

# **POSTER ABSTRACTS**

## **Basic and Medical Sciences**

**Analysis of Mutagenicity of Common Household Substances by Modi dH.C(om)7(m)- 0 0 1 8/830.8h dH.C(oT**

### **3D Printed Educational 3D Puzzle**

McKenzie Scheckelhoff, Nicholas Walker, Logan Weinreber, Edward K Ellks

Youngstown State University

*Snjezana Balaz, Mentor*

We designed and made hand size puzzle toys to promote STEM (Science, Technology, Engineering, and Mathematics) fields. Instilling an interest in the STEM fields in younger learners should be held as a top priority among educational institutions across the country. Our project promotes an interest in those fields by demonstrating various principles of mechanics and kinematics while promoting our university. Additionally, our project is produced primarily with 3D printing technology, emphasizing our university's

### **Transposon Mutagenesis of *Stenotrophomonas maltophilia* Oak Ridge strain 02**

Haley Gianfrancesco, Gabriella Hosack, Hanna Gilligan

Youngstown State University

*Jonathan Caguiat, Mentor*

A multi-metal resistant strain of *Stenotrophomonas maltophilia* OR02 (*S. maltophilia* 02) grows when exposed to toxic salts of gold and selenite. An E-Z Tn5 transposome was introduced into *S. maltophilia* 02. Transformants were replica plated onto plates containing copper sulfate, sodium selenite, mercuric chloride, sodium arsenite, and M-9 minimal salts medium to see if the transposon interrupted genes required for selenite resistance, arsenite resistance, mercury resistance, chromate resistance or growth on minimal media. 12 mutants were discovered. The genomic DNA from the mutants was purified, digested, ligated and transformed into *E. coli*. These transformants will contain new plasmids with transposon flanked by the interrupted genes. We expect DNA sequencing to identify genes involved in oxidative stress response, metal efflux, metal transformation and sequestration.

### **Behavioral Health Implications as it Relates to Childhood Obesity and Vitamin D Levels**

Ramandeep Gill, Evan Leek, Sreya Brahmandam, Ashley Amendol, Hannah Haynie

Youngstown State University

*Charles McGowen, Ronald Dwinells, Mentor*

As part of Dr. McGowen







**Type-2 Diabetes Mellitus (DM) with Attention Deficit Disorder (ADD) and/or ADHD in Pediatric Population as it is Related to BMI**

Ashley Labatte, Brandy Peprah, Isna Khaliq, Jason Lee  
Youngstown State University

*Charles McGowen, Mentor*

In China, a study showed that children with Type-2 Diabetes were more likely to have ADHD/ADD. In our research, we evaluated pediatric patient charts and codes to look for obese children to see if they have been tested for pre-diabetes/diabetes. We also evaluated patients who have ADD and/or ADHD to see if they have been tested as well.

## **Engineering and Technology**

**Environmental Design of Soft Drink Bottling Plant**

Kyle Bryan, Carmen Acierno, Hus

### **Conversion of Flanger to Joggler**

Michael Kunzer, Johnny Medina, Jonathan Kanos, Jonathan Fortney  
Youngstown State University

*Anthony Viviano, Mentor*

YSU students were to re-engineer an existing machine and make it do a different process. A company located in Youngstown, Ohio asked for the assistance of YSU students to convert a flanging machine into a joggling machine. Joggling a process done to pressure vessel tank heads that allows the tank heads to fit inside the pressure vessel body in order to make an easier weld. The students converted a large, non used flanging machine and converted every component of it in order to joggle their product.

### **Green Infrastructure for Runoff Control**

Benjamin Nimrod, Jalecia Fair  
Cleveland State University

*Kocher, Mentor*

A combined sewer system is a sewer system where the runoff, domestic sewage, and industrial sewage flows into the same sewer system. CSO's occur in combined sewer systems when there is an abundance of rainfall. As a result of the rainfall excess rainfall the sewage system cannot contain the excess rainfall. The untreated sewage and the rainfall spills over into lakes and rivers. One of the causes of CSO's are due to the lack of infiltration because of impermeable surfaces. We are investigating how Green infrastructure helps to mitigate CSO's. Specifically Green Infrastructure that helps with the infiltration of water.

