Spatial Recall). Partial correlation analyses with age controlled for found that out of three possible correlations among SJS, NRB, and BRIEF WMS, only the one between SJS and NRB was significant. Additionally, Word List Memory Recall and Spatial Recall don't correlate with SJS, NRB, and BRIEF WMS in the same pattern. These findings suggested that the three major measures may be tapping onto different facets of working memory. To determine the underlying constructs for all five measures, an exploratory factor analysis identified two different factors: one for SJS, NRB, Word List Memory, and Spatial Recall, and the other for BRIEF WMS and Word List Memory. Both analyses supported the differentiation view of working memory and the idea that the working memory system encompasses multiple facets of cognitive ability.

ABSTRACT #84

84. Loss of FKBP5 Promotes Atrial Fibrillation Science

Arren Simpson, Biology
Na Li, Biology

Atrial fibrillation (AF) is the most commonly observed cardiac arrhythmia in the clinical setting, affecting 2.7 million people in the United States. Currently, the molecular mechanisms leading to AF are poorly understood. A better understanding of the pathophysiology of AF will aid in the discovery of novel therapeutics. Previously, our laboratory, demonstrated that human patients with paroxysmal AF (pAF) had a significant reduction in the mRNA and protein levels of FK506-binding-protein 51 (FKBP5) compared to patients with normal sinus rhythm (NSR). However, whether the lack of FKBP5 is arrhythmogenic remains elusive. In this study, I tested the hypothesis that loss of FKBP5 in cardiomyocytes (CMs) is causative in AF development. To test this hypothesis, our laboratory has utilized the inducible cre-lox system to generate a CM-specific FKBP5 knockdown mouse model (Myh6iCre+;FKBP5f/f, or cKD). To induce a knockdown, I injected these mice with tamoxifen (50mg/kg, 5 days) intra-peritoneally to activate the Cre, which subsequently allowed the removal of FKBP5 in CMs specifically. Cre negative littermates (Myh6iCre-;FKBP5f/f) receiving the same injections of tamoxifen were used as control (Ctl). To confirm the reduction of FKBP5 in our model, I performed qPCR and Western blot analysis and found a 68% and 33% of reduction in FKBP5 mRNA and protein respectively in the atria of cKD mice compared to Ctl mice. To determine whether the lack of FKBP5 in CMs increases AF susceptibility, we challenged the heart using electrical pacing (EP) to induce AF in vivo. While none of the Ctl mice (n=6) developed pacing-induced AF, 62.5% of cKD mice (n=8, P<0.05) exhibited pacing-induced AF. Following EP, I harvested atrial and ventricular tissues from all mice for further biochemical analysis via Western blotting, immunocytochemistry and co-immunoprecipitation. I utilized these tests to determine FKBP5-associated complex proteins. Our results indicate the lack of FKBP5 in CMs predisposes the heart to AF development. We plan to utilize an adeno-associated virus mediated gene delivery to restore the level of FKBP5 in atrial specific cardiomyocytes and to explore new avenues in the treatment of AF. Future studies will determine the molecular mechanism underlying AF development due to the lack of FKBP5.

ABSTRACT #85

85. Improvements of isolation methods for cisplatin adducts with deoxyguanosine to better understand the stabilization of the glycosidic bond

Science

Ken Dada, Chemistry & Biochemistry

Bett Kimutai, Chemistry & Biochemistry

Christine Chow, Chemistry & Biochemistry

Cancer is a lethal disease that causes uncontrolled cell division at an increased rate in the body. The disease can alter biological processes and eventually lead to death. Cisplatin is a drug that has been used to successfully treat cancers, such as testicular and ovarian, for many decades. Unfortunately, all drug treatments come with drawbacks, which is why the goal of this project is to reduce toxicity and avoid resistance mechanisms observed with cisplatin. The known target of cisplatin is deoxyguanosine (dGuo), the nucleoside building block of DNA. The short-term goal of this project aimed at understanding (de)stabilization of the dGuo glycosidic bond caused by platination. In order to meet this goal, adducts were generated between cisplatin and dGuo. The next step involved isolation of the adduct using high performance liquid chromatography (HPLC). However, HPLC was very time consuming and resource intensive, so an alternative method was desired. Therefore, a thin layer chromatography (TLC) method was developed to complete isolation as well as to visualize the progress of adduct formation over time. Mass spectrometry will be used next to determine adduct stability. By understanding the impact of platination on chemical stability of dGuo, platinum compounds can be improved to treat cancer more efficiently.

