NASA / OHIO SPACE GRANT CONSORTIUM

2019-2020 SCHOLAR / FELLOW STUDENT JOURNAL

Students Representing Ohio Congressional Districts

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FELLOWSHIP AND SCHOLARSHIP PROGRAM

The Ohio Space Grant Consortium (OSGC), a member of the NASA National Space Grant College and Fellowship Program, awards graduate fellowships and undergraduate scholarships to students working toward degrees in **S**cience, **T**echnology, **E**ngineering and **M**athematics **(STEM)** disciplines at OSGC-member universities. The awards are made to United States citizens, and the students are competitively selected. Since the inception of the program in 1989, over 1,320 undergraduate scholarships and 181 graduate fellowships have been awarded.

Matching funds are provided by the 24 member universities/community colleges, the Ohio Aerospace Institute (OAI), and the Ohio Department of Higher Education (State of Ohio). Note that this year ~ $500,000 will be directed to scholarships and fellowships representing contributions from NASA, the Ohio Aerospace Institute, State of Ohio, member universities, foundations, and industry.

By helping more students to graduate with STEM-related degrees, OSGC provides more qualified technical employees to industry. The research conducted for the Master's fellowship must be of interest to NASA. A prime aspect of the scholarship program is the undergraduate research project that the student performs under the mentorship of a faculty member. This research experience is effective in encouraging U. S. undergraduate students to attend graduate school in STEM. The Education scholarship recipients are required to attend a workshop conducted by NASA personnel where they are exposed to NASA educational materials and create a lesson plan for use in their future classrooms.

18 Affiliate Members

- The University of Akron
- Baldwin Wallace University
- Case Western Reserve University
- Cedarville University
- Central State University
- Cleveland State University
- University of Cincinnati
- University of Dayton
- Kent State University
- Marietta College
- Miami University
- Ohio Northern University
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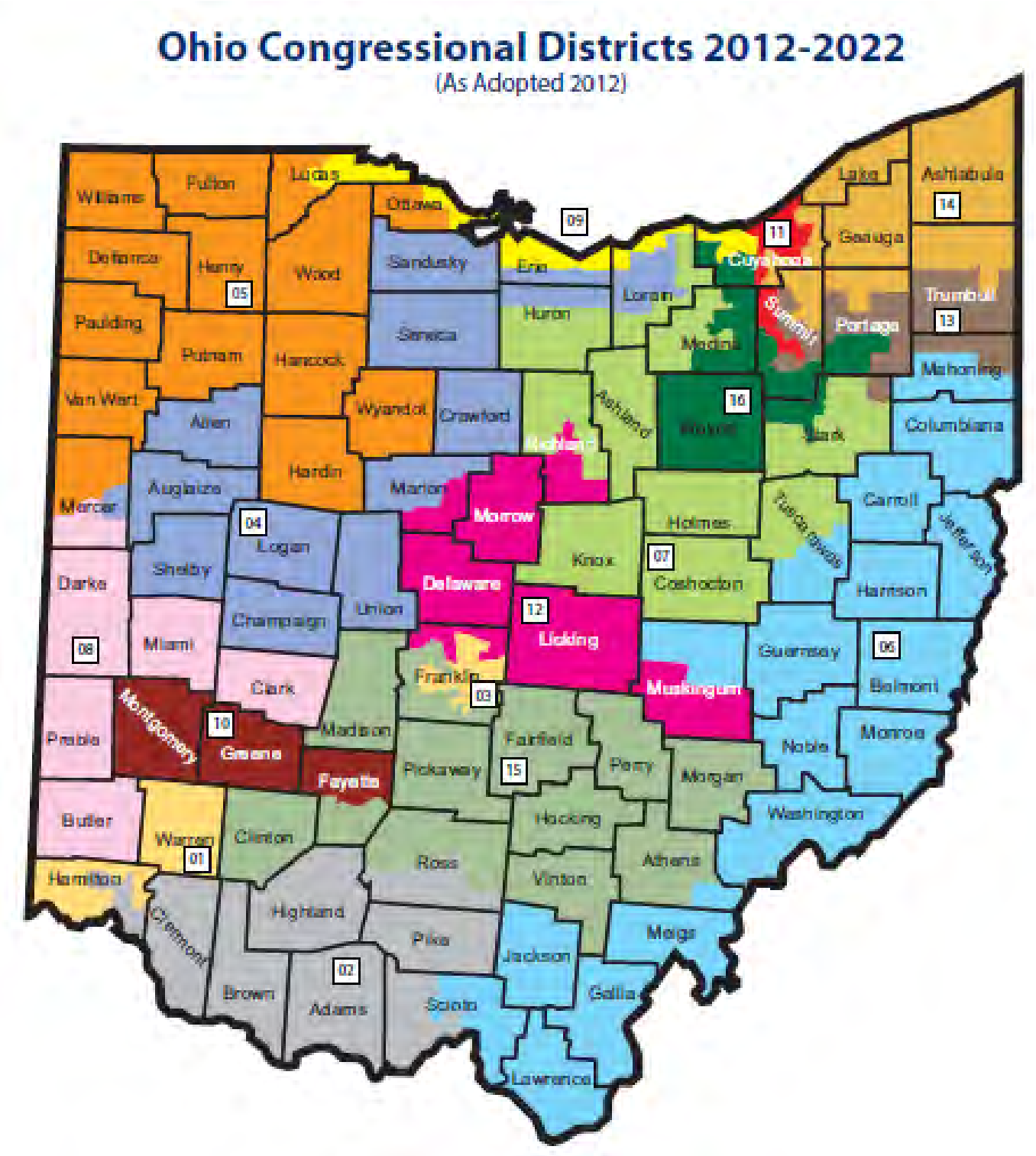
OHIO CONGRESSIONAL MAP



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FELLOWSHIPS

Erin M. Tesny

Status: Master's 2, Mechanical Engineering

Research Topic: Design of a Heat Exchanger for Intense Cooling of Inlet Bleed at High Mach Numbers

Advisor(s): Dr. David Davis, Dr. Wei Zhang

Biography: A Cleveland native, Erin Tesny is currently a second-year Master's student studying Mechanical Engineering at Cleveland State University. In addition to earning her M.S., she works as a Pathways Intern in the Fluid & Cryogenic Systems Branch at NASA Glenn Research Center. Erin graduated with a Bachelor of Arts in Neuroscience from Oberlin College in 2014 before deciding to pursue engineering. She received her B.S. in Mechanical Engineering from Cleveland State in 2017. While attending CSU she was an active member of both AIAA and Tau Beta Pi, serving as the president of the student chapter of both organizations during her senior year. After graduation she plans to convert to full time work at NASA Glenn.

Abstract: Boundary-layer bleed is typically used in supersonic aircraft inlets to improve inlet performance and enhance inlet stability. A heat exchanger using cryogenic fuel as the working fluid is a potential method of rapidly cooling the bleed air. An initial proof-of-concept design has been proposed by NASA Glenn Research Center (GRC). This project intends to create a combined fluid & thermal model of the heat exchanger to predict its efficiency and load capabilities, and then investigate how the design can be improved. A computational fluid dynamics (CFD) model was set up using two different avail-able tools to investigate different aspects of the design: tube orientation and tube profile. First, variations on the original heat exchanger were tested with different tube angles relative to the incoming flow. Then more complicated geometry was investigated where the profile of the straight tubes was twisted to create the appearance of plaited strands. The results of the simulations found that a twisted tube configuration gives the highest heat transfer rate and results in the greatest number of elements cooled at or below the liquefaction temperature of air. If the air could be cooled to the point of liquefaction, it could serve as an auxiliary coolant aboard aircraft and space vehicles, and potentially as an oxidizer in an auxiliary propulsion unit. This study will establish the performance of a proof-of-concept heat exchanger in support of future aerospace projects.

Publication(s):

1. Tesny E, Hauser D. Thermal Modeling of Zero Boil Off Tank Experiment. Paper and Presentation. Presented at: AIAA Propulsion and Energy Forum; 2019 August 19-22; Indianapolis, IN.
2. Tesny E, Davis D. Mission Analysis for Improvements in Classified Aircraft Propulsion. Poster Session. Presented at: NASA Glenn Summer Intern Symposium; 2017 August 15; Cleveland, OH.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

The Ohio State University

Collin J. O'Neill

Status: Master's 1, Aerospace Engineering

Research Topic: Active Flow Control in an Aggressively Offset High-Speed Inlet/Diffuser Model

Advisor(s): Prof. Mo Samimy and Dr. Nathan Webb

Biography: Collin O'Neill grew up in Chardon, Ohio, where he attended Notre Dame Cathedral Latin high school. In high school, he developed his interest in physics and engineering by actively participating in Science Olympiad. He graduated with a Bachelor's Degree in Aerospace Engineering from The Ohio State University (OSU) in May, 2019. He is currently the first year of his master's program in aerospace engineering at OSU. At Ohio State, Collin works in the Gas Dynamics and Turbulence Laboratory at the Aerospace Research Center. Outside of research/work, Collin volunteers with Habitat for Humanity and a local charter school that primarily teaches refugee students. He is also on the executive board of Sigma Gamma Tau, the Aerospace Honorary at OSU.

Abstract: Offset diffusers are becoming increasingly prevalent in both commercial and military aircraft. The compact, offset shape reduces radar cross section, increases the integration of the propulsion system, and improves the thrust-to-weight ratio. Despite these benefits, the curves in the inlet also introduce a variety of problems. The main problems are total-pressure loss and the development of secondary flow structures at the aerodynamic interface plane (AIP). The concentrated regions of total-pressure loss produced by these secondary flows result in unsteady loading on engine turbomachinery components. This unsteady loading decreases engine performance and results in a shorter propulsion system lifespan. Recent research has shown that the secondary flows and resulting distortion can be modified by affecting the separated flow region downstream of the second turn (Burrows et al. 2017). High-frequency, high-amplitude actuators, called localized arc-filament plasma actuators (LAFPAs), have been successfully used for flow control in several high-speed and high-Reynolds number shear layers similar to the one that exists over the separated region in an offset inlet (Samimy et al. 2018). The low power use, scalability, and adaptability provided by LAFPAs make them perfect for high-speed inlet flow control. This project will investigate the application of LAFPAs to improve the aerodynamic performance of an offset inlet.

Publication(s):

1. O'Neill, Collin J., Aggressively-Offset Inlet Flow Facility Design and Characterization, Jan 6, 2020, American Institute of Aeronautics and Astronautics (AIAA) SciTech 2020-1614.
2. O'Neill, Collin J., Active Flow Control in an Aggressively Offset High-Speed Inlet/Diffuser Model, Jan 6, 2020, American Institute of Aeronautics and Astronautics (AIAA) SciTech 2020-0112.
3. O'Neill, Collin J., Active Flow Control in an Aggressively Offset High-Speed Inlet/Diffuser Model, May 2019, OSU Undergraduate Research Thesis.
4. O'Neill, Collin J., Active Flow Control in an Aggressively Offset High-Speed Inlet/Diffuser Model, April 2019, Ohio Space Grant Consortium 2018-2019 Proceedings, pages 178-181.

Congressional District: 14th

Congressional Representative: David P. Joyce

University of Dayton

Shane T. Kosir

Status: Master's 1, Chemical Engineering

Research Topic: A Machine Learning Framework for Drop-in Volume Swell Characteristics of Sustainable Aviation Fuel

Advisor(s): Dr. Joshua S. Heyne

Biography: Shane Kosir is a Master's student at the University of Dayton working toward his M.S. in Chemical Engineering. His passion is sustainability and renewable energy. He began working at the University of Dayton HEAT Lab in the spring of 2018 and has done research for the Department of Energy funded JET Program related to high-performance jet fuel material compatibility and optimization. Since beginning in the HEAT Lab, Shane has presented at the 2019 AIAA SciTech Forum in addition to presenting at numerous regional conferences and was awarded the University of Dayton Class of 1902 Award of Excellence for Outstanding Mechanical Engineering Achievement and the Ohio Space Grant Consortium Undergraduate STEM Scholarship. A future goal is to become involved in research related to biomass conversion technology that can provide a renewable alternative to conventional fuel and reduce emissions. Beyond engineering, Shane enjoys going for hikes and volunteering with the Five Rivers MetroParks. After graduation, he will pursue a Ph.D. in Chemical Engineering.

Abstract: A machine learning framework has been developed to predict volume swell of non-metallic materials commonly found in commercial aircraft fuel systems submerged in neat molecules. Volume swell, a material compatibility concern, serves as a significant impediment for the minimization of the environmental impact of aviation. Sustainable aviation fuels, the only near and mid-term solution to mitigating environmental impacts, are limited to low blend limits with conventional fuel due to material compatibility/O-ring swell issues. A neural network was trained to predict volume swell for neat molecules found in conventional jet fuel. Subsequent blend optimization incorporated swell predictions for cyclo- and iso-alkanes to create a high-performance jet fuel within 'drop-in' limits.

The results of this study are neat molecule volume swell predictions with a cross-validated mean absolute error of 4.5% v/v, representing sufficient accuracy for material groups with high mean volume swell, such as nitrile rubber and polythioether. Optimization considering nitrile rubber volume swell achieved median specific energy [MJ/kg] and energy density [MJ/L] increases of 1.9% and 5.1% respectively relative to conventional jet fuel while maintaining a median volume swell of 6.2% v/v, 68% higher than the lower swell limit. Optimized solutions were heavily biased toward monocycloalkanes, indicating that they are a suitable replacement for aromatics. This study concludes that cycloalkanes can replace aromatics in jet fuel considering volume swell and other operability requirements while also significantly reducing soot and particulate matter emissions, which are largely associated with aromatics in conventional jet fuel.

Publication(s):

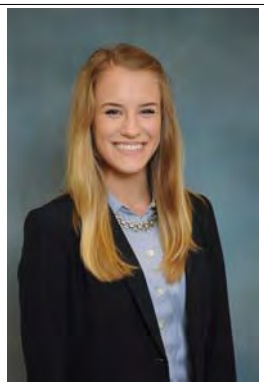
1. S. Kosir, L. Behnke, J. Heyne, R. Stachler, G. Flora, S. Zabarnick, A. George, A. Landera, R. Bambha, R. Denney, and M. Gupta, "Improvement in Jet Aircraft Operation with the Use of High-Performance Drop-in Fuels," AIAA SciTech Forum, 2019.
2. G. Flora, S. Kosir, L. Behnke, R. Stachler, J. Heyne, S. Zabarnick, M. Gupta, "Properties Calculator and Optimization for Drop-in Alternative Jet Fuel Blends," AIAA SciTech Forum, 2019.
3. S. Kosir, J. Heyne, and J. Graham, "A Machine Learning Framework for Drop-in Volume Swell Characteristics of Sustainable Aviation Fuel", Fuel. Under review.

Congressional District: 14th

Congressional Representative: David P. Joyce

University of Dayton

Katherine C. Opacich



Status: Master's 1, Aerospace Engineering

Research Topic: An Investigation on Kernel Growth Variations between Conventional Spark Discharges and Nanosecond-Pulsed High-Frequency Discharges

Advisor(s): Dr. Joshua S. Heyne, Dr. Timothy Ombrello

Biography: Katherine Opacich is currently a graduate student at the University of Dayton who is pursuing a Master's Degree in Aerospace Engineering. She is a research assistant under Dr. Joshua Heyne and Dr. Timothy Ombrello that works on ignition physics research at Wright-Patterson Air Force Base. As a part of this work, Katherine focuses on investigating the ignition differences between conventional spark discharges and nanosecond-pulsed high-frequency discharges. She has presented her research at the Dayton Engineering Sciences Symposium and at the 2020 AIAA Science and Technology Forum. At the University of Dayton Katherine has been a member of Tau Beta Pi, a participant of Christmas on Campus, and a teaching assistant for the mechanical and aerospace engineering department.

Abstract: Depositing energy using nanosecond-pulsed high-frequency discharges (NPHFD) has been shown to lead to successful fuel-lean ignition. However, questions still remain regarding how the NPHFD ignition system will perform against the conventional ignition system on shorter timescales and in a flowing environment. This work provides a comparison between the NPHFD ignition system and a conventional, capacitive discharge system in a flowing environment where the total energy deposited, and average power is matched. The results show that matching these characteristics result in similar trends in radius growth, time to minimum growth rate, and radius at which minimum growth rate occurs between the two systems. In utilizing these results as a baseline, it was found that decreasing the average power of the NPHFD system while maintaining the total energy deposited resulted in an increase in streamwise radius due to advective effects. This larger kernel size comes at the expense of the kernel taking longer to transition to a self-propagating flame that occurs at a radius that is larger than the baseline condition. This behavior can be explained by the long duration of the discharge and the low energy density per unit volume in the fluid. Ultimately, the convenience of the larger kernel size comes at the cost of reliability. Therefore, in combustor conditions with strong external quenching physics, depositing the most energy in the shortest time will be optimal in preventing kernel extinction. Conversely, for kernels developing in the presence of mild turbulence, the average power can be decreased, and flow advection can be utilized to grow the kernel over a longer duration without risk of extinction.

