NASA / OHIO SPACE GRANT CONSORTIUM

2018-2019 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 1,265 undergraduate scholarships and 175 graduate fellowships have been awarded.

Matching funds are provided by the 24 member universities/community colleges, the Ohio Aerospace Institute (OAI), Choose Ohio First, the Nord Family Foundation, the Nordson Corporation Foundation, and private industry. Note that this year ~ $500,000 will be directed to scholarships and fellowships representing contributions from NASA, the Ohio Aerospace Institute, 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.

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- 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 Aerospace Institute

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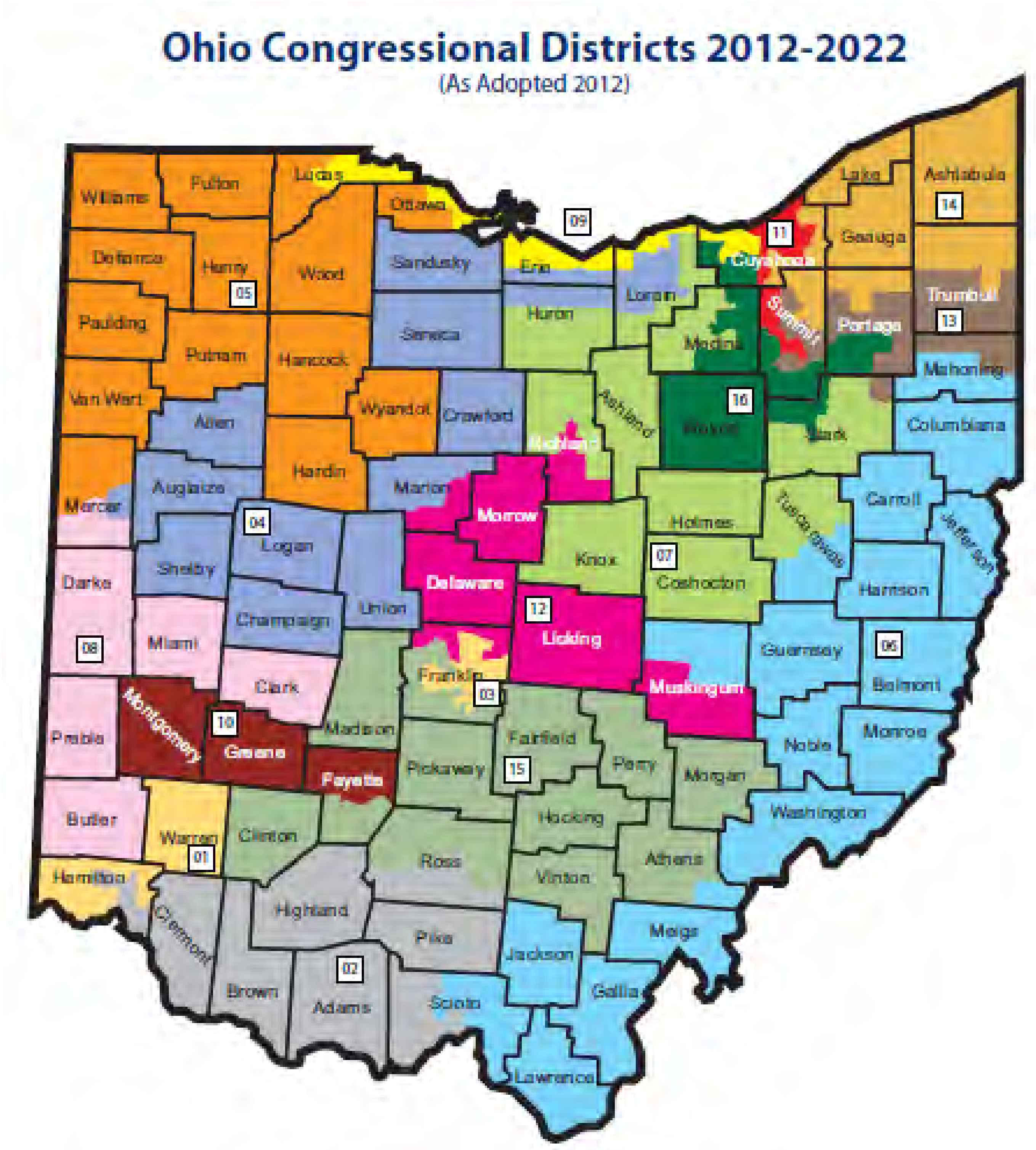
OHIO CONGRESSIONAL MAP



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FELLOWSHIPS

Evan N. Rose

Status: Master's 1, Mechanical Engineering

Research Topic: Effects of Fuel Oscillation on Flame Spread in Microgravity

Advisor(s): Dr. Vedha Nayagam

Biography: Evan Rose is a graduate student at Case Western Reserve University pursuing his Master's in Mechanical Engineering with a Thermal-Fluids concentration, with plans to graduate in May, 2019. He attended Case Western for his undergraduate degree, also in Mechanical Engineering, where he graduated with honors. Evan's interest in combustion research originated with a summer internship at the Glenn Research Center, where he worked on the Flame Extinguishment (FLEX) flight experiment. He was a member of a student research team that won the Ken Souza Spaceflight competition at the 2016 Meeting of the American Society for Gravitational and Space Research (ASGSR). His goal is to use his combustion experience to improve engine design and fire safety in the aerospace and automotive industries.

Abstract: The rate at which flames spread over a solid fuel surface gives a measure of the flammability of the fuel in a given environmental condition. Historically, opposed and concurrent flame spread rates over stationary solid fuel samples have been studied in great detail, and standardized flammability test methods have been developed based on flame spread rates to screen materials used in a spacecraft. This project supports a study to investigate the effect of longitudinal vibration on opposed-flow flame spread over thin solid fuels. The longitudinal vibration of the fuel is hypothesized to alter the boundary layer characteristics adjacent to the fuel surface, and accelerate the flame spread process. Preliminary tests under normal gravity conditions support this hypothesis. The objective is to test flame spread rates in microgravity onboard the Blue Origin New Shepard suborbital vehicle, which provides a microgravity environment for approximately three minutes. During the experiment, the fuel vibration frequency and acceleration will be varied and the resulting flame spread process will be recorded for later analysis.

Publication(s):

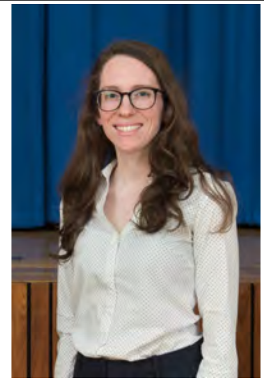
1. Rose, E., Nayagam, V., Dietrich, D. L., and Williams, F. A. Thermocapillary Induced Oscillations of a Fiber-Supported Droplet in Microgravity. Poster presented at ASGSR 34th Annual Meeting. Rockville, MD.
2. Rose, E. and Nayagam, V. (2018, April). Design and Manufacture of Payload for Solid Fuel Microgravity Combustion Experiment. Poster presented at Research ShowCASE. Cleveland, OH.
3. Rose, E., Nayagam, S., Sun, B., Srinivasan, S., and Nayagam, V. (2017, October). Vibration Enhanced Flame Spread over Solid Fuels in Microgravity: A Suborbital Flight Experiment. Concurrent presentation on subject, ASGSR 33rd Annual Meeting. Seattle, WA.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Cleveland State

Erin M. Tesny



Status: Master's 1, Mechanical Engineering

Research Topic: Heat Exchanger Design for Air Liquefaction

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 student chapter president of both organizations during her senior year. After graduation she plans to convert to full-time work at NASA Glenn.

Abstract: Efficient methods of air liquefaction are needed to quickly produce and store liquefied air for various aerospace applications. A heat exchanger using liquid hydrogen as the working fluid is a potential method of liquefaction of the air. However, the feasibility and efficiency of such a device remains unknown. The ability to design, model, and fabricate a heat exchanger capable of liquefying air for aerospace applications is crucial to the advancement of various aerospace fields. This project intends to create a thermal fluid model of the heat exchanger to predict its efficiency and load capabilities, then to fabricate a test article for later use in testing and verification of the predictive model.

Potential issues arise from the presence of water vapor in the air, which solidifies at the cryogenic temperatures required to liquefy air. Additionally, it will be equally important to ensure the device can be fabricated using additive manufacturing. Overcoming these challenges will be another key component of this project. This project will verify the validity of the designed heat exchanger for use in future aerospace projects. A similar device does not currently exist outside of private industry, and would be a useful addition to future aircraft and spacecraft designed by NASA or the U.S. military.

Publication(s):

1. Tesny E, Hauser D. Thermal Modeling of Zero Boil Off Tank Experiment. Presentation. Presented at: 28th Thermal and Fluids Analysis Workshop; 2018 August 20-24; Galveston, TX.
2. Tesny E, Davis D. Mission Analysis for Improvements in Hypersonic Aircraft Propulsion. Poster Session. Presented at: NASA Glenn Summer Intern Symposium; 2017 August 15; Cleveland, OH.
3. Tesny E, Halloran J. Development of a Mechanical Loading and Measurement Device For Use In Studies of Neuron Dynamics. Poster Session. Presented at: 32nd Annual Meeting of the American Society for Gravitational and Space Research; 2016 October 25-29; Cleveland, OH
4. Tesny E, McKissock D. Analysis of Solar Panel Configurations of Orion Multipurpose Crew Vehicle for Maximum Power Output. Poster Session. Presented at: NASA Glenn Summer Intern Symposium; 2016 August 15; Cleveland, OH.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Miami University

Roan M. Kirwin

Status: Master's 1, Mechanical Engineering

Research Topic: Tool Path Optimization of Wire-EDM to Improve Corner Accuracy in Rough Cutting Operations

Advisor(s): Dr. Muhammad P. Jahan

Biography: Roan Kirwin is currently in his first year of Miami University's MS Mechanical Engineering program and plans to graduate in August, 2019. He graduated with his BS in Mechanical Engineering December, 2018, also from Miami University.

Roan grew up in a rural area between Newark and Granville, Ohio. Growing up he gained an appreciation for woodworking working at his father's timber framing company. This led him to pursue a job at Miami's Architecture woodshop. He has found satisfaction applying engineering principles to his job working with students and running the large format CNC router in the shop. For his senior design project, Roan assisted in integrating a robot arm mounted cutting head into an existing waterjet. The course of Roan's work has allowed him to gain practical experience in many areas, from simple home electrical work, to Arduino, to stage light and sound design. Outside of school Roan likes to stay active through hiking, backpacking, and cycling. Roan has been researching Wire-EDM for two and a half years, beginning when he received Miami's Undergraduate Summer Scholars Research award.

Abstract: Wire EDM (Electrical Discharge Machining) is a common process used to manufacture injection molds and other applications of high hardness, high strength materials. One such material is Ti-6Al-4V (grade 5 titanium alloy), this is an aerospace grade material commonly used for early stage blades in jet turbines as well as many other applications that require high heat, high strength, and/or high hardness. As the industry progresses higher tolerances and more intricate components are desired. While Wire-EDM allows for sub-micron accuracy, to achieve these tolerances very low cutting speed is required driving up costs and machining times. My research focuses on increasing the accuracy of Wire-EDM during higher speed roughing operations, which would speed up subsequent finishing operations. I plan on doing this by incorporating two previously developed models for wire lag and wire vibration induced inaccuracies along with a minimum energy path optimization algorithm into a program to post process the toolpath code. This process could theoretically increase accuracy by at least 50% as over 50% of error can be attributed to wire lag alone.

Publication(s):

1. Kirwin, R. M., Mahbub, M. D. R., and Jahan, M. P., 2018, "Investigating the Effect of Wire Feed Rate and Wire Tension on the Corner and Profile Accuracies During Wire-EDM of Ti-6Al-4V," ASME 2018 13th International Manufacturing Science and Engineering Conference, ASME, p. V004T03A057-V004T03A057.
2. Jahan, M. P., Alavi, F., Kirwin, R., and Mahbub, R., 2018, "Micro-EDM Induced Surface Modification of Titanium Alloy for Biocompatibility," Int. J. Mach. Mach. Mater., 20(3), pp. 274–298.
3. Roan Kirwin, Aakash Niraula, Chong Liu, Landon Kovach and Muhammad P. Jahan, Optimization of Electric Discharge Machining Based Processes, In "Optimization of Manufacturing Processes" (Editor: Kapil Gupta and Munish Kumar Gupta), Springer International Publishing, AG, 2019.

Congressional District: 8th

Congressional Representative: Warren Davidson

Miami University

Alex J. Mazursky

Status: Master's 1, Mechanical Engineering

Research Topic: A Compact and Compliant Electrorheological Actuator with Pressure Sensing for Haptic Rendering

Advisor(s): Dr. Jeong-Hoi Koo

Biography: Alex Mazursky is a Master's student at Miami University working on problems at the intersection of applied materials science and human computer interaction. He has spent the past two summers abroad at KAIST in South Korea working with research scientists from national labs as a visiting student researcher. He has worked on projects ranging from smart materials applications and modeling, haptic interfaces, drone-docking mechanisms, and multiphysics modeling and optimization of induction heating processes. His future research interests include smart materials, haptics, HRI/HCI, soft robotics, applications of mechanical metamaterials, and wearables. Currently, he is applying to Ph.D. programs with the intent of pursuing a career in academic research.

Abstract: For a device to convey realistic haptic feedback, two touch sensations must be present: tactile feedback and kinesthetic feedback. Tactile feedback consists of the sensations felt at the surface of one's skin and just underneath it, whereas kinesthetic feedback is felt in one's joints and muscles and provides information about position and movement. Though many devices today display tactile feedback through vibrations, most neglect to incorporate kinesthetic feedback due to size constraints associated with conventional actuators. To address this issue, this study investigates a haptic device based on an unconventional actuation method: electrorheological (ER) fluid, a smart fluid with tunable yield stress under the application of electric field. This study aims to convey both kinesthetic and vibrotactile information in a small-scale design. The design centers on an elastic membrane that acts as the actuator's contact surface. Moreover, the control electronics and structural components are integrated into a compact printed circuit board, resulting in a slim device suitable for mobile applications. By controlling the ER fluid flow via applied electric fields, the device can generate a range of haptic sensations. Embedded impedance sensing allows for real-time monitoring and control of the device's feedback. The device's dynamic behavior may be controlled to render specific and realistic haptic sensations.

Publication(s):

1. Mazursky, A. J., Koo, J.-H., and Yang, T.-H., 2018. "Experimental evaluation of a miniature haptic actuator based on electrorheological fluids". In Proc. of SPIE Smart Structures and NDE, Vol. 12.
2. Mazursky, A. J., Koo, J.-H., and Yang, T.-H., 2018. "Application of Electro-Rheological Fluids for Conveying Realistic Haptic Feedback". In Proc. of ICAST 2018.
3. Mazursky, A. J., Park, H.-C., Song, S.-H., and Koo, J.-H., 2018. "Multiphysics Modeling And Parametric Analysis Of An Inductor For Heating Thin Sheet Materials". In Proc. of ASME IMECE 2018.
4. Mazursky, A. J., Koo, J.-H., and Yang, T.-H., 2018. "Design, modeling, and evaluation of a slim haptic actuator based on electrorheological fluid". Submitted to the Journal of Intelligent Material Systems and Structures.

Congressional District: 8th

Congressional Representative: Warren Davidson

The Ohio State University

Nicole N. Whiting

Status: Master's 1, Aeronautical and Astronautical Engineering

Research Topic: Active Control of Dynamic Stall Over a NACA 0012 Using NS-DBD Plasma Actuators

Advisor(s): Dr. Mo Samimy

Biography: Nicole Whiting is an Aerospace Engineering Master's student at The Ohio State University. She also attended Ohio State for her undergraduate degree where she graduated with Honors Research Distinction in Aerospace Engineering. Both her undergraduate and graduate research are in the Gas Dynamics and Turbulence Lab at the University's Aerospace Research Center. Nicole has interned at NASA Glenn Research Center and General Motors. At NASA Glenn, she worked in the Engine Combustion branch where she investigated the non-volatile particulate matter from jet engines. At General Motors, she performed a cross tunnel correlation between their three climactic wind tunnels in Warren, Michigan. Through these internships, Nicole was able to achieve a practical understanding of how her research is relevant to a variety of applications.