ABSTRACT #86

86. A Survey of Computational Intelligence Techniques in Ecology and Sustainability Engineering

Karthika Balan, Electrical and Computer Engineering
Michael Santora, Electrical and Computer Engineering
Mariam Faied, Electrical and Computer Engineering
Victor Carmona, Electrical and Computer Engineering
Nizar AL Holou, Electrical and Computer Engineering

Recent developments and research in the field of computational intelligence techniques has proved outstanding success for solving a wide variety of tasks in the area of ecology and sustainability. The biological inspirations are very important for computational intelligence researchers. The branches associated with Computational Intelligence techniques include Fuzzy Logic, Artificial Neural Networks, Machine Learning, Deep Learning and Evolutionary computation. In this paper a survey of current implementations with computational intelligence techniques in the area of ecology and sustainability is presented. In terms of ecology, computational intelligence techniques serves as a way to model the relationships with population-level dynamics from measures of landscape-level elements and associated metrics. The main aim of this review is to understand the current systems used in computational intelligence to model ecological dynamics and to further these studies of integration with a custom UAV equipped with state of the art sensors. The goal is to automate ecological dynamic decisions of forests using computational intelligence as the model and sensors as the input.

ABSTRACT #87

87. PTSD Screening in Primary Care: Health and Relationship Correlates
Other

Briana Murdock, Other

PTSD is a significant public health problem in the U.S. PTSD is associated with numerous negative health outcomes. Primary care clinics are an appropriate setting for screening for PTSD. This study explored the impact of a positive PTSD screen on patient health, alcohol misuse, and doctor-patient relationships. 72 males and females from a suburban primary care clinic were recruited and completed self-report questionnaires while physicians of these patients completed an overall health rating. 25% of primary care patients had a positive PTSD screen. Having a positive PTSD screen was significantly associated with greater alcohol misuse and less positive rating of the doctor-patient relationship than patients in the control group. No differences on patient- or doctor-rated health were found between the groups

ABSTRACT #88

88. Implementation and Testing of Interoperability Profile on Segway Robots Engineering

Melvin P Manuel, Electrical and Computer Engineering

Karthika Balan, Electrical and Computer Engineering

Utayba Mohammad, Electrical and Computer Engineering

Michael J. Santora, Electrical and Computer Engineering

The main objective of this research is to develop, implement and test the Interoperability Profile on a Segway robot. This work has been done as a part of IGVC 2019 (Intelligent Ground Vehicle Competition) interoperability challenge. IOP (Interoperability Profile) was an initiative started by the United States Department of Defense (DoD) to organize and maintain open architecture interoperability standards for Unmanned Ground Vehicles (UGVs), to help facilitate interoperability between controller, robotic platforms, and payloads. As the part of project, we were asked to implement number of IOP attributes, primarily based on JAUS (Joint Architecture for Unmanned Systems) profiling rules document. For operating the robot with JAUS commands, which are sending from the Conformance Verification Tool (CVT) it needs to be converted back to ROS command. For achieving this , a ROS-JAUS bridge has been developed. The ROS-JAUS bridge will be acting as a bridge between ROS and JAUS. For testing the functionality of the bridge, instead of CVT , an Operator Control Unit (OCU) has been developed and used it for testing the functionality of the bridge.

ABSTRACT #89

89. Design and Development of LoRa Based Children Tracking System Engineering

Melvin P Manuel, Electrical and Computer Engineering
Dr. Nizar Al-Holou, Electrical and Computer Engineering

All around the world, missing child cases and crimes against children are increasing at alarming rates. Considering this fact, it is the perfect time to develop a safety support system for children going to schools and parks. This paper focuses on design and developing a children tracking system based on LoRa technology. There are many tracking device available in market today, but these devices are based on RFID (radio-frequency identification) , Blue-tooth, WIFI , GSM (Global System for Mobile)and GPS (Global Positioning systems). If we closely look in to these devices, they have many disadvantages. Most of the techniques mentioned above can not be used for long range applications. RFID, Blue-tooth and WiFi based devices can be used in a range of 200 to 400 feet. GSM based devices have good range, but they are not permitted in schools. GSM based devices needs a cell phone to send the information to parent's cell phone . GSM uses microwave radiation for communication, which can badly affect the mental and physical health of children. Also, many schools discourage their students to bring cell phones to schools. Some schools have installed mobile jammers to stop the use of GSM devices inside the school zone. To overcome these disadvantages and health issues associated with available tracking devices, a new long range child safety device based on LoRa technology has been proposed. LoRa devices consume very little power making it ideal for battery-powered devices . It can transmit and receive data for up to 15 km in suburban areas and 5 km in urban areas. Considering these facts LoRa seems to be the perfect choice for developing a safety device for tracking students. The tracking device will have a GPS module, a microcontroller, a battery and a LoRa transceiver module. The location information of the child will be captured and transmitted through the LoRa network. At the LoRa receiver side (parents side), another LoRa device will be receiving the location information of their child and will be displayed on its LED display.