Publication(s):

1. Opacich, K. C., Heyne, J. S., Ombrello, T., Lefkowitz, J. K., Leiweke, R. J., Busby, K., "An Investigation on Kernel Growth Variations between Conventional Spark Discharges and Nanosecond-Pulsed High-Frequency Discharges," AIAA Scitech 2020 Forum, Reston, Virginia: American Institute of Aeronautics and Astronautics, 2020.
2. Opacich, K. C., Heyne, J. S., Peiffer, E., and Stouffer, S. D., "Analyzing the Relative Impact of Spray and Volatile Fuel Properties on Gas Turbine Combustor Ignition in Multiple Rig Geometries," AIAA Scitech 2019 Forum, Reston, Virginia: American Institute of Aeronautics and Astronautics, 2019.
3. Heyne, J. S., Opacich, K. C., Peiffer, E., Colket, M., "The Effect of Chemical and Physical Fuel Properties on the Approval and Evaluation of Alternative Jet Fuels," 11th U. S. National Combustion Meeting, 2019.

Congressional District: 14th

Congressional Representative: David P. Joyce

Wright State University

Rachel E. Evans

Status: Master's 1, Mechanical Engineering

Research Topic: Thermal Modeling of Coordinated Multi-Beam Additive Manufacturing

Advisor(s): Dr. Joy Gockel

Biography: Rachel Evans is a Master's student majoring In Mechanical Engineering at Wright State University. She was born in Youngstown, Ohio, but she later moved to Urbana, Ohio, and graduated from high school at Graham Local Schools in Saint Paris. She continued her education at Wright State University, where she earned a Bachelor of Science in Mechanical Engineering in May 2019. T hroughout her undergraduate years at Wright State, Rachel was an active member of Tau Beta Pi and Wright State's Honors Program, along with earning a spot on the Dean's List every semester. Alongside her studies, Rachel participated in an internship program at Oak Ridge National Laboratory, where she worked as an undergraduate researcher and investigated the material properties of additively-manufactured polymer composites. Since then, she has become involved in the additive manufacturing research group at Wright State University, where she has completed research projects in metal additive manufacturing as both an undergraduate student researcher and a graduate research assistant. After she completes her Master's Degree this spring, Rachel plans on pursuing a Ph.D. in Engineering at Wright State University.

Abstract: In additive manufacturing (AM), it is necessary to know the influence of processing parameters in order to have better control over the mechanical performance of the part. Laser powder bed fusion (LPBF) is a metal AM process in which thin layers of powdered material are selectively melted to create a three-dimensional structure. This manufacturing process is beneficial for many reasons; however, it is limited by the thermal solidification conditions achievable in the available processing parameter ranges for single-beam processing methods. Therefore, this work investigates the effect of multiple coordinated heat sources, which are used to strategically modify the melting and solidifying in the AM process. The addition of multiple heat sources has the potential to provide better control of the thermal conditions, thus having better control of the microstructure of the additively manufactured parts. To model this, existing thermal models of the LPBF process have been modified to predict the thermal effects of multiple coordinated laser beams. These computational models are used to calculate melt pool dimensions and thermal conditions throughout the LPBF process. Furthermore, the results of the simulations are used to determine influence of the distance between the coordinated laser beams. The predictive method used in this research provides insight to the effects of using multiple coordinated beams in LPBF, which is a necessary step in increasing the capabilities of the AM process.

Publication(s):

1. Evans, R. and Gockel, J. "Thermal Modeling of Multi-Beam Additive Manufacturing," Presentation, Dayton Engineering Sciences Symposium, October 2019.
2. Evans, R. and Gockel, J. "The Effects of Scan Strategy in Additive Manufacturing," Presentation, OSGC Student Research Symposium, April 2019.
3. Evans, R. and Gockel, J. "The Effects of Scan Strategy on Porosity in Additive Manufacturing," Poster session, OSGC Student Research Symposium, March 2018.

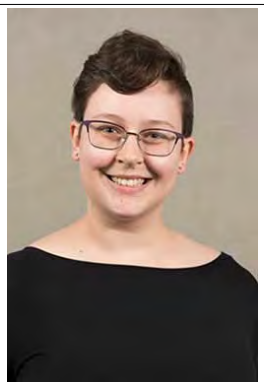
Congressional District: 4th

Congressional Representative: Jim Jordan

SCHOLARSHIPS

Baldwin Wallace

Delenn R. Hartswick



Status: Junior, Neuroscience/Psychology

Research Topic: The Neuroscience of Gender – Exploring the Link between Prenatal Hormone Exposure and Sex-Specific Neuroanatomy in a Rat Model

Advisor(s): Dr. Clare Mathes

Biography: For longer than I can remember, I have always wanted to know about the world around me. I was lucky to have a family which encouraged not only questioning but finding the answers yourself. When I was young my mother went back to school to study child development, and ever since I have been interested in how we, as humans, become who we are. In high school, a combination of health problems which sent me to a neurologist, teachers who challenged and encouraged me to explore my personal interests, and my well-timed reading of a book about "the biology of belief" aggregated into my discovery of neuroscience. With very little knowledge of what neuroscience would entail beyond "brain" and "science" I decided to take that path and have never looked back. While exploring my identity and becoming more involved with the LGBTQ+ community I found a serious lack of scientific understanding surrounding LGBTQ+ issues as well as a lack of representation in the scientific community. I believe science has a social presence which is underutilized allowing confusion and falsities to reign in some situations. I wish to use science, accessible communication of science, and encourage minority representation in science to push past these issues and create a more informed world.

Abstract: Previous research supports a biological basis for transgender identity, but the data do not suggest that genetics, gonads, genitalia, or adult hormone levels are responsible. Instead, it is hypothesized that sexual differentiation of the brain prenatally, which happens due to hormone levels after the surge that promotes peripheral sexual differentiation, may follow a different pattern in transgender individuals than it does in cisgender individuals. The role of prenatal hormones on the development of sexually dimorphic brain nuclei can be modeled in rats. They possess similar neurological structures to humans in both function and volumetric differences between sexes. One such structure is the bed nucleus of the stria terminalis (BNST) which in both humans and rats is larger in volume in males compared to females. While research exists on prenatal testosterone exposure and its effects on BNST size in rats, more can still be done.

I will expand on previous research by reducing the dose and number of doses of testosterone to avoid external genital effects on the rats, treating at the critical point of differentiation, and considering persistence of any effect throughout the lifetime. I hypothesize that prenatal exposure to testosterone will increase the size of the BNST in rats as compared to non-exposed rats of the same sex and this effect will persist into sexual maturity. The expected pattern is as follows: the BNST of testosterone exposed males are larger than control males which are larger than testosterone exposed females which are larger than control females. TP female rats possessing this intermediate BNST volume would be a model of transgender humans and offer a possible explanation for this phenomenon.

Publication(s): None yet.

Congressional District: 13th

Congressional Representative: Timothy J. Ryan

Baldwin Wallace

Sarah M. Shapley

Status: Senior, Neuroscience and Biology

Research Topic: Role of PAD2 on Actin in Myelination

Advisor(s): Jacqueline Morris, Ph.D.

Biography: I am a Senior at Baldwin Wallace University, studying Neuroscience and Biology; however, my ideal career wasn't always in the sciences. I had grown up in the arts, including painting, literature, and orchestra. In the same way, a conductor must guide an ensemble to give meaning to a symphony; I felt neurosciences are a revelation to the functions, or dysfunctions, of the brain. The Ohio Space Grant Consortium has presented a fantastic opportunity to conduct undergraduate research at BW. Throughout my undergraduate career, I had opportunities to research neurodegenerative diseases such as amyotrophic lateral sclerosis, Alzheimer's disease, and multiple sclerosis.

Additionally, my love of neuroscience and science as a whole extends beyond the classroom. I have been involved in BWU's Interdisciplinary Neuroscience Society as the Brain Fair outreach chair and a course assistant for our introductory Biology course. One of my future goals is to make neuroscience relatable to the public by offering accessible science; in doing this, I hope to elucidate the importance of the sciences.

Abstract: Myelin is a lipid sheath that acts in the nervous system to propagate neuronal signaling. Demyelinating disorders, such as multiple sclerosis, disrupt this signaling process due to the leakage of ions. The maturation of myelin occurs in two stages. The first stage is the wrapping of the oligodendrocyte membrane around the neuronal axon, where actin is depolymerized at the leading edge. Secondly, compaction is the extrusion of the cytoplasm. We hypothesize myelin basic protein (MBP), which is essential for compaction, does not interact with the membrane at this stage due to temporal regulation by the peptidyl arginine deiminase (PAD) enzyme.

Additionally, PADi2 is upregulated in myelinating oligodendrocytes and is required in oligodendrocyte differentiation and maturation. We hypothesize deimination of MBP prevents premature compaction, and the deimination of actin filaments promotes the filament's depolymerization. We predict a PADi2 inhibitor increases F-actin; thus, we predict a loss of actin depolymerization during wrapping. PADi2 was inhibited in zebrafish during myelination at 2.5 days post fertilization (dpf), 5 dpf, 7 dpf, and 10 dpf. Then, ratios of G/F-actin and mean fluorescence intensities (MFI) of myelin were analyzed to determine if the loss of PADi2 activity disrupted myelination. As expected, exposing fish to a PADi2 inhibitor did not alter oligodendrocyte cell number, nor G/F-actin ratios at 60 hpf. Additionally, if PADi2 prevents MBP from early compaction, we expect that inhibiting PADi2 activity promotes premature compaction and result in a lower MFI. Overall, elucidating the regulatory role of PADi2 during myelination may assist in developing remyelination therapies for people suffering from demyelinating disorders.

Publication(s): None yet.

Congressional District: 9th

Congressional Representative: Marcy Kaptur

Baldwin Wallace

Patrick G. Woller

Status: Senior, Neuroscience and Biology

Research Topic: Aquaporin-4 Distribution Correlates to Increase in Tau Accumulation in Sprague Dawley Rats Fed a High Fructose Diet

Advisor(s): Jacqueline Morris, Ph.D.

Biography: It wasn't until my freshman year in high school that my own passion for neuroscience. Since then, I have become more aware of the harmful effects of neurodegenerative diseases and how researchers are trying to solve their complexity. I am currently an undergraduate senior at Baldwin Wallace University studying Neuroscience and Biology. My research plans to help bridge the unknown connection between type 2 diabetes and Alzheimer's disease progression. I am thankful for all the help and support I have received along the way from my friends and family including my advisor Dr. Jacqueline Morris. I am excited to participate and be a part of the Ohio Space Grant Consortium.

Abstract: According to the Center for Disease Control, 10% of the U.S. population has type 2 diabetes. Type 2 diabetes is a resistance to the presence of insulin in the bloodstream and occurs primarily in adults over 45. Cells utilize glucose in response to insulin in the bloodstream. Since a neuron's main energy source is glucose, type 2 diabetes can have devastating effects on neurons and may result in neurodegeneration. Consumption of fructose may lead to a greater risk of diabetes. Individuals that consume fructose convert the fructose into lipids or free fatty acids in the liver, which in excessive amounts, can be detrimental. The major blood vessels in the brain's glymphatic (waste clearance) system are covered by astrocytes that form a barrier between brain tissue and the blood. Aquaporin (water-channel) proteins are present in the astrocytic endfeet that surround the blood vessels and allow cerebral spinal fluid to collect and remove waste from the brain. Inflammation and brain injury lead to a redistribution of Aquaporin-4 (AQ4) channels from the endfeet to the astrocytic cell bodies. Thus, disruption of the glymphatic system is known for an accumulation of amyloid plaques and tau tangles. Streptozotocin (STZ) injections disrupt the glymphatic system as a model of type I and II diabetes mellitus. Because the STZ-model of diabetes can be toxic to animals and cause stress, we are seeking to compare this model directly to a fructose-fed rat model. Sprague Dawley rats were either fed a control diet (n = 5) or a 60% fructose diet (n = 5) for 10 or 13 weeks, then perfused with appropriate tissues collected. Floating sections were stained for Cresyl violet, phosphorylated tau, or AQ4 proteins and then analyzed with non-biased stereology using the Microbrightfield system on the Olympus BH2 fluorescent microscope.

Publication(s): None yet.

Congressional District: 12th

Congressional Representative: Troy Balderson

Case Western Reserve

Joel A. Hauerwas

Status: Senior, Mechanical Engineering

Research Topic: Abdominal Kinematics of Manducca Sexta

Advisor(s): Roger D. Quinn, Ph.D.

Biography: Joel Hauerwas is a fourth year Mechanical Engineering simultaneously pursuing his masters in engineering at Case Western Reserve University. Growing up in Eastern Massachusetts, Joel spent much of his time studying science and math and coaching his local robotics team. Once he came to college Joel look involved to get involved in more robotics and research. At Case he found the Biorobotics lab and has worked on a number of projects for the lab. In addition to his work in the research lab Joel is a member of the schools quidditch team and works for the university makerspace, Think[box]. Upon graduation in December of 2020 Joel will look for opportunities to develop and research robotics.

Abstract: Biomicry is the design of systems modeled around biological entities or processes. The Case Western Biorobotics lab has been working to develop a flapping winged robot modelled around the Tobacco Hawkmoth. The Tobacco Hawkmoth is a subject of frequent study by neurobiologists so there is significant research regarding its anatomy. This along with its stable flight patterns make it an ideal candidate for a Flapping Winged Micro Air Vehicle. After developing a mechanism which mimics the flight patterns of the moth we needed to create a method for steadying and controlling the moth. Looking to the biological model I realized that moth uses its abdomen as an aileron or fin. Joel will be developing the mechanical equivalent to the biological abdomen.

Publication(s):

1. Moses, K. C., Michaels, N. I., Hauerwas, J. A., Willis, M., & Quinn, R. D. (2017). Biomimetic And Biohybrid Systems: 6th international conference, living (2017 ed.).(pp. 589-594) S.l.: Springer International PU.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Cedarville University

Sara A. Mitchell

Status: Junior, Geology

Research Topic: Investigations of Radiohalos from the Galway Batholith in Ireland

Advisor(s): Dr. John Whitmore

Biography: Sara Mitchell grew up in Atlantic Beach, Florida. She has always loved the ocean and the outdoors and spent many hours at the shore meticulously looking for fossil shark teeth. She discovered Cedarville University and met her advisor at a high school summer camp and has enjoyed studying geology ever since. Sara loves teaching labs and tutoring her peers, and hopes to go to grad school after her undergraduate years. In addition to active involvement in her department, Sara also participates in Cedarville's Honors organization and enjoys hiking and exploring Ohio's parks as she finishes her education at Cedarville.

Abstract: Granite often has an abundance of biotite. Zircon crystals can be embedded within the biotite, and these crystals have a high percentage of uranium in them. This makes them highly susceptible to radioactive decay. As the uranium undergoes alpha decay, the alpha particles scar the surrounding biotite and leave a spherical ring around the parent material. Radiohalos are, then, these radioactive scars on grains of biotite. The radiohalos, though, can only form at temperatures less than 150° C. If the temperature of the rock rises above this, the radiohalos will be essentially erased. Thus, all of the scarring must take place after the granite has cooled sufficiently. The granite under study is from a batholith near Galway, Ireland and is late-Caledonian. Under a petrographic microscope, different types of radiohalos will be counted and logged. Then a statistical analysis will be done to understand the abundance and distribution of these radiohalos. This study could have implications for the speed of cooling of the studied plutons, the nature of radioactivity, and the history of heating of the granite.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Cedarville University

Reese J. Watkins

Status: Senior, Molecular and Cellular Biology

Research Topic: Characterization of the Effects of Aging on the THP-1 Cell Line

Advisor(s): Dr. Kaleb Pauley

Biography: Reese Watkins is a current Senior at Cedarville University majoring in Molecular and Cellular Biology with minors in Bible, Bioethics, and Spanish. Originally from Wooster, Ohio, he was exposed to the sciences early in high school and took an interest in biology. Pursuing this, he enrolled at Cedarville where he was instantly fascinated by the way academic knowledge and research could make a difference in human health and medicine. He has worked as a research assistant in various biology laboratories, served as an intern in the Immunotoxicology Department at Charles River Laboratories, and obtained his state and national EMT certifications. It was these combined academic, industry, and healthcare experiences that led him to pursue a career in biomedical research. Moreover, the guidance and opportunities afforded by many wonderful faculty members at Cedarville, especially Dr. Kaleb Pauley, encouraged him to pursue graduate level training in biomedical research following graduation.

Abstract: Human monocytes are a type of white blood cell that play a significant role in innate immunity. In response to foreign pathogens, the innate immune response triggers inflammation which then “calls” monocytes from the blood stream into the infected tissue where they differentiate into macrophages. Due to the importance of monocytes in human immunity, there are a few cell lines of human monocytes that are available for in vitro experimentation. One cell line in particular, THP-1, can be used for the many immunological assays common in translational medicine.

Originally derived and immortalized from an acute monocytic leukemia patient in 1980, much has been discovered about the characteristics of this cell line. However, there is still more that we do not know about THP-1 cells and monocytes in general. Little to nothing is currently known about the effects of extended culture on this cell line. As the basis for much research, it is necessary to exact how long these cells are stable in culture. Moreover, it must be determined whether extended periods of continuous culture have any impact on THP-1 phenotypes and, if so, what that change is. As such, this study sought to characterize the long-term effects of continuous culture on the THP-1 cell line while also looking at the effects of added glucose at concentrations of 5mM and 25mM as a model for diabetes. Characterization included analysis of TNF- production, migration, phagocytosis, and replication rate.