Abstract: Dynamic stall occurs in applications where airfoils are rapidly changing angle of attack, like rotorcraft or wind turbines. When the change is fast enough, flow over a pitching airfoil remains attached beyond the static stall angle. This results in the formation of a dynamic stall vortex (DSV) on the leading edge of the airfoil, which eventually convects over the airfoil and sheds. During DSV convection and the accompanied flow separation, unsteady aerodynamic loads are produced. These loads can lead to fatigue and eventually structural failure, making it essential to mitigate the effects of dynamic stall. Nanosecond Dielectric Barrier Discharge (NS-DBD) plasma actuators have shown promise at mitigating dynamic stall and reattaching the flow over a NACA 0015 airfoil, a thick, symmetric airfoil, significantly reducing unsteady loads. A high-voltage nanosecond pulse drives the actuator and creates rapid, localized heating that results in a thermal perturbation. The thermal perturbation then excites the flow's natural instabilities and generates coherent flow structures. Previous computational work has shown that high Strouhal number (non-dimensional frequency) excitation results in small structures that quickly develop, breakdown, and result in smooth, partial reattachment of the flow whereas low Strouhal number excitation results in large structures that are capable of fully reattaching the flow cyclically and lead to unsteady loads. This work aims at improving the understanding of the flow physics associated with dynamic stall so the effects of it can be mitigated. A NACA 0012 airfoil will be experimentally tested using high Strouhal number excitation. Detailed load cell and flow velocity and turbulence measurements will be carried out to assess the effect of control. Mitigating the negative effects of dynamic stall has the potential to increase the lifespan of blades and increase lift, which will allow rotorcraft to fly higher, faster, or carry larger loads.

Publication(s):

1. Whiting, N. "Active Control of Dynamic Stall over a NACA 0012 Using NS-DBD Plasma Actuator." The Ohio State University. Department of Mechanical and Aerospace Engineering Undergraduate Honors Thesis, 2018.

Congressional District: 4th

Congressional Representative: Jim Jordan

University of Cincinnati

Nathaniel L. Richards

Status: Master's 2, Aerospace Engineering

Research Topic: Comparison of Machine Learning Methods for Applications in Concussion Prevention and Prognosis

Advisor(s): Dr. Kelly Cohen and Dr. Adam Kiefer

Biography: Nathaniel is a second-year graduate Aerospace Engineering student at the University of Cincinnati. He completed his Bachelor's Degree early through the ACCEND program at UC. He has co-oped at three organizations: Gulfstream Aerospace, NASA Langley Research Center, and the UAV MASTER Lab at the University of Cincinnati. He has worked in the areas of rapid prototyping (3D printing), UAV navigation, and optimal control.

Nathaniel has also been involved with the UAV MASTER Lab under Dr. Cohen since the start of his undergraduate career. He has conducted research under the NSF-REU and OSGC Undergraduate STEM Scholarship programs, and he has worked with Dr. Cohen to develop and teach an undergraduate course on UAV construction and flight-testing. He has developed several Genetic Algorithms that have been applied to the Traveling Salesmen Problem, PID control tuning, and Fuzzy Logic control tuning. He is currently applying these and other machine learning methods to the medical field, collaborating with the Division of Sports Medicine at Cincinnati Children's Hospital Medical Center.

Abstract: This research looks to apply a variety of machine learning algorithms to advance the field of concussion prevention and prognosis. For prevention, it has been shown that unanticipated collisions result in larger g-forces and greater potential for injury. The TEAM Virtual Reality (VR) Lab at Cincinnati Children's Hospital has collected data from high school soccer players regarding collision frequency and g-forces. It is hypothesized that a player's oculomotor fitness, as determined by two eye gaze tracking tests, is a predictor of unanticipated collision risk.

When a patient is admitted for a head injury, they fill out several forms consisting of numerical, categorical, and linguistic descriptions of pain severity, pain location, symptoms, and other relevant details – a total of 59 input variables. Cincinnati Children's Hospital has created a database with these input variables and how long it took for the patients to return to unrestricted physical activity. It is hypothesized that these inputs can be used to predict the number of days until unrestricted physical activity.

Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

SCHOLARSHIPS

Baldwin Wallace

Joel R. Kavaras

Status: Senior, Mathematics

Research Topic: Mathematical Modeling of the Spread of Beech Leaf Disease

Advisor(s): Dr. Aaron Montgomery and Dr. Kathryn Flinn

Biography: Joel Kavaras grew up in Independence, Ohio, where he fostered a love of the outdoors and a curiosity for exploring the science behind nature's wonders. Whether it was reading field guides or watching science documentaries, he always had a passion for learning more about the planet. In high school, Joel began his current job working as a naturalist with Cleveland Metroparks during summer and winter breaks. He has published a field guide to local land snails for Cleveland Metroparks. As a senior at Baldwin Wallace University, Joel studies mathematics along with a minor in biology, hoping to combine these fields for a career in mathematical biology.

Abstract: Beech Leaf Disease (BLD), after first appearing in Lake County in 2012, now affects American beech *(Fagus grandifolia)* populations across northeast Ohio, northwest Pennsylvania, southwest New York, and possibly parts of West Virginia and Ontario. So far, a causal agent remains unknown, while tree mortality (especially in saplings) and the thinning of canopies in larger trees across affected areas make the disease a growing concern each year. This research project will be focused on mapping the diseased trees graphically to analyze its spread across a geographic area over time. Using the tools of graph theory as a framework, there will be potential to identify patterns in the data revealing how the disease spreads, which could further our understanding of BLD and shed light on how to slow its spread.

Publication(s):

1. **Kavaras, Joel R.,** *The Fascinated Naturalist's Guide to Snails and Slugs of Cleveland Metroparks.*

Congressional District: 14th

Congressional Representative: David P. Joyce

Baldwin Wallace

Garrett S. McCue

Status: Senior, Neuroscience and Biology

Research Topic: FTY720 and the Effect on Neurofibrillary Tangles Within *Caenorhabditis elegans*

Advisor(s): Jeffrey Zahratka, Ph.D.

Biography: I have always had a strong passion for sciences throughout my youth and over time I realized my interest in neuroscience. This interest sparked due to the complexity of the brain and how much is known on its processes, but more importantly how much more is unknown. The puzzling nature of the networks that make up the brain fascinated me in high school and is why I am here today. My interest in neurodegenerative diseases comes from the increasing number of individuals touched by these diseases every year on top of how largely ineffective the treatments are today. I am a senior at Baldwin Wallace University and am currently working towards my undergraduate degree in both Neuroscience and Biology. After my time at Baldwin Wallace I plan to find a job within the industry before continuing my education. I am extremely grateful for the opportunities that have been given to me by Baldwin Wallace and the Ohio Space Grant Consortium as well as the guidance I have received from Dr. Jeffrey Zahratka.

Abstract: Alzheimer's disease (AD) is a neurodegenerative disease in which dementia progressively worsens over time with increasing neuronal death. The cause of dementia is unclear and has been hypothesized to be multifaceted, which includes the accumulation of tau tangles. The tau hypothesis of dementia shows tau being one of the main causes of dementia. In a healthy biological system tau proteins are primarily active in the axonal portions of the neuron and function to provide structural stability as well as flexibility through modulating microtubule activity. Phosphorylation of tau proteins can inhibit proper tau functioning, and hyperphosphorylation can result in neurofibrillary tangles (NFTs). NFTs accumulate and are a largely seen within AD.

Due to the ambiguity of the disease, there are very few current treatments for AD that prove to be effective. This experiment aims to target one aspect of dementia, the tau tangles, through administration of a current Multiple Sclerosis (MS) drug, Fingolimod. Fingolimod (FTY720) is a sphingosine-1-phosphate receptor modulator and is used to reduce the severity of MS over time. One of the secondary methods of action of FTY720 is its action as a phosphatase. It is predicted that the administration of FTY720, within a C. elegans model organism that contains NFTs, would act to dephosphorylate the NFTs and would result in an increased life span.

Publication(s): None yet.

Congressional District: 9th

Congressional Representative: Marcy Kaptur

Baldwin Wallace

Sarah M. Shapley

Status: Junior, Neuroscience and Biology

Research Topic: Role of PAD2 on Actin in Myelination

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

Biography: Since my high school psychology course and various lab experiences, I have become increasingly passionate about understanding neurodegenerative diseases. Many of these diseases offer a puzzle for researchers to solve, which will ultimately assist in treating those who are afflicted with these diseases. I am currently a Junior at Baldwin Wallace University pursuing an undergraduate degree in Neuroscience and Biology. My past research experiences have focused on neurodegenerative diseases such as Amyotrophic Lateral Sclerosis, Alzheimer's Disease, and Traumatic Brain Injury. My love of neuroscience and science as a whole extends beyond the classroom. I have been vice president of BWU's Interdisciplinary Neuroscience Society, a supplemental instructor for an introductory Biology course, and volunteered for our neuroscience outreach Brain Fair committee. One of my future goals is to make neuroscience relatable to the public through offering accessible science. Hopefully, this assists in an understanding of how everyone fits into this "puzzle" the research community is trying to solve to find treatments and cures for diseases. I'm excited to join such a dynamic group of scientific scholars through the Ohio Space Grant Consortium and am thoroughly grateful for this opportunity.

Abstract: Multiple Sclerosis (MS), is a neurodegenerative disease in which the immune system targets the myelin sheath for degradation and removal. It is characterized by the presence of lesions due to the immune system attack on the myelin and axon. Current treatments for MS do not focus on the remyelination or repair of the degraded myelin; thus, there are clinical applications for research toward understanding mechanisms of myelination.

This experiment aims to offer insight into neurological pathologies by studying oligodendrocytes, the myelin-producing cells of the central nervous system. These cells wrap their plasma membrane around a neuronal axon to assist with the conduction of nerve impulses down their membranes. A current model of membrane wrapping was proposed based on actin and its relationship with myelin basic protein (MBP). Actin is a structural protein expressed as polymers (f-actin) or monomers (g-actin). Wrapping of membranes around the axons occurs when f-actin is disassembled. After wrapping, MBP binds to the membrane to extrude the cytoplasm for the compaction process. A chemical change- citrullination- does not allow MBP to bind the membrane. MBP is citrullinated by the peptidyl arginine deiminase, type 2 (PAD2) enzyme. In MS patients, PAD is upregulated, and the loss of MBP compaction makes myelin vulnerable to attack by immune cells. 2-chloroacetamidine (2-CA) is a drug which inhibits citrullination (decreases the activity of PAD); thus, it is predicted to inhibit active compaction. In order to understand the role of citrullination in wrapping and compaction, we will measure the ratio between f-actin and g-actin. This ratio will be used to determine the state of the actin cytoskeleton in the nervous system of zebrafish embryos in the presence of the two drugs: 2-CA and latrunculin A (Lat-A). Wrapping and compaction of myelin in zebrafish larvae occur within the first 3-5 days post fertilization in fluorescently labeled oligodendrocyte zebrafish lines that allow for analysis of myelination when 2-CA inhibits citrullination.

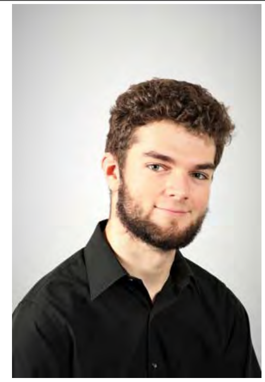
Publication(s): None yet.

Congressional District: 9th

Congressional Representative: Marcy Kaptur

Case Western Reserve

Joel A. Hauerwas



Status: Junior, Mechanical Engineering

Research Topic: Abdominal Kinematics of Manducca Sexta

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

Biography: Joel Hauerwas is a third 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):

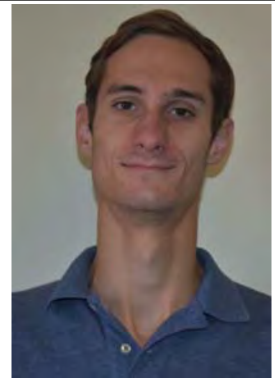
1. Moses, K. C., Michaels, N. I., Hauerwas, J. A., Willis, M., & Quinn, R. D. (2017). Biomimetic And Biohybrid Systems: 6th international conference, living (2017 ed.).(pp. 589-594) S.I.: Springer International PU.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Case Western Reserve

David B. Prigg



Status: Senior, Mechanical Engineering

Research Topic: Robot to Clean Fresh Water Pipes

Advisor(s): Roger D. Quinn, Ph.D. and Richard. J. Bachmann, Ph.D.

Biography: David Prigg grew up in Elmhurst, IL. He developed an early passion for engineering, tinkering, and building things such as go-karts, rockets, and robots. David is now pursuing a Bachelor's and Master's degree in Mechanical Engineering through the BS/MS Dual Degree Program at Case Western Reserve University. He will graduate in 2019. Prior to Case, David became an Eagle scout of Troop 17 and was a captain of the men's track team at York Community High School. At Case, David participates in Varsity track and field and has competed in all UAA conferences. He participated in the Battle of the Rocket competition, video payload team as a part of Case Rocket Team. He also did undergraduate research with Dr. Roger Quinn's Biologically inspired robotics team. David has future plans to apply his studies in the sustainable energy industry.

Abstract: Clean water is at the core of any city's infrastructure. Clean tap water is often something that is taken for granted, however when water systems get old, impurities can build up in the water pipes causing cloudy and unpleasant drinking water. These piping systems travel from the purification plants to major cities for distribution. A pipe cleaning robot would allow for an automatic, uninterrupted way to prevent sediment buildup in pipes. This robot would agitate particulate on the bottom of the pipe and suck it up through a filter to remove it. For the process to be automated, the robot must be able to navigate through the pipe system, be able to recharge, and clean the filters. The unit will be fully submerged in a high pressure environment. The robot must not release any harmful toxins as it will be in contact with already treated drinking water. Optimal locomotion, filtration, and control will be tested and compared, then combined to create a functional prototype. From here, iterations can be made to improve performance and make the design more robust.

Publication(s):

1. Moses, Kenneth C., et al. "Simulating Flapping Wing Mechanisms Inspired by the Manduca Sexta Hawkmoth." Biomimetic and Biohybrid Systems Lecture Notes in Computer Science, 2018, pp. 326–337.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Case Western Reserve

Matthias S. Weisfeld

Status: Senior, Mechanical and Aerospace Engineering

Research Topic: Robot Moth

Advisor(s): Dr. Roger D. Quinn

Biography: Matthias is a student in the Bachelor's/Master's program at Case Western Reserve University, studying Mechanical and Aerospace Engineering. He is currently a senior and will be graduating in 2019. He has a strong interest in robotics and aviation. Matthias works as an undergraduate research assistant at the CWRU Biorobotics Laboratory, aiding in the construction and design of a robotic moth, closely resembling the Manduca Sexta Hawkmoth. In addition to his research, Matthias is also an active member of the Phi Kappa Tau Fraternity and the Case Aeronautics Team.

Abstract: The Flying Wing Micro-Air Vehicle Moth Project (FWMAV Moth Project) seeks to replicate the flying characteristics of a real life Manduca Sexta Hawkmoth. These FWMAVs could be used for a quite large number of applications. This particular portion of the project focuses on the production and analysis of the wings, including both the forewing and hindwings, with a heavy focus on the forewings.

In order to create a robotic moth that adequately simulates the conditions of a real Manduca Sexta, the wings must have a similar mass and flexural characteristics. Likewise, it must have a similar ratio of venation structure to membrane structure, in this case made of unidirectional carbon fiber and a number of other materials respectively.

These materials are carefully cut to the appropriate shape and length, then placed into a mold, that fits the experimentally determined curve of the Manduca Sexta wing. This is then baked in a vacuum bag to form the finished wing.

Publication(s): None yet.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Cedarville University

Michaela M. Crouch

Status: Senior, Mechanical Engineering

Research Topic: Quality Assessment of 3D Printed PLA Scaffolds for Tissue Engineering of Bone Restoration Implants

Advisor(s): Dr. Timothy Norman

Biography: Michaela Crouch is a Senior at Cedarville University, and will graduate in May 2019 with a B.S. in Mechanical Engineering and minors in Math and Biblical Studies. While at Cedarville, she has held positions as a math tutor, a grader for the engineering department, and an engineering intern. Outside of her studies, Michaela enjoys spending time outdoors with her husband and starting new creative projects. After graduation, she plans on working for Lockheed Martin.

Abstract: The ability to repair and initiate the healing of large bone defects is a major challenge being faced by the medical field today. Small bone defects will typically heal unaided, but large bone defects require medical intervention. Modern solutions are to replace the missing bone tissue with biocompatible and readily customizable materials such as 3D Printed PLA (Polylactic Acid).

This work builds on previous research that investigated the use of biodegradable scaffolds to stimulate the healing of large bone defects. The scaffolds were created using a desktop 3D printer and polylactic acid (PLA) filament and were seeded with cells to assess viability of approach. The current work investigates assessing the precision of the 3D printed scaffolds by microscopic examination methods for quantifying the effects of multiple printing parameters. Microscopic measurements (e.g. print diameter) were used to test the effects of 3D printing parameters including nozzle size, extrusion temperature, print speed, travel speed, and layer thickness. The results from this work will be used to conduct high precision production of 3D printed PLA scaffolds for the study of their use to promote bone growth.