ABSTRACT #90

90. MCP-1 Promotes Migration and Invasion of Ovarian Cancer Cells by Inhibition of AMPK Science

Jada Nelson, Biology

Ovarian cancer cells use adipocyte fat to fuel their growth. We've shown ovarian tumor cells exposed to adipocytes increases Monocyte Chemoattractant Protein-1 (MCP-1). MCP-1 an inflammatory response protein increases ovarian cancer cells adhesion. We showed that a high-fat diet induced aggressive ovarian cancer tumors in mice increased MCP-1 amounts, and decreased phosphorylated AMPK (Amino Monophosphate activated Kinase) expression. We hypothesize that MCP-1 promotes migration/invasion of ovarian cancer cells via inhibition of AMPK. MCP-1 treated ID8 ovarian cancer cells were tested for effects on proliferation, migration, and invasion assessed by MTT, scratch, and migration/invasion assay kits. Western blots were performed to identify pAMPK. We investigated the preclinical efficacy of an MCP-1 neutralizing monoclonal antibody (mAb) in high-fat and regular diet mice. Tumor growth was monitored by in situ luciferase guided imaging and immune-histochemical markers. In-vitro MCP-1 doesn't affect the ovarian cancer cell proliferation but increased the rate of cell migration at low (50 ng) and high (100ng) doses ($p < 0.01$, $p < 0.001$), and invasion ($p < 0.05$). MCP-1 at low and high doses reduced AMPK activity. Activation of AMPK by Metformin reversed the increase seen in MCP-1 mediated migration and invasion ($p < 0.05$). In-vivo MCP-1 mAb treatment slowed ovarian cancer tumor growth in the immunocompetent ID8 model. We are performing immune-histochemical, gene expression and immune analysis to determine the mechanism of tumor-promoting function of MCP-1. MCP-1 plays a crucial role in promoting ovarian cancer growth possibly by AMPK inhibition, under increased adiposity conditions. Blocking MCP-1 may be a therapeutic option, in high body mass index patients.

ABSTRACT #91

91. Maternal Report of Child Anger and Externalizing Behavior: Associations with Child and Dyadic Behavior during In-Home Observations Science

Alexzander Riggins-Greer, Psychology

Preschoolers who exhibit higher levels of anger and externalizing problems are at heightened risk for later psychopathology and impairment (Kim et al., 2012). However, the proximal mechanisms explaining this gap are unclear. The aim of this study was to evaluate whether maternal reports of child dysregulated anger and externalizing behavior are associated with in-home observations of child or mother-child dyadic interaction behavior. Analyses were based on data collected for 53 African American mother-child dyads from low-income families (M child age= 3.88 years; 52.8% male). Mothers reported on their child's dysregulated anger using the Children's Emotion Management Scale: Anger-Parent Report (PCEMS) and their child's externalizing behavior using the Child Behavior Checklist (CBCL). Dyads were videotaped in 3 different interaction tasks: free-play, clean-up, and a copy task using an Etch-A-Sketch. Masked coders then rated multiple dimensions of child and dyadic behavior using the Parent-Child Interaction Coding System (Beeghly, 2018). Higher child dysregulated anger and externalizing behavior were significantly correlated with higher child negative affect and noncompliance and greater dyadic conflict during the interaction tasks. Findings support the use of the PCEMS and CBCL for preschool children from low-income families. These maternal report instruments may be a cost-effective way to evaluate children's anger management problems to help inform and guide prevention and intervention programs for at-risk children.

ABSTRACT #92

92. Community Members' Experiences with the Michigan Department of Environmental Quality Permit Granting Process

Psychology

Natalia Gomez, Psychology

Najat Nahshal, Psychology

Kristen M. Abraham, Psychology

Pollution has been known to have many harmful effects on the environment and its community members (Coogan et al., 2012; Guarnieri & Balmes, 2014; Dockery et al., 1993). In studies that accounted for covariates such as smoking, an increase in health effects due to pollution such as asthma and diabetes were found (Coogan et al., 2012; Guarnieri & Balmes, 2014; Dockery et al., 1993). The 48217-zip code is known to be one of Michigan's most polluted zip codes due to the large amount of industries in the area (CA-PHE, 2016). For this reason, it is important to assess how the Michigan Department of Environmental Quality (MDEQ) interacts with community members when it comes to the permit granting process. Prior to 2019, the MDEQ was the state regulatory agency that worked with the general public and industries to implement the laws mandated by the state House and Senate regarding public health, the appropriate use of the environment, preventing adverse effects of the environment and restoring the quality of the environment (Michigan Department of Environmental Quality, 2014). The present study focused on understanding the barriers and facilitators to community member's meaningful involvement in the MDEQ's permit-granting process and to assess whether race, ethnicity, and socioeconomic status play a role in community members being treated fairly or unfairly in that process. The present study used background questionnaires and semi-structured interviews to learn about our participants and their experiences. Results indicated that participants have varying views of the MDEQ, and varying levels of MDEQ knowledge can impact their participation. Additionally, there are barriers, such as time of day, and facilitators, such as active community members, that can influence their participation. Furthermore, no participant stated experiences of overt discrimination on the basis of race, ethnicity, or socioeconomic status in the permit granting process.