Publication(s):

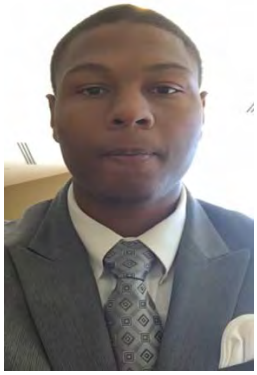
1. Adam, N., Burton, C., Butts, E., Conway, E., Flint, K., Gibbs, D., Ortiz, H., Seher, A., Testas, A., Watkins, R., Pauley, K. (2019, April). Miracle Drug? Determining the effect of metformin on miR-146a expression in human monocytes. Poster presented at Cedarville University’s Research and Scholarship Symposium, Cedarville, Ohio.
2. Adam, N., Burton, C., Butts, E., Conway, E., Flint, K., Gibbs, D., Ortiz, H., Seher, A., Testas, A., Watkins, R., Pauley, K. (2019, April). Aging Gracefully? Effects of Aging on the Immunological Functions of a Human Monocytic Cell Line. Poster presented at Cedarville University’s Research and Scholarship Symposium, Cedarville, Ohio.
3. Anderton, L., Bradley, N., Paris, S., VanGeest, A., Watkins, R., Young, K., Kuruvilla, H. (2019, April). Netrin-3 and Netrin-4-Like Proteins are Secreted from Tetrahymena thermophila. Poster presented at Cedarville University’s Research and Scholarship Symposium, Cedarville, Ohio. DOI:10.13140/RG.2.2.23380.24969.

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

Central State University

Stuart W. J. Dixon



Status: Senior, Manufacturing Engineering

Research Topic: CCR: Color Changing Roofing

Advisor(s): Dr. Morris Girgis, Dr. Jeremy Holtgrave

Biography: Stuart Dixon was born and raised in Chicago, Illinois. His mother started to introduce STEM to him at a young age which began his quest for understanding. He is currently majoring in Manufacturing Engineering, with plans of designing and patenting new innovations. He is a member of the National Society of Black Engineers (NSBE), and volunteers at Dayton Young Life. His pass times include working on cars, researching his ideas for better understanding, and being a mentor to his peers and youth.

Abstract: Global Warming and Climate Change have become a growing problem as time passes showing exponential growth in recent years. CCR (Color Changing Roofing) is a way that could combat the problem the world faces on different levels. As the effects of Climate Change become more evident countries across the world look for solutions and way to combat the effect. By changing the color of the roofing in relation to the outside temperature the amount of energy needed to maintain a comfortable temperature will be lowered. In combination with the amount of energy that can be reflected off the earth more time should be allotted to find solutions to global warming if implemented.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Central State University

Kirshaun D. Francis

Status: Senior, Manufacturing Engineering

Research Topic: Autonomous Solar Tracker

Advisor(s): Saleh Almestiri

Biography: My name is Kirshaun Francis, a Bahamian who was born on the 19th of January, 2000 in West Palm Beach, Florida. I am majoring in Manufacturing Engineering at Central State University. I chose Manufacturing Engineering because I love practical work, but at the same time I also love speaking, writing, etc. My parents are Rochelle Anderson and Kirk Francis. Both of my parents are hardworking civil servants, and I think it is this- the fact that they are struggling- that has driven me to always succeed.

When I was two months old (so I was told), it was discovered that I had a medical issue that required several surgeries in order to be corrected. The first surgery was done when I was ten months old. The last set of surgeries was done in 2002, when I was two years old. It was that same year when my mother, a high school teacher, transferred from Freeport, The Bahamas to Exuma, The Bahamas. It was here that I eventually got my pre-school and early primary education at Mount Thompson Primary and then Moss Town Primary. In 2009 my mom was transferred to Long Island, The Bahamas. Here, I completed primary school at Simms Primary, and junior high at North Long Island High School, where I sat for my BJC examinations. Then, in 2013, we moved back to Freeport.

Having to move so often in my young life, has exposed me to experiences and places I may have not gotten a chance to as a regular individual. I have had to learn to catch up and work harder as my illness, which persisted for a time, often kept me in hospital and out of school. My hunger to achieve has been influenced by these factors. Subsequently, I have determined to always do my best. Over the past years, I have been rewarded with many achievements. In 2010, I received a National Merit Scholar Award for sports and academics, representing Simms Primary School, Long Island, The Bahamas. I was nine years old at the time. This award was given to sixth grade students nation-wide who achieved a GPA of 3.05 or higher. I was one of the top students in my sixth-grade class, with a cumulative GPA of 3.80. In 2010, as a seventh-grade student, I was introduced to the junior Toastmasters program, which I eagerly participated in. I was very interested and decided to join. During the course of the program, I learned effective public speaking and communication skills, and how to organize speeches for public presentation. This eight-week program was one that I was able to successfully complete. In 2013, I passed the nine BJC subjects I took. These included: Math, Language, General Science, Health Science, Art, Social Studies, Religious Studies, Technical Drawing and Home Economics. In the same year, I was once again invited to join the Youth Leadership Program of Toastmasters, but this time in Freeport, Grand Bahama. This time I entered with a better understanding and appreciation for the program, as I had prior knowledge of Toastmasters. During the program, I served as Secretary and Assistant Sergeant at Arms. Once again, I successfully completed the eight-week training graduating from the program as Best Evaluator and Most Outstanding Youth Leader.

In 2014, I was offered a scholarship at Terreve College. As a tenth-grade student, I had never dreamt that I would have been afforded the opportunity to begin tertiary education before completing high school. However, this was an initiative of Mr. Terrence Archer, Director of Terreve College: to prove that focused high school students are able to meet the challenges of college life. In a bold and historic move, Mr. Archer offered ten scholarships to students from various schools on Grand Bahama. Gratefully, I was one of the first ten students to be accepted into this program. I completed my studies at the end of summer 2016, attaining my Associates Degree in Law and Criminal Justice as a result.

In 2016, I graduated from Jack Hayward Senior High School, and received my acceptance letter into Central State University with the intent to study Manufacturing Engineering. I have now been at Central State University for four years and I must say, my time spent here has been truly amazing! After graduation, I hope to start my career at a Fortune 500 company like Apple, Honda, etc. gaining experience would affect me greatly by giving me a head start since I am still young.

Recognizing my achievements thus far, I've come to acknowledge and appreciate that with hard work you can do anything. My future goals are to further my education and obtain my bachelors and masters. Also, my career goal is to become a maritime lawyer and advance in my career. We are not restricted to do anything. Whatever it is that you want to do in life, get up and strive for it. You should always do things the right way, every time, from the first time. Taking shortcuts is not necessarily the easier way; it often gives you more work. Additionally, I've learned that you should always stay focused on your goals, and to never give up. At times when you feel like quitting, that's when you should push harder on the throttle. Success may be just around the corner.

Abstract: Solar Shadow is simply a solar tracker. It will track the sun using a dual-axis system which consists of rotation about the x-axis and z-axis. This is similar to a discontinued project that attempted to use a Fresnel lens in order to concentrate solar energy. So, by removing the Fresnel lens and solely focusing on the platform itself, it left more room open for alternative designs. Therefore, the idea of placing a mobile solar panel on top came about which lead me to do further research. This research is sought to capture and store solar energy, instead of concentrating it into a focal point. When mounted onto the base, results from the solar panel will be measured under stationary circumstances, rotation about the x-axis and rotation about both the x and z-axis.

Congressional District: 10th

Congressional Representative: Michael R. Turner

CLEVELAND STATE UNIVERSITY

Cleveland State

Marola W. Issa

Status: Senior, Chemical Engineering

Research Topic: The Influence of Interfacial Properties on the Propulsion of Active Janus Particles Near an Air-Water Interface

Advisor(s): Dr. Christopher L. Wirth

Biography: I am a Senior Chemical Engineering student at Cleveland State University and will be completing my Bachelor's Degree in May, 2020. I obtained my first Bachelor's Degree in Biology pre-medicine from The Ohio State University and was accepted into medical school, but quickly realized after completing my first semester that it was not my true calling. My love for math, physics, and problem solving helped direct me into choosing Chemical Engineering as my true passion.

I am originally from Syria and moved to the United States with my family about 13 years ago. I am the oldest of four and a first generation college student. In pursuit of my Chemical Engineering degree, I have participated in multiple different research projects at Cleveland State University with Dr. Christopher Wirth, and at Sherwin-Williams Company. My research interest lies in the filed of nanotechnology, specifically in active particles dynamics at interfaces. I was awarded the Undergraduate Summer Research Award through Cleveland State in 2017 where I was first introduced to active particles and was given the opportunity to conduct my first research project. My summer internship with the research and development team at Sherwin-Williams allowed me to achieve a practical understanding of how research is applicable in a manufacturing environment. Outside of school, I enjoy reading and learning about various different disciplines in addition to engineering.

Abstract: Self-propelled or "active" micrometer scale particles are capable of supplying local mechanical work necessary for micro-scale cargo delivery and useful in other applications within bio imaging and sensing. Such particles with chemical or geometric anisotropy have the potential to transform applications in chemical, and medical drug delivery as analogous for molecular scale phenomena and in consumer products. Research in the last decade focused on developing, measuring and manipulating the locomotion mechanisms of active particle in simple environments. However, most applications will be in complex environments with nearby boundaries or variations in physiochemical cues such as viscosity and density.

The current project seeks to analyze the swimming of active particles near an air-water interface populated with bio-surfactants. Bio-surfactants, such as Rhamnolipids, are microbially produced by Pseudomonas aeruginosa as anionic amphiphilic molecules. They are composed of a hydrophilic head and a hydrophobic tails of varying length are highly biodegradable and non-toxic. In addition, they provide excellent foaming/wetting properties and can work at extremes of pH, salinity and temperature. The presence of these naturally occurring surfactants are thought to influence the way microorganisms swim and interact with water-air interfaces. Thus, this research project will specifically focus on analyzing the influence of Rhamnolipids on swimming near a water-air interface. This will assist in the development of the experimental technology needed for studying microorganism swim dynamics. This work will help to address these challenges by working with simple, synthetic versions of biological colloids. This is a necessary first step because answering these questions initially for far more complex biological colloids would not be possible.

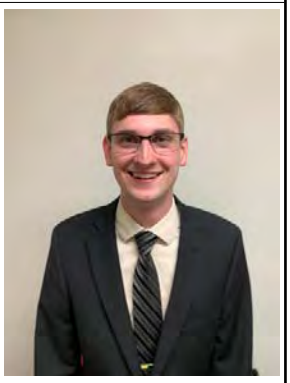
Publication(s):

1. Issa, M W.; Baumgartner, N.; Kalil M.; Shawn, D R.; Wirth, C. L. Charged Nanoparticles Quench the Propulsion of Active Janus colloids. ACS Omega 2019, 4, 13034−13041.
2. Rashidi A.; Issa M.W.; Martin I.; Avashi A.; Razavi S.; Wirth C.L. Local Measurement of Janus Particle Cap Thickness. ACS Appl. Mater. Interfaces 2018,10, 37, 30925-30929.

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

Stephen M. Matz



Status: Senior, Electrical Engineering

Research Topic: Channel Detection and Synchronization in Ultra-Wideband Communication Systems

Advisor(s): Dr. Moncef Tayahi

Biography: Stephen is a Senior at Cleveland State University studying Electrical Engineering with a minor in Mathematics. Born and raised locally in Cleveland, he attended Benedictine High School. After completing a number of technical classes, Stephen became interested in analog/digital communications and signal processing.

At Cleveland State, Stephen is active on campus in the Institute of Electrical and Electronics Engineers (IEEE), the Tau Beta Pi Honor Society, the Sigma Phi Epsilon (SigEp) Fraternity, and the Dan T. Moore Makerspace. Outside of school, he spent the 2019 Summer and Fall semesters as an engineering intern at Champion ONE, developing test procedures for fiber optic transceivers and reviewing the design of an embedded system project. During the 2020 Spring semester, Stephen is an intern at NASA's Glenn Research Center, working on waveform characterization of CubeSat radios. In his free time, Stephen enjoys working on personal electrical projects, spending time outdoors, and spending time with family and friends.

Abstract: The Radio Frequency (RF) spectrum is becoming increasingly crowded with high-power signals, especially with an increase of Internet of Things (IoT) devices. A potential solution to this overcrowding is the use of Ultra-Wideband (UWB) signals, since they can provide adequate data rates while using significantly less power. UWB systems are a class of communication systems that use wide bandwidth and low power to support high data rates. While some UWB systems exist, signal detection, estimation and synchronization pose technical challenges to their widespread deployment. This project will use computer software simulations to evaluate an UWB system model. By analyzing the effects of varying system parameters, characteristics for an optimal communication system will be gathered.

Publication(s): None yet.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Kent State University

Adam J. Fertig

Status: Senior, Aerospace Engineering

Research Topic: Thermal Investigation of sUAS Motors Under Varying Power Conditions

Advisor(s): Dr. D. Blake Stringer

Biography: My love for aeronautics and astronautics developed throughout middle school as my passion for planes and rockets was cultivated by my enrichment teacher, Mr. Hawks. His classroom had a focus on experimentation and exploration and I was encouraged to test how changing sizes and shapes of rockets would affect performance. Fast forward several years and this passion manifested into a decision to study Aerospace Engineering at Kent State University (KSU).

Since joining the first Aerospace Engineering class at Kent State, I have had incredible opportunities to participate and make a significant impact on my university community and the aerospace industry with undergraduate research, design projects, and mentorship. As a senior graduating this Spring, I am the elected President of KSU's student chapter of American Institute of Aeronautics and Astronautics (AIAA), and Assistant Project Manager of KSU's AIAA Design, Build, Fly Team. Because my middle school experience had such a major impact on my decision to pursue a STEM related career, I commit time to mentoring a middle school student completing a STEM fair project using KSU's Subsonic Wind Tunnel to test rocket nose cone designs and their drag coefficients. During my sophomore and junior year, I completed research under Dr. Stringer to improve vertical axis wind turbine feasibility. This research won the Ohio Space Grant Consortium's (OSGC) STEM award at Kent State University's Undergraduate Research Symposium. Aside from these extra-curricular activities, I also have been a part-time intern for Saint-Gobain since February 2019. In my little bit of free time I have, I enjoy hiking in Cuyahoga Valley National Park (CVNP).

Abstract: My research consisted of measuring the thermal properties of various small UAS (sUAS) motors. While an unmanned aerial vehicle (UAV) motor is running the airflow created by the motor-rotor combination is generally able to cool the motor, keeping the motor temperature under control. Once the motor is shut off the airflow created by the motor-rotor is removed, and the temperature of the motor spikes to high and sometimes unsafe temperatures. Landing a UAV is a high power condition, and common practice is to shut the motors down upon landing to prevent rollover. As UAVs are continuing to increase in size this means the size of the rotor-motor configurations will continue to increase along with power consumption. During my research, I tested conditions of various sized motor-rotor combinations measuring their temperatures while running at high power conditions then immediately shutting down the motor. All of the tests were conducted on Kent State's sUAS Static Thrust Test Bench. It investigated the relationships between the size of the motor, temperature, and cooling time; along with finding a function to predict the cooling time from peak temperature. Further, I investigated ways of cooling the motor to reduce thermal spikes upon shut down. One option investigated was to return the motor to 20% throttle to self-cool the motor before shutting down, while another cooling method involved developing a new motor housing to test if static pressure was a contributing factor.

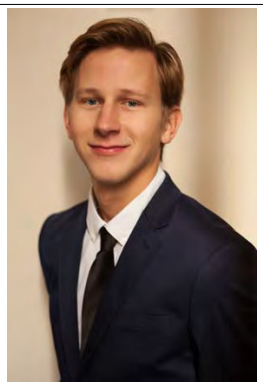
Publication(s): None yet.

Congressional District: 13th

Congressional Representative: Timothy J. Ryan

Kent State University

Alex J. Rosul



Status: Senior, Geology

Research Topic: Tracking Seasonal Change in USVI Sentinel-3A and VPCA

Advisor(s): Dr. Joseph D. Ortiz

Biography: My name is Alex Rosul, I am a Senior at Kent State University working toward finishing my B.S. in Geology with a minor in Chemistry. I'm from Lakewood, Ohio, and come from a family that loves to explore the natural world. I decided to study geology for two major reasons: I love history and every rock has a story to tell. I was first introduced to the applications of remote sensing by my faculty advisor, Dr. Joseph Ortiz, in 2017 and since then, it has allowed me to see the world in a new perspective (quite literally). I hope to find a career in which I can use my skills in remote sensing, GIS or mapping once I graduate.

Abstract: Remote sensing first began in the 1840s when balloonists took photos of the ground. It was then used for reconnaissance in the first World War. In the 1960s sensors began to be mounted to meteorological satellites and started giving us black and white images of the earth. Things really started to modernize when the first Landsat satellite was launched in 1972. Now with constant incoming data we were able to track how the earth was changing year by year. Since then 8 Landsat missions have been sent into space, each sensor improving upon the last with a 9th in development. Remote sensing is an extremely powerful tool that can be used to see things that we would otherwise not be able to see with the naked eye. With more and more satellites being sent into space every day, and a large arsenal of public data it is becoming a fast growing and important field in earth studies. In this project Sentinel-3A was selected as the data source. This satellite is equipped with the Ocean and Land Color Instrument (OLCI), which provides 300m resolution data with a swath width of 1270km and a repeat cycle of 27 days. Taking data from the flyovers of the USVI and BVI a seasonal time series was built starting when the satellite was first launched in 2016. A varimax principle component analysis (VPCA) was used in order to unmix the data and identify the components in the surface waters around the islands. Samples collected from various sites around the islands were also taken to ground truth the data.