Publication(s):

1. Crouch, Michaela M. "Three-Dimensional Surface Analysis for Validation of Electrochemical and Numerical Estimates of Fretting Corrosion." OSGC Student Research Symposium, 23 Mar 2018. Poster presentation.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Cedarville University

Jared I. Klimek

Status: Senior, Mechanical Engineering

Research Topic: Design and Testing of 3D Printed Scaffolds for Large Bone Defects

Advisor(s): Dr. Timothy Normann

Biography: Jared Klimek is a Senior at Cedarville University and will graduate in May 2019 with his B.S. in Mechanical Engineering with minors in Engineering Honors and Biblical Studies. Hailing from Colorado Springs, CO, he loves to ski, play sports, hike, camp, and do anything outdoors. In the summer of 2017, he had an engineering internship at Colorado Springs Utilities. During his internship, he had the opportunity to work in the water and wastewater departments, doing fluid mechanics analysis and project management. In the summer of 2018, he had a mechanical engineering internship at Air Force Research Laboratory at Eglin Air Force Base in Florida. During his internship, he conducted finite element modelling in the munitions directorate, observing the effect of varying nose geometry on survivability of a projectile fuse.

During his time at Cedarville University, Jared has served in campus and engineering department leadership. For the last two years, he has served as a Resident Assistant in his dormitory. For his senior year, he has served as the President of the Ohio Nu chapter of Tau Beta Pi, the engineering honor society. His senior design project is design and construction of a remote control airplane for the 2019 SAE Aero Design East competition. On the team, he has been a member of the aerodynamics team and the leader of the report and presentation teams. In the future, he plans to get a Master's in Mechanical Engineering and work in the aerospace industry.

Abstract: A major challenge in the medical field today is the ability to repair and initiate the healing of large bone defects. While small bone defects may heal unaided, large bone defects require medical intervention. One promising solution is to replace the missing bone tissue with a biocompatible and customizable material such as 3D-printed PLA (polylactic acid).

This project builds on previous research that investigated the use of biodegradable scaffolds to stimulate cell growth for healing of large bone defects. The goal was to manufacture scaffolds using a 3D printer with PLA filament, seed them with cells, and observe them for growth characteristics. This project investigates the use of a desktop 3D printer to print PLA bone scaffolds in order to quantify the effects of varying printing parameters on geometric and mechanical quality. Starting with a control specimen made with the standard print parameters used by previous Cedarville biomedical research, multiple printing parameters were varied, including nozzle diameter, extrusion temperature, layer height, print speed and travel speed. A test matrix was created by varying the control specimen by a single print parameter at a time. Finally, all of the specimens were mechanically tested for a stiffness comparison. The results of this project will help future researchers and engineers conduct high-quality production of 3D-printed PLA scaffolds for future use in biomedical applications

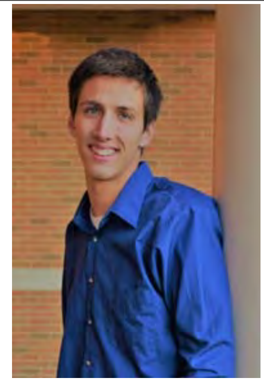
Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Cedarville University

Timothy M. True



Status: Senior, Physics

Research Topic: Analysis and Decomposition of Signal from Musical Instruments

Advisor(s): Dr. Steven Gollmer

Biography: Tim was raised in Kalamazoo Michigan. His numerous extracurricular interests in high school included sports, music, and theatre. Now a Senior at Cedarville University, Tim is studying physics and music. He plays piano in the Jazz Band, cello in the orchestra, and enjoys singing loudly and joyfully. His study on the history of temperament—an application of mathematics to music—recently led to his first publication. Tim is the president of the Student Academic Advisory Board, a committee which discusses the direction of academics at Cedarville University.

Upon graduation, Tim will continue his education at the Air Force Institute of Technology (AFIT). He plans to complete a master's degree in either applied physics or optics. Long term, he will either continue research in the Department of Defense or seek employment in a private acoustics consulting firm. His research at AFIT thus far has focused on the study of the high-pressure excited state lineshapes of various alkali metals. This work contributes to the development of the diode-powered alkali laser, a potential high energy laser source of the future. A paper summarizing his findings thus far is pending publication in the Journal of Quantitative Spectroscopy and Radiative Transfer.

Abstract: This project examines signal inputs from various musical instruments. The project focuses on decomposing the source input and analyzing the resulting content; the end goal is to determine several characteristics about the input signal, including pitch, instrument, and rhythm. We began by analyzing a single tone of one instrument, using FFT analysis to observe the spectral content. A windowing technique was created to break down a dynamic signal. The resulting frequencies were then outputted, producing a type of auto-scoring function. This function was then expanded to include input from multiple instruments. Adaptations allowed for basic analysis of this much more complicated situation. Continued effort will also be made to modify the decomposed signal in an advantageous way, and then recombine it into a usable form. This will allow audio files to be edited in a way that removes one instrument/source and allows others to remain intact.

Publication(s):

1. True, Timothy M. (2018) "The Battle Between Impeccable Intonation and Maximized Modulation, "*Musical Offerings*: Vol. 9: No. 2, Article 2..

Congressional District: 10th

Congressional Representative: Michael R. Turner

Central State University

Lynnae S. Frisco

Status: Senior, Manufacturing Engineering

Research Topic: Solar Concentrator

Advisor(s): Augustus Morris, Jr., Ph.D. and Saleh Almestiri, Ph.D.

Biography: Lynnae Frisco is from Wilmington, Ohio, and is currently a student enrolled in the Manufacturing Engineering Program at Central State University. Lynnae first enrolled at Central State in the Fall of 2014 after graduating from Wilmington High School and Laurel Oaks: Great Oaks. Since high school she has taken her academics seriously and has continued to do so into her college years. In the Summer of 2017 she earned her first internship. Her internship allowed her to participate in research to help create safety equipment for sports out of natural materials. Another part of her responsibilities for her internship was to help teachers in the Dayton area create a lesson plan that includes STEM education into our public schools.

Lynnae plans to continue her education at Central State until graduation day which is May, 2019. Once she graduates she wants to pursue a career in either programming or design which are her passion in her field.

Abstract: The earth rotates around the sun 24 hours a day 365 days a year. As we rotate around the sun solar radiation is being emitted and can be used to create electricity, thermal energy or even to heat water for industrial, domestic or commercial use. The solar energy from the sun is one of the cleanest and most abundant forms of energy and we want to tap into this. The purpose of this project is to create a solar concentrator to collect the maximum amount of solar radiation.

This solar concentrator will use a magnifying glass to be used as the fresnel lens and have a solar tracker programmed on the system as well. We are using the magnifying glass because when the sun rays hit the lens the fresnel lens will concentrate and intensify the radiation into a tight beam. A tracking system will always be used to ensure that the magnifying lens is always directed towards the sun rays and the focal point of the lens is aimed at the receiver. The receiver will be a piece of metal surrounded by some sort of fluid, most likely water or some type of oil, to collect the radiation as well as preventing overheating. A thermal sensor will also be programmed to further protect our system from overheating.

The purpose of our project is to collect solar radiation and use it as an on the go basis to provide heat for a small house or apartment. With the use of a solar tracker on our system we can collect up to 30 % more energy. If we are successful in collecting the maximum amount of solar radiation then we plan to take our project to the next level and install a solar desalination system to work alongside with our solar concentrator. This will be beneficial to people in third world countries who have an abundance of sun and a scarcity of water. This system can be used to turn the salt water into clean drinking water. We also have plans to upscale our design and supply enough heat on a bigger scale such as a house, apartment building or a business.

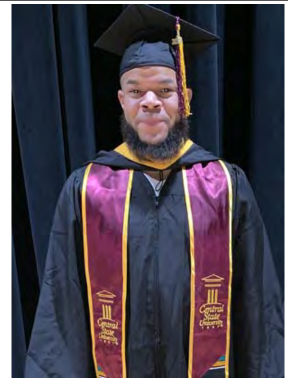
Publication(s): None yet.

Congressional District: 15th

Congressional Representative: Steve Stivers

Central State University

Andre L. Love



Status: Senior, Computer Science

Research Topic: Nationwide Youth Move Narrative

Advisor(s):

Biography: Andre' L. Love is a Graduating Senior at Central State University, as of May 4, 2019, he will receive a B.S. in Computer Science. He has experience in various languages such as C++, Java, HTML and Python to name a few. André has also conducted himself in an aspiring manner to his peers and actually mentors a number of youth through the Ohio youth empowerment program. He utilizes his own experiences as inspiration for consistent growth and an obligation to uplift each and every individual he crosses paths with.

Abstract: As a volunteer for the Youth Move group here in Ohio through N.A.M.I., I've worked as a youth leader to guide and help at-risk youth in any way I am able. My experience there along with my interest in consumer behavior and social media led me to pursue my Computer Science Degree. I plan on building the next platform for youth to connect in a healthy manner allowing parents the ability to easily find or create events in their communities such as volunteering events for community enhancement via gardening, or a neighborhood kickball game. The concept could be compared to a crossover between Facebook and Eventbrite, but this would use location services to give the youth points for checking in to events. Those earned points can eventually be redeemed for prizes, giving the youth and their families greater incentive to partake in events.

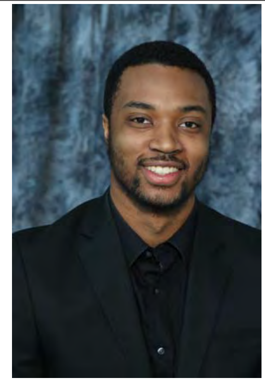
Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Central State University

Kylon J. Payne



Status: Senior, Manufacturing Engineering

Research Topic: Solar Tracker

Advisor(s): Augustus Morris, Jr., Ph.D. and Saleh Almestiri, Ph.D.

Biography: Kylon Payne, who is a Senior at Central State University and will graduate in May 2019 with a B.S. in Manufacturing Engineering, was born and raised in St. Paul, Minnesota, where he attended Tartan Senior High School. Growing up Kylon played various instruments including the guitar, piano, and trumpet. He also played a number of sports including baseball, football, and basketball. Kylon has always had an interest in Mathematics since he started attending school; it was always his favorite subject.

Since attending Central State University, Kylon has become more involved with many different student organizations on campus. One the organizations he is most proud of joining is Alpha Phi Alpha Fraternity Inc., Delta Xi Chapter, where he currently serves as the Chapter President for the 2017-2018 Academic School Year. Kylon is also proud of receiving the opportunity of Summer Internship in the summer of 2016. He conducted research with two of his peers from Central State University, and was able to learn and observe many unique things and the NASA Glenn Research Center located in Cleveland, Ohio. In the summer of 2017, Kylon was given the privilege of a summer internship, Research Experience for Undergraduates (REU) funded by the National Science Foundation (NSF), where his research mainly focused on the improvement of the navigation of Unmanned Aerial Vehicles (UAVs).

Abstract: Solar trackers are used to collect the maximum amount of solar energy. There are three way currently to collect solar radiation. These ways are by solar dishes, solar towers, and parabolic troughs. The structures and characteristics of the sun determines the nature of energy it radiates into space. Our goal for our solar tracker design is to create a solar tracker that collects solar radiation emitted by the sun. We plan to use the focal point of a magnifying glass to collect the maximum amount of energy. With our solar tracker we hope to be able to provide enough energy to power a small structure.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Cleveland State

Curtis A. Flack

Status: Junior, Mechanical Engineering

Research Topic: Flow Visualization of a Nature-Inspired Low-Pressure Turbine Blade

Advisor(s): Dr. Wei Zhang

Biography: Curtis Flack is a Junior Mechanical Engineering student at Cleveland State University. Originally from Mentor, Ohio, Curtis developed a love of learning, math, and physics while in high school. Since beginning his undergraduate degree, Curtis has sought to apply himself outside of the classroom, becoming a physics tutor, undergraduate researcher, and member of the American Institute of Aeronautics and Astronautics (AIAA) and the Society of Automotive Engineers (SAE) Baja Team. In SAE, Curtis is the brake and throttle team lead while also leading design optimization. In the 2019-2020 season he will be the team's president and design lead. Curtis has also completed several co-op rotations with nVent, where he has been able to learn about engineering from an industry perspective. His goal is to work in the Aerospace and Defense Industry in Research & Development while teaching part time.

Abstract: A major point of interest in the aerospace industry is the improvement of airplane engine efficiency. One studied method to improve efficiency is by applying seal whisker morphology to the design of low-pressure turbine blades. Studies of seal whiskers have been have shown highly desirable flow performance due to their three-dimensional undulating geometry defined by seven parameters, indicating resistance to turbulence and reduction in vortex-induced-vibrations when compared to non-undulating geometries. Previous studies of whisker-treated low-pressure turbine blades have been done primarily using computational fluid dynamics (CFD) and show promising results, however little work has been done to experimentally quantify the flow effects due to the undulating geometry. The purpose of this study is to quantify the flow effects of whisker-treated airfoils of varying amplitude and pitch in a free-stream environment, observing boundary layer separation and the flow field behind the airfoil. Results will be helpful, not only to the application in a low-pressure turbine, but also toward a wide variety of other airfoil applications.

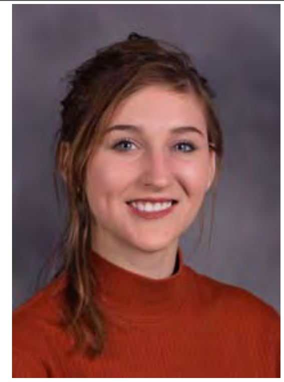
Publication(s): None yet.

Congressional District: 14th

Congressional Representative: David P. Joyce

Kent State University

Angela M. Deibel



Status: Senior, Mechanical Engineering and Marketing

Research Topic: "What Does it Take to Produce 1MW of Power?"

Advisor(s): Dr. Yanhai Du

Biography: An engineer's job is to find solutions. A marketer's job is to communicate them. Angela M. Deibel wishes to do both.

Angela Deibel was first introduced into the stirring world of fuel cells as a sophomore in 2016 when she accepted an internship in Kent State University's Clean Energy and Sustainability lab. As a marketing student, she found herself among chemical engineers and PHD post-docs studying fuel cells. A fuel cell can produce electricity using hydrogen, with water as its only byproduct. No greenhouse gas emissions are emitted during the process.
By the end of the internship, Angela had cultivated a growing love of technology and declared a second major in engineering. Sustainability emerged as a calling. Deibel's career goals include decreasing greenhouse emissions by increasing the efficiency of its operation through research and its demand as a service for a product.
"Fuel cells have gotten under my skin as only a healthy passion for something does. My curiosity is peaked, my understanding is challenged, and my intelligence tested," Angela remarks. Angela aspires to achieve a PhD in engineering. Most of her future work will be done in a lab writing grants, testing materials, educating, reviewing scientific literature, and evaluating performances. One day, Angela hopes to find herself back in a classroom, as a professor, where she can help mentor students.

The marketing aspect of Angela's personality plays a large role in her future: as the go-between for researchers and the general public. Renewable energy needs promotion, funds, and awareness just like any other product. Angela's ambition for public speaking hopes to bring awareness.

An engineer's job is to find solutions. A marketer's job is to communicate them. Deibel wishes to do both.

Abstract: In the US and around the globe, over 60% of our electricity is from burning fossil fuels. Fuel cells can be twice as efficient and have the potential to dramatically change the way electricity is generated. When hydrogen and oxygen meet on the electrolyte plate, a catalyst spurs a reaction that creates H2O and electricity, without greenhouse emissions. Emissions can be generated through obtaining hydrogen, but with significantly less greenhouse gases and higher fuel-energy conversion.

There is a unique opportunity to study a large commercial fuel cell, a 150 Kilowatt Fuel Cell Module (FCM). This FCM was donated by a company represented by the letter B*, per a Non-Disclosure Agreement. The FCM weighs 720 pounds and works with 9 other units to create one megawatt of power. 1 unit is disassembled.
The Objective of this project is to understand gas distribution, exhaust and operating conditions, focusing on the flow of hydrogen, oxygen and water in the module. To achieve this objective, the 150 kW FCM will be dissembled and mapped. All parts taken out will be identified and reassembled.

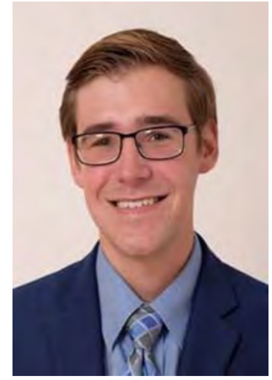
Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

Kent State University

Nicholas B. Manning



Status: Senior, Geology

Research Topic: Water Quality Assessment of Euclid Creek using Remote Sensing and VPCA Analysis

Advisor(s): Dr. Joseph D. Ortiz

Biography: Nicholas (Nick) Manning is currently a Senior with a dual major at Kent State University, pursuing a B.S. in Geology with a concentration in Environmental Geology, and a B.A. in Environmental Studies with a minor in Sustainability. During his time at Kent State, he has participated in a number of clubs and organizations as well as being a *Phi Beta Kappa* initiate and having worked as a Learning Assistant and a student manager. Last summer, Nick took part in the Summer Undergraduate Research Experience (S.U.R.E.) program at Kent State, completing an accelerated project on colloidal acid mine drainage. Nick plans on becoming an environmental or sustainability consultant and attending graduate school to either further his education in the environmental sciences or work to receive his MBA to help businesses make sustainable changes.