ABSTRACT #93

93. Yeast Polygalacturonase Activity is Resistant to Extreme Temperature and pH Science

Mary Lou Caspers, Chemistry & Biochemistry

Polygalacturonase cleaves the β -1-4 galactosidic bonds of polygalacturonic acid (PG), a major component of fruit mucilage, to produce galacturonic acid. A unit of polygalacturonase activity is defined as the number of micromol of galacturonic acid produced per min at pH 5.0. Polygalacturonase is stable to submersion in a boiling water bath for 1 hour or 10 minutes at 200 oC. When the polygalacturonase assay is conducted at a pH 3 or 14, no loss of activity is noted. Addition of 0.3 M beta-mercaptoethanol abolishes polygalacturonase activity and so this concentration of beta-mercaptoethanol is used as an assay control. Dithiothreitol is able to reduce polygalacturonase activity in a dose-dependent manner. A 38 % reduction in enzyme activity is seen at 81 mM dithiothreitol and this increases to 95 % inhibition at 162 mM dithiothreitol. Tris(2-carboxyethyl)phosphine at 50 mM completely inhibits polygalacturonase activity. Beta-Mercaptoethanol, dithiotheitol and tris(2-carboxyethyl)phosphine all reduce the disulfide bonds formed between the side chains of cysteine residues. This suggests that the resistance of polygalacturonase to denaturation by high temperature and acid or base is due to the stabilization of its tertiary structure by disulfide bonds.

ABSTRACT #94

94. Aphid infestation affects stomatal dynamics of tomato plants in an urban garden
Science

Sarah Nasher, Biology

Connor Gum, Biology

Shawn Messer, Biology

Lauren Riffenburg, Biology

Victor Carmona, Biology

Southwest Detroit Environmental Vision (SDEV) is an organization aimed to combat environmental issues throughout Southwest Detroit. SDEV's Cadillac urban gardens is open to the public and is built on a lot once used by a trucking company. Cadillac urban garden serves as a free grocery and as an important resource for many low income residents in the community. Our project objective to evaluate the effect of an aphid infestation in the tomato plant garden using stomatal density and morphology. We hypothesized that stomatal density, stoma size, and percent open stoma would differ on tomato plants with aphids and without aphids. We collected six leaves from tomato plants with aphids and 10 leaves from tomato plants without aphids. We found that the stomatal density and stoma size did not differ significantly between tomato plant with and without aphids. However, percent open stoma significantly lower in tomato plants with aphids relative to tomato plants without aphids. Our finding suggest that tomato plants may be able sustain greater photosynthetic rates in the absence of aphids. Higher net primary production in a urban garden system means greater crop yields.

ABSTRACT #95

95. AN ANALYSIS OF VARIANCE FOR METHADONE AND HEROIN RELATED DEATHS BY AGE GROUP IN THE UNITED STATES

Science

Rishi Patel, Biology

Sean Oja, Biology

Nicole Junn, Biology

Victor Carmona, Biology

Opioid use has been part of human life dating back to 3000 BC. Opioids are drugs widely used for pain management and are considered to be the most effective pain-reliever by pharmacologists and clinicians. Initially identified in the 1990s, the United States is currently facing a national crisis as the abuse of prescription and non-prescription opioid drugs are rapidly increasing. The rise in non-medical use and prescription abuse has spawned a substantial and increasing number of drug overdose deaths every year. The Center of Disease Control (CDC) suggests that certain age groups are more likely to die from an opioid drug overdose than other age groups and that over two thirds of all drug overdoses are the direct result of opioid abuse. The objective of this paper is to characterize the death rates from drug overdose (number of overdose deaths per one hundred thousand users) in the United States for prominent opioids and drug types that are commonly abused. We hypothesized that death rates from drug overdose would change with respect to both age group and drug type, specifically methadone, heroin, general, natural, semisynthetic and synthetic opioids. Our results indicate that death rates were significantly higher across age groups 25-54 years relative to other groups. Death rates from drug overdose were highest for opioids, intermediate is natural and semisynthetic opioids, while the lower end of death rates among drug overdose is methadone, synthetic opioids (excluding methadone) and heroin. We further characterize changes in death rates from drug overdose for each age group and identify the drug types of highest concern. Characterization of death rates from drug overdose among age groups and opioid type would allow our society to identify existing trends and test new methods for prevention and treatment of opioid addiction and abuse.