Publication(s): None yet.

Congressional District: 9th

Congressional Representative: Marcy Kaptur

Kent State University

Hayley D. Shasteen

Status: Senior, Molecular and Cellular Biology

Research Topic: The Role of Sunlight Exposure in Tasks of Inhibition in Patients with Systemic Lupus Erythematosus

Advisor(s): Dr. Rachael Blasiman

Biography: Hayley Shasteen is currently a Junior with a dual major at Kent State University pursuing a B.S. in Biology with a concentration in Molecular/Cellular Biology and a B.S. in Psychology. Expressly interested in defining and understanding the mechanisms of the symptom 'brain fog' in people with systemic lupus erythematosus (SLE), an autoimmune disease, Hayley has worked with Dr. Rachael Blasiman completing several projects that emphasize longitudinal designs examining fluctuations in cognition in relation to environmental variables in people with SLE. Working on this particular problem has led Hayley to become interested in circadian rhythms and how sunlight may impact disease progression of SLE, as well as the presentation of physical and cognitive symptoms. Hayley also works alongside Dr. Eric Mintz and Dr. Douglas Delahanty of Kent State University, working on projects pertaining to circadian rhythm function and trauma and stress, respectively. After graduating in Fall 2021, Hayley intends to pursue a PhD in cognitive neuropsychology and continue working towards defining and ultimately alleviating 'brain fog', as well as understanding how the biological clock plays a role in SLE. Hayley was named a 2019 Goldwater Scholar for her work regarding cognition in SLE.

Abstract: In this project, we examine the negative impact of sunlight exposure on inhibition task performance and physical and cognitive symptoms in participants with systemic lupus erythematosus (SLE). This study is a continuation of a longitudinal experiment we completed in Summer 2018. In addition, we compare variations in SLE participants' cognitive performance to those of healthy controls without cognitive impairment over a ten-week time period. The longitudinal design of this study allows us to further investigate fluctuations in cognitive performance and physical and cognitive symptom reporting by looking at the variations in sunlight exposure over time. Additionally, we examine differences between the Summer 2018 data with this Winter 2019 data.

Publication(s):

1. Shasteen, H. D., & Blasiman, R. N. (in progress). A longitudinal investigation of cognitive function in SLE.

Congressional District: 6th

Congressional Representative: Bill Johnson

Marietta College

Victoria L. Clarchick

Status: Junior, Petroleum Engineering

Research Topic: BelleFlex Dehydrator and the Efficiency of Phase Separation

Advisor(s): Professor Ben Ebenhack

Biography: Victoria Clarchick is a Junior at Marietta College majoring in Petroleum Engineering with a minor in Computer Science and a certificate in Leadership. Originally from Pittsburgh, Pennsylvania, Victoria has immersed herself in her school and community. At Marietta College Victoria is a student athlete, engineering and math tutor, executive coordinator of the Marietta College Petroleum Engineering Mentoring Program, campus president for the Society of Women Engineers (SWE), as well as a member of the campus chapters of American Association of Drilling Engineers (AADE) and the Society of Petroleum Engineers (SPE). Victoria has also completed several internships where she has been able to learn about the industry from a hands-on perspective.

Abstract: The separation of oil, gas, and water in the Oil and Gas Industry is continuously changing. The creation of new processes occurs practically every day, yet there is still always a small percentage of water and smaller hydrocarbons still left in the hydrocarbon mixture at the end of the separation process on locations. The purpose of this experiment is to determine if there is a device that can separate the three phases on site locations. The current problem is that there is not a device that is small enough to fit onto locations that can perform the required separation procedure at the rates of the flowing wells. The BelleFlex dehydrator is a device that has the potential to separate the three phases, oil, gas and water, on a smaller scale. This will be important to environmental protection as well as efficient operations. Therefore, outlined in this experiment is the process for how the BelleFlex Dehydrator separates oil, gas, and water.

Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

Marietta College

Johnathan L. Kungle

Status: Senior, Petroleum Engineering

Research Topic: Platform Decommissioning: Alternatives for Offshore Operators

Advisor(s): Professor Craig Rabatin, P.E.

Biography: Johnathan is a Senior Petroleum Engineering major at Marietta College, also pursuing an Engineering Leadership Certificate through the McDonough Leadership Program. During his junior year, he served as the President of Energy Business Alliance, a simulated company giving students relevant industry experience through projects and field trips. Johnathan now serves as the President of Marietta College's chapter of the Society of Petroleum Engineers. He is currently serving in his third year as a Resident Assistant. Johnathan has a passion for math and science in addition to traveling and seeing new places. These qualities are what led him to the oil industry as it seemed to be the perfect combination of engineering and excitement for him. Two summers ago, he worked in Houston, Texas, as a Drilling Engineering Intern in a Gulf of Mexico Business Unit where he had the opportunity to spend a few days on the biggest drillship in the world. This experience was the inspiration for his research project. In his free time, Johnathan enjoys outdoor activities such as backpacking, hunting, and fishing.

Abstract: Water covers 70% of the Earth, yet hydrocarbon discoveries are still made on land despite continuous exploration for the past 150 years. Two decades ago, 5,000 ft of water was considered an "ultra-deep" offshore well; now, a large majority of offshore rigs are rated for either 10,000 or 12,000 ft of water. Needless to say, offshore technology in the oil and gas field is rapidly growing and will continue to do so as demand increases and operators push into deeper water to find more hydrocarbons. Thus, offshore infrastructure is and will continue to become outdated quickly, resulting in a lengthy and expensive decommissioning project for operators.

With the ever-growing amount of obsolete offshore structures, it is time the industry investigates alternatives to the standard decommissioning process. This study investigates artificial reefing, wind and wave power, tourism, and fisheries as alternatives. It focuses on feasibility, potential cost savings and profit, and real-world examples to determine the best option for operators.

Publication(s): None yet.

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

Miami University

Owen C. Brown

Status: Senior, Mechanical Engineering

Research Topic: Chemical Signature of Cured Epoxy Fracture Surfaces

Advisor(s): James Moller, Ph. D., P.E.

Biography: Owen Brown is a 4th-year Mechanical Engineering major from Loveland, Ohio and is preparing to graduate from Miami University of Ohio in May 2020.

Owen grew up creating his own inventions from Legos, tinkering with dad's computer, and experimenting outside with anything he could get his hands on. He graduated from Loveland High School early and participated in a post-secondary program at the University of Cincinnati before attending Miami University in 2016 for Mechanical Engineering. He quickly became passionate in many areas of his studies especially material science, manufacturing processes, and creative design thinking. During the beginning of Owen's junior year, he began a material science research project supported by Dr. James Moller. Owen spends most of his free time working on a handful of passionate personal projects related to robotics, 3D printing, motorcycles, and physical therapy devices. After graduation Owen hopes to establish a fantastic career in a creative engineering position, utilizing his skills and excellent experiences developed from his OSGC research project, studies, and personal projects.

Abstract: The mechanisms of chemical bond failure in resin epoxies are largely unknown and influence the mechanical behavior in epoxy resin applications that could result in catastrophic system failure if left undiscovered. The aim of this research is to change how the industry utilizes epoxies and to expand the knowledge and applications of epoxy resins. To understand the mechanical behaviors of epoxies it is essential to first identify and study the chemical mechanisms that cause the behavior. The outcome of this research will provide a procedure to obtain the fundamental evidence needed to understand the basic chemical origins of epoxy failure.

As a result of their versatile mechanical properties, high thermal and chemical resistance, and low thermal coefficients, the utility of epoxy resin in engineering applications is swiftly expanding. Resin epoxies have their own chemical group and are classified as polyepoxides, a class of reactive prepolymers and polymers which contain epoxide groups. Epoxy resins react i.e., cross-link, with either themselves through catalytic homopolymerization, or with a wide range of co-reactants referred to as polyfunctional hardeners. The extensive range of stoichiometric possibilities results in an ever-expanding list of epoxy applications, from advanced adhesives to composite matrices. With the increasing use of epoxies in worldwide industries, the consequences of defects and failure of epoxy can vary from inconvenient to catastrophic, just like any other material in engineering applications. Developing a repeatable procedure to discover the fundamental influence of chemical bond links on the epoxy's deformation and failure behavior is clearly necessary to determine the strength and safety of epoxy in an applied context.

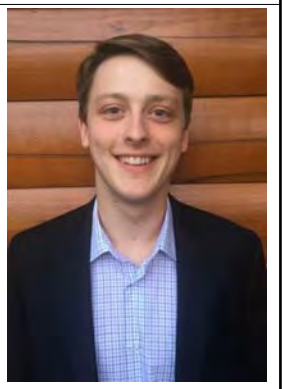
Publication(s): None yet.

Congressional District: 2nd

Congressional Representative: Brad R. Wenstrup

Miami University

Taylor W. Mason



Status: Senior, Mechanical Engineering

Research Topic: Evaluation of a New Electrostatic Actuator's Vibrotactile Feedback Performance in Large Touchscreens

Advisor(s): Dr. Jeong-Hoi Koo

Biography: Taylor Mason is a fourth-year Mechanical Engineering student that is simultaneously pursuing his master's degree in engineering at Miami University. His undergraduate research is in the field of mechanical vibrations and vibrotactile feedback technologies. He plans to continue this research into his graduate studies and master's thesis. Taylor spent last summer abroad at KAIST in South Korea working with scientists at several top institutes as a visiting scholar researcher. In addition to working in Miami University's Mechanical Vibrations lab, Taylor enjoys playing intramural hockey and being an active member of the Ski and Board Club. After graduation, Taylor plans to work in the fields of structural dynamics or mechanical vibrations.

Abstract: The vibrational sensation felt on the surface of a screen, known as vibrotactile feedback, is a key feature of many modern touch displays. This sense of touch enhances user feedback and improves object usability. There exists a number of actuators used today for generating haptic feedback in touch displays, such as eccentric rotary motors, linear resonant actuators, piezoelectric actuators, and electrostatic actuators. These actuators are primarily used for small displays in hand-held devices to effectively create touch feedback. However, the current actuators are not suitable for large touchscreen displays because they cannot create sufficiently large vibrotactile sensations. Devices such as tablets, information kiosks, and automotive dashboard panels are examples of large touchscreens that typically lack the capability of generating vibrotactile feedback for the users. To address a growing need for actuators used for large touch displays, this research studies the effectiveness of a new electrostatic actuator prototype that utilizes a moving mass. The addition of the moving mass was proposed to increase the actuator's vibration intensity and generate greater vibrotactile feedback. The proposed actuator attempts to fulfill the need for actuators that can create sufficient vibrotactile feedback in large touchscreens.

The primary goals of this study are to create mathematical models that predict the prototype actuator's behavior and compare the vibrational output when using one versus two electrodes. Based on a parametric analysis and experimental testing, a newly designed electrostatic actuator that generates greater vibrotactile feedback sensations will be proposed. These goals will be achieved through model development and vibration testing of the prototype actuator. This research not only provides a valuable learning opportunity for the undergraduate student but also contributes to the developing field of haptic feedback technologies.

Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

Miami University

Dylan J. Shumway

Status: Junior, Mechanical Engineering

Research Topic: Reproducing Radial Pulse Waveforms Using a Hybrid Pulsatile System

Advisor(s): Dr. Jeong-Hoi Koo

Biography: Dylan Shumway is currently a Junior at Miami University of Ohio and is pursuing his Bachelor of Science Degree in Mechanical Engineering with a minor in Paper Engineering. Originally from Oxford, Ohio, he attended Talawanda High School where he developed a passion for engineering, taking as many math and science classes as the school offered. Sophomore year of college, Dylan became involved with Dr. Koo's research into the biomedical application of smart materials. Outside of research, he was president of the student chapter of the American Institute of Aeronautics and Astronautics, leading the club to its acceptance into its first national aeronautic design competition.

Abstract: In the current age as technology continues to grow in support of the human population, the wearable technology industry has continued to expand. Currently, most of the consumer wearable device market has been limited to functions related to activity tracking and with reliable medical functionality including only basic heartrate monitoring operations. Increasing the functionality of these devices to include the continuous monitoring of blood pressure could help predict and therefore reduce the occurrence of life-threatening cardiovascular events, such as heart attack and stroke. A major boundary to expanding the wearable market is the prohibitive nature of human testing. This project set to standardize a non-human testing model in which an existing pneumatic pulsatile system could be hybridized to allow for use with more realistic fluids on which to evaluate and develop increased functionality of wearable devices.

Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

Ohio Northern University

William A. Deisler

Status: Junior, Mechanical Engineering

Research Topic: Modeling a Liquid Propellant Rocket Engine Using MATLAB

Advisor(s): Jed E. Marquart, Ph.D., P. E.

Biography: I am an Ohio native from Paulding, OH. As far back as I can remember I have always wanted to be involved in the aerospace industry. As a kid I dreamed of being an astronaut, and as I grew older my passion for space exploration has not faded. My focus has now shifted to becoming an Aerospace Engineer for NASA and contributing to humanities exploration of the unknown. During my time at Paulding High School I became involved with our school's science Olympiad team as well as our engineering team. These experiences along with the incredible teachers I had at Paulding, led me to degree in Mechanical Engineering at Ohio Northern University.

At ONU, I continued to develop my interest in engineering and declared an Aerospace concentration to compliment my mechanical engineering degree. My continued desire to work for NASA led me to apply for pathways internships at NASA centers around the country. In the past six months I was fortunate enough to accept a pathways internship at NASA Glenn Research Center at Lewis Field and assist with the Wind Tunnel Testing Division. I am honored and excited to continue with this position and contribute to NASA's amazing accomplishments in any way possible.

Following my graduation from Ohio Northern, I intent to convert to full-time employment at NASA as well as pursue my Master's Degree in Aerospace Engineering.

Abstract: Often the early stages of development can be the most time consuming due to constant revisions and unforeseen obstacles. An effective way to improve the efficiency of the early development process would be to use common engineering software, such as MATLAB, to quickly analyze potential designs/solutions to decide how to move forward. For aerospace applications, using MATLAB to develop a program that will allow engineers to quickly analyze the performance characteristics of various rocket engines could significantly decrease the amount of time spent on early development, and allow for more time to be spent on detailed analysis of viable solutions.

Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

Ohio Northern University

Joseph W. Mileski

Status: Senior, Mechanical Engineering

Research Topic: Direct Numerical Simulation of Cavity Flow

Advisor(s): Jed E. Marquart, Ph.D., P. E.

Biography: **O**riginally from Tiffin, Ohio, Joe is a Post-Graduate Senior studying Mechanical Engineering at Ohio Northern University. On Campus, he belongs to the President's Club, a group of student ambassadors for the University President's office as well as a similar group for the T.J. Smull College of Engineering, the Dean's Team. He is an officer for the Colony of Theta Tau at ONU, and maintains alumni status for the Rho Pi Chapter of Phi Mu Alpha Sinfonia.

Joe has been a Robotics Lab Assistant since 2018, where he works with industrial robots, and Roombas communicating with Arduinos, and was a student research fellow applying Inertial Measurement Units in Biomechanical Applications. Having Graduated from ONU in 2012, he taught high school mathematics until 2017. Returning to ONU, he is pursuing a new degree to work toward a career in the aeronautical/astronautical industry**.**

Abstract: Direct Numerical Simulation is used to model turbulent flow, without the use of a turbulence model. To achieve this, a structured grid must be adequately fine to completely capture even the smallest length scale eddy produced by the geometry. This is achieved using the Kolmogorov microscale of length. Cavity flow consists of introducing a cavity into an existing geometry, focusing on the flow inside and around that cavity. This work-in-progress project investigates a rectangular cavity with a length/height ratio of 4 and a Reynolds number of 5000.

Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

Ohio Northern University

Zane R. Myers

Status: Junior, Mechanical Engineering

Research Topic: Drone Equipped Probing Thermal Hardware (DEPTH)

Advisor(s): Jed E. Marquart, Ph.D., P. E.

Biography: I am a Junior at Ohio Northern University and will graduate in May, 2021, with a B.S. in Mechanical Engineering and a minor in Business Administration. I am originally from Bluffton, Ohio, and I love fishing, snowmobiling, and the outdoors. During my time at Ohio Northern, I have had the opportunity to participate in the Las Vegas Design Experience as well as an EPICS service-learning design program. I currently serve as the Chair of our AIAA Student Branch where I am acting Project Lead for the 2020 SAE Aero Design East Competition. I also serve on the executive board of our Engineering Leadership Council which is a member of NAESC.

In the Summer of 2019, I became a Pathways Intern in Facilities Project Management at NASA Glenn Research Center. This summer I will return to NASA for my second rotation as a Pathways intern as well as continue my training towards a PPL at Medina Airport. Once I finish my degree, I intend to convert to full-time employment at NASA and continue my education on a part-time basis.

Abstract: The purpose of this project is to design and build a UAV mountable data acquisition module for studying Lake Erie algae blooms and their relation to water temperature. Project DEPTH is a piece of drone flight hardware designed to capture temperature and GPS data at different points in a body of water. With this data, maps will be created to show water temperatures at different locations and depths. These data maps could then be compared to pre-existing satellite images of the algae to help further understand the relation of water temperature to algae blooms. The long-term

Publication(s): None yet.