### **Tri-C's Extre Green Ecosystems**

Steven Fairley  
Cuyahoga Community College

*Bilal Bomani, Mentor*



**Bent Knee Adapter For Experimental Testing**

Santino Bianco

Cleveland State University

### **Revitalization and Calibration of an Aerolab Three Component Pyramidal Balance**

Matthew Hamman

Cleveland State University

*Wei Zhang, Mentor*

This work summarizes the steps taken to revitalize an Aerolab Three-Component Pyramidal Balance made in 1966. The balance served to measure two forces in horizontal and vertical directions as well as the bending moment acting on a scaled model mounted in the test section of the wind tunnel. The balance was first rebuilt by fixing structural and wiring damage. Then a LabVIEW program was created to conduct the data acquisition. A new calibration procedure is developed to correlate the voltage output to the strain sensed by fine metal rods in the balance. The entire balance and data acquisition system was examined by measuring the drag coefficient of a steel circular cylinder (diameter of 1 inch). Preliminary result of the drag coefficient vs. Reynolds number is well aligned with data in literature.

### **Optimized Rim for Spring Tires**

Antonio DiSalvo, Mark Plant, Elizabeth Urig

Youngstown State University

*Jae Joong Ryu, Mentor*

The objective at hand was to design for NASA a rover tire rim that was able to be prototyped and tested at NASA Glenn Research Center in Cleveland, Ohio. The Mars Curiosity rover's rigid wheels have been experiencing wear and damage from the rocky terrain of the planet. This in turn has decreased the projected lifetime of the rover's ability to successfully navigate Mars. To maximize this lifetime for the Mars 2020 mission, engineers have been investigating the performance of spring mesh tires. Subsequently, the rim was designed to be used in spring mesh tires and to meet the requirements provided by NASA. The design process consisted of 3D CAD design, finite element analysis, refinement of design, and fabrication drawings in order to build and test a fully functional spring mesh tire.

### **Youngstown State University EPA Campus Rainworks Challenge**

### **Projection of Computation**

Sarah Alabsi, Caitlin Cole, Victor Ipinmoroti  
Cleveland State University

*Pong Chu, Mentor*

Computation is a key aspect of our lives. Therefore, it is important to consider its evolution in the future and how it affects all of us as individuals. In this poster, we would look at the concept of computation and its progression. Additionally, we would compare two types of computers (classical and non-classical) based on how they work and their current state. We would discuss where they are likely to be in the future and how they would affect the lives of individuals. We plan to explain Moore's law; specifically capitalizing on the exponential growth he predicted in computational advancements, which has held true for over 50 years. However, we also plan to explain that there is evidence to prove that although Moore's law continues to hold true, it will indefinitely plateau at some point. The solution of this we believe lies in the realm of non-classical computers.

### **Interior Ballistics: Flow of Hot Gases Into a Side Chamber**

Justin Stellmar, Carmen Marinucci, Matthew Hetzel  
Youngstown State University

*Richard Goldthwait, Brian Vuksanovich, Mentor*

We modeled the flow of the hot combustion gases from the inside of a gun chamber into a small side chamber. We want to predict the time-varying pressure in the small side chamber as a function of the pressure inside the cartridge chamber of the gun. The side chamber represents a portion of the automatic reloading mechanism of an actual semi-automatic or fully automatic gun, and the ability to predict the pressure in this chamber is helpful in the reloader design.

### **3D Printed Sand Casting of Low Density Gyroid Structure**

Alex Fitzgerald, Matthew Manna, Eric Haake, Kayla Theisler, Mackenzie Scrocco, Matthew Osinak  
Youngstown State University

*Jason Walker, Brett Connor, Mentor*

The purpose of this project is to create a unique design that can replace basic structural components at a reduced volume without compromising overall strength. Using a mathematical model created in Matlab, the group produced a gyroidal structure that has many applications, 3D printing in particular. Due to the gyroid's complex geometry and size, directly 3D printing was not feasible. The group then turned to 3D sand casting, a method of manufacturing that enables aluminum cast gyroid structures to be produced in an easy and cost effective manner. Traditional casting methods limit the ability to create unique and complex internal geometries. Software's such as Magma and FEA were utilized to run computational simulation and analysis before finalizing designs.