ABSTRACT #96

96. Chagas disease vector recognition using Data mining Engineering

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Shadi Banitaan, Electrical and Computer Engineering

Vector based Chagas disease is getting more common in Southern States of USA, causing serious cardiac morbidity and mortality among infected individuals. It imposes a great social burden on public health and is ranked amongst the most serious threats to human health. To come up with preventing strategies, precise surveillance of Triatomine vectors (Chagas disease kissing bugs) is needed. The possibility of automating the identification process of different types of insects have been discussed and explored, but there is not a great progress in automating identification of medically important vectors. Just few papers of a research team have acceptable results in this matter [1]. In this research we present an automatic Chagas vector identification system that composed of feature extraction and classification phases. PCA and Random Forrest are used for these two phases respectively. Our success rate is promising and compared to reference research we reached better results. We got success rate of 83% for 410 vector images of 12 Mexican classes and 86.7% for 1664 vector images of 40 different Brazilian vector classes.

97. Are Child Protective Factors Associated with Mother-Child Interaction Quality in a Low-Income Sample?

Psychology

Emily Jones, Psychology

Marjorie Beeghly, Psychology

Initiative, self-regulation and positive attachment relationships are evidence-based resilience factors for preschool-aged children from low-income backgrounds. However, most prior research is based on measures derived solely via maternal report. The current study evaluated whether these protective factors were associated with direct observations of mother-child interaction quality rated from videotapes of a challenging mother-child copy task using an Etch-a-Sketch: dyadic reciprocity, conflict, and mutual cooperation. The sample included 53 mother-child dyads (100% African American, M child age=3.89, 52.8% male children) recruited from WIC centers in the metro Detroit area. Mothers reported on their child's initiative, self-regulation, and attachment relationships using the Devereux Early Childhood Assessment (DECA, LeBuffe & Naglieri, 1999). In bivariate correlations, higher DECA child initiative and attachment scores were significantly associated with higher dyadic reciprocity and cooperation ratings during the copy task. Lower DECA self-regulation was correlated with higher dyadic conflict ratings. Family income (but not maternal education, child age, or gender) was significantly correlated with DECA scores. In partial correlations controlling for income, the findings for DECA self-regulation and attachment (but not initiative) remained statistically significant. Results suggest that children's self-regulation and attachment relationships are associated with direct observations of mother-child interactive behavior during a challenging copy task and provide support for the validity of the DECA in a Detroit low-income African American sample. Further research in larger samples is needed to increase statistical power and generalizability of findings.

ABSTRACT #98

98. Determining Drug Targets in Candida Albicans Biofilm Formation Science

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Kunal Desai, Biology

Candida albicans is the most prevalent fungal infection for humans. It is the root cause of many infections including urinary tract infection, genital yeast infection, and oral thrush. The intimacy of the human relationship with *Candida albicans* is showcased in the estimated 9.4 million cases of infection of hospital implants by *Candida albicans* a year. This fungus, when systematic is the 3rd most prevalent secondary infection in hospitals, with a systematic mortality rate of 30%, which it achieves through producing a biofilm. Our laboratory aims to understand and identify genes that are required for biofilm formation on medical implants. To do so, we have conducted in vitro tests using catheter squares on multiple strains of wild type and mutated yeast. Assaying for the ability of these strains to form a biofilm. We focus on cell wall defects and adherence issues of yeast and filamentous cells through PCR DNA manipulation of yeast cells, observation of biofilm after being stressed, weighing of the biofilms, and observing drop tests and dilutions of specific yeast strains. Because human cells do not have cell walls, finding a way to target the cell wall of yeast or filamentous biofilm-forming cell would be the safest and most beneficial form of treatment. In our laboratory, we hope to find biofilm jeopardizing cell wall defects and adhesion issues between the yeast and filamentous cells.