Congressional District: 4th

Congressional Representative: Jim Jordan

Ohio University

Laura R. Jackam

Status: Senior, Biological Sciences

Research Topic: The Effect of Diabetes Mellitus on Bone Fracture Risk

Advisor(s): Dr. Anne B. Loucks

Biography: Laura Jackam is a Senior in the Arts and Sciences College at Ohio University pursuing her Bachelor's Degree in Biological Sciences with minors in Applied Nutrition and Spanish, as well as a Diabetes Certificate. Laura's interest in diabetes mellitus was sparked by its high prevalence and many downstream effects in the human body. Dr. Loucks' research lab provided her with the opportunity to explore the relationship between diabetes and bone fracture risk. Laura hopes to attend medical school in the future to continue her education.

Abstract: The mechanical property of bone strength cannot be measured directly in vivo because the gold standard method for measuring bone strength and stiffness, known as Quasi-static Mechanical Testing (QMT), requires the bone to be removed from the body and fractured. Mechanical Response Tissue Analysis (MRTA) was developed in the 1980s to measure the bending stiffness (EI) of long bones in vivo in a non-invasive manner, but MRTA measurements were found not to be accurate or reproducible. Dr. Anne Loucks and colleagues at Ohio University identified sources of error in MRTA and corrected them in Cortical Bone Mechanics Technology (CBMT). This technology provides a clinical way of measuring ulna's EI in vivo, which can then be used to accurately predict the ulna's bending strength (i.e., the peak moment before fracture, Mpeak). For this study, I am compiling CBMT and QMT data on ulnas in pairs of diabetic and non-diabetic male cadaveric human arms and using ImageJ software to measure their interosseus diameter (IOD). The CBMT and QMT data include ulna EI and Mpeak. I am performing statistical analyses comparing the effects of ulna IOD, body mass index (BMI) and age on Mpeak between diabetic and non-diabetic male cadaveric human arms. The objective of this study is to test the hypothesis that diabetes changes the effects of IOD, BMI, and age on Mpeak. I will conclude that diabetes changes these effects, if the the slopes and/or Y-intercepts of the regression lines relating IOD, BMI, and age to EICBMT, EIQMT, or Mpeak are different in ulnas from diabetic and non-diabetic arms. If so, in future clinical settings, diabetes patients could be made more aware of their risk of bone fracture by using CBMT to measure ulna EI.

Publication(s): None yet.

Congressional District: 14th

Congressional Representative: David P. Joyce

The Ohio State University

Jacob M. Beardslee

Status: Senior, Aeronautical and Aerospace Engineering

Research Topic: Screech Noise Modes in Rectangular Single and Twin Supersonic Jets

Advisor(s): Dr. Mo Samimy and Dr. Nathan Webb

Biography: Jacob Beardslee is a Senior in Aerospace Engineering at The Ohio State University. He grew up in Mason, Ohio, where he went to Summit Country Day high school. Attraction towards math and physics combined with a lifelong interest in space and flight influenced Jacob's career path. At Ohio State, Jacob works in the Gas Dynamics and Turbulence Laboratory at the Aerospace Research Center. Outside of class, Jacob works as a university peer tutor for math, physics, and chemistry. Jacob is a member of the Design/Build/Fly competition team and Phi Gamma Delta Fraternity where he is the Scholarship Chair and sits on the Judicial Board. Jacob interned at Wright-Patterson Air Force Base this past summer and plans to return for their PALACE Acquire Program after graduating this Spring.

Abstract: Jet noise has been an issue for commercial and military aircraft since the advent of jet-powered flight. Circular jets have been the dominant configuration for military jets throughout history with a significant amount of research focused on their noise characteristics. The next generation of tactical aircraft are expected to have more integrated aerodynamic and propulsion systems for stealth, superior performance, and agility. For such an integration, rectangular jets are preferred over circular jets. The rectangular shape will produce different flow structures compared to circular jets therefore presenting many new aspects to investigate regarding their noise characteristics. The dominant noise sources for supersonic jets include mixing noise from large-scale turbulence structures, broadband shock associated noise, and screech.

Screech, which has an upstream and sideline directivity, can be detrimental to the structural integrity of the engine nozzle if the noise frequency is close to the natural frequency of the structural component. In addition, screech and shock associated noise could inflict significant pain and damage to hearing of the crew on aircraft carriers helping with the takeoff and landing of the aircraft. This project will investigate the screech modes in rectangular jets with small aspect ratios. A common configuration seen in supersonic military aircraft today is the twin jet configuration therefore both single and twin jet configurations will be investigated.

Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

The Ohio State University

Dustin T. Goetz

Status: Senior, Mechanical Engineering

Research Topic: 3D-Printed Electrochemical Cell for *In Situ* Analysis

Advisor(s): Vicky Doan-Nguyen

Biography: Dustin Goetz is a Senior majoring in Mechanical Engineering and minoring in Computer Science at The Ohio State University. Dustin has research experience in both the fields of energy and robotics. Since his sophomore year of college, he has worked in the Doan-Nguyen Group at Ohio State University, researching electrochemical cells. He participated in a research experience for undergraduates (REU) at Georgia Tech with Dr. Shannon Yee, researching a continuous flow electrochemical cooling system. This past summer, he participated in an REU at the University of Southern California with Dr. Heather Culbertson, helping to develop a wearable soft robotic sleeve that delivers haptic cues to users. Outside of research, Dustin is active in the campus entrepreneurship community, helping to run an incubator for student startups. In his free time, Dustin enjoys playing soccer and spending time with his three brothers. After graduation, Dustin plans to pursue a Ph.D. in Mechanical Engineering specializing in robotics.

Abstract: This project is focused on in situ analysis of battery cells. In situ analysis allows researchers to observe the electrochemical mechanisms of the components of batteries in real time. Unfortunately, commercial cells for holding battery stacks for different in situ techniques are expensive, which has led to individual labs modifying inexpensive cells or constructing their own cells for in situ applications. This practice has led to non-standardized results across labs. The goal of the project is to create a standardized in situ cell using 3D-printed components and inexpensive commercial components that can be printed and assembled at individual labs.

Publication(s):

1. Dustin T. Goetz, David K. Owusu-Antwi, & Heather Culbertson. PATCH: Pump-Actuated Thermal Compression Haptics. IEEE Haptics Symposium 2020.

Congressional District: 15th

Congressional Representative: Steve Stivers

The Ohio State University

Mikala J. Malkus

Status: Senior, Aerospace Engineering

Research Topic: Modal Decomposition of Complex Unsteady Flow

Advisor(s): Dr. Datta Gaitonde

Biography: Originally from Brunswick, Ohio, Mikala is currently pursuing a Bachelor's and Master's Degree in Aerospace Engineering through Ohio State University's BS/MS dual degree program. She chose to study aerospace because of her passion for propulsion, rockets and space travel. On campus, she is an undergraduate research assistant in the High Fidelity Computational Multi-Physics Laboratory through which she is completing her honors undergraduate research thesis. She is also an active member of the Society of Women Engineers. Outside of campus, Mikala completed two internships at NASA Marshall Space Flight Center researching mitigation techniques for undesirable structural dynamic responses on rockets and aircraft. In addition, this past summer she completed an internship at Pratt and Whitney as a combustor durability intern.

Abstract: The ability to study complex fluid flow phenomena is becoming increasingly viable due to recent advancements in both computational and experimental methods. As a result, there is an abundance of high-fidelity data readily available, but it can be computationally straining to deal with it directly. While analysis of these systems can seem intimidating, many contain dominant features that serve as a foundation to the underlying dynamics. The emergence of these features indicates that the high-dimensional problem at hand may be represented in a low-dimensional form. Modal decomposition offers a means for extracting these organized dynamics directly from the data, so that these complex problems can be described in a simpler form. Methods such as the Proper Orthogonal Decomposition (POD) and Dynamic Mode Decomposition (DMD) are commonly used in the fluid's community. While these methods are well developed, their application to complex unsteady flow has room for expansion. In this research, POD and DMD will be applied to various computational data sets with a variety of unsteady flow features. The ability of these techniques to find organization in such problems will help to analyze the underlying physics, thus providing a means to identify mechanisms for flow control. In addition, the low-dimensional models will be constructed which greatly reduce the computational costs of analyzing such problems.

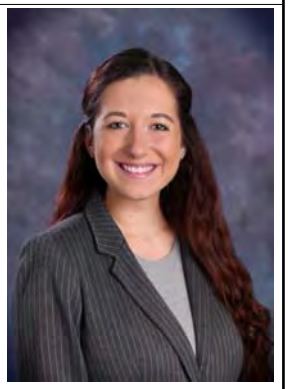
Publication(s): None yet.

Congressional District: 7th

Congressional Representative: Bob Gibbs

The University of Akron

Mikayla L. Aowad



Status: Junior, Mechanical Engineering

Research Topic: Behavior of Sandwich Core Under Extreme Temperature Conditions

Advisor(s): Dr. K. T. Tan

Biography: Mikayla L. Aowad is pursuing a major in Mechanical Engineering and a minor in Business from The University of Akron. Mikayla graduated from Jackson High School in Massillon, Ohio, and was a member of the National Honor Society. She was involved in the community and was a cheerleader from middle school throughout high school. Throughout her college career, she has been involved in the community and is a cheerleader for The University of Akron. Her love for problem solving began at a young age from watching her father. He is a “Mr. Fix-it” and always knows the answer to any question anyone in the family has. She wanted to strive to be as knowledgeable as her father, which is what originally drove her to engineering. Once in engineering school, she realized that she loved problem solving, but often was intrigued by the question “why?” Answers to problems were obtained, but why were they done that way, were there other ways of doing the problem, and why are these equations the way they are were often questions that popped into Mikayla’s head. When a research opportunity came about early on in her engineering career, she enthusiastically accepted. She was going to be able to find answers to questions she often had in class. Being able to add knowledge to the world and expand others’ development gave her joy. Throughout her engineering journey, she has had many great opportunities such as co-op rotations as well as volunteering to help middle school students use design software and show them what engineering really is about. She enjoys learning and adding valuable information and data to the scientific world.

Abstract: Composite materials are being used in a wide variety of industries including aerospace, marine and wind energy. The unique characteristics of composite materials, including high stiffness, low weight and high strength, are beneficial over other materials already used in these applications. The type of composite material I am studying is a sandwich structure. This means the material is designed with three layers and adhesive in between. There are two lightweight, but strong outer skins and a thick shear-resistant core in between. My research focuses on the microstructures of the core material and how they affect the overall mechanical behavior. I am studying three types of foam core: H, PN and F. They are made of cross-linked polyurea and PVC, polyethylene terephthalate and thermoplastic polyethersulfone, respectively. There are multiple densities of each type of foam and the density is given as the number after the type of foam in kg/m3. The specimens I study are H60, H100, F50, F90, PN115, PN200 and PN250. Compressive and shear strength have been studied already in sandwich structures, which drives my research in the bending strength of the materials. Specifically, I am interested in how extreme low temperatures affect the foam performance. This data will have significant impact on aerospace for space environment and marine arctic region applications. Three-point bend tests have been executed and the data is in the process of being analyzed. Micro CT scans of the specimens have been conducted and are being analyzed to view the cell structure in the different types of foams and the different densities. Microscope images have been captured and are aiding in analysis of the cell wall thickness and how that affects the strength of the foam. These images will also aid in determining if modeling each cell as a cube is sufficient in predicting call wall thickness in foam. This study evaluates arctic effects on mechanical properties in varying types of foam core at varying densities along with general analysis on how microstructure effects mechanical properties of the foam.

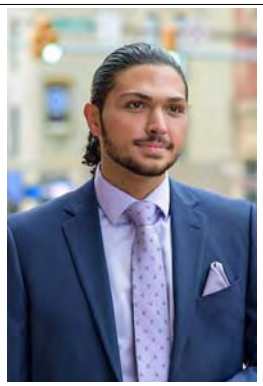
Publication(s): None yet.

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

The University of Akron

Niccolo D. Lemonis



Status: Senior, Electrical Engineering

Research Topic: High-Temperature, Flexible, Piezoelectric Transducers Based on Nylon-11 Nanowires

Advisor(s): Dr. Ryan Christopher Toonen

Biography: Niccolo Lemonis is a 5th year undergraduate student at The University of Akron and is currently studying Electrical Engineering specializing in electromagnetics. He began working on this project in the fall of 2019 shortly after Dr. Toonen contacted him with the opportunity. Nicco has always had an inquisitive mind always wanting “to figure out what makes things tick”. Nicco has completed two co-op rotations with Goodyear Tire. Nicco is the student branch Chair of Institute of Electrical and Electronics Engineers (IEEE) at The University of Akron. Nicco has strong intentions of pursing a Doctorate degree.

Abstract: Ceramic piezoelectric transducers are rigid and relatively expensive, and they typically contain heavy metals (such as lead) that are harmful to the environment. Polymer-based piezoelectric transducers are cost-effective and flexible but are not stable at temperatures that are even as high as 85°C. There is a critical need for cost-effective, flexible piezoelectric transducers that meet aerospace and military temperature specifications (−55 °C to 125 °C).

We propose the innovation of a high-temperature, flexible piezoelectric transducer that is based on nylon-11 nanowires. Nylon-11 nanowires (synthesized in rigid substrates) have been shown to exhibit the unique feature of self-polarization, which results in resilience to temperatures approaching 200°C. The self-poling property is especially significant because conventional piezoelectric materials, in both bulk and thin-film form, require poling in relatively high electric fields. Self-polarization will reduce the complexity in manufacturing in addition to eliminating the need for periodic re-poling of transducers that have experienced degradation due to aging.

The objective of the proposed research is to innovate a flexible transducer that can be used for mechanical-sensing and energy-harvesting applications while operating at higher temperatures than are achieved by current state-of-the-art, polymer-based piezoelectric transducer technologies. To achieve this objective, we will build a customized system for synthesizing nylon-11 nanowires in flexible, track-etched polycarbonate (TEPC) templates. Nanowires produced from this apparatus will be physically characterized using scanning electron microscopy (SEM) and X-ray diffraction (XRD) analysis. SEM will allow for the average length and diameter of the nanowires to be determined. XRD will allow for the characterization of the nanowire crystallinity. The materials will be evaluated for piezoelectric responses at temperatures ranging from 20 °C (near room temperature) to 125°C.

Publication(s): None yet.

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

The University of Toledo

Zachary J. Buchman

Status: Senior, Electrical Engineering

Research Topic: An Investigation of Maximum Power Point Tracking for Space Applications

Advisor(s): Dr. Raghav Khanna

Biography: I am an Ohio native raised in Paulding, OH, where I attended Paulding High School. During high school, I developed an interest in science and mathematics and was able to flourish at these subjects thanks to my incredible teachers that pushed me to strive to achieve up to my potential. After graduating high school in 2016, I decided to attend The University of Toledo and study Electrical Engineering.

During my time at The University of Toledo, I developed a burning passion for space exploration. This new-found passion encouraged me to apply for internships at NASA and other aerospace companies—eventually leading to an internship at NASA's Glenn Research Center in Cleveland, OH. I have since completed three semester-long rotations in the Space Environments Test Branch working as an Electrical Test Engineer. Working for NASA has been a dream come true and I am both humbled and honored to be able to contribute to humanity's journey beyond our home planet.

Once I finish my Bachelor's Degree, I intend to convert to full-time employment at NASA and continue my education on a part-time basis.

Abstract: Maximum power point tracking (MPPT) is a critical aspect of photovoltaic systems that ensures maximum power transfer between a solar array and its load. While it is widely used for terrestrial applications, there is an increased demand for MPPT implementations for photovoltaics in space applications (such as solar electric propulsion and small-sats.) This project is part of an ongoing research project that has been funded by NASA's Jet Propulsion Lab to investigate such applications.

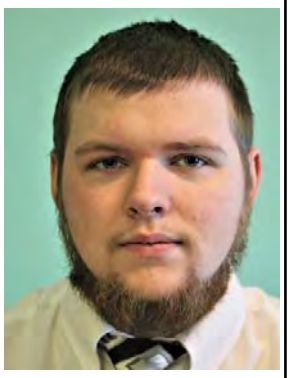
Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

The University of Toledo

Austin C. Cox



Status: Junior, Computer Science Engineering

Research Topic: Usefulness of Video Games in Education

Advisor(s): Dr. Kathy Shan

Biography: Austin is the third generation of the Cox family at The University of Toledo (UT) where he is majoring in Computer Science Engineering. While completing high school in Information Technologies at the Penta Career Center, Austin also began his college career by taking classes at Owens Community College under the Rocket Express program that transferred to UT. He also plans to complete an electrical engineering major and a degree in mathematics. His interest in computers came as early as preschool playing computer games with his dad. Later he discovered a video game called "Kerbal Space Program" that taught him such things as orbital mechanics, calculus and an introduction to linear algebra. From his experience with this and other so called "educational" video and computer games, Austin has become a firm believer that exposure to interesting, entertaining games at an early age is highly beneficial both to the child and to the science community. He believes this is a worthwhile subject for further research and hopes to continue contributing to the field in the future.

Abstract: The use of video games in education has long been debated. The goal of this research project will seek to provide evidence that video games that purport to be "educational" also need to be "entertaining" to achieve success in educating students. Video games that are boring and not challenging result in students not returning to play the game that is not entertaining. However, video games that challenge, entertain and reward the player result in repeat play and increased skills and understanding of the concepts covered. Many video game developers claim their product is "educational" just because it has a math or language, or other educational component. Time and money on video games that do not enhance education is a waste of money and may serve to turn students away from educational activities.

Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

The University of Toledo

Cameron D. McCaskey

Status: Junior, Electrical Engineering

Research Topic: Wireless Mesh Networking for Swarm Robotics

Advisor(s): Dr. Brian Trease

Biography: Cameron McCaskey is a Junior at The University of Toledo majoring in Electrical Engineering. He is an engineer at heart with a deep passion in electronics. In his free time, he develops open source electronics projects and maintains his website where he showcases his designs. At the University of Toledo, he is the President of the Rocketry club that competes each year in the NASA Student Launch competition. The Student Launch competition allows colleges and high schools to design, build, and launch high powered rockets to an altitude of one mile in Huntsville Alabama. These rockets carry a scientific or engineering payload set by NASA. Cameron currently works in Dr. Brian Trease's lab where he researches networking systems for swarm robotics.

Abstract: Swarm robotics are robotics in which multiple robots are deployed, often with different sensor packages. In this case, the robotic swarm takes shape in the form of small boats that are deployed on Lake Erie to study harmful algae growth patterns. Swarm robotics are a complicated subject because any small increase in cost or complexity exponentially increases the cost or complexity of the entire robotic swarm. One of these key areas of interest is telemetry. Telemetry in the robotic swarm allows for the robots to be controlled from a central base station and also communicate with each other their exact location to avoid collisions. The goal of this research project is to use and adapt off the shelf wireless transceivers to implement the telemetry system for these swarm robotics. These off the shelf solutions allow for other labs to implement the same robotic swarm without investing in building custom electronic hardware.

Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

University of Cincinnati

Karlee D. Birchfield

Status: Junior, Aerospace Engineering

Research Topic: Finite Element Modeling of Direct Laser Metal Deposition

Advisor(s): Dr. Yao Fu

Biography: Karlee is a Junior studying Aerospace Engineering at the University of Cincinnati. She is originally from a small rural community in Northwest Ohio where she found her love of aerospace engineering at the age of 14. While at the University of Cincinnati, she has participated in the Co-op Education Program, where she has spent four semesters working for GE Aviation in the areas of research and development, design, performance, and lean manufacturing. She has also been an officer of Kappa Alpha Theta, a Bearcat Buddy tutor, a STAR club tutor, and a member of Its on Us. She is currently working as an assistant to the Aerospace Department and has also worked at the combustion research lab on campus. Her passion lies in additive manufacturing and other advanced manufacturing techniques for its ability to reshape our industry as well as being an advocate for women in STEM fields.

Abstract: Direct Laser Metal Deposition is an additive manufacturing technique that provides opportunities for manufacturing of complex geometries, weight reduction, better component quality and waste reduction. The purpose of this work is to develop a finite element model to gain a deeper understanding of the relationship between process parameters, temperature history, thermally induced residual stresses and microstructures in the DLMD process in a thin wall structure of stainless steel 316L.

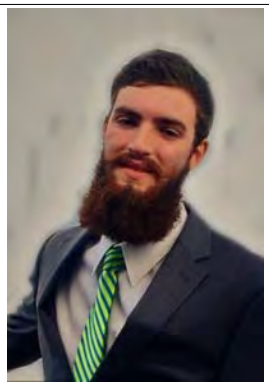
Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

University of Cincinnati

Jacob Owen Gamertsfelder



Status: Senior, Aerospace Engineering

Research Topic: Investigation of Atomization Behaviors of Liquid Monopropellants in Pintle Injectors

Advisor(s): Prashant Khare

Biography: I am a Senior Aerospace Engineering student at the University of Cincinnati. I have been pursuing research in multi-phase fluids, in the multi-phase fluids lab under Dr. Khare. While pursuing research I have taken on several other tasks including, leading the FLYUC club and being the chief engineer on my senior design team. So far I have presented in 4 conferences and one paper is in review for the ASME Turbo Expo.

Abstract: This research effort focuses on the atomization physics of liquid monopropellents emanating from a pintle-type injector at high-pressure conditions. These injectors are used extensively in liquid-fueled propulsion systems, such as rockets and diesel engines, and undersea vehicles and munitions. While extensive research has been conducted in the past on bipropellant fuel injection and atomization, limited literature exists on the understanding of atomization processes of monopropellant fuels in a pintle injector configuration for viscous fluids at elevated pressures. Therefore, in the current work, injection and subsequent atomization processes of a liquid monopropellant fuel are investigated as it is injected through a pintle injector in a stagnant environment using direct numerical simulations. The pintle injector consists of an annulus with an outer diameter twice the size of the inner diameter, and center pintle that throttles the fuel out of the injector. The theoretical and mathematical formulation to investigate these two-phase problems is based on the three-dimensional incompressible Navier-Stokes equations with surface tension. A critical issue is the treatment of multi-scale liquid-liquid and gas-liquid interfaces, therefore, a state-of-the-art, high resolution, volume of-fluid (VOF) interface capturing method is adopted to resolve the interfacial evolution. Surface tension is accommodated as a Dirac delta distribution function on the interface. The theoretical formulation outlined above is solved numerically using a finite volume method augmented by an adaptive mesh refinement (AMR) technique, based on an octree spatial discretization to improve the solution accuracy and efficiency. As a first step, for model validation, we simulate water injection in the aforementioned geometry at a flowrate of 44.4 g/s in a stagnant chamber at 1 atm and room temperature conditions. Comparison of our results with experimentally measured Sauter mean diameter and spray angle shows excellent agreement – both quantities are within 4.2% of the measured quantities. Next, Otto fuel II injection and atomization is studied to elucidate the atomization characteristics of the fuel in a pintle injector. The dynamic viscosity of the representative liquid monopropellant, Otto fuel II is 0.0044 Pa-s, density is 1232 kg/m3 , and the surface tension at the gas-liquid interface is 0.03445 N/m. The operating conditions consists of p = 106.2 bar, T = 300 K, and inlet velocity u = 3.34 m/s, corresponding to a density ratio of 10, dynamic viscosity ratio of 212 and Weber number of 20 (based on gas density). Results indicate that a radially growing hollow cone spray film attached at the injector exit is formed. Instability waves are formed on the outer and inner surfaces of the cone that facilitates breakup. Once droplets are completely separated from the cone, they are convected to recirculation zones, thus interacting with the hollow cone and amplifying the instability waves to cause further breakup. Droplet size distributions, and their time evolution are also calculated during the research effort to quantitatively characterize the atomization behaviors.

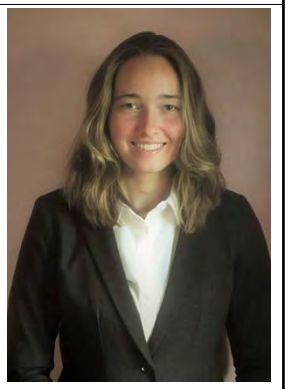
Publication(s): None yet.

Congressional District: 14th

Congressional Representative: David P. Joyce

University of Cincinnati

Lynn K. Pickering



Status: Senior, Aerospace Engineering

Research Topic: Genetic Fuzzy Logic based 2-Player Tetris

Advisor(s): Dr. Kelly Cohen

Biography: Lynn is a Senior in Aerospace Engineering at the University of Cincinnati. She has co-oped at Gulfstream Aerospace for two rotations, and will interned at BMW in Munich, Germany for 8 months through the International Co-op Program offered by the University.

As a young child Lynn had the opportunity to fly with her father, who had a pilot's license, first igniting her passion for aerospace. A strong interest in math and science led her down the path of aerospace engineering. On campus she is the team lead of one of the aerospace senior design teams. She enjoys this leadership role as well as working with others. Fuzzy logic has become a passion of hers under the guidance of Dr. Kelly Cohen, and she looks forward to making a positive impact on the world and people's lives through the field of aerospace engineering and fuzzy logic.

Abstract: Tetris is normally a single player game, the objective being to place four-piece blocks and clear as many rows of blocks as possible. The game requires quickness and flexibility in its decision making, which makes it a good candidate for Fuzzy Logic decision making. To test the capabilities of a Fuzzy Logic Tetris Player, a two player Tetris game was created, so the human could play against the Fuzzy Logic system. Previously the input functions and rules were created and iterated upon by hand. To expand on this research and to create a better performing Player, a genetic algorithm was created from scratch. The genetic algorithm has genes of length 51, encompassing the membership function parameters for the inputs and output, and the rules. The Fuzzy Logic Tetris Player is trained by this genetic algorithm to optimize the player.

Publication(s): None yet.

Congressional District: 2nd

Congressional Representative: Brad R. Wenstrup

University of Dayton

Katrina A. Coleman

Status: Senior, Industrial Engineering Technology

Research Topic: Industry 4.0 in the Retail Sector: Sustainability of Food Retail with a Focus on Food Insecurity in Dayton, Ohio

Advisor(s): Sean Falkowski, M.S.

Biography: Katrina Coleman is currently a Senior undergraduate student at the University of Dayton pursuing her Bachelor's Degree in Industrial Engineering Technology. As a Dayton local, Katrina chose to do research upon becoming passionate about sustainability of food retail, and seeing a need for change in the aspect of food insecurity in the Dayton area. Katrina was accepted into the University Honors Program's Berry Summer Thesis Institute in the summer of 2018 where she began her research, and presented and published the beginning of her Honors Thesis. While in the institute, Katrina volunteered at Mission of Mary Cooperative, an urban farm in Dayton that helps those in the Dayton community obtain fresh produce. Beyond engineering, Katrina is a Resident Assistant and Office Assistant at UD, an intern at Wright-Patterson Air Force Base, a member of Phi Sigma Rho, Tau Beta Pi, Society of Women Engineers and the Institute of Industrial and Systems Engineers. Upon graduation in December 2020, Katrina plans to pursue her Master's Degree in Engineering Management.

Abstract: In recent years, large scale agricultural and food processing industries have experienced a great worldwide digital transformation. The advent of Industry 4.0, which has become popular in Europe has helped many industries optimize their operations. Relatively new is the idea that food processing industries and other stakeholders in the food distribution supply chain cannot only optimize their processes but also, track and provide timely customer service. This has technical and managerial challenges that might limit the potential benefits of industry 4.0 in the efficient distribution of fresh food produce. For example, food retailers have to meet the increasing customer desire for fresh and high-quality food produce on demand. This has led to overstocking and understocking of some food items, as well as waste in transportation and labor, which adds to the total cost of food. Dayton, Ohio and other cities designated as food deserts have limited access to affordable and healthy high-quality fresh food. Preliminary data from this study suggest that lower-income communities in Dayton do not have immediate access to affordable, healthy and high-quality food. However, the other communities in the Dayton area usually see an oversupply of fresh, affordable and high-quality food in retail shops. Therefore, this study aims to utilize Industry 4.0 concepts to propose a more equitable and efficient way to minimize food insecurity in food deserts and create a more sustainable environment.

Publication(s):

1. 1. K. A. Coleman, and S. Falkowski, "Industry 4.0 in the Retail Sector: Sustainability of Food Retail Industries," Berry Summer Thesis Institute Proceedings, 2018.

Congressional District: 10th

Congressional Representative: Michael R. Turner

University of Dayton

Christopher L. Hartnagel

Status: Senior, Electrical Engineering

Research Topic: Polymerized Liquid Metal Networks for Stretchable Microwave Circuits

Advisor(s): Dr. Alex Watson

Biography: Christopher Hartnagel is a Senior at the University of Dayton (UD) and will graduate in December 2020, with a Bachelor of Electrical Engineering. His research interests lie in the field of stretchable radio frequency (RF) electronics. He began working with RF circuits when he acquired a student researcher position at The Air Force Research Laboratory, Soft Materials Division, at Wright-Patterson Air Force Base in September 2019. He will also present research at the UD Student Tech Symposium. He has been part of a rotational co-op program for Eaton Corporation for three years and plans to work in Electrical Field Services in Seattle, WA, this Summer.

Abstract: Currently, no reliable, highly strain able, conductive material exists for stretchable microwave circuits. The topic of this research is stretchable radio frequency circuits using polymerized liquid metal network (Poly-LMN's) concept as a conductor on a stretchable substrate. Poly-LMN was first synthesized in 2016 with the discovery that Polymerized Gallium and Indium metal form an oxide shell that cracks and releases liquid metal under strain. The liquid network gives conductivity then retracts into the oxide shell when strain is alleviated. Success means characterizing basic microstrip and coplanar waveguide circuits (transmission lines, filters) made from Poly-LMN on a stretchable substrate. This requires the characterization of the substrate and conductor while under strain greater than 400%. Areas of research radio frequency dielectric properties of 3M Very High Bond Tape, methods of patterning and curing the Poly-LMN material, electrical properties of Poly-LMN material, SubMiniature version A (SMA) device connection, co-planar waveguides, single and dual stub tuners, and monopole and dipole antennas.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

University of Dayton

Faith A. Loughnane

Status: Senior, Mechanical Engineering

Research Topic: Effect of Airfoil-Preserved Undulations on Wing Performance

Advisor(s): Sidaard Gunasekaran

Biography: Faith Loughnane is a Senior undergraduate student pursing a degree in Mechanical Engineering with a concentration in Aerospace Engineering at the University of Dayton. Faith began working with the University of Low-Speed Wind Tunnel (UD-LSWT) research lab in January, 2019, after being accepted into the Clare Boothe Luce research program and has research interests of bioinspired and low-Reynolds number flows. Faith has worked as a co-op at L3Harris Technologies at the Fuzing and Ordnance Systems and Electrodynamics branches in Cincinnati, OH and will begin a structural engineering co-op role at the Aerospace Systems branch in Greenville, TX this coming summer. Outside of school and work, Faith is a member of Tau Beta Pi, AIAA, and SWE. After graduating, Faith is planning to either pursue graduate study in aerospace engineering or begin work in the aerospace/defense industry.

Abstract: Most leading-edge tubercles studies involve serrated-type or undulated leading edges where the airfoil cross-section is destroyed unintentionally. Experimental investigations were performed at the University of Dayton Low Speed Wind Tunnel (UD-LSWT) on an undulated wing where the NACA 0012 airfoil cross-section is preserved along the wingspan. Sensitivity study was done on the number of undulations along the span (6, 9 and 12) and undulation placement (leading edge, trailing edge, and both leading and trailing edge). The effect of the undulations on the wingtip vortex was also investigated through Particle Image Velocimetry (PIV). The wing with trailing edge undulations gave better aerodynamic performance and lower parasitic drag when compared to the baseline and other wing cases at higher angles of attack. The aerodynamic coefficients were found to be independent of the number of undulations. For the same coefficient of lift, the undulated wing cases reduced the wingtip vortex circulation by 25% which in turn affected the balance of induced and parasitic drag. Investigation into the wingtip vortex RMS and aerodynamic efficiency revealed an inverse relationship.

Publication(s):

1. Loughnane, F., Mongin, M., Gunasekaran, S. “Effect of Airfoil-Preserved Undulations on Wing Performance,” AIAA SciTech Forum, 2020.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Wilberforce University

Alexandra D. Shealey

Status: Senior, Electrical Engineering

Research Topic: Radar Signal Analysis and Processing Using MATLAB

Advisor(s): Dr. Nkorni Katte

Biography: Alexandra Shealey, also known as Zandra, is a Senior at Wilberforce University pursuing a Bachelor of Science Degree in Electrical Engineering. She graduated from Middletown High School of Middletown, Ohio, in 2016. She chose to pursue electrical engineering after changing her major three times in hope to find a more challenging major that reflects her ability of mathematical skills and problem-solving. Zandra works on campus for the Center for Academic Support & Student Success (CASSS) as a math and Spanish tutor. She also is a member of Sigma Gamma Rho Sorority Inc. After graduation her plans are to attempt to pursue Nuclear Engineering through The Navy, but if things do not go as planned, she would like to expand her engineering background by furthering her education.

Abstract: Our research with Radar Signal Analysis and Processing Using MATLAB seeks to provide answers about how signals can be generated and adapted to maintain significant integrity in harsh environment in order to convey proper intelligent information. We have analyzed signals generated from a cheap 433MHz source, and showed how it can be adapted to withstand harsh conditions.

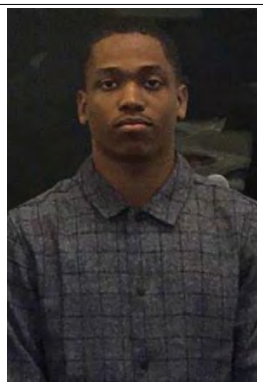
Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Wilberforce University

Ty'Quan D. Smiley



Status: Senior, Electrical Engineering

Research Topic: Optomechanical and Electronics design of Lidar Systems

Advisor(s): Dr. Nkorni Katte

Biography: Ty'Quan Smiley originally from Cleveland, Ohio, is a Senior at Wilberforce University where he is majoring in Electrical. His interest in electrical engineering came from a young age where he use to fix things around the house with his uncle. He knew it would the major for him after a digital electronics class where he did a lot of hands on assignments on a bread board. Ty'Quan is a stem assistant at Wilberforce where he helps organize and plan a lot of stem activities.