Abstract: The Euclid Creek Watershed contains multiple rivers of Northeast Ohio and drains into Lake Erie at Villa Angela Beach near Cleveland. The beach has been closed with access to the water restricted multiple times over the past decade, mainly due to E. coli bacteria. The problem is amplified during heavy rains where the flooding of multiple combined sewer overflow systems feeds into the stream. This project is a continuation on the work done to assess the content and amount of the contaminant influx near the mouth of Euclid Creek and its interaction with the local beach. Landsat-8 images were combined with the KSU spectral decomposition method of image analysis, which employs varimax-rotated principal component analysis (VPCA) to determine water quality issues along the creek and in the nearshore area to explore their interactions with the aquatic systems of the lake. This is a more cost- and time-effective method that can reduce the potential biases common in traditional remote sensing techniques arising from atmospheric errors or correlated input variables. These errors are limited by decomposing the spectral properties of the image into their individual components by using VPCA, breaking the mixed spectral bands down into their respective and corrected spectral fingerprints.

Publication(s): None yet.

Congressional District: 7th

Congressional Representative: Bob Gibbs

Kent State University

Robert R. Wilson

Status: Senior, Aerospace Engineering

Research Topic: Subsonic Wind Tunnel Development

Advisor(s): Dr. David Blake Stringer

Biography: During my youth, I found interests in the fields of Robotics and Aerospace. My interest in robotics and engineering were then solidified with programs such as Project Lead The Way, and Gateway To Technology offered in Ohio schools. After Sophomore year of high school, I pursued a private pilot license which exposed me to the world of Aerospace. I decided to combine these passions and pursue Aeronautical Systems Engineering Technology at Kent State University.

At Kent State, I found a love for physics and math. This along with other factors aided me to change my major to Aerospace Engineering. During my sophomore year I wanted to find ways to become more involved with the rapidly expanding program at Kent State. I started working in Dr. Stringer's Aerospace lab and participated in the Summer Undergraduate Research Experience (SURE) during the summer of 2017. I presented on the topic of the Sure program and the progress that was made continuing into the next year at the OSGC Symposium in March, 2018. Since then, I have continued pursuing this project as well as focusing on upper-level classwork in my major. I intend on pursuing graduate school in the fields of aeronautics or astronautics.

Abstract: The Aerospace Engineering program at Kent State University is a brand-new program breaking away from Aeronautics and focusing on traditional dynamics of engineering. With this new program the university is expanding its current facilities to benefit new students. A wind tunnel is an instrument used to measure aerodynamic forces and pressures applied to an object at a certain airspeed. The current wind tunnel is enough for basic analysis but, as the Aerospace program rapidly expands, a new and improved wind tunnel is needed for academic, public and private use. This wind tunnel will allow students to analysis data from test completed with larger testing equipment, at higher speeds, and in a more controlled environment. This project serves to determine factors needed for development of a closed loop wind tunnel for the university.

Publication(s): None yet.

Congressional District: 7th

Congressional Representative: Bob Gibbs

Marietta College

DerekAllen L. Krieg

Status: Senior, Petroleum Engineering

Research Topic: Electric Generation Potential in the Upstream and Midstream Oil and Gas Industry

Advisor(s): Professor Craig Rabatin

Biography: As a Senior Petroleum Engineering student at Marietta College, I am pursuing a minor in energy systems engineering and an engineering leadership certificate from the McDonough Center for Business and Leadership. I am driven by my passion for the energy sector, along with my constant desire to see and experience new things. I love learning and deeply value hands-on field experience. Once I learn something new, I often desire to share it with others. As the Co-Founder of Oilfield Basics, my team and I are creating what will be the #1 educational platform serving the oil and gas industry.

Over the few years that I have worked in this industry, I have gained experience in engineering, execution, strategic development, field operations, base and wedge production, and more while working for companies such as Anadarko Petroleum Corporation, Chesapeake Energy, Blue Ridge Mountain Resources, and Thunder Resources. Finally, it is my goal to never stop learning and to build my reputation as a professional upon integrity, responsibility, efficiency, communication, and safety.

Abstract: With our world becoming ever more so dependent on electricity and energy, why not take advantage of every opportunity we have to produce electricity with existing systems? In 2015, the United States produced over 27 trillion cubic feet of natural gas (EIA). Likewise, the U.S. output about 8.8 million barrels of oil PER DAY in the same year (EIA). With such staggering production volumes, I want to research the potential for electricity to be produced just by the mere production and transportation of the hydrocarbons. My research last year showed there are multiple ways to produce electricity in such manner, but the question then became “which options are feasible?”

Publication(s):

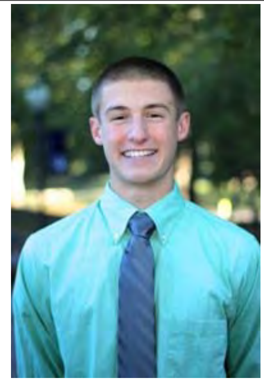
1. Material on **www.OilfieldBasics.com**

Congressional District: 6th

Congressional Representative: Bill Johnson

Marietta College

Johnathan L. Kungle



Status: Junior, Petroleum Engineering

Research Topic: Platform Decommissioning: Alternatives for Offshore Operators

Advisor(s): Professor Craig Rabatin

Biography: Johnathan is a Junior Petroleum Engineering major at Marietta College, also pursuing an Engineering Leadership Certificate through the McDonough Leadership Program. He is the President of Energy Business Alliance, a simulated company giving students relevant industry experience through projects and field trips. Johnathan is also the President-Elect of Marietta College's chapter of the Society of Petroleum Engineers. He is currently serving in his second year as a Resident Assistant. Johnathan has always excelled in math and science, and he likes to travel and see new places. These qualities are what led him to this field as it seemed to be the perfect combination of engineering and excitement for him. He spent last summer in Houston, Texas, working as a Drilling Engineering Intern in Chevron's 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

Marietta College

Reannah N. Rymarz

Status: Senior, Petroleum Engineering

Research Topic: The Future of Geothermal Energy

Advisor(s): Professors Ben W. Ebenhack and Craig Rabatin

Biography: Reannah Rymarz is a Senior at Marietta College pursuing a Bachelor of Science Degree in Petroleum Engineering. Reannah graduated from North Harford High School in Pylesville, Maryland, in 2015. She chose to pursue petroleum engineering after discovering her love of geology as well as the incorporation of challenging calculations and problem solving. Reannah works on campus at Marietta College at the Career Center, as a tutor and a Resident Assistant. She also is an active member of Energy Business Alliance, a club on campus that simulates an oil and gas company focused on making venture capital decisions in the energy systems market. Additionally, Reannah serves as the Vice President of Society of Woman Engineers. After graduation Reannah will be moving to Bakersfield, California, to work as a drilling engineer for Chevron.

Abstract: In a dynamic world of continuous technological improvements, the energy industry is no exception. As energy demands change, so must the methods of cultivation. Geothermal methods are becoming increasingly utilized, creating a need for research into feasibility on a larger scale. Recent studies have investigated the application of geothermal energy production as a long term, large scale, sustainable resource. Geothermal energy is respected as a widely available and useful method of energy generation. This study evaluates the current and future applications of geothermal energy methods and how technology plays an important role in the evolution of the process.

Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

Miami University

Justin C. Demus

Status: Junior, Electrical Engineering

Research Topic: MOSFET Junction Temperature Measurements based on Conducted Electromagnetic Emissions

Advisor(s): Dr. Mark J. Scott

Biography: Justin Demus is currently enrolled in a combined B.S./M.S. Degree Program for Electrical Engineering at Miami University in Oxford, Ohio and plans to pursue a Ph.D. in Electrical and Computer Engineering. Justin grew up in Erie, Colorado, graduating Summa Cum Laude from Peak to Peak Charter School. Starting at a young age, he was fascinated by computer and radio technology. Finding an interest in mathematics and the physics of electrical circuits in high school, he decided to pursue electrical engineering at Miami University. Early in his studies, Justin was drawn to the study of power electronics and began to pursue research experience in the Miami Power and Energy Research Laboratory. His current research serves as the basis for his Senior Design Project and will be developed further for use in a Master’s Thesis in 2019. Justin plans to attend graduate school to obtain a Ph.D. in Electrical Engineering, furthering his studies in power electronics and machine learning.

Abstract: As the electric vehicle transportation industry grows, more precise and effective diagnostic methods are required to reduce the maintenance costs that arise from inefficiencies in existing test procedures. In the context of aircraft electrical systems, preventative maintenance and false diagnostics lead to unnecessary replacement of equipment, inflating maintenance costs drastically. These situations apply to other vehicle transportation industries as well. More reliable and accurate diagnostic procedures can be implemented by analyzing the spectrum of electromagnetic interference in a circuit to determine the “health” of equipment under test. This research seeks to determine the junction temperature of a MOSFET device in a buck converter using EMI-based diagnostics. Machine learning algorithms will determine a model for relating EMI to the temperature dependent characteristics of a MOSFET device, allowing for the determination of junction temperature without interruption of device operation and without altering system performance.

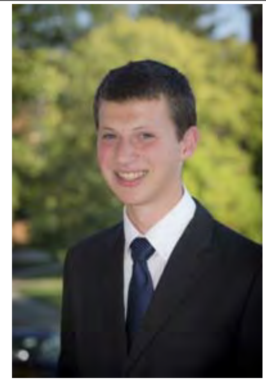
Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

Miami University

Kyle A. Weaver



Status: Senior, Chemical Engineering and Biochemistry

Research Topic: Characterization of the Indentation and Pulse Properties of Vein-Inserted Magnetorheological Elastomers for use as Skin Models

Advisor(s): Dr. Jeong-Hoi Koo

Biography: Kyle Weaver is a Senior at Miami University double majoring in Chemical Engineering and Chemistry. During his time at Miami, he has had the opportunity to get involved in a wide variety of organizations- he has played trombone in the Miami University Marching Band, served as the treasurer and president of Tau Beta Sigma, been an active member of Tau Beta Pi, and was selected to participate in the Lockheed Martin Leadership Institute. He has a strong passion for materials, working in three on-campus labs studying different classes of materials- smart materials, polymeric materials, and adsorbents. Outside of Miami, Kyle has had two internship opportunities that have allowed him to develop his engineering skills and learn more about the industries he would like to pursue.

Abstract: Modeling skin is a difficult process due to the complexity of its structure. This research has two major components: 1) the development of a magnetorheological elastomer (MRE) skin model capable of replicating the age-dependent material behavior of human skin and 2) the development of a relatively transfer function able to account for the dissipative effect of skin to arterial pressure. For the first research objective, various indentation tests were done on MRE samples ranging from 0 to 80% iron by weight in order to note the hysteric effects and modulus trends of the model to compare against that of in-vivo skin. The ultimate goal of this research is to create a single skin model capable of behaving as each age group based on the applied magnetic fields. The second research objective involves more complex skin models and a cam system to generate human pulse waveforms. The pressure of the waveforms is then recorded using an air pressure sensor connected directly to the pressure generator and the pressure felt by an indenter pressing on a skin model. The differences in the noted pressures is representative of the dissipative effects of the skin, quantified by the augmentation index and other parameters. This research hopes to create a model capable of measuring blood pressure based solely on the pressure experienced by a small indenter pressing on skin above a vein. This model could then be integrated into wearables to take consistent and accurate blood pressure measurements without requiring constriction.

Publication(s):

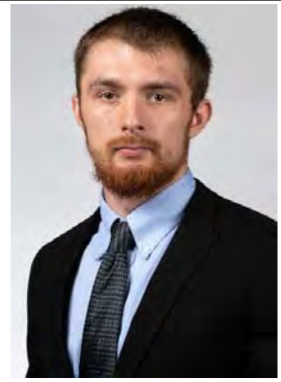
1. Pierce N. Kurek, Alex J. Kloster, Kyle A. Weaver, Rodrigo Manahan, Michael L. Allegrezza, Nethmi De Alwis Watuthanthrige, Cyrille Boyer, Jennifer A. Reeves, and Dominik Konkolewicz, How Do Reaction and Reactor Conditions Affect Photoinduced Electron/Energy Transfer Reversible Addition–Fragmentation Transfer Polymerization? *Industrial & Engineering Chemistry Research* 2018 *57* (12), 4203-4213, DOI: 10.1021/acs. iecr.7b05397.

Congressional District: 8th

Congressional Representative: Warren Davidson

Ohio Northern University

Nathaniel M. Payne



Status: Senior, Mechanical Engineering

Research Topic: Cant Angle Effect on Winglet Performance

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

Biography: Originally from Upper Sandusky, Ohio, Nate Payne is a Senior at Ohio Northern University majoring in Mechanical Engineering. Nate is involved with AIAA and the SAE Aero Design competition at ONU. As design lead, he coordinates the design and construction of the overall plane and acts as team lead for the wing. Nate enjoyed providing guidance as peer mentor within the college to freshmen as well. Outside of engineering, he is involved with the preforming arts department working in the scene shop and as stage manager for events. His work experience includes working as an intern at Varo Engineers during the summer of 2018 and he completed two internships at Marathon Petroleum during the summers of 2016 and 2017.

Abstract: Winglets are angled extensions from wing tips, used in many aircraft to improve performance. The performance of the wing is improved with the winglet by reducing induced drag due to wing tip vortices. Winglets also improve the lift to drag ratio of the aircraft. This improved performance results in cost savings for airline companies. The angle the winglet makes with vertical is referred to as the cant angle. A CFD analysis was performed to study the effects of the cant angle on the performance of the wing. The lift to drag ratio and the wing tip vortices will be observed and compared between the various geometries.

Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

Ohio Northern University

Mallory L. Taylor

Status: Junior, Mechanical Engineering

Research Topic: How Camber and Angle of Attack Impact Drag and Lift of NACA Airfoils

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

Biography: I am a Junior at Ohio Northern University (ONU) studying Mechanical Engineering with an honors concentration. I am heavily involved on campus in multiple organizations such as Society of Women Engineers, Joint Engineering Council, and Delta Zeta Sorority.

I had the chance to intern over the summer at Airstream in Jackson Center, Ohio and was able to participate in multiple projects which allowed development of engineering skills which will be needed in the future. On campus, I work as a robotics lab assistant in the mechanical engineering department and as a tutor for the college of engineering.

Abstract: The drag and lift on NACA airfoils between airfoils that had camber and airfoils that did not have camber were determined and compared. The selected non-cambered airfoils were the NACA 0012 and 0015, and the corresponding NACA 2412 and 2415. Conclusions were drawn regarding the effect of camber on the performance of these selected NACA four-digit airfoil shapes.

The drag and lift were also compared using the same four airfoils, but this time varying the angle of attack. Lift and drag values, as well as the pressure distributions, were compared between the airfoils over a range of angles of attack. A summary was provided regarding the effect of angle of attack on cambered and non-cambered airfoils.

Publication(s): None yet.

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

Ohio Northern University

Carly G. Waugh

Status: Senior, Mechanical Engineering

Research Topic: Observing the Effects of Airfoil Alteration on Flight Parameters

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

Biography: My name is Carly Waugh, and I am a Senior Mechanical Engineering Major at Ohio Northern University. Originally, I am from New Philadelphia, Ohio. I began my engineering pursuits at New Philadelphia High School my freshman year through the Project Lead The Way program and I have been on the engineering track ever since.

During my time at Ohio Northern, I have had the opportunity to be involved in numerous student organizations, including Club Women's Ultimate Frisbee, Orientation Leaders, Dean's Team, and Peer Mentor. I have also completed four summer internships during my collegiate career.

Abstract: Airfoils are the curved cross sections of aircraft wings that are designed to give the aircraft the most favorable lift to drag ratio. The subject of this paper is to explore the effects of altering geometric characteristics of modified NACA 4-digit airfoils on various flight parameters. The airfoil computer models were "built" using the DesignFOIL software, and then the maximum thickness and maximum thickness location was altered. Calculations were performed within DesignFOIL on the modified airfoil shapes to determine the effects of these alterations on the maximum coefficient of lift, zero-lift drag coefficient, and the maximum lift to drag ratio. Comparisons were made between the various configurations.

Publication(s): None yet.