ABSTRACT #99

99. Nifedipine-induced gingival overgrowth: Underlying mechanisms tested in human periodontal ligament fibroblasts
Science

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Naama Sleiman, School of Dentistry

Cristine Smoczer, School of Dentistry

Gingival overgrowth is observed in patients treated with one of three classes of drugs: anticonvulsants, immunosuppressants, and calcium channel blockers (CCB). The incidence of drug-induced gingival overgrowth (DIGO) is about 30-50% in hypertensive patients treated with CCB, particularly with nifedipine. Inflammation, dental plaque, genetics, and inappropriate uptake of folate (necessary for DNA replication) are some of the factors implicated in DIGO pathogenesis. However, the molecular mechanism by which nifedipine induces abnormal gingival growth is still largely speculative. It is thought to be one of two mechanisms: 1) increased number of gingival fibroblasts caused by either increased proliferation or suppressed apoptosis; or 2) accumulation of collagen as a result of either collagen overproduction or reduced collagenase activity. The goal of this study was to examine the proliferative status of fibroblasts and the change in collagen receptor expression in response to treatment with varying concentrations of nifedipine. Human periodontal ligament fibroblasts (HPDL) were cultured and treated with 30, 60, and 100 ng nifedipine for 24 hrs. Immunostaining for the proliferation marker Ki67 and the collagen receptor integrin alpha2 was visualized using fluorescence microscopy. Quantification of Ki67-expressing cells showed higher proliferation rates for cells treated with 30ng nifedipine as compared to the 60 and 100ng treatments. The expression of integrin alpha2 followed a similar pattern. These preliminary results show that lower doses of nifedipine induce a more notable effect as compared to higher doses, suggesting a dose-dependent response to the drug. Future plans for this project include replication of these findings in human gingival fibroblasts and evaluation of the collagen turnover status.

ABSTRACT #100

100. Ergonomic Instruction and its Effects on Students and Dental Professionals Science

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Laura Mannin-Lee, Dental - Division of Clinical Dentistry
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Musculoskeletal disorders (MSD) are common in dentistry and studies have demonstrated that dental professionals acquire pain in the neck, back, shoulder, and wrist. The goal of this study was to determine whether dentists and dental hygienists commonly sit or stand while practicing, and to associate the MSDs that occur with specific operator positions. Additionally, student instruction during pre-clinical training was assessed. Methods: Two surveys were created in which participants were asked to respond regarding ergonomic instruction received, preferred operator position, and disclosure of specific MSDs. One survey was disseminated to dental and dental hygiene students currently clinically active, and the other was sent to dental professionals that were current members of the faculty and staff at the school. In addition, dental students were observed while in clinic to assess actual positioning and to identify specific MSDs relative to operator positioning. Results: Most dentists/hygienists (N=44) prefer sitting opposed to standing during procedures, perhaps due to limited training in alternative operator positions. However, standing is typically preferred during specific procedures, such as oral surgery and extractions. Moreover, respondents claimed that they had pain or discomfort in the back, neck, shoulders, and wrist. Faculty/dentists/hygienists, most of which have been practicing for over twenty years, generally reported pain or discomfort localized to the neck or shoulder, which was associated with sitting or standing, respectively. Responses from the student (N=39) survey demonstrated similar preference for sitting. However, students reported more back pain or discomfort while sitting. Conclusion: Sitting is the preferred dental operator position during most procedures. While there are specific MSDs that are attributed to sitting, dental practitioners seem to prefer sitting primarily due to lack of exposure to other positions. As a dentist or hygienist, being self-aware is essential to maintaining a healthy posture and avoiding MSDs.

ABSTRACT #101

101. Ecological Effect of Biofilm Bacteria and *Spirodela polyrhiza*
Science

Zahraa Alhabib, Biology
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Rasha Abbas, Biology
Dahlia Israel, Biology
Stokes Baker, Biology

Phosphorus is the rate limiting factor in most aquatic ecosystems. A *Spirodela polyrhiza* (giant duckweed) population found in Lake Saint Clair is being used as a model to understand the ecology of phosphorus assimilation. Experimental observations have shown that rich bacterial communities live on the surfaces of the plant and the community can help the plants grow faster. To investigate the roles of individual species growing on duckweed, eleven different bacterial strains were isolated from field- collected plants. To assess how the bacteria impact duckweed phosphorus assimilation, inoculated plants were grown in defined media containing orthophosphate, tricalcium phosphate, DNA, and phytate as the sole phosphorus sources. Improved duckweed growth was observed with *Rhizobium* isolates O on media containing orthophosphate. While testing *Pseudomonas protegens* isolate 13, preliminary results produced dead fronds when using DNA as its phosphate source. Further testing will be conducted in order to confirm these results. Additionally, bacteria closely related to *Pseudomonas cichorii*, were shown to be pathogenic. Analysis of covariance showed statistically significant differences in growth rates for plants inoculated with *Rhizobium* isolate sigma, large increase (28%, 24%) when no phosphorus and phytate were the conditions. in contrast *P. protegens* did not show a significant growth rate and was deleterious with DNA as the main phosphate source.