Abstract: In this work we will examine primarily novel techniques in the designing Optical systems that are used in Modern LIDAR systems. The optical systems typically function normally because of its associated mechanics and electronic controlled actuating mechanism is properly designed. So we will consider these for our work too. We will concentrate our effort to study and optimize the actuating process for micromirrors which are typically used to reflect light for large field angles. Actuating techniques for the mirrors includes electrostatics, piezoelectric effects, electrothermal and electromagnetic technique. There are a few reasons why the electromagnetic technique which uses a Lorentz force is advantageous over the other techniques. First, this technique will require low power, compared to the electrostatic technique and it also provides high frequency of oscillation of the mirror. This technique suffers from the set back of electromagnetic interference (EMI). Modern Lidar systems using micromirrors need typically larger micromirrors in order to reflect light at broad angles and transmit all possible information necessary to control the vehicles hosting the Lidar.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Wright State University

Andrea Gomez-Carrillo

Status: Senior, Biomedical Engineering

Research Topic: Combined fNIRS and EEG Probe for Improved TBI Monitoring

Advisor(s): Dr. Ulas Sunar

Biography: Andrea Gomez is a Senior at Wright State University earning a Bachelor of Science in Biomedical Engineering and a Master's of Science in Biomaterials Engineering through Wright State's 4+1 program. Andrea was born in Mexico City, Mexico, and graduated from Loveland High School located in Southwest Ohio. She has been placed on the Dean's High Honors list in her seven semesters attending university and is a leader in Wright State's S.A.L.T. Athletes in Action Team. Additionally, she enjoys being the Vice-President of External Operations for Wright State's Student Athlete Advisory Committee (SAAC). Outside of academics, Andrea is a captain of her collegiate soccer team at the NCAA Division 1 level and was a member of the Horizon League's All-Freshman team. Additionally, she is a member of the athletic department's Rowdies committee, helping create the videos and graphics for the annual sports award event. Finally, Andrea enjoys coaching the WCSA G04 Elite club soccer team as a volunteer assistant.

Abstract: There is a need to improve monitoring tools for traumatic brain injury (TBI) patients. Current TBI monitoring techniques are mainly invasive, which put the patient at a higher risk for a second brain injury. These invasive probes are used to measure cerebral blood flow and oxygenation in the brain, imperative to understanding brain activity. Hospitals require a method for real time monitoring of patients without putting them at risk. Continuous-scalp EEG and fNIRS offer non-invasive solutions for this real-time brain monitoring. EEG detects electrical activity while fNIRS measures changes in oxygenated and deoxygenated blood, providing crucial neurovascular coupling information needed to assess cerebral activity. This project's goal is to combine EEG electrodes and fNIRS optodes into one wearable device. The device will display the signal of each technique on separate graphs for convenience. The benefit of using two techniques is reliable continuous data. If one technique does not pick up a medical problem, then the other one provides an additional warning. This is essential due to sensitivity issues with EEG and poor signal to noise ratio due to probe-skin contact.

Publication(s): None yet.

Congressional District: 2nd

Congressional Representative: Brad R. Wenstrup

Wright State University

Madison M. Jewell

Status: Senior, Neuroscience

Research Topic: Effect of DNA Methyltransferase Inhibition on Human Diffuse Intrinsic Pontine Glioma Cell Lines in Normoxic and Hypoxic Conditions

Advisor(s): Dr. Robert Lober, M.D., Ph.D.

Biography: Maddie Jewell is a Senior at Wright State majoring in Neuroscience with a minor in Psychology. She grew up in Cincinnati, Ohio, where she found an early passion for science, sports, and music performance. At Wright State she plays on the varsity soccer team, earning all-conference honors both athletically and academically. Currently, she is working in Dr. Robert Lober's neuro-oncology lab which has a central focus on diffuse intrinsic pontine gliomas (DIPGs), a rare and aggressive form of pediatric brain cancer. In addition to her undergraduate research, she is a module facilitator for a high school educational program through Wright State called Neuro Lab. She is also a brigade member for Wright State's Global Public Health Brigades and spent time in Nicaragua and Ghana improving village public health through construction of latrines, eco-stoves, and sanitation stations. She has a strong passion for science and helping others which led to her career aspirations in the field of medicine, specifically pediatrics.

Abstract: Diffuse intrinsic pontine glioma (DIPG) is an aggressive form of pediatric brain cancer that contains an abysmal survival rate of less than 1-year. The anatomical location and infiltrative nature of DIPG makes current available treatment options ineffective. A distinct and abnormal epigenetic profile of DIPG is evident in which the most commonly observed mutation occurring in over 80% of DIPGs is a methionine substitution at lysine 27 on histone H3 (H3.3K27M), resulting in global reduction of H3K27me2/3 and central gain of H3K27me3. The tumor suppressing protein p16 experiences increased levels of H3K27me3 at its promoter site in conjunction with H3.3K27M induced targeted repression of p16/ink4a, a critical cell cycle regulator of the G0-G1 to S-phase transition. Loss of p16/ink4a is associated with accelerated tumorigenesis and thus restoration suggests a potential therapeutic avenue in treatment of DIPG. The hypermethylation occurring at the repressed p16 promoter suggests the possible efficacy of a DNA methyltransferase inhibitor in rescuing p16 expression and thus restoring its tumor suppression and cell-cycle regulation abilities. Prior studies utilizing the DNA methyltransferase inhibitor decitabine reported rescue of p16 mRNA expression in murine models and an increase in p16 protein expression was observed in humans. Significant differences in the prior-observed global reduction of H3K27me3 and DNA hypomethylation in human sample DIPGs as compared to murine models warrant further investigation into the success and mechanisms of p16 rescue using decitabine in human cell lines. This study will look to examine the ability of the DNA methyltransferase inhibitor decitabine to rescue p16 expression in three different human DIPG cell lines treated in both hypoxic and normoxic environments.

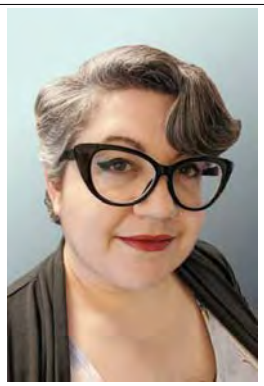
Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

Wright State University

Sara L. Walsh



Status: Senior, Computer Science

Research Topic: Why Software Projects Fail: A Case Study in Implementing a GUI for a Satellite Imaging Training System

Advisor(s): John Reisner

Biography: Sara Walsh is a Senior at Wright State University majoring in Computer Science with a minor in Women's Studies. Raised in Cleveland, she enjoyed problem solving with her engineer father from a young age. She especially enjoys challenges that utilize her technical as well as her artistic & creative skills. She is very interested in subjects at the intersection of humanity and technology, such as science communication, human factors, and UI/UX design. She hopes to work at NASA after graduation.

Abstract: There are many methods for developing software, but a large percentage of software projects still fail. In an undergraduate software engineering course, the class was divided into 5-person teams and given real-world projects. One team was tasked with developing a browser-based Graphical User Interface (GUI) for manipulating a large set of parameters in a satellite imaging training system. This paper chronicles the team's efforts to identify various risk factors that have an impact on the success probability of a project, such as the team members' skillset, ill-defined requirements, and unrealistic timelines and schedules; some of these risk factors can be especially hard to identify, control, or mitigate. Analyzing real-life examples of development snares provides valuable insight that can be leveraged to avert future failures. This case study explores how common causes of failure can adversely affect development and provides recommendations for averting such failures in similar software projects.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Youngstown State

Grant A. Wagner

Status: Senior, Mechanical Engineering

Research Topic: The Calibration of Optical Paints for Aerodynamic Testing

Advisor(s): Dr. Kevin J. Disotell

Biography: Grant is an East Palestine, Ohio, native who is currently a Senior Mechanical Engineering major at Youngstown State University (YSU). At YSU, Grant is an active member of the Honors College, the American Institute of Aeronautics and Astronautics (AIAA) branch, and the YSU Robotics Club. Following his graduation in the spring of 2020, he will be entering industry with the goal of obtaining a career in the aerospace field.

Abstract: With a heightened focus on the Aerospace industry due to the success of Space X and confirmation of a Moon Expedition in 2024, advanced testing methods are needed. One of these advancements include the use of Pressure /Temperature Sensitive Paints (PSP & TSP). These paints allow for live pressure / temperature gradient measurements across the surface of the object under observation. The paints react to the oxygen concentration in the contacting fluid and when subjected to UV light, they will emit a specific light intensity corresponding to the exerted surface pressure and temperature. With a high-definition camera, the emitted light can be measured to generate a direct correlation between the reflected light and known pressure / temperature. From previous work performed by Stern and Volmer, the pressure / temperature and light intensity share a linear relationship when the absolute pressure remains greater than zero. This relationship can be achieved by creating a temperature and pressure - controlled environment and observing the correlating light emitted from a painted sample. With a known pressure / temperature, the correlating emitted light intensity can be measured once this procedure is repeated, the linear calibration can be developed. Therefore, the goal of the research is to create an apparatus for this calibration to be generated. From the initial research on the mechanics behind these paints and designing of the apparatus during last year's scholarship period, the apparatus is to be fabricated and the calibration is to be established during this scholarship period.

Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

Youngstown State

Reis L. Zandier

Status: Senior, Chemical Engineering

Research Topic: Detection of Hazardous Gases with 3D Printed Flexible Sensors

Advisor(s): Dr. Pedro Cortes and Dr. Eric MacDonald

Biography: Reis Zandier is working to complete her Senior year as an undergraduate Chemical Engineering student at Youngstown State University. Reis has experience in material science and additive manufacturing. On campus, she has been an active member of the varsity women's volleyball team during her first three years of undergraduate studies. As the secretary of the Youngstown State chapter of Society of Women Engineers, Reis actively networks in the region to bridge the gap between engineering students and women who are working in the field. When she is not studying or playing volleyball, as a member of the honors college, she also enjoys spending time volunteering in the Youngstown community. Reis hopes to further her interests and discoveries through a future career as a chemical engineer in her hometown of Pittsburgh, Pennsylvania.

Abstract: The current interaction of individuals with threatening environments has emphasized the need for real-time devices capable of detecting minimal traces of explosives agents. Rapid and accurate identification of chemical agents is a national concern that requires suitable actions to protect public safety. To date, the use of carbon nanotubes as the core detection material seems to represent a very promising nanostructure for detecting chemical agents. Indeed, one of the most promising sensing platforms of carbon nanotubes relies on the electrochemical properties of the nanostructures. Here, the nanotubes based circuit sensors display an ampermetric profile and measure changes in conductance in the presence of a foreign moiety. In addition to the potential sensing capabilities of the aforementioned carbon nanotubes, it seems that novel supporting platforms are required where embedded circuits can be placed to assemble complex and intricate structures. Thus, the use of additive manufacturing seems to be the answer to this kind of requirement. The present work will investigate the incorporation of carbon nanotubes as a sensing platform into 3D printing structures for detecting hazardous gases as well as threatening bio-agents. This research will lead to the production of flexible sensors for the department of defense.

Publication(s): None yet.

Congressional District: 13th

Congressional Representative: Timothy J. Ryan

COMMUNITY

COLLEGE

SCHOLARSHIPS

Roneishah S. Nixson

Status: Sophomore, Chemical Technology

Research Topic: Synthesis of Peppermint

Advisor(s): Ann Fallon and Michele Mangels

Biography: Roneishah Nixson is 27 years old and a Chemistry student at Cincinnati State Technical and Community College. Roneishah's love for chemistry grew after extracting an egg yolk with vinegar in the third grade. That project sparked her curiosity for science and by the end of high school she had competed in more than a dozen locally and nationally STEM and business competitions. During high school, Roneishah was the first female to compete in Cincinnati's NAACP Math and Science competition with projects in both categories winning first and second place. Obtaining her Associate's Degree in Chemical Technology will be one of her greatest achievements, but certainly not her last.

Abstract: Peppermint was first brought to the USA in the late 1700's where it became the main focus of a chemist named Hieronymus David Gaubius. With intensive studies and lab time he was able to identify and isolate the compounds responsible for peppermint unique characteristics. He was the first chemist to isolate menthol from peppermint and synthesis it. Menthol is also known as Mentha and has the IUPAC name 5-methy—2-Propan-2-yl cyclohexan-1-ol. The chemical formula is C10H20O with a molecular mass of 156.269 g/mol and has a white crystalline structure. Extracting menthol out of a plant naturally can yield very low results and with wide range concentration. Past research has measured the concentration of menthol using different types of gas chromatography. The best way to ensure the most menthol can be extracted is synthetically using fraction columns. Gas chromatography can measure the different compounds with complex solutions like an essential oil. This research will examine the composition of several commercial peppermint oils and determine the variability in menthol using gas chromatography. Peppermint is widely known for its many uses in culinary applications for flavoring teas and dishes, in hygiene for fighting bad breath and in medicine for calming digestive complaints and minor muscle tension. The quality of essential oils can vary depending on the nature of the plant it was extracted from. Analyzing different brands will be beneficial to Americans that are seeking alternative ways to improve their health.

Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

Cincinnati State

Cincinnati State

Michelle M. Willoughby

Status: Sophomore, Electrical Mechanical Engineering Technology

Research Topic: Efficiency and Return Investments on Remote Solar Panels

Advisor(s): Abigail Yee, Lawrence Feist

Biography: Michelle is a student attending Cincinnati State studying Electrical Mechanical Engineering Technology with a focus in Alternative Energy. She is graduating in December of 2020, with plans to transfer to Miami of Oxford where she will pursue a Bachelor's in Electrical Mechanical Engineering Technology. Michelle has spent a semester working hand in hand with engineers designing custom conveyors at Conveyor's Solutions. As well as currently working in Co-op position at Duke Energy in Electrical Meter Engineering.

Abstract: Using a remote solar panel, battery, and inverter to calculate energy absorbed and stored. Define the ability to transfer that energy into utility savings, as well as travel usage. By means of either magnetic or portable solar panel to interpret utility savings. Placement of the solar panel will be located on a car. Usage of two batteries to interchange when the primary battery has reached a full charging capacity will allow user to efficiently obtain consistent benefits of the stored energy while the secondary battery continues to charge. Maintaining this cycle will contribute to the observation of the most accurate return on investment based on energy absorbed, stored and used.

Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

Columbus State CC

Grace A. Ciminillo Delamotte

Status: Freshman, Applied Science in Construction Management

Research Topic: Comparison of Glulam-members and Steel-Members Within the Built Environment

Advisor(s): Dean Bortz, M.A., CSI, CDT

Biography: *Grace Ciminillo Delamotte* is a current high school senior dual enrolled in Columbus City School district and Columbus State Community College through the College Credit Plus program. She has served as student program outreach coordinator for the architecture/construction management program at Eastland Fairfield Career Center, a member of National Technical Honor Society, made the dean's list at Columbus State Community College, and state finalist for SkillsUSA in the prepared speech category.

Grace is pursuing her Associate in Applied Science in Construction Management at Columbus State Community College. Upon graduation, she will continue her studies pursuing a BS in Interior Architecture/Construction Management and a Master's degree in Landscape Architecture. She will continue to work in the built environment studying sustainable construction and universal design principles that address the health, safety, and well-being of all. Grace believes the construction field is being asked to solve more and more problems, and feels those that represent the field must be diverse in experience, expertise, and in thinking. She hopes to combine the best practices of design and construction management to lead teams of great people to do remarkable builds for all.

Abstract: Conduct a comparative study through a literature review examining the features of strengths, sustainability, and environmental impacts between Glulam-members (*glue laminated timber*) and steel-members used within the construction field.

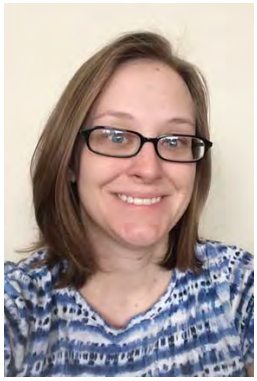
Publication(s): None yet.

Congressional District: 3rd

Congressional Representative: Joyce Beatty

Columbus State CC

Molly M. McCullough



Status: Sophomore, Electro-Mechanical Engineering Technology

Research Topic: Future Advancements in the field of Programmable Logic Controllers

Advisor(s): Professor Jeffery Woodson

Biography: My first undergraduate degree/field from several years ago did not work out as I intended. The field of Engineering had always interested me but I could never picture myself as an actual Engineer. I was ecstatic when I found the Engineering Technology program at Columbus State and knew that I had found the career for me. I have already obtained my Associate of Electro-Mechanical Engineering Technology and plan to continue my education for a Bachelor degree in the same field.

Abstract: If the machines in a manufacturing facility are the body and organs of a living animal then the Programmable Logic Controller (PLC) is the brain. Ever since the PLC was developed in the 1960's it has allowed the manufacturing field to grow exponentially. What is next for PLCs? Can facilities become safer, more efficient, and more energy sustainable? The goal of this study is to research the trends and the future of the PLC and what advancements are in store for the various industries that utilize them.

Publication(s): None yet.

Congressional District: 3rd

Congressional Representative: Joyce Beatty

Bradley T. Gartner

Status: Sophomore, Engineering

Research Topic: Removing and Preventing Ocean Microplastics

Advisor(s): David Stumpf

Biography: Bradley Gartner is currently pursuing an Associates of Science with the intent to transfer to a four-year institution to major in Mechanical Engineering to learn more about the field of robotics. Bradley has grown up in Chardon, Ohio and works as a firefighter and EMT, a snowboard and ski instructor, and a Bob Evans Server. At Lakeland Community College, Bradley Volunteers at HIVE Makerspace and in the Engineering building. In addition, he runs the Robotics Club and is an officer of Lakeland Honors Organization. Bradley hopes to obtain a master's in mechanical engineering and a bachelor's in electrical engineering to specialize in robotics. His future career goal is becoming an astronaut with hopes of being one of the first humans to ever step foot on Mars.