Congressional District: 7th

Congressional Representative: Bob Gibbs

Ohio University

Erica M. Custer

Status: Senior, Exercise Physiology

Research Topic: Cortical Bone Mechanics Technology and Quasi-Static Mechanical Testing Sensitivity to Bone Collagen Degradation

Advisor(s): Dr. Anne B. Loucks

Biography: Erica is from Hilliard, Ohio, and was drawn to Ohio University's Honors Tutorial College, beautiful campus and vast research opportunities. While working in numerous research labs, she discovered her passion for problem solving, human physiology and biomechanics. Working on her thesis in Dr. Loucks' lab combined all of these interests and helped Erica develop autonomous research skills. She hopes to attend graduate school next year to continue her education in biomechanics.

Abstract: Presently, there is no way to measure bone strength in living people. The gold standard for measuring bone strength, Quasi-static mechanical testing (QMT), quantifies bone stiffness and strength on bone that has been excised from the body. Cortical Bone Mechanics Technology (CBMT) is a technology being developed at Ohio University that measures the mechanical properties of cortical bone, including bone stiffness, in living people. Bending strength can then be calculated.

The quality and interaction between the bone mineral and the organic matrix are what make up the mechanical properties of the bone. The organic matrix is made of approximately 90% collagen. Potassium Hydroxide (KOH) can cause collagen degradation in bone while leaving the bone mineral unaffected. In this research project, I compared CBMT and QMT measurements of bone stiffness before and after human cadaveric ulnas were immersed in KOH. Matched ulnas from the same donor were immersed in saline as a control. This study will determine whether CBMT accurately measures bone stiffness changes with advanced collagen degradation compared to QMT. The validation of CBMT could lead to more accurate measures for predicting bone fracture risk in clinical populations.

Publication(s): None yet.

Congressional District: 15th

Congressional Representative: Steve Stivers

Ohio University

Sarah M. Warnock

Status: Senior, Biological Sciences

Research Topic: CBMT and DXA Sensitivity to Bone Collagen Degradation

Advisor(s): Dr. Anne Loucks

Biography: Sarah Warnock is a Senior in the Honors Tutorial College at Ohio University pursuing her Bachelor's degree in Biological Sciences with a minor in Sociology. She is currently completing her senior thesis comparing the capabilities of Cortical Bone Mechanics Technology and Dual X-Ray Absorptiometry to detect changes in nonmineral parameters of bone strength. Sarah is a member of the osteopathic medical organization Pre-SOMA, as well as Athens HOPE, a community public health initiative addressing the opioid epidemic in the region. She plans to graduate in May, 2019, and begin medical school in the Fall.

Abstract: Osteoporosis a disease associated with risk of fracture, decreased quality of life, and increased mortality and morbidity. The current diagnostic standard of care for assessing fracture risk is Dual X-Ray Absorptiometry (DXA), which assesses bone mineral density. However, assessing only bone mineral ignores many other important nonmineral strength determinants and thus this method is a poor predictor of fracture risk and bone integrity. It is therefore imperative to find a technology that incorporates these nonmineral strength determinants such as the bone's size, geometry, microarchitecture, and organic collagen matrix.

Cortical Bone Mechanics Technology (CBMT) is a noninvasive, dynamic three-point test that measures bone stiffness. As a mechanical test, it may be able to assess changes in the nonmineral contributions to bone strength that DXA cannot detect. To test this, matched sets of human cadaveric ulnas were incubated in either saline solution or 1M KOH, which is believed to denature the collagen matrix in bone tissue while leaving the mineral content unaffected. The matched sets were assessed by CBMT and DXA both before and after incubation and their respective abilities to detect decrease in bone strength assessed.

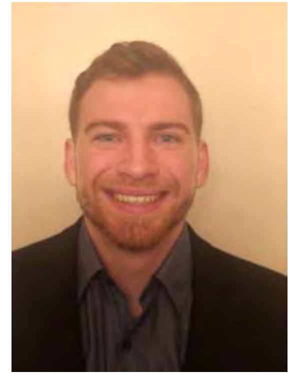
Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

The Ohio State University

Collin J. O'Neill



Status: Senior, Aerospace Engineering

Research Topic: Active Flow Control in Compact Inlet/Diffuser Model of Next Generation Tactical Aircraft

Advisor(s): Dr. 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 is currently in his senior year at The Ohio State University (OSU) pursuing a Bachelor's and Master's degree in Aerospace Engineering through the BS/MS dual degree program. 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 is on the executive board of Sigma Gamma Tau, the Aerospace Honorary at OSU.

Abstract: The next generation of tactical aircraft are expected to use serpentine inlet ducts. While this compact, offset shape reduces radar cross section, increases the integration of the propulsion system, and improves the thrust to weight ratio, it also introduces a variety of problems. The main problems are a total pressure loss and the development of secondary flow structures at the aerodynamic interface plane (AIP). These problems translate into reduced engine performance and shorter life for the engine turbomachinery components. These negative effects reduce the performance and longevity of the entire aircraft. Recent experiments have suggested that the negative aerodynamic effects associated with an offset inlet may be mitigated through the use of plasma actuators. These actuators, called localized arc filament plasma actuators (LAFPAs), have been used successfully for flow control in several high-speed and high-Reynolds number flows (Samimy et al. 2018). The low power use, scalability, and precise control 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): None yet.

Congressional District: 14th

Congressional Representative: David P. Joyce

The University of Akron

Steven H. Innocenzi

Status: Junior, Biomedical Engineering

Research Topic: Octaworm (Semi-Rigid Robotics)

Advisor(s): Dr. Daniel C. Deckler

Biography: Steven Innocenzi is a 3rd year undergraduate student at The University of Akron and is currently studying Biomedical Engineering specializing in Biomechanics. He began working on this project in the fall after Dr. Deckler contacted him with the opportunity. The project began in South America several years ago and was brought back to The University of Akron to improve its design. Steven has always had an affinity towards problem solving and has joined the Biomedical Engineering Design Team to continue his interest in making a difference that will affect lives for the better.

Outside of engineering, Steven is an officer for The University of Akron Bowling Club and a member of the Tournament Team. He has volunteered for the Akron Trunk or Treat event throughout his college career and participates in several intramural sports. He works part time for a local electric company and will begin working for his first Co-op rotation this spring in Cuyahoga Falls.

Abstract: Pipe inspection is a common practice that occurs in all fields of industry and must be completed efficiently and cost effectively. The goal of the project is to modify an existing semi-rigid robot so that it can traverse pipes and execute turns of any degree when needed. The design is being completed with 3D printed parts to keep cost low and allow easy adjustability to the design. A library of executable turns will be constructed that can be indexed into in order to perform the right series of commands to traverse the pipe. The overall size of the robot can be adjusted by switching the actuators out with ones that possess a different stroke length. This design will allow pipe inspection to occur in hopefully any direction of motion and at most sizes of industrial piping at a relatively low cost.

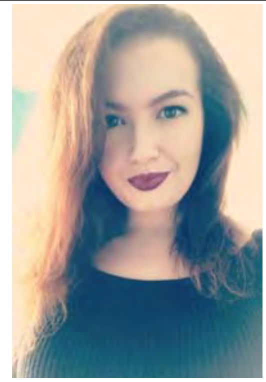
Publication(s): None yet.

Congressional District: 14th

Congressional Representative: David P. Joyce

The University of Akron

Madelyn P. Jeske



Status: Senior, Chemical Engineering

Research Topic: Increasing Mechanical Properties of a Double-Network Hydrogel From Agar and N-Hydroxylethyl Acrylamideon

Advisor(s): Dr. Jie Zheng

Biography: Madelyn is currently a Senior in Chemical Engineering at The University of Akron while minoring in Biotechnologies and Business. On campus, she has had the pleasure of working in Dr. Jie Zheng's Biomaterials and Biophysics lab, as well as Dr. Jiahua Zhu's Intelligent Composites lab. Through the department she has also been a supervisor for our Project Management and Teamwork course, overseeing projects in extracting oil from sand, removing lead from water, and creating an efficient cold brew coffee process. Madelyn has been able to showcase her engineering and teamwork skills by becoming a co-op at Meggitt Aircraft Braking Systems for their Applied Research and Technology (AR&T) department in carbon braking systems.

Outside of her academics and career, Madelyn enjoys participating in service and leadership projects with my co-ed fraternity, Alpha Phi Omega. In September 2018, she was the winner of my subdivision for the Oktoberfest 5k in Cleveland and has participated in many other races.

Abstract: Hydrogels are a soft material consisting of three-dimensional networks comprised mainly of water and have become applicable in the medical industry for usage; however, they tend to be weak and brittle. Double-network hydrogels have shown promise in the field of having advanced mechanical properties with a tensile stress of 1-10 MPa, a tearing fracture of 102-103 J/m2, and a compression capacity of 17.2 MPa. The double-network hydrogel of interest for this study is of a physically cross-linked first network and a second chemically cross-linked. Agar was selected for the first, physically cross-linked network due to thermo reversible properties with N-Hydroxylethyacrylamide (HEAA) as the second with cross-linked methylenebisacrylamide (MBAA). A photoinitiator, HMP, was selected as well for chemical cross-linking under UV light. All reagents will synthesize a hydrogel by the one-pot method; an efficient process that will require 1.5 hours and minimal labor. Samples will be cut into equivalent sizes and shapes to undergo tensile, compression, and tearing testing. The composition of the reagents will be evaluated based upon analysis of mechanical properties by the proposed methods. The hope is that these results will further the understanding of the fundamentals of double network hydrogels that can be used for future medical applications.

Publication(s):

1. Mehra, N.; Madelyn J.; Li, Y.; Li, J.; Kashipour, M.; Zhu, J., Engineered thermal interfaces for enhanced thermally conductive polymer composite via supramolecular chemistry (SUBMITTED).
2. Mehra, N.; Madelyn J.; Kashipour, M.; Li, Y.; Zhu, J., Thermally Conductive, Optically Transparent and Highly Elastic polymer composite with non-conventional hybrid fillers (TO BE SUBMITTED).

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

The University of Akron

Liam M. Omer

Status: Senior, Biomedical Engineering

Research Topic: Hyaluronan Conjugate Drug Delivery

Advisor(s): Dr. Yang Yun

Biography: Growing up in a large family with seven aunt and uncles on my father's side and seventeen on my mother's, family events have always been a very memorable part of my childhood. At the age of five, I was already learning the inner workings of building homes as I spent every weekend helping my father and my family build my grandparents' home. My father always found one of the easier jobs so that I was able to take part in the process of building. No matter the question, my dad always had an answer to why we were putting the house up in a certain way. No matter the day, I was always finding a question to find out more about the inner workings of the house that was being brought up around me.

I personally believe the experience of building my grandparents' home is what shaped me into a researcher. It gave me the foundation to ask countless questions and the resources to answer all of them. At the age of five, I had learned the value of knowledge and consistent hard work. With a new found quest for knowledge started in home construction, I was excited to learn the inner workings of everything in my surrounding world. How did cars, dirtbikes, computers, microwaves all work? As I began to grow and learn more, my questions became more and more complex.

Today, the questions I ask are based on cancer and aging.I work in the Olson Research Laboratory under Dr. Yang Yun. Under Dr. Yun's guidance, I am working toward creating more effective solutions to cancer treatment. Using hyaluronan-conjugates as a selective drug delivery for chemotherapeutics, we can lower side effects common to current cancer treatments.

Abstract: The induction of nanomedicine has created an entire new mindset in the way that we approach medicine. Our ability to diagnose, treat, and prevent disease in patients is revolutionized by the ability to augment our medicine to selectively target areas of the body. Hyaluronan, a hydrophilic, linear polysaccharide is a polymer naturally produced in cellular scaffolding of human tissues. This polymer is a reliable delivery system for chemotherapeutics and hydrophobic materials.

The successful conjugation of hyaluronan with a hydrophobic chemotherapeutic allows for the targeted delivery of hydrophobic drugs that bind more aggressively to cancer cells that possess upregulated receptors such as CD44 and RHAMM. This conjugation will also reliably dissolve within an aqueous solution without the use of potentially toxic organics solvents such as DMSO. The higher affinity to cancer cells and effective delivery offers a promising alternative to current chemotherapeutics with lower probability of side effects induced by the toxic components of treatment.

Publication(s): None yet.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

The University of Toledo

Zachary J. Buchman

Status: Junior, Electrical Engineering

Research Topic: Investigating the Role of Commercial-of-the-Shelf Products in CubeSat Development

Advisor(s): Dr. Richard Molyet

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 the NASA Glenn Research Center. I have since completed two 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: Commercial-off-the-shelf (COTS) technologies have become trendy options in the world of CubeSat development. The technologies are gaining popularity because of their standardization, modularity, readiness, thorough documentation, and cost-effectiveness. Additionally, because CubeSats are often developed by students, an already-existing option is favorable and allows for simple "plug and play" of a subcomponent into a larger overall design for the mission at hand. Many CubeSat efforts seek not to reinvent the wheel and embrace the use of proven technologies to accomplish their missions, allowing them to focus on the specific task or experiment at hand.

Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

Derek K. Messer

Status: Senior, Mechanical Engineering

Research Topic: Exfoliating 2D Nanomaterials Using Compressible Flows

Advisor(s): Dr. Reza Rizvi

Biography: Derek Messer is a Senior at The University of Toledo and is graduating with a Bachelor of Science degree in mechanical engineering. He has been involved on campus as president of the cross country/ track and field club. He has also held leadership positions in Tau Beta Pi, the engineering honors society. As part of the mandatory co-op program, Derek completed his rotations at Norplas Industries in the Advanced Product Quality Planning department. Upon deciding to pursue research, Derek joined Dr. Rizvi's team in the Polymer & Inorganic Composites, Structures and Surfaces Lab. His focus in the group is exfoliating two-dimensional nanomaterials. Derek hopes to continue his education into graduate school, where he seeks a Ph.D. in Aerospace Engineering.

Abstract: Over the past decade, various methods have been looked at to develop graphene based two-dimensional (2D) materials to harness their excellent and unprecedented properties. However, these methods can be very time consuming and introduce significant amount of defects. Our study is designed to compare the flake quality between our new compressible flow exfoliation (CFE) and the previously investigated processes like sonication. In CFE, 2D layered materials are rapidly jettisoned through a small orifice using high-pressure gases without the need for any time-based treatment.

This new fast and continuous process could broaden the applications for graphene. This zero bandgap material is strong, lightweight, flexible, and transparent. Therefore, CFE produced graphene could be used in conductive ink for the purpose of flexible electronics

Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

The University of Toledo

Joshua B. Steiner

Status: Senior, Chemical Engineering

Research Topic: Carbon Dioxide Microenvironments for Improved Conversion to Methanol

Advisor(s): Dr. Ana C. Alba-Rubio

Biography: Joshua Steiner is a Senior student at The University of Toledo and will graduate with a Bachelor of Science Degree in Chemical Engineering, a minor in Chemistry, and a minor in Business Administration in December of 2019. He is involved in multiple organizations on campus, some of the most prominent being Omega Chi Epsilon (a Chemical Engineering honors society) and the Society of Plastics Engineers. Josh has also completed three co-op rotations at the Toledo Refining Company, where he has worked in the Process Engineering Department, Environmental Department, and Process Safety Management Department. Upon graduation, Josh plans to pursue a career as a Process Engineer, with plans to go back and further his education by getting both his Master of Business Administration and his Master's Degree in Chemical Engineering.

Abstract: Carbon dioxide (CO_2) is one of the primary causes of global warming. Catalytic conversion of CO_2 to chemicals and fuels is more desirable than sequestration, since products of CO_2 are value-added. Specifically, capture and conversion at the exhaust of combustion (e.g. industrial smoke stacks) provides the most promise. This project focus on the development of dual functional materials able to capture CO_2 at the surface of the catalyst for efficient hydrogenation to methanol: $CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$. This approach could eliminate current energy intensive and corrosive capture and storage processes, while producing an important commodity chemical.

Publication(s): None yet.

Congressional District: 5th

Congressional Representative: Robert E. Latta

University of Cincinnati

Amanda M. Miller

Status: Senior, Mechanical Engineering

Research Topic: Development of a Sensor Frame Based Gait Assessment Device for the Sit-to-Stand Transition

Advisor(s): Dr. Kelly Cohen

Biography: Amanda is currently in her fifth year at the University of Cincinnati pursuing both a Bachelor's Degree and Master's Degree in Mechanical Engineering through the ACCEND program (Accelerated Engineering Degree Program). While at the University of Cincinnati, she has participated in the Co-op Education Program, where she has spent four semesters working for Siemens PLM Software. During the summer of 2015, she also participated in the WISE Program (Women in Science and Engineering), where her eyes were opened to how technology could help people live normally through research towards developing an active exoskeleton for the sit-to-stand transition.