ABSTRACT #102

102. Veillonella Species Associated with Root Caries Enhance Streptococcus mutans Biofilm Formation and Modulate Acid Production
Science

Amber Abram, Biology
Jamal Alhabeil, Biology
Eric Krukonis, Biology

Objective: Root caries is a growing dental concern in aging populations. Our previous studies have found two bacterial species, *Streptococcus mutans* and *Veillonella parvula/dispar*, to be highly associated with root caries that tend to be found together on teeth. *S. mutans* is a strong biofilm former playing an important role in enamel caries. To assess metabolic and biofilm interactions of *S. mutans* and *V. parvula*, co-culture experiments were performed to determine the impact of *V. parvula* on *S. mutans*-mediated biofilm formation and acid production.

Methods: Single or mixed cultures of *S. mutans* and *V. parvula* were grown overnight, pelleted, washed with PBS and resuspended at an OD600 of 1.0 or 0.1. 0.25 ml of bacteria were used to inoculate 24-well tissue-culture plates overnight in Brucella Broth or artificial saliva at 37°C under anaerobic conditions with and without 0.5% sucrose (final volume was 1ml). Culture supernatants were filter sterilized and the pH was measured. Biofilms were washed twice with PBS, stained with propidium iodide (PI) and SYTO9 to measure the ratio of live (SYTO9-stained) and dead (PI-stained) bacteria. Biofilms were then stained with crystal violet to measure biofilm formation.

Results: Mixing *V. parvula* with the strong biofilm-former *S. mutans* allows for an even thicker biofilm (150% compared to *S. mutans* alone). Based on DNA analysis, these biofilms are comprised of nearly equal proportions of *S. mutans* and *V. parvula*, even though *V. parvula* on its own does not form a biofilm. When inocula of OD600=1.0 were used, co-culturing with *V. parvula* results in a final pH adjustment from 4.0 (*S. mutans* alone) to 5.0 (mixed culture). With inocula of OD600=0.1, even *S. mutans* alone only modestly acidified the medium after 24 hours.

Conclusion: Our results demonstrate that *V. parvula* typically enhances *S. mutans* biofilm formation in the presence of a sucrose rich environment. In addition, since *V. parvula* can metabolize lactic acid produced by *S. mutans*, the final pH of the mixed biofilms was typically higher than *S. mutans* alone. One surprising observation was that in three separate experiments aged *V. parvula* ATCC 17445 (grown on plates in the anaerobic chamber for >2 weeks), inhibited *S. mutans* biofilm formation. Our results demonstrate that *V. parvula* typically enhances *S. mutans* biofilm formation, although culture-adapted *V. parvula* ATCC 17445 can inhibit *S. mutans* biofilms. We are currently investigating this unprecedented finding.

ABSTRACT #103

103. Discuss the shortcomings and reasonable solutions for 5G technology
Engineering

Mofei Cheng, Electrical and Computer Engineering
Shiping Lyu, Electrical and Computer Engineering

Mobile communication has profoundly changed people's lives. In 2020, in order to cope with the explosive growth of the mobile data and equipment connections in the future. The fifth-generation mobile communication system(5G) is appeared. However, the 5G technology is not mature. It will change our life more convenience and faster but there are a lot of problems that need to be solved. Such as the establishment of signal base stations, multiple hidden antennas will interfere with each other, etc. This paper will discuss what the 5G technology bring to our life, what problem need to be solve and the feasible solutions. In this paper, we mainly want to discuss is the signal instability caused by the base station coverage being too small when establishing a 5G mobile base station. We try to find a suitable way to solve it. This is the difficulties of our paper. We believe that creating a signal booster between base stations and improving the spatial distribution of the base station is an effective method. It will involve ACP and ASP technology.

ABSTRACT #104

104. N-Acetyl-L Cysteine Sustainability and Effects on Hydrocephalus Shunting Science

Mitchell Mims, Biology

Hydrocephalus is a neurological disorder that is characterized by accumulation of excess cerebrospinal fluid (CSF) within the cerebral ventricles. Hydrocephalus affects 1 in 500 people worldwide and is a major cause of death and a significant morbidity. Treatment of hydrocephalus requires surgical diversion of the ventricular CSF with a catheter that drains CSF into extracranial spaces such as the abdomen. However, shunt failure rates are exceedingly high, with over 50% failing within the first year and 90% failing within 10 years of implantation. A leading cause of shunt failure is obstruction of the ventricular catheter by brain tissue that occludes the ports of CSF flow through the catheter. Recent in vitro studies have shown that short-term modification of polydimethylsiloxane (PDMS) catheters with N-Acetyl-L-Cysteine (NAC) can reduce cellular attachment to catheters. However, the long-term stability of the NAC modified catheters has not been investigated. The objective of this study was to assess the long term stability of NAC-modified catheters by using in vitro and in vivo experiments. We hypothesize that NAC-modified PDMS catheters can reduce the risk of shunt obstruction . Contact angle measurements in vitro indicate that surface wettability is increased on NAC-modified PDMS catheters vs non-modified (control) catheters when placed in a buffer solution for 2 weeks. Ongoing experiments in a piglet model of hydrocephalus will determine the long-term stability of the NAC-modified catheters. These results indicate that NAC-modified catheters maintain their hydrophilic properties over time and could be a promising advancement in the treatment of hydrocephalus.