### **Patient Motion Detection Using KINECT**

Destinee Battle, Nia Simmpnds, Quin Breitfeller  
Case Western Reserve University

*Jason Sohn, Mentor*

This project uses the Microsoft Kinect sensor to detect patient motion with an accuracy of 1 mm. The sensor is aimed at a target that is manually moved in the x and y directions. The depth of the object is measured as well. The data is collected by placing a rectangular and spherical target various distances from the sensor, moving the targets on grid paper in the x and y directions, and then recording the net displacements. The goal of this project is to determine whether the rectangular or spherical target results in the greatest accuracy and least amount of error. In the future, this research will provide a more affordable way for radiation technicians to detect patient movement and protect healthy tissue from radiation.

### **Pile Driving Monitor: Measuring Foundation Displacement**

Barnabas Brennan, Carmaletta Hinson, Quinten Hutchinson, Katilin Newcombe, Sydney Tenaglia

### **Transcutaneous Functional Electrical Stimulation of a Human Arm**

Kyra Rudy

Cleveland State University

*Eric Schearer, Mentor*

High spinal cord injuries often leave patients paralyzed and with little to no ability to perform everyday tasks on their own. One method of restoring motion to the arms of patients with high spinal cord injuries is functional electrical stimulation (FES). While implanted neuroprosthesis devices that deliver electrical stimulation to the arm show promise, they are highly invasive and patients with these devices are limited. In contrast, a fully external transcutaneous electrical stimulation device would allow for testing on a larger number of patients, including healthy individuals. The plausibility of using a transcutaneous electrical stimulation device to induce functional motion in the arm was investigated. These devices show promise for reducing the need for implanted devices during research and prove to be a potential alternative to invasive neuroprosthesis devices altogether.

### **Autonomous Localization Utilizing Strobing Light Sources**

Jacob Boyd

Kent State University

*Darwin Boyd, Mentor*

In the NASA Robotic Mining Competition the goal is to design a robotic system that is capable of completing challenging simulations of tasks an autonomous Martian system would encounter. One of the largest obstacles when designing any autonomous robotic systems is localization and orientation. While many systems for localization have been designed and implemented such as GPS and ultrasonic ranging, the conditions of the Martian surface exclude many such systems and demand a minimalistic system. By utilizing strobing sheets of light and precise timing, it is possible to calculate the position of the robot as a function of time intervals in order to achieve high definition localization and accurate positioning, while being viable for use on the Martian surface.

### **Reducing the Corrosion of a Potential Vehicular Structural Alloy**

Rana Abu-Hashim, Seth Egry, Ricky Ferry

Youngstown State University

*Holly Martin, Mentor*

Magnesium is of structural interest for its low density and high weight-to-strength ratio. However, magnesium is easily corroded and cannot currently be used in exposed areas within vehicles. Protecting magnesium with a hydrophobic polymer that is also resistant to aqueous solutions and hydrocarbons is vital for its use within vehicles. This research is studying the corrosion resistance and mechanical properties of an AE44 Magnesium alloy, which contains 4% aluminum and 4% rare earth elements, coated with polyetherimide. The ability of the magnesium to withstand exposure to 3.5 wt% saltwater and the ability of the coating to adhere to the magnesium surface are both vital first steps in creating strongly bonded PEI to a magnesium to prevent corrosion and increase the use of magnesium in vehicles.

### **Predicting the Impact of Climate Change on Future Ice Jams in Waterways of the Midwest & Northwest Regions**

Jesse Saluga, Michael Craver, Kelly Kovacevich, Michael Kacir, Allison Rea

Youngstown State University

*Suresh Sharma, Mentor*

An ice jam is a dam on a river formed by blocks of fragmented ice. Knowledge of ice jams is important in the design of structures being built near waterways as these fragments of ice can cause significant damage if not properly accounted for. Being able to predict where ice jams are likely to occur can have a huge benefit on hydraulic and structural engineering. Because ice jams can only form under certain temperatures, our project used various spreadsheets and historical temperature databases to analyze past temperature data in two regions where ice jams are likely to occur, Billings MT and Bismark, ND. With the research that has been done we will be able to predict the likelihood of an ice jam. Adjustments can then be made for if and or when an ice jam will occur in these particular regions.