Abstract: As of 2013, there are 40 million people over the age of 65, and it is projected to continue increasing in the coming years, resulting in more and more people needing assistance with the activities of daily living, including the sit-to-stand motion. This motion is a key factor to one's independence, as it is the beginning and ending action for moving from one place to the next, and is involved in many other basic tasks, such as getting out of bed and using the restroom. This work presents the process of developing a sensor fame to collect and predict the user's movements for the sit-to-stand transition. This includes recording the motion for the sit-to-stand transition, analyzing the forces along the plane located at the bottom of the feet, and interpreting the data to determine the proper movements of the pilot.

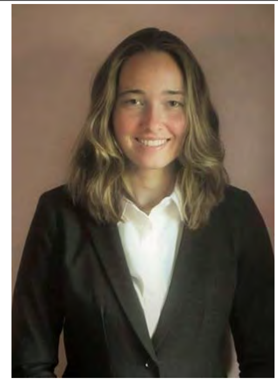
Publication(s): None yet.

Congressional District: 12th

Congressional Representative: Troy Balderson

University of Cincinnati

Lynn K. Pickering



Status: Junior, Aerospace Engineering

Research Topic: Fuzzy Logic based 2-Player Tetris

Advisor(s): Dr. Kelly Cohen

Biography: Lynn is a Junior in Aerospace Engineering at the University of Cincinnati. She has co-oped at Gulfstream Aerospace for two rotations, and will interning at BMW in Munich, Germany for the next two semesters 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 Co-President of Fly UC, a student group attempting to rise to the challenge of the Go-Fly Boeing competition. 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. After the game was played repeatedly, input functions and rules were created and iterated upon using identified faulty decisions from previous runs. The Fuzzy Logic Tetris Player scores similarly to a beginner Tetris Player. In a two-player game the Fuzzy Logic Tetris Player shows its strength in the upper levels due to its faster decision making than the human but shows its weakness on the earlier levels when the human player can use the extra time to make better decisions. Because of the complexity added by any further inputs, a Genetic Algorithm would be needed to train the inputs, membership functions and rules to achieve a higher level for the Fuzzy Player.

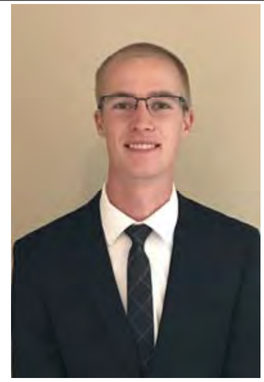
Publication(s): None yet..

Congressional District: 2nd

Congressional Representative: Brad R. Wenstrup

University of Cincinnati

Austin M. Wessels



Status: Senior, Aerospace Engineering

Research Topic: VertiCat: Custom VTOL Platform

Advisor(s): Dr. Kelly Cohen and Dr. Manish Kumar

Biography: : I am currently a Senior in Aerospace Engineering at the University of Cincinnati. While in high school, I started flying model airplanes and helicopters as a hobby. Anyone who has flown remote control vehicle knows crashing is part of learning. The important lesson to learn is to rebuild and fly again. I was able to learn basic concepts of lift, thrust, balance, and control. After a year in this model aviation hobby, I had to choose an area of study for my college career. Aerospace Engineering was a natural choice. I wanted to learn how such a simple shape as an airfoil had such an amazing effect as to lift my plane into the sky. While at the University of Cincinnati I am learning the fundamentals and theory behind the flight of these aerial vehicles.

More recently, I have been co-oping in the UAV Master lab under Dr. Cohen. I have worked to integrate ADS-B technology on small unmanned aerial systems. Also, I have had the opportunity to teach an undergraduate course on the construction and flight testing of small unmanned aerial vehicles. Some of my other work includes aerial mapping and inspection. Through these recent flight mission profiles, I have seen a need for a transitional vertical takeoff and landing (VTOL) platform.

Abstract: The goal of this project is to design, build, and test a custom transitional vertical takeoff and landing (VTOL) small unmanned aerial system (sUAS). Multirotor sUAS are notoriously inefficient, while fixed-wing sUAS cannot operate in the same confined area as a multirotor. These vehicle limitations restrict the mission parameters of each individual platform. A transitional VTOL is intended to be a middle ground between a multirotor and a fixed-wing. There are a variety of transitional VTOL sUAS designs on the market with different methods for takeoff and landing. The quadplane style of transitional VTOL is the focus of this research and will show the advantages and disadvantages of a transitional VTOL compared to its multirotor and fixed-wing counterparts.

Publication(s):

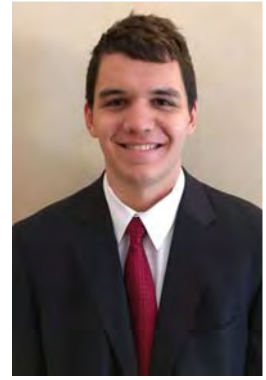
1. Wessels, A., “Variable Pitch Quadcopter Flight Control,” Ohio Space Grant Consortium Symposium, March, 2018.

Congressional District: 1st

Congressional Representative: Steve Chabot

University of Dayton

Shane T. Kosir



Status: Senior, Mechanical Engineering

Research Topic: Improvement in Jet Aircraft Operation with the Use of High-Performance Drop-in Fuels

Advisor(s): Joshua S. Heyne

Biography: Shane Kosir is currently a Senior undergraduate student at the University of Dayton working toward his Bachelor of Mechanical Engineering degree. His passion lies in sustainability and the environment. He began working at the University of Dayton HEAT Lab in the spring of 2018 and has had the opportunity to do research related to jet fuel performance optimization which he presented at the AIAA SciTech conference in San Diego. A future goal is to become involved in research related to biomass conversion technology that can provide a renewable alternative to conventional fuel. Beyond engineering, Shane plays drums in the university jazz band and participates in the campus Habitat for Humanity chapter. After graduation, he will pursue a M.S. in Renewable and Clean Energy.

Abstract: If the current rate of global warming continues, the world will reach a temperature of 1.5°C higher than pre-industrial levels by 2040. This level of warming would result in greater food shortages, a higher likelihood of deadly heat waves, and an increase in forest fires. High performance fuels (HPF) provide an alternative energy source that could help negate climate change and allow airlines to grow sustainably by producing significantly less greenhouse gas emissions than conventional fuels via reduced aromatic concentration. As aircraft account for 9% of US transportation-related greenhouse gas emissions, the impact that HPF could have is significant. In addition to its environmental impact, conventional jet fuel contributes significantly to airlines' annual expenses, totaling close to 135 billion dollars or 19.1% of total operating cost globally in 2016. High performance fuels have the potential to mitigate fuel cost by reducing the amount of fuel required to complete flights, increasing the number of allowable passengers or cargo on a flight, and by increasing the range of an aircraft, allowing airlines to add new flights and generate additional revenue. The goal of this study is to bound the performance and economic benefits that airlines can expect from HPF created from bio-derived molecules as well as molecules from other sources. Three approaches were taken to bound HPF economic benefits: identifying and calculating properties of bio-derived molecules with HPF characteristics via quantum chemistry methods, using ant colony optimization to determine blends of conventional and strained molecules that meet HPF specifications, and simulating flights to correlate HPF performance increases to economic benefits for airlines.

Publication(s):

1. S. T. Kosir, L. Behnke, J. S. Heyne, R. D. Stachler, G. Flora, S. Zabarnick, A. George, A. Landera, R. Bambha, R. K. 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. T. Kosir, L. Behnke, R. D. Stachler, J. S. Heyne, S. Zabarnick, M. Gupta, "Properties Calculator and Optimization for Drop-in Alternative Jet Fuel Blends," AIAA SciTech Forum, 2019.

Congressional District: 14th

Congressional Representative: David P. Joyce

University of Dayton

Katherine C. Opacich

Status: Senior, Mechanical Engineering

Research Topic: Analyzing the Relative Impact of Spray and Volatile Fuel Properties on Gas Turbine Combustor Ignition in Multiple Rig Geometries

Advisor(s): Dr. Joshua Heyne

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 is involved in the National Jet Fuels Combustion Program (NJFCP) and their mission to help streamline the certification process of alternative jet fuels. As a part of this program, Katherine focuses on analyzing the relative impact of spray and volatile fuel properties on gas turbine combustor ignition. She has presented her research at the Dayton Engineering Sciences Symposium and at the 2019 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 student ambassador for GE Aviation. She is also the recipient of the Martin C. Kuntz, 1912 Award of Excellence to the Outstanding Junior in Mechanical Engineering.

Abstract: Implementing alternative fuels into the aviation market involves an extensive certification process due to their novel properties and correspondingly unique combustion performance characteristics. The current certification process is not only costly, but time intensive. As a result, the National Jet Fuels Combustion Program (NJFCP) has made it their mission to streamline the approval process of alternative jet fuels by bounding the combustion performance characteristics of alternative fuels to those of conventional fuels. Historically, the impact of alternative fuels on ignition performance, i.e., altitude relight and cold start, for extreme conditions and fuel properties was only moderately explored. Previous research from Lefebvre et al. shows fuel spray atomization as having a strong influence on ignition behavior. The fuel properties of density, viscosity, and surface tension control spray atomization characteristics. In contrast to Lefebvre's findings, recent statistical results reported previously show that the distillate or volatile properties of a fuel largely affect ignition behavior. These differing results present the question: Are the spray or volatile properties of a fuel more important in predicting relative ignitibility? The aim of this research is to utilize statistical analysis techniques to establish a model and qualitative ranking that accurately conveys the impact that a fuel's spray property characteristics have on ignition probability for both cold start and altitude relight Figures of Merit. It is anticipated that this work will be applied toward guiding future computational fluid dynamic (CFD) modeling targets, evolving the gas turbine combustion community's understanding of dominating physics in gas turbine ignition, and finally, defining the properties that are most important for the early screening of alternative jet fuels in the certification process. The results exhibit that a fuel's surface tension is a better predictor of fuel ignitability at higher temperatures, in contrast to previous results, while viscosity has a greater impact at lower temperature. Rankings between the Honeywell APU and the Referee Rig are nearly consistent for similar conditions. The implications of this and other work suggests that a generic Referee Rig is capable of screening fuels for a multitude of geometries, and that surface tension may need to be a future specification property for the approval of alternative fuels.

Publication(s):

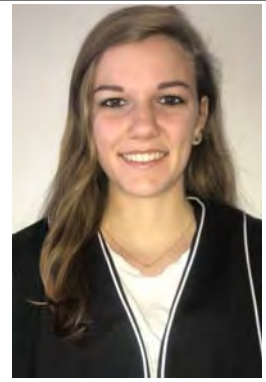
1. Opacich, K. C., Heyne, J. S., Peiffer, E., and Stouffer, S. D., "Analyzing the Relative Impact of Spray and Volatile Fuel Properties on Gas Turbine Combustor Ignition in Multiple Rig Geometries," AIAA Science and Technology Forum, 2019, pp. 1–10.

Congressional District: 14th

Congressional Representative: David P. Joyce

University of Dayton

Christina E. Scott



Status: Senior, Physics

Research Topic: Fabrication of Periodic Poled Lithium Niobate for Three-wave Mixing

Advisor(s): Dr. Imad Agha

Biography: Christina Scott is a Senior at the University of Dayton and plans to graduate with a Degree in Physics December, 2019. She is a member of the Society of Physics Students (SPS) and the treasurer of her club lacrosse team. She has worked in the electro-optics labs for about a year now and has two projects she works on. With Dr. Imad Agha she is doing research on the fabrication of PPLN and with Dr. Jay Mathews along with Air Force Research Lab (AFRL), she is doing etch pit density tests on plasma enhanced chemical vapor deposition grown Ge and GeSn on Si. With her background in biology and optometry, Christina would love to work in bio/vision optics in her future.

Abstract: Lithium niobate ($LiNbO_3$, LN) is a ferroelectric crystal used in many nonlinear optical conversions. By periodically poling LN (PPLN) nonlinearities are enhanced for select wavelengths. This is due to the longer interaction length of the crystals in PPLN, instead of sub-mm it increases to a few cm, which produces a crystal with a high degree of effective nonlinearity. Poling LN causes a localized reversal in the direction of the permanent polarization of the crystal (i.e. domain reversal). In this work, we report our efforts towards the development of PPLN using photolithography and applying the bias voltage in a conductive aqueous solution. Ultra-high biased voltages show great promise for fabricating PPLN. The ultimate goal of this work is to use PPLN crystals for three-wave mixing and terahertz (THz) generation.

Publication(s): None yet..

Congressional District: 10th

Congressional Representative: Michael R. Turner

Wilberforce University

Destonee S. Burks

Status: Junior, Biological Sciences

Research Topic: Interaction of 5G Waves with the Human Body

Advisor(s): Jennifer N. Williams, Ph. D. and Nkorne Katte, Ph.D.

Biography: Destonee Burks is an Ohio Space Grant recipient for the 2018-2019 school year. Destonee was born in Dayton, OH, and graduated from Fairmont High School. She now attends Wilberforce University as a junior Biological Sciences major. She is also a member of the Wilberforce Women's Basketball Team. Her appreciation and interest in science, primarily oncology, stems from her early days in grade school with heavy influence from her science teachers. Destonee has always had an interest on the human body, which drove her towards research. She's worked as a lab tech for oncology at the James Cancer Hospital at OSU, and now does research on external effects on the human body. Destonee is on track to pursuing her Master's in Molecular Biology, and hopes to one day become an oncologist scientist in molecular biology.

Abstract: The evolution of cellular phone devices, in the past decade, has raised serious health concerns over the level of radiofrequency waves these devices emit. The signals being sent and received through electromagnetic waves fall between the radio waves and microwave regions of the electromagnetic spectrum and are also known by the term radio frequency (RF). This study seeks to review updated research associated with many of the health concerns raised from the specific interaction of electromagnetic waves that are absorbed in human body tissue. Energy absorption mechanisms and near-field body-antenna interactions were studied at frequencies of relevance for the next generation of mobile communication networks, 5G. Correlation between the frequencies emitted by cellular phone use and the measurement of Specific Absorption Rates (SAR), or the amount of radiation absorbed per mass of tissue within a specific time. In this poster we discuss the use of COSMOL software and the finite element method (FEM) technique are also analyzed to show the propagation of RF waves through human tissue.

Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

Wilberforce University

Cyaira K. Cook

Status: Junior, Mechanical Engineering

Research Topic: Optomechanic Analysis of Micro Mirror Systems

Advisor(s): Nkorni Katte, Ph.D.

Biography: Cyaira Cook is currently a Junior Ohio Space Grant Consortium Scholarship Recipient. She hails from the great city Detroit, Michigan, and started at Wilberforce University in the Fall of 2016. While attending America's First Private HBCU, she has cultivated her love for engineering and received experience in her field while working part-time as an IT Tech Assistant. Her passion and interest are in drafting and research, as she takes on many personal projects throughout the year. Her current involvement on campus includes being Secretary and founding member of NSBE STEM Club and a 2018- 2020 Next Generation Leadership Institute Fellow.

Abstract: The challenge of our current research is to design large aperture MEMs scanning mirrors for Light Detection and Ranging (LIDAR) applications such as in unmanned driving or Unmanned Aerial Vehicle. The current MEMs scanning mirror have a smaller aperture which limits application it can only deflect light at small angles. In this research we show how to engineer new designs for MEMs mirrors with larger aperture to increase the deflection angle while also maintaining at optimal scanning rate. We also show how these MEMs mirrors are incorporated in a holistic optical design for practical systems.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Wilberforce University

Kweisi F. Wilson

Status: Senior, Electrical Engineering

Research Topic: Optimizing Terahertz Wave Emission for Photoconductive Switches

Advisor(s): Nkorni Katte, Ph. D.

Biography: Kweisi Wilson is a native of Baltimore, Maryland. He is a Senior Ohio Space Grant Consortium Scholarship recipient for the 2018-2019 year, and a past OSGC scholar from 2016-2017 year as well. He is currently majoring in Electrical Engineering, with aspirations of building planetary rovers for space exploration. Kweisi Wilson is a member of Clef Society of Distinguished Artists, and has served as the former Mister Wilberforce University for the 2017-2018 Royal Court. Kweisi is a distinguished member of Alpha Phi Alpha Fraternity Inc. Mighty Xi Chapter. He enjoys studying martial arts in his spare time and being a peer mentor on campus. Kweisi leads his legacy with the infamous quote "The time is always right to do what is right" - Martin Luther King, Jr.

Abstract: This research revisits the problem of Terahertz generation with Photoconductive Switches and shows how the output power of Terahertz generation can be improved by carefully controlling, parameters which leads to a heat load within the material. Multiphysics simulations with COMSOL is used extensively to couple the various physical processes taking place, such as wave propagation, Joule effect, and particle concentration. Terahertz technologies will provide new solutions in Medical Imaging, Security, Astronomy, Spectroscopy and Material Characterization.