ABSTRACT #105

105. Association Between Sleep, Salivary Cortisol, and Exam Scores in Dental Students Science

Rawan Herfy, Biology
Juliette Thomas, Biology
Maha Ahmad, Biology
Joshua Scheys, Biology

Objective: The goal of this study was to determine whether the amount of sleep had an effect on cortisol levels and exam scores in dental students.

Materials and Methods: Unstimulated saliva was collected from second year dental students immediately following an exam or during a regular day of classes with no scheduled exam. Subjects were given a survey to evaluate their exam preparedness, feeling of stress prior exam, stress during the exam, recent and long-term amount of sleep, and performance on the exam. Samples were collected on three occasions: following a Biomedical Sciences midterm exam, following a Pharmacology final exam, and on a class day with no scheduled exam. Cortisol was measured in each of the collected saliva samples using an Enzyme-Linked Immunoabsorbent Assay (ELISA).

Results: For each collection date, hours of sleep prior to the exam was compared to measured cortisol levels. There was a trend showing that increased hours of sleep prior to the exam was associated with lower cortisol levels. Students that obtained zero to two hours of sleep had the highest cortisol values of any group, with an average value of 55.1 ng/mL. In students obtaining two to four hours of sleep, the average cortisol level was 32.4 ng/mL, while in students obtaining four to six hours of sleep, the average cortisol level was 37.9 ng/mL. The average cortisol level for students who slept for six to eight hours was 36.6 ng/mL and 29.1 ng/mL in students that slept for a full eight hours or more immediately prior to the exam.

Conclusion: These data reveal a possible correlation between hours of sleep and stress levels during dental school exams. Students obtaining the most sleep prior to the exam seemed to have the lowest cortisol levels, while those who had the least sleep, had the highest levels. Although the results could have been affected by external factors that play a role in cortisol levels and more rigorously controlled studies would have to be performed to obtain a definitive answer.

ABSTRACT #106

106. Redesign of an Undergraduate Mechanics of Materials Laboratory to Include Embedded Technical Writing
Engineering

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Mary McCall, English
Celeste Flores, English

An undergraduate Mechanics of Materials Laboratory class has been redesigned to add embedded technical writing to the existing technical content. The goals of this redesign are to provide students discipline-specific writing experiences, and to help the students develop a mindset that good communication is crucial to the professional practice of engineering. The development of discipline-specific writing skills is important for students of all majors, but each field of study has its challenges. In engineering, frequently there is a student expectation that calculations and drawings are the primary output of their work. That expectation is, however, incorrect. Effective communication, written and graphical, is crucial for the practice of engineering. Laboratory classes provide excellent opportunities for students to apply technical skills covered in engineering lecture classes, but they also provide the opportunity to apply written communication skills covered in previous English classes.

The redesigned course is co-taught by a faculty member from one of the engineering departments and a faculty member who has a background in composition or communication. The course is structured with lectures, in-class activities, experiments, and homework assignments. The engineering professor and the technical communication professor grade both the lab reports. The lectures, in-class activities, and homework assignments address both engineering principles and technical communication. Each experiment includes pre-lab questions, laboratory testing, and post-lab questions, and is then submitted as either a report or homework assignment.

The course has been offered four times with this format. Early results indicate that the quality of the reports submitted in this format is better than those written in the previous format. Future work includes tracking student progress throughout the remainder of the undergraduate experience and into professional practice.

107. A Survey of Inter-Vehicle Communication: Methods for Securing Data Transfer
Electrical & Computer Engineering & Computer Science

Samar Bayan, Electrical & Computer Engineering & Computer Science

Utayba Mohammad, Electrical & Computer Engineering & Computer Science

Nizar Al-Holou, Electrical & Computer Engineering & Computer Science Department

Inter-vehicle communication represents exchange of data within vehicular ad-hoc network (VANET). It enhances safety through regular messages including vehicle's position, emergency messages, etc. However, injecting false data through forged nodes within or outside VANET causes severe problems that may result in accidents. This survey paper describes a focused literature survey of methods implemented for securing VANET. A short description of inter-vehicle communication and its techniques is provided. Papers representing each securing method are read, categorized and identified. The complexity of securing such type of communication and the challenges for implementing each method are discussed, and then recommendations for future technique improvement are provided.