## **Aquatic Toxicity of Common Household Chemicals and Storm Water**

Amanda Seidler and Lydia White

Youngstown State University

*Felicia Armstrong, Mentor*

Toxicity testing is a process by which environmental conditions can be evaluated. *Daphnia magna*, a standard test organism, were used because they are easily cultured in the lab and sensitive to a variety of contaminants. Common household chemicals were used in 24 hour acute toxicity tests. *Daphnia* were acclimated to moderately hard water following USEPA guidelines prior to testing. Using the same water, chemicals were added at multiple concentrations and replicated three times at each level including an uncontaminated control. *Daphnia* were exposed for 24 hours while being monitored. Counts were done every couple of hours for living *Daphnia* and dead *Daphnia* were removed. Water tests were done for

**Medtronic's Minimed 670G**

Nick Bryson, Taylor Catri-Eakes

Cleveland State UniversityBT/F4 11.04 Tf1 0 0 1 99.024 683.62 Tm0 g0 G[C]4(l)-4(ev)9(el)-5( 1 242.69 696.22 Tm

### **Ceva's Theorem**

Emily Herendeen, Nick Verbus  
Kent State University

*Donald White, Mentor*

Our project consists of Ceva's Theorem, its relations to other geometric occurrences and the real world.

### **How to Beat the Dealer**

Emily White, Josephine Sabatino, Drew Horn, Alexander Margetis, Sarah Cook  
Kent State University

*Mohammad Khan, Mentor*

The goal of our project is to describe the probability and underlying mathematics that go into card counting for the famous "Blackjack" casino card game. We describe strategies and techniques that are used to make bets given the probabilities of each possible outcome in order to beat the dealer on any given hand. Not only do we describe probabilities of each hand dealt, but we also explain how the dealer has the advantage and what is an "ideal" hand mathematically.



## **Deterministic Chaos: Understanding Random Number Generation**

Evan Bause, Nick Pappas, Joshua Oberlin, Jared Anderson  
Kent State University

## **Data Sorting Analyzer**

Arik Stewart

Case Western Reserve University

*Chris Fietkiewicz, Mentor*

In the field of Computer Science, there already exist numerous ways for programmers to efficiently sort data. Using the method that is most efficient is normally preferred, but each sorting method does have its own unique purpose. The goal of this expository project is to analyze and graph the runtimes of the most commonly used methods: Insertion, Merge, and Quick Sort. The methods are analyzed using preset and randomized arrays in addition to differing array sizes.

## **Towards Mining Eye-Tracking Datasets for Expertise Prediction**

## **Theoretical and Practical Significance of One-Time-Pad Cryptography**

Timothy Szeltner, Luka Komljenovic, Jonathan Wright  
Cleveland State University

*David Aloi, Mentor*

If two parties wish to exchange a coded message without an intrusion from a third party, the former have many cryptographic options. With regards to information security and absolute protection from decryption, the one-time-pad is unmatched. When the message is matched with an equally long plaintext encryption/decryption “pad” shared by the sending and receiving parties, which is discarded and replaced for each new message, the method is mathematically proven to be unbreakable by adversarial third parties. This has far reaching implications for military and security applications, including the transmission of coded messages in plain sight, without any risk of decryption.

## **Probabilistic Programming**

Barton Yadlowski  
Kent State University

*Jenya Soprunova, Mentor*

An introduction to probabilistic programming and MCMC methods as helpful tools to have in a toolbox of anyone operating in domains where uncertainty is present. PyMC3 (<https://github.com/pymc-devs/pymc3>) and Python is used as an environment within which these ideas get explored and illustrated. Topics covered include defining Bayesian models, fitting the models, and posterior analysis.

## **Bet On It**

Kory Slusser,

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Richard Goldthwait, Youngstown State University

Steve Rodabaugh, Youngstown State University