Publication(s): None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner

Wright State University

Rachel E. Evans

Status: Senior, Mechanical Engineering

Research Topic: Effects of Scan Strategy in Additive Manufacturing

Advisor(s): Dr. Joy Gockel

Biography: Rachel is a Senior Mechanical Engineering Student at Wright State University, where she is an active member of Tau Beta Pi and the Wright State University Honors Program. She grew up in Urbana, Ohio, and attended Graham Local Schools. Along with her schooling, Rachel previously participated in an internship program at Oak Ridge National Laboratory's Manufacturing Demonstration Facility, where she researched the material properties of additively-manufactured polymer composites. In the future, Rachel plans on obtaining her Master's Degree in Mechanical Engineering through the 4+1 Program at Wright State.

Abstract: There are many factors to consider when manufacturing any type of product. In additive manufacturing, many of these factors are a direct result of part defects and microstructural variations that are caused by the scan strategy used to build the part. The existence of defects can be detrimental to the performance and efficiency of the part; however, they are often difficult to predict and detect. In order to gain a better understanding of these occurrences, this project will focus on spatial visualization of values such as temperature distributions and cooling rates in the geometry of parts that are manufactured via laser powder bed fusion. This will be done by using a heat transfer code that utilizes a semi-analytical approach to solve for the temperature at each spatial point as a result of the moving heat source. Additionally, these visualizations will be compared to in-situ experimental results for verification.

Publication(s): None yet.

Congressional District: 4th

Congressional Representative: Jim Jordan

Wright State University

Andrea Gomez-Carrillo

Status: Junior, Biomedical Engineering

Research Topic: Mathematical Modeling for Release Kinetic Prediction of LENVIMA

Advisor(s): Dr. Tarun Goswami

Biography: Andrea Gomez is a Junior 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 five semesters attending university and is a leader in Wright State's S.A.L.T. Athletes in Action Team. Additionally, she enjoys being a teaching assistant for the anatomy program at her school. Outside of academics, Andrea plays collegiate soccer 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 event.

Abstract: In the field of pharmaceuticals, side effects regarding oral medication exposes a major weakness to an otherwise progressive area of study. LENVIMA, a differentiated thyroid cancer drug that inhibits various growth factors, has fifteen serious side effects such as hypertension, renal failure, hemorrhagic events, etc. By analyzing the properties of nano particles used in the manufacturing of LENVIMA, specifically hydroxypropyl methylcellulose (HPMC), mathematical relationships can be made. Additionally, understanding the location of dissolution and its properties such as pH and type of intestinal fluid adds other mathematical relationships. The objective of this research project is to develop a mathematical model specific to this cancer pharmaceutical, in order to make its release kinetics predictable. An additional goal of this research is that the model provides a foundation for an improved universal model for other pharmaceutical drugs. The majority project will consist of rigorous literature review on HPMC properties and its use with numerous drugs, data extraction of HPMC dissolution rates of various drugs and in different mediums, research on current mathematical models present, and a foundation of the drug release process. Once all the data is collected and properties are understood, a mathematical model will be proposed based on curve fittings of the data using MATLAB and all of the properties of release kinetics of HPMC. Finally, ADF and ReaxFF, softwares capable of creating molecules and analyzing their properties during reactions will create experimental data of LENVIMA and be compared to the mathematical model proposed.

Publication(s): None yet.

Congressional District: 2nd

Congressional Representative: Brad R. Wenstrup

Wright State University

Madison M. Jewell

Status: Junior, Neuroscience

Research Topic: Effect of a DNA Methyltransferase Inhibitor in Restoration of H3.3K27M- Induced p16 Repression in Human DIPG Cell Lines

Advisor(s): Dr. Rob Lober

Biography: Maddie Jewell is a Junior 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 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

Youngstown State

Grant A. Wagner

Status: Junior, 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 Junior Mechanical Engineering major at Youngstown State University. At YSU, Grant is an active member of the Honors College and the American Institute of Aeronautics and Astronautics (AIAA) club. Following his graduation in the spring of 2020, he wishes to obtain a master's degree in Aerospace Engineering. His ultimate goal is to work in with research and development portion of designing new air and space craft.

Abstract: As the aerospace industry continues to flourish, new testing methods are needed. One of these recent advancements include the use of Pressure/ Temperature Sensitive Paints (PSP & TSP). These paints allow for a live pressure/ temperature gradient to be developed over the surface of the craft/ model. The paint reacts to the oxygen concentration in the surrounding fluids. When subjected to UV light, the paint will reflect a specific concentration of the light with respect to the amount of pressure/ temperature exerted on an area. With a very high- definition camera, the differing concentrations in the reflected light can be observed and recorded. The goal of the research is to create an apparatus that allows for the calibration between the pressure/ temperature and the observed reflected light to be developed. The apparatus will provide a pressure and temperature- controlled environment, where a painted sample can be tested. Since the relationship between these quantities is linear, the correlation can be interpolated for any observed light concentration for any material.

Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

Youngstown State

Reis L. Zandier

Status: Junior, Chemical Engineering

Research Topic: Production of Flexible Sensors

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

Biography: MReis Zandier is working to complete her Junior 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 women's volleyball team for the past three years. When she is not studying or playing volleyball, as a member of the honors college, she 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

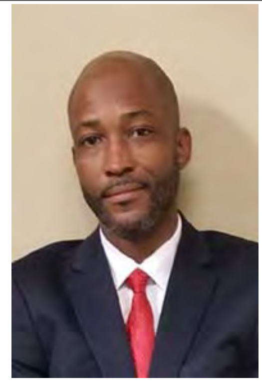
COMMUNITY

COLLEGE

SCHOLARSHIPS

Cincinnati State

Brian M. Brooks



Status: Sophomore, Civil Engineering Technology

Research Topic: Renovating a Historical Building

Advisor(s): Carol Moorman

Biography: I am a 45-year old single parent returning to school to obtain a degree in Construction Management. I have 18 years of construction experience and after serving as a foreman on my last project i decided to return to further my career. My short-term goal is to return to the work force as middle management. My long-term goal is to branch off and start my own construction and remodeling company so that i may secure my daughter's future.

Abstract: Renovating a historical building is a process that starts with contacting the local Historical Society so they may assess how much of the buildings original integrity must be preserved. Your Project Manager should be present at this stage to assist in the process. After which renovation can begin with periodic checks to ensure guidelines are met. The last project I worked on was the historical School of Creative and Performing Arts, now called Alumni Lofts. This building is over 100 years old and used different construction methods. The walls where made of plaster instead of drywall and needed to be repaired and restored. After years of water damage the process was very time consuming but due to its historical title could not be covered. The original floor had to be repaired and restored as well in keeping with the guidelines. We were however allowed to use current construction method to create walls to separate rooms within apartments as well as to create separate units. All other construction was consistent with current practices.

Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

Cincinnati State

Sarah T. Closson

Status: Sophomore, Electro-Mechanical Engineering

Research Topic: Solar Technology Applications

Advisor(s): Lawrence Feist

Biography: My name is Sarah Closson, and I am an Electro-Mechanical Engineering Technology student at Cincinnati State Technical Community College, with a focus in Renewable Technology. I chose this major because I am looking to challenge myself, and have always had a curiosity to find out how things work. I am currently working at Balluff as a Technical Displays Intern, and I plan to continue my Electro-Mechanical Degree at Miami University.

Abstract: With Earth's growing population, access to clean drinking water continues to be a struggle for millions of people. Recent advances in ultraviolet sterilization technology promise an easy and practical way to purify water without the use of harsh chemicals. Harmful and sometimes life-threatening bacteria and viruses such as E.coli, cryptosporidium, giardia, and many others can all be eliminated using concentrated ultraviolet light. Along with better and more efficient solar cells being developed every day, the marriage of these two technologies has the potential to offer clean drinking water to even the most remote places in the world.

My goal is to research how solar powered UV technology can help to kill disease-causing microbes. This study will explore the process of water purification through ultraviolet treatment and emphasize the efficiency of solar powered devices in isolated areas.

Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

Cincinnati State

Kathleen M. Licht

Status: Sophomore, Electrical Engineering Technologies

Research Topic: Self-Sufficient Medical Devices

Advisor(s): Dr. Ralph Whaley

Biography: Kathleen Licht is finishing her Associate of Applied Science Degree at Cincinnati State Technical and Community College in Electrical Engineering Technology-Biomedical Equipment. She is currently participating in a Co-op at Cincinnati Children's Hospital in their Clinical Engineering Department. Kathleen first found her love of science in her high school chemistry and physics courses. Through the years, she started to discover that she loved analyzing how and why technology works and more specifically how medical equipment works. Participating in the Co-op for the first time, it has so far made her realize that this is where she belongs. Kathleen aspires to become a certified technician through AAMI (Association for the Advancement of Medical Instrumentation) and work her way to a specialty in either Imaging Equipment or OR Equipment (Operating Room Equipment).

Abstract: The concept of solar powered devices keeps expanding and the world is now seeing more and more groves of these panels showing up on resident's homes and in fields. The idea of a different power source and starting out in my chosen field has led me to see some errors in the way that hospital equipment is designed, specifically the power sources. Almost all of the medical equipment that is currently in use by hospitals have plugs that need outlets and back-up batteries for when they are not directly connected to a power supply. However, what if the need for plugs and batteries was not there? How would necessary medical equipment be powered? This can be answered through the same thinking as solar panels. Instead of solar power though, what if devices were self-powered? The concept of self-powered devices is fairly new and I would like to see how it would fair under medical conditions. I aim to explore the idea of eliminating cords and batteries on medical equipment and look at how power can be self-sufficient.

Publication(s): None yet.

Congressional District: 1st

Congressional Representative: Steve Chabot

Columbus State CC

Samantha K. Arthurs

Status: Sophomore, Environmental Science, Safety, and Health

Research Topic: Cost-benefit Analysis of Using Ozone to Treat Extracellular Cyanotoxins in Drinking Water Treatment Plants

Advisor(s): Dr. Jeff Bates

Biography: Samantha is beginning her final year at Columbus State Community College (CSCC) where she is focusing on water treatment as part of the AAS in Environmental Science, Safety, and Health. She is also pursuing a certificate in Geographic Information Systems to compliment her current environmental interests and her social science background from her BA in Linguistics from The Ohio State University. Her interest in all things water was sparked by her experiences traveling abroad and a summer of news clippings about harmful algal blooms and has only grown during her time at CSCC. After graduating, she plans to obtain the operator-in-training status while working towards her goal of a master's degree in water resource management.

Abstract: Harmful algal blooms (HABs) are large colonies of blue-green algae, known as Cyanobacteria which can produce cyanotoxins that can range in severity from skin irritation to liver failure. They are a problem for drinking water treatment plants that use surface water sources, such as Lake Erie, because typical treatment techniques can break open the cells and release the cyanotoxins into the drinking water. Once the cyanotoxins are released from their cells, or lysed, they are considered extracellular toxins and must be treated differently than intact blooms that can be dealt with in the coagulation/flocculation stage of treatment.

Ozone can be used as a disinfectant in drinking water treatment, and existing research suggests that ozone can be effective in treating the most common types of cyanotoxins: microcystin, anatoxin-a, and cylindrospermopsin. The reality of water treatment is that each treatment plant has its own budget and source water quality; therefore, treatment techniques are rarely universal. For this project, I will first consider the pros and cons of using ozonation in drinking water treatment plants. Then I will perform a basic cost-benefit analysis of utilizing ozonation in water treatment plants in Ohio based on the system's physical and financial feasibility to be installed and maintained all year.

Publication(s): None yet.

Congressional District: 12th

Congressional Representative: Troy Balderson

Columbus State CC

Andrew D. Cain

Status: Sophomore, Mechanical Engineering Technology

Research Topic: Improving Upon Current Mid- & High-Rise Structures with Hybrid Floor Systems

Advisor(s): Adele Wright

Biography: Andrew Cain is a young entrepreneur, photographer, farmer, automotive assembly associate, and student of Mechanical Engineering Technology at Columbus State Community College. Growing up on a family farm he has lived around mechanical equipment and farming all his life. These things have led to his interest in mechanical design and engineering, environmental studies, and agricultural studies. Using these backgrounds, and his education in engineering he wants to make a positive impact on our world and make it better for the next generation.

Abstract: The research project Andrew is conducting is studying the benefit of concrete and timber hybrid structure to replace the current steel and concrete structure in large commercial buildings. The goal of the project is to find a lighter and more resilient structure that reduces material usage, and environmental impact.
To study this he is designing material samples that are a hybrid timber foundation, with a poured concrete top layer that is reinforced with various reinforcement materials such as mock rebar, fiberglass, steel fiber, hemp, and several others. These samples will be compared against poured concrete samples that are only reinforced without timber.

Throughout this project Andrew has been learning electro-mechanical design skills to build a custom test rig to measure force and deflection, CAD skills in designing a test rig, and components, as well as material sample design. He has also gained considerable knowledge in material science to better understand properties of concrete and timber to make more informed hypothesis about sample designs.

Publication(s): None yet.

Congressional District: 4th

Congressional Representative: Jim Jordan

Columbus State CC

Malia R. Mast

Status: Sophomore, Construction Management

Research Topic: BIM, VR, & AI Utilization to Solve Construction's Top Issues

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

Biography: Malia Mast is a Construction Management student at Columbus State Community College. She previously graduated from The University of North Carolina at Greensboro (UNCG), where she received a Bachelor of Science in Textile Product Design. As Malia states, "My purpose beyond passion is to develop people, places, and things. As a child I knew that I would be some type of engineer. Filling my curiosity by taking apart anything that was working & attempting to reassemble it. With my favorite question being "why", I was always extremely curious. I loved computers. I learned AutoCAD and drafting through vocational studies and implemented the technology in consumer products".

After graduating from UNCG, she has held a successful career in managing diverse consumer product categories, internal teams, and global partners for major U.S. branded retailers. She has won many corporate/community awards over this period for outstanding performance and results. When asked what has been one of your greatest achievements, she replies "the opportunity to teach and give my trades to children and young adults through S.T.E.AM outreach and camps." Her future aspirations are to leverage the construction field development path and advance community educational engagement in S.T.E.A.M fields to children and young adults.

Abstract: Construction is a major contributor to the U.S. economy with expenditures reaching over 1,231 billion, 670,000 employers, 7 million employees, and nearly 1.3 trillion worth of structures each year. The U.S. construction industry grew from $1.0 trillion in 2012 to $1.2 trillion in 2016, and is expected to reach $1.4 trillion by 2021. The major factors contributing to the expected growth over the next 12 years; infrastructure, healthcare, manufacturing, educational facilities, and positive trends in residential including affordable housing. Renewable energy and the suitability development sector will also be a significant factor pushed by the new governmental initiatives to make renewable energy 20% of the country's total energy mix by 2020. An additional 4.5% was reported in the beginning of 2017 of US $9.8 trillion in January–August 2017. The American Association of Contractors predict the construction industry will have one of the largest increases in real output, reaching almost $1.2 trillion by 2020. Despite continued and predicted growth in the overall US Construction industry, the industry is challenged with old and new issues. The top issues include labor shortages, production efficiency, and safety are resulting in significant waste, profit loss, and injury. With the predicted continued growth in the industry, the shift for renewable energy use, coupled with those top issues: newer technologies including BIM (Building Information Modeling), VR (Virtual-Reality), & AI (Artificial Intelligence) will be necessary to resolve those top issues and keep pace with demand including renewable energy & sustainability development requirements.

Renewable energy and suitability is defined under the EPA's green building requirements as "the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high-performance building." The practice of designing the building and the spaces within to benefit from natural light, ventilation, temperatures, and material selection is also known as passive design.

Thru partnership with construction and development companies, professional organizational reports, internet research and actual model creation; I will parallel the development process between traditional building techniques and those newer technologies of BIM, VR, and AI. I will utilize this opportunity to examine cost, time, and sustainability levels achieved in a multi-unit project to determine if BIM, VR, & AI utilization are viable solves to the top construction issues and sustainability requirements of the future.

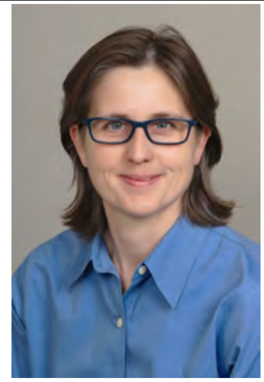
Publication(s): None yet.

Congressional District: 3rd

Congressional Representative: Joyce Beatty

Columbus State CC

Barbara L. Watkins



Status: Sophomore, Construction Management

Research Topic: Mass Timber as a Sustainable Alternative for the Construction Industry

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

Biography: Materials used to construct modern buildings, roads and bridges are mined, harvested, or extracted from the earth. Concrete and steel have been the primary materials used to build mid – and high-rise building for many decades. There have been improvements in the manufacturing of concrete and steel, but it remains a source of both high energy consumption and emissions.