Abstract: As plastic waste grows more abundant; it continues to migrate to the ocean creating microplastics overtime. These microplastics have become a major problem because of their difficulty to remove them and their effect on the marine ecosystem. This project will focus on using robotics to remove microplastics from the ocean in the most efficient and environmentally friendly way. This includes extracting microplastics without harming microorganisms. Another focus this project will emphasize on is finding various and creative ways to prevent more plastic waste from reaching the ocean so that new microplastics can never form.

Publication(s): None yet.

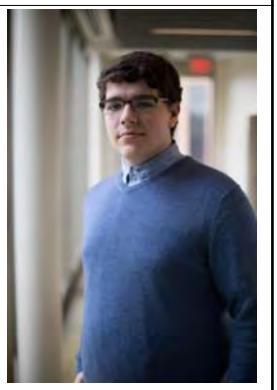
Congressional District: 14th

Congressional Representative: David P. Joyce

Lorain County Community College

Lorain County CC

Paul A. Warkentien



Status: Sophomore,Mechanical Engineering

Research Topic: Thermal Properties of 3D Printed Multi Materials

Advisor(s): Jay Singh, Michael Helbig, and Regan Silvestri

Biography: Paul Warkentien is a Sophomore at Lorain County Community College. Through Lorain County Community College, he has gained the opportunity to work at NASA Glenn Research Center where he researched Ceramics under the guidance of Fredrick Dynys. Paul worked in this position for 9 months before having the opportunity to work under the guidance of Mrityunjay Singh through the Ohio Aerospace Institute and the Ohio Space Grant Consortium where he found a passion for additive manufacturing and specifically 3D printing and when he conducted his research on the thermal properties of additively manufactured multi-layer materials. Paul will be transferring to Cleveland State University to continue his education into a Bachelor's Degree of Mechanical Engineering, after which he would like to continue work within the additive manufacturing field.

Abstract: Additive manufacturing/3D printing is becoming increasingly important in industrial applications owing to its relative ease of use and the ability to make production changes quickly. A variety of filaments are being created for 3D printing to fill specific needs in respective industries. Subsequently, it is necessary to understand how printed materials will perform in their intended environment and application. NASA is especially interested in thermal management, and the evaluation of new materials is a critical part thereof. The thermal properties of materials used within Fused Deposition Modeling (FDM) based 3D printing have been evaluated, along with the effect of different processing variables. The materials studied were Ultem 9085 and Ultem 9085 carbon fiber impregnated. Samples were printed of both of the different materials and also the materials in bi-layer configurations, and their thermal properties were evaluated. The thermal properties evaluated include thermal diffusivity, thermal conductivity, and specific heat, along with the effect of thermal testing methods. As such, the effects of pre and post printing variables were observed on the subsequent thermal properties.

Publication(s): None yet.

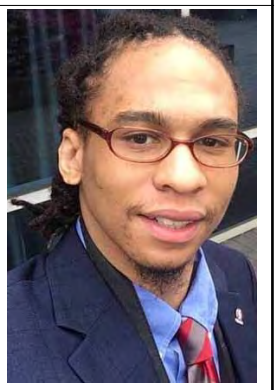
Congressional District: 7th

Congressional Representative: Bob Gibbs

SINCLAIR COLLEGE

Sinclair CC

Brandon Lamar Dunson



Status: Sophomore, Computer Engineering and Electronic Engineering

Research Topic: Heaven and NASA

Advisor(s): Mr. Derek Petrey

Biography: Growing up in America on the West side of Dayton Ohio was not easy. Every day presented new obstacles: a leaking roof, no heat during the winter, the drug epidemic, and devastated city schools, all of this while living in a single-parent family.

I struggled because I realized I had a drive for education, but my male peers did not accept that I was academically dedicated. In high school, I was in an altercation that left me with a broken jawbone, an injury that causes me continued mental and physical pain. Despite these challenges, I caught up on my studies and was able to graduate with my class in 2013.

I was the first in my family to go straight into college. I chose Sinclair Community College. As an Electronic Engineering student, I took an international service-learning trip to Guatemala in 2017. In the short time I was there, I made strong connections with my fellow Sinclair classmates and faculty. They became like a family to me, allowing me to have a wonderful experience studying abroad for the first time. I was humbled seeing the poverty level, realizing both how blessed I was, but also seeing how similar the situation of the rural Guatemalans was to my own.

I plan to graduate in Spring, 2020, from Sinclair College with associate degrees in both Computer Engineering and Electronic Engineering, and then transfer to a four-year institution for a B.S. Degree in Computer Engineering. My long-term career goal is to work in an aerospace company in the Dayton or Cincinnati area. Eventually, I want to become the CEO of my own engineering cybersecurity company. I want to mentor others as I was mentored and inspire them to learn and to study abroad.

Abstract: I am currently enrolled in a CIS 1350 (Web Development – HTML & CSS) and I would like to develop a website that would work in a way similar to GasBuddy, but instead refer people to locally-owned businesses and non-profits. The City of Dayton uses CityBOTS to update their information daily. CityBOTS™ is a software service which tracks minority utilization, contract compliance, and vendor certifications for entities maintaining DBE, MBE/WBE, SBE, or other business enterprise programs in Excel format. Dr. Derek Petrey, former director of the Sinclair Community College Honors Program, has indicated that he would be willing to mentor me on the project.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

EDUCATION

SCHOLARSHIPS

Cedarville University

Rachelle E. Everswick

Status: Junior, Adolescent to Young Adult (AYA), Science

Project Title: Relationships within Ecosystems

Advisor(s): Dr. William Jones

Biography: I spent most of my life in Zimbabwe which is in Southern Africa due to my parents' mission work there. We returned every four years to the US and spent the majority of our time in New Jersey. I am currently a Junior at Cedarville University where I am pursuing a Bachelor's Degree in Adolescent and Young Adult Integrated Science Education and a Bible minor. At Cedarville, I have the opportunity to tutor other students on campus as well as to give campus tours.
Growing up I experienced both the American and British school systems and have noticed strengths and weaknesses of both approaches. After graduation, I hope to teach high school science and use some of my background to give students a meaningful learning experience. My hope is to help students find and develop the skills they do not know they have. While I absolutely love science, my heart is for people, specifically my future students.

Abstract: This lesson is geared towards high school students in a Biology or Earth Science class. While learning about ecosystems, the NASA Earth Observatory will be utilized to provide students the opportunity to explore real data from earth. Students will learn about both biotic and abiotic factors within ecosystems. Using the Earth Observatory, students will use the data depicted on global maps to examine net productivity and then compare it with other factors such as rainfall, fire, and surface temperature. They will draw on this data to speculate the relationships between factors and their influence on the net productivity of a given area.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Central State University

Jordan A. Graves

Status: Senior, Adolescent to Young Adult (AYA), Life Science

Project Title: Health and Wellness Testing

Advisor(s): Rajeev Swami

Biography: Jordan is a current Senior at Central State University majoring in Life Science Education. Jordan grew up in Indianapolis, IN and attended Ben Davis High School. Having many educators in her family like her mother, grandmothers, and aunts lead to the desire to help students and become a teacher.

While at Central State University, Jordan is involved in the Campus Tour Guides Department, the Secretary for FCLA (family community leadership action) which is a community service organization, as well as a second year Resident Advisor. Jordan likes working in a team setting and helping others when needed.

Abstract: It is important for astronauts to maintain a healthy lifestyle because of increased risk of cardiovascular disease and muscle deterioration. Researchers study astronaut health for safety and disease prevention. Many of these methods are used in other health fields (exercise science, nutrition, medicine.) In this lesson students will be given the opportunity to learn and perform these techniques, calculate risk factors, and make recommendations for “clients.” I will teach the methods, healthy eating and exercise, and testing techniques and sample calculations on paper. Then, students will be divided into groups of three, with each student assigned a role (future astronaut, doctor/exercise scientist, and nutritionist.) Students will record height, weight, blood pressure, heart rate, and waist circumference. Calculations and standard risk charts will be used to evaluate “future astronaut” health risk. Students will then work in a group to determine nutrition and exercise recommendations for their “client.” By the end of the lesson, students will understand healthy eating practices, demonstrate ability to perform common health measurements and calculations of risk, and demonstrate ability to translate risk analysis into health recommendations.

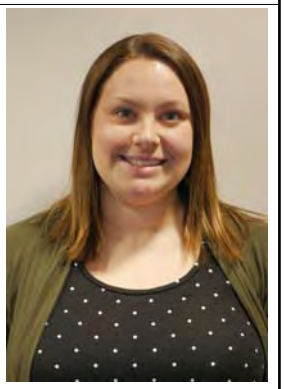
Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Kent State University

Madison M. McBryer



Status: Senior, Adolescent to Young Adult (AYA), Integrated Science

Project Title: Observations of Cloud Formations

Advisor(s): Bridget Mulvey, Ph.D.

Biography: Madison McBryer grew up in Silver Lake, OH. Madison realized her passion for science education when she first attended Kent State University as a College Credit Plus student. She loved the hands-on nature of science and wanted to share that passion with others through education. She is currently an Integrated Science Education major at Kent State University, with a concentration in Life Science. She is graduating in May, 2020 and is working towards a career as a high school science educator. She plans to continue her education in the future to pursue a Ph.D in Adolescent Education.

Abstract: This lesson is designed to allow middle school Life Science students to explore different types of clouds. My lesson plan would ideally span a few class periods to allow the students to collect qualitative data each day. I have integrated NASA's GLOBE Observer system, which will allow my students to use their technology devices to submit real photographed data of cloud coverage, surface conditions, cloud types, opacity and visibility. Not only will my lesson allow students to explore the different types of clouds, but it will also provide them an opportunity to be a part of NASA's GLOBE observer data collection process. By the end of the lesson(s), the students will be able to create their own landscape representations of the different types of clouds we see in the sky.

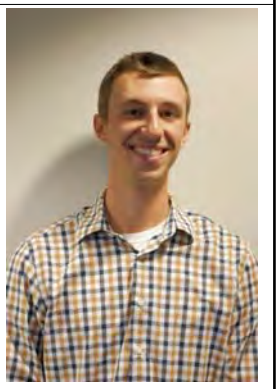
Publication(s): None yet.

Congressional District: 13th

Congressional Representative: Timothy J. Ryan

Ohio Northern University

Ethan A. Smith



Status: Soph., Adolescent to Young Adult (AYA) Education, Int. Science

Project Title: Gravitropism in Maize

Advisor(s): Dr. Todd France and Dr. Linda Young

Biography: At Ohio Northern, I am a Biology major pursuing an education certification in AYA Integrated Science. I am a member of Beta Beta Beta and the Vice President of Kappa Delta Pi at ONU. I am the captain of the Men's ONU Golf Team and the Resident Director of Park Hall, one of ONU's freshman dorms.

After graduation, I wish to return to my alma mater, Southeastern High School in Chillicothe, OH and teach Biology. I hope to eventually introduce an ecology class at Southeastern, so high school students will learn the importance of the interactions between the biotic and abiotic factors in nature.

Abstract: My project is intended for a high school biology class, but could be differentiated to fit anywhere in the K-12 curriculum. This hands-on project will demonstrate gravitropism in maize. Gravitropism is important in plants, and especially plants in space. Plant stems always grow in opposition to gravity (negative gravitropism) and plant roots always grow in the direction of gravity (positive gravitropism). Students will theorize how to successfully grow plants in space using resources from NASA, and also other known factors of stem growth, including phototropism and root cap manipulation.

Publication(s): None yet.

Congressional District: 15th

Congressional Representative: Steve Stivers

University of Cincinnati

Margaret A. Lorenz

Status: Junior, Middle Childhood Education, Math and Science

Project Title: Our Solar System

Advisor(s): Laura Dell, Ed.D.

Biography: Margaret Lorenz grew up in Hilliard, Ohio, and is currently a Junior at University of Cincinnati. In addition to majoring in Middle Childhood Education Mathematics and Natural Sciences, she has also completed a certificate in Deaf Studies. While at University of Cincinnati, Maggie enjoys spending her time volunteering. She participates with a local tutoring program, volunteers as an Ambassador for the College of Education, is President of University of Cincinnati's Middle Childhood Education Society, and also serves as President of her sorority. Maggie's interest for middle school education and teaching students began her senior year of High School through a mentorship program. When teaching, Maggie is passionate about meeting every students' learning needs while building the learning and studying skills needed for continued success in education. In the classroom she also strives to make learning math and science hands-on and relatable to the real world. In her free time Maggie enjoys leading a small group at her church, playing tennis, and working out.

Abstract: This lesson, designed intentionally for Middle School Students, focuses on the scale of our solar system and its planets. Part one of this lesson focuses on students' gaining an introduction to our Solar System's Planets. Student will use the NASA app to research each planet and complete a fact sheet on them. To accomplish part two of this lesson, the class will utilize three of the NASA classroom activity plans: Planetary Travel Time, Kinesthetic Radial Model of the Solar System, and Solar System Scroll. From these activities, student will be able to understand the diversity and vastness of our Solar System. Students will also be able to express the proportion of distance and size of planets to one another and the Earth.

Publication(s): None yet.

Congressional District: 3rd

Congressional Representative: Joyce Beatty

University of Cincinnati

Michael Kirby Slater

Status: Senior, Middle Childhood Education, Math and Science

Project Title: Relative Size of Our Solar System in Comparison to What's Around Us

Advisor(s): Christopher Atchison, Ph.D.

Biography: Michael "Kirby" Slater is currently a Senior at the University of Cincinnati studying Middle Childhood Education with concentrations in Science and Mathematics. He is from the greater Cincinnati area growing up in Mason, Ohio. Over his course of time at the University of Cincinnati, Kirby has had a lot of opportunities in giving back to his community. He has worked with Inner City Youth Opportunities by helping in after school tutoring for students in the Cincinnati Public area. He also has been working at a summer camp for the past 3 years which he now holds the supervisor role at.

This passion for helping and influencing children has been a major factor in why Kirby is pursuing his career in Middle Childhood Education. Kirby Believes that math and science are extremely important for everyone to understand but the curiosity of wanting to learn can fade in time. He wants to bring the excitement of wanting to explore and learn more into the classroom, and from this, help influence future generations to make groundbreaking discoveries which will impact our world.

Abstract: This lesson is focused on how we can conceptually understand how large our solar system actually is. The appropriate age for this activity would be for middle grade students but could be manipulated for any age. The main idea students will take away from this lesson is that the solar system we live in is vast and the star and planets that make it up are relatively small compared to everything else around. Within this lesson, students will have the chance to not only focus on science and our solar system but will be cross disciplinary by using mathematics and having students find distances between these planets and compare them to distances on earth. The lesson will start off by actually viewing the size of our solar system and seeing how much distance there is between each of the planets. Once these distances are discovered they now need to compare these distances to distances they can imagine. Students will be given a map of the city in which they live in and will use this to help them conceptually see how large the solar system is. Groups will then be given specific objects for each of the planets to show how much larger or smaller planets are compared to one another. The goal for them is to place each of the objects in specific parts around the city to make a small-scale representation of how large the solar system is. A formula will be given to each of the groups showing how to convert the large-scale distances that are present in our solar system to our scale model each of the groups will create. Once students have found appropriate places to put each of their objects in the city they will go out and actually place these objects there. The goal of this, is to show just how large the solar system is and to think if the scale they created was increased by 100x how much larger it would look.

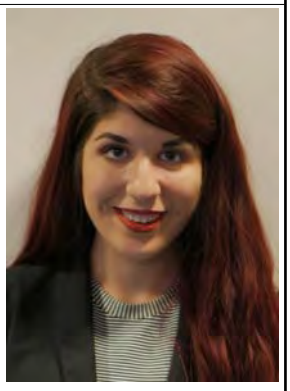
Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

Youngstown State

Elainie C. Huncik



Status: Junior, Adolescent to Young Adult (AYA) Education, Int. Science

Project Title: Understanding and Comparing Stars

Advisor(s): Karen L. Henning

Biography: Elainie Huncik is a Junior at Youngstown State University dual majoring in Physics/Astronomy and Integrated Sciences Education and minoring in Geosciences and Mathematics. She is a first-generation college student from Lowellville, Ohio, and plans to attend graduate school to pursue a Ph.D. in Astrophysics. She is the secretary of Youngstown State University's chapter of Society of Physics Students and is a member of the Honors College. She works at the Ward Beecher Planetarium and presented at the 2019 Great Lakes Planetarium Conference. She also works for the Department of Physics & Astronomy at Youngstown State University and has been involved in several research projects.

Her work at the Ward Beecher Planetarium in addition to her work at OH WOW! The Roger & Gloria Jones Children's Center for Science and Technology has confirmed her passion for education. She hopes to continue teaching and learn new ways to be an effective teacher.

Abstract: This lesson is based on Ohio's Learning Standards for a high school physical science class. Students will learn how astronomers categorize stars based on their color, temperature, luminosity, size, and mass. Students will also become familiar with Hertzsprung-Russell diagrams. Each student will be assigned a star from a predetermined list of stars and will be tasked with doing research about the properties of the star and compiling the information to share with their classmates. Students may create a poster, presentation, paper, model, etc. to compare their star with others and answer questions about how stars with different properties share some similarities but also have many differences.

Publication(s): None yet.

Congressional District: 13th

Congressional Representative: Timothy J. Ryan