An alternative building material that is starting to be used for mid-rise buildings is mass timber. Mass timber construction offers a more environmentally friendly approach to meeting the growing demands on the building industry. Unlike concrete and steel, wood is a renewable resource that can be sustainably grown and harvested. Wood products also serve as carbon reservoirs, sequestering carbon for the life of the wood product. This project will focus on how mass timber could be a viable alternative for building midrise, and hopefully soon, high-rise buildings in a more environmentally friendly way.

Abstract: Barbara Watkins completed a graduate degree in 2001 and spent the majority of her career working in conservation, public service, and public education. She recently decided to change careers and is currently pursuing a degree in Construction Management at Columbus State Community College. She's long had an interest in the construction industry and is excited to learn how to manage construction projects.

Barbara plans to continue promoting conservation interests and principles in construction, blending her old career with the new. She's particularly interested in material use in the construction industry. She plans to focus on conservation ideas in academic projects that can be carried into her new career.

Publication(s): None yet.

Congressional District: 12th

Congressional Representative: Troy Balderson

Lorain County Community College

Lorain County CC

Eleana Cintron

Status: Sophomore, Arts and Science

Research Topic: Evaluating Ceramic Electrolyte Morphology Composed of Several Compositions via the Phase Inversion Method

Advisor(s): Regan Silvestri and Frederick Dynys

Biography: Eleana Cintron is a current high school senior in the Lorain County Community College's (LCCC) Early College High School program. Graduating in May with her Associate of Science and Associate of Arts, she has been able to use her high school years to the fullest. She is currently a member and the former secretary of the American Society for Microbiology LCCC chapter. Through ASM, she has had the ability to join a microbiology lab to research harmful algal blooms within the Sandusky Bay. Furthermore, she is a current member of the Society of Women Engineers and is currently working at NASA Glenn Research Center as an intern within the Materials and Chemistry Branch. She will be attending Case Western Reserve University in the Fall of 2019 majoring in Chemical Engineering and minoring in Biochemistry.

Abstract: The use of different polymer additives and production techniques can change the morphology of ceramic electrolytes of solid oxide fuel cells. This change in morphology can inhibit or enhance the overpotential that occurs at the electrode and electrolyte interfaces. In order to increase oxygen diffusivity within ceramic electrolytes, porous membranes can be produced both as a planar or a tubular geometry. In this study, the fabrication of the ceramic membranes is via the phase inversion technique as well as freeze casting. To evaluate how different morphologies are formed with the addition of different additives such as polyvinylpyrrolidone, polyethylene glycol, different amounts of the polymer polyethersulfone, and different solvents such N-Methyl-2-Pyrrolidone, Dimethylformamide, and Dimethylacetamide.

Multiple slurries of different combinations and with different amounts of polyethersulfone will be created and planar sheets will be the chosen geometry. Different temperatures, and other factors can affect the morphology during the process of creating the slurries, several of these factors will be controlled and manipulated within this study. These include creating and casting the slurries at different temperatures, controlled humidity, and with different internal and external coagulants. Furthermore, different molecular weights of the polymer can also be used and have effects on the morphology. Finally, the ceramic membrane sheets will be analyzed through scanning electron microscopy. X-Ray powder diffraction may be used to look at possible crystalline structures, and later testing for electrical properties can also be conducted. As well as the addition of creating the other ceramic membranes in tubular geometry via extrusion method and with different sintering temperatures.

Publication(s): None yet.

Congressional District: 9th

Congressional Representative: Marcy Kaptur

Lorain County CC

Lorain County Community College

Miranda Ghrist

Status: Sophomore, Computer Information Systems

Research Topic: Numerical Solutions of Heat Transfer Models to Determine Thermal Properties of Novel Insulating Materials for Hypersonic Aerospace Applications

Advisor(s): Dr. Regan L. Silvestri

Biography: Miranda Ghrist is from Cleveland Ohio, and graduated from Lorain County Community College with an Associate of Applied Business in Computer Information Systems with a focus on network communications technology. Currently she is pursuing a second Associate's Degree in Mobile Application Development at Lorain County Community College and a Bachelor's of Science in Computer Information Systems at The University of Akron.

Abstract: Novel insulating materials developed for use in aerospace have led to the necessary exploration of new test methods that effectively mimic the thermal loads experienced by hypersonic flight applications. One such test method, coined THERMIC for THERMal Insulation Characterization, comprises of measuring the temperature gradient through layers of insulation as heat is applied to one side.

A 1-dimensional heat transfer model of the developed test method can yield calculated values for thermal conductivity and specific heat of an insulation in close agreement with known values for a materials properties, and demonstrate the validity of this new test method.

In addition to this, inverse heat transfer problems can solve for an unknown in the model by training a neural network with given temperature data. One of the most efficient optimization methods for neural networks is the continuous genetic algorithm.

Publication(s): None yet.

Congressional District: 11th

Congressional Representative: Marcia L. Fudge

Lorain County Community College

Lorain County CC

Ashley E. Innes

Status: Sophomore, Biology

Research Topic: Analysis of a Novel Mutation Located on the *ccr5* Gene with Potential Effects on HIV Infectivity

Advisor(s): Dr. Regan L. Silvestri

Biography: My name is Ashley Innes. I grew up in New London, Ohio, and graduated from New London High School. I am a single mother to an eight-year-old daughter. I started attending Lorain County Community College (LCCC) in the Summer of 2013. I originally enrolled in the Physical Therapist Assistant Program, but soon realized my passion for science. I was riveted by the information being presented to me in class that I decided to change my major. Since being in school I have attended the Ohio Branch of American Society for Microbiology Conference in Athens, Ohio, and the Ohio Academy of Science conference at Bowling Green State University (BGSU). I am also a University Partnership student through BGSU and LCCC majoring in biology. My future endeavors include working in a lab performing advanced research and to receive my Ph.D. in Molecular Biology.

Abstract: The project title is “Analysis of a novel mutation located on the *ccr5* gene with potential effects on HIV infectivity”. The project consists of studying the DNA of a woman whom did not contract HIV at birth. She was the only child out of five children that did not contract HIV from the mother. On her *ccr5* gene there is a missense point mutation that changes a lysine to an arginine. This mutation is being investigated because it is believed to affect the *ccr5* receptor on the surface of T-cells, which will cause ineffective binding of the HIV retrovirus.

In the process, the TG5 mutation will be amplified through PCR and cloned into the plasmid vector PLXSN. The cloned plasmid vectors will be used to transfect the PT67 cell lines that will be grown in the lab. Those cell lines will then assemble viral particles with the TG5 mutation in them. The retroviral particles will be introduced into the H9 cell line. The TG5 gene in H9 and its effect on HIV infectivity will be measured.

Publication(s): None yet.

Congressional District: 7th

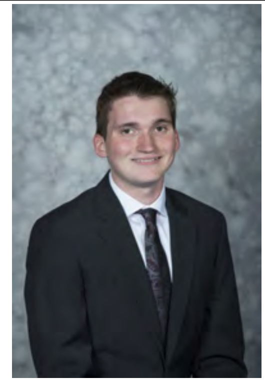
Congressional Representative: Bob Gibbs

EDUCATION

SCHOLARSHIPS

Cedarville University

Kristopher A. Gibboney



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

Project Title: Understanding and Responding to the Physical and Economic Impact of Natural Disasters on Communities and Agriculture

Advisor(s): Dr. Robert Chasnov

Biography: I am Kristopher Gibboney, a Junior at Cedarville University pursuing a Bachelor of Arts Degree in Adolescent to Young Adult (AYA) Integrated Science Comprehensive Education. Ever since I was very young, I have had a strong desire to help others, pour into their lives, and help them learn. As such, I have wanted to become an educator for several years. At the same time, I have always been interested in science and STEM as a whole. Thus, I have decided to pursue a career as a high school science teacher.

As I have been mentoring, tutoring, and teaching others, I have had it confirmed to me several times: this is the path I need and absolutely want to take! I love being able to encourage young adults, help them learn, and pour into their lives in every way that I can. I absolutely look forward to being able to do this daily in the future, being able to build meaningful relationships with my students and their families.

Abstract: This lesson activity incorporates NASA's technical data and satellite imagery in a study of the hydrologic cycle, weather, and natural disasters, eventually leading to a study on smart growth strategies for communities for resilience and recovery. The lesson activity is split over three days: On the first day, students engage in a guided discussion as they learn the necessary vocabulary and concepts involved with the hydrologic cycle and weather patterns. On the second day, students engage in a discussion recapping what they learned on the first day, and then research, document, and cite several facts from NASA technical reports about natural disasters, explaining how such data would be useful in preparing for future natural disasters and recovering from previous ones. Students also research smart growth strategies for resilience and recovery. Finally, on the third day, students form groups to collaborate in to create theoretical communities, which must include the location/land formation built on, utilizing all they have learned in the previous two days. A natural disaster is randomly assigned to each group, which they must respond to. The students end the lesson by reflecting on what occurred in their community, how effective their smart growth strategy was, and determine what new smart growth strategy could be implemented to recover, presenting such to the rest of the class.

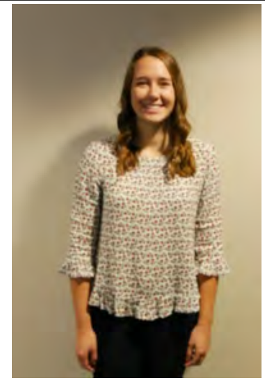
Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

Cedarville University

Nicole A. Peters



Status: Senior, Middle Childhood Education, Science and Math

Project Title: Sizing the Solar System

Advisor(s): Dr. William Jones

Biography: Nicole Peters grew up in Green, Ohio, and is currently a Senior at Cedarville University. She is majoring in Middle Childhood Education with concentrations in mathematics and science. Nicole will also graduate with a minor in Bible. She has had the opportunity to get involved and serve in a number of ways throughout her time at Cedarville, specifically, at her church and with a women's ministry team on campus. She also tutors Elementary and Middle School students at the local public school in Cedarville. Nicole has mentored a number of middle school girls back home for the past couple of years at her church. Nicole's passion for middle school students has led her to pursuing a career in education because she loves being able to help equip students with the skills needed to learn and grow in their knowledge of math and science. Nicole Peters enjoys a variety of activities including reading, running, traveling, and hiking outdoors.

Abstract: This lesson, geared towards Middle School Students, is focused on the planets in our universe and allows for interdisciplinary content in mathematics. The goal for this lesson is for students to have more of an understanding of how massive the universe is and the planets that are in it. Students in groups will be comparing and contrasting the different sizes of the planets as well as their location from one another. Students, using a number of written clues will complete a space mission by determining the volume and diameter of each planet in our Solar System. Students will have to use their knowledge of spheres, the circumference formula, and proportional reasoning to determine the diameter of each planet. After finding all of the information about each planet students will be provided with a hands on scale model of the solar system using everyday items like basketballs, tennis balls, etc. which all represent a specific planet. Using the scale model items of the solar system the students will determine which object represents which planet and manipulate them to put them in the correct order from the Sun to Neptune. This lesson requires students to use their background knowledge on the solar system as well as collaborate and communicate with their group to complete the space mission assigned to them.

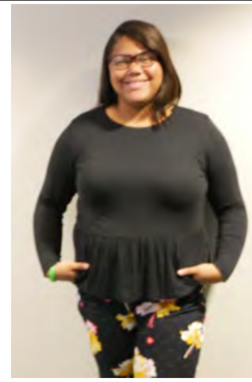
Publication(s): None yet.

Congressional District: 16th

Congressional Representative: Anthony Gonzalez

Central State University

Nya McMullen



Status: Sophomore, Middle Childhood Education, Mathematics

Project Title: Ice and Snow Changes

Advisor(s): Dr. Rajeev Swami

Biography: Nya is a current Sophomore at Central State University, working towards a Bachelor's of Science in Math Education. Nya grew up in Hamilton, Ohio, and attended Hamilton High School. During her time there she gained a strong passion for helping students and giving back. With her mother as a role model, Nya knew that being an educator was for her. When she becomes an educator, she hopes to help her students gain a passion for math while challenging them to be better.

While at Central State University, she is involved NAACP, Interfaith Campus Ministers, S.O.U.L (Servicing Opportunities to Uplift Lives), in the Central State University branch of the Ohio Education Association. While being involved in these organizations, she is a Resident Advisor for a mostly freshman residence hall. Nya enjoys being a helping hand for people and wants to continue this path when she's an educator.

Abstract: This lesson will use data collected by NASA to compare snow and ice over the span of ten years. From the data students collect, they will be plotting and analyzing it. They will access their data from the MY NASA DATA Live Access Server. They will need to collect monthly averages for two different years in a city of their choice, compile the data in a spreadsheet, and make a line graph for each year. Students will also create a difference plot to compare and contrast the yearly data. By the end of the lesson, students will be able to understand how calculations can be performed on data expressed as maps, such as averaging or subtracting. With this data, students will be able to recognize trends and they can start hypothesizing different factors that change the snow and ice levels. Also, students will work in teams and prepare a presentation that they could present to environmental policy makers in regard to global climate change.

Publication(s): None yet.

Congressional District: 8th

Congressional Representative: Warren Davidson

Kent State University

Brooke A. Collins

Status: Senior, Early Childhood Education

Project Title: "What is happening to Our School's Trees and its Leaves?", Changes in Season

Advisor(s): Bridget Mulvey, Ph.D. and Joseph Ortiz, Ph.D.

Biography: I am currently in my fourth year within my Education program. During these past five semesters, I have had the opportunity to work with children within a preschool setting to a fourth-grade setting. In my last three years of attending Kent State, I have also been employed at Kent State's Child Development Center, which is an International Baccalaureate certified preschool and kindergarten. By immersing myself into this philosophy of schooling, my perspective in constructivist, inquiry instruction has grown. My appreciation towards education also grew, in that I was learning from experiences and information that helped me to understand best practices and approaches towards working with young children.

As a result, I chose to continue learning more about my increased interest in global and international education and was given the opportunity to pursue a chance in working within an International Baccalaureate certified primary school in Madrid, Spain, along with another colleague during the spring of 2019. In terms of this opportunity, I will have the chance to complete my final semester of student teaching within this district, further assisting to influence and impact my growth as an educator of young children.

Upon graduation, I would like to continue working towards higher-level education by completing an endorsement program that will allow me to instruct fourth and fifth-grade students, in addition to my licensure that allows me to teach preschool to third-grade aged children. After obtaining this certification, I would also like to continue my practice in interacting with and learning from children within a school setting.

Abstract: In describing the series of lessons I planned, I chose to make the focus localized and personal to directly influence the students that were a part of this lesson. I planned my lessons around a 5E inquiry cycle, centered around how to engage my students, provide them with an opportunity to explore its initial information, explain components that need more clarification, extend children's learning to become applicable to knowledge outside of this unit, all the while using formal and informal types of assessments to help guide the decisions I would make. The lesson is concentrated on the students using their discoveries to drive this lesson; in understanding and searching for the reason as to why the leaves of the trees near their playground are changing color and falling, and will be presenting their findings to the class and other administrators at the end of the unit. In order to conduct this study, the students will be using resources provided by NASA, along with Nature of Science concepts to think about throughout this overall investigation. Students will be using their own observations to drive this study and will be encouraged to support their claims with evidence found throughout this unit of inquiry.

Publication(s): None yet.

Congressional District: 13th

Congressional Representative: Timothy J. Ryan

Marietta College

Monica L. Curtis

Status: Senior, Early Childhood Education

Project Title: What Can You See in the Sky?

Advisor(s): Dr. Cathy Mowrer

Biography: I grew up near New Matamoras, Ohio, graduated from River High School in 2015 and am now a Senior at Marietta College pursuing a Bachelor's Degree in Early Childhood Education with a 4/5 Reading Endorsement. I have always loved learning and helping others, so education has always been a passion for me. I enjoyed working with the younger students throughout my years in school, so this is where I decided on early childhood. I also want to be a role model to young students who may need someone to look up to and make a difference in someone's life. I want children to learn to enjoy school and bring the things that they love into a classroom for them to connect to.

On campus, I am involved in the Academic Resource Center as a peer tutor, Intervaristy Christian Fellowship, Marietta College Teacher Education Association, Pioneer Activities Council, Alpha Lambda Delta, and Kappa Delta Pi. I have also had the opportunity to attend workshops throughout the past two years that I look forward to implementing in my classroom. I have also worked at an after-school/summer camp program off campus for 2 years.

Outside of school, I enjoy playing sports, reading, being outdoors, and being with my family.

Abstract: This lesson will be geared toward kindergarten as they explore the sun and the stars and the visibility at different times of the day. We will use the NASA website as a resource to see pictures of the sun and stars and as a resource to teach about the sun and compare it to stars. The students will have a "Sky Journal" that they will use to create pictures of the sky and write what they see when they observe it throughout the unit, as we discuss these things, and as we see pictures of it. They will be able to draw, write things that they learn about, and things they can do during the time when each is visible. By the end of the unit, the students will create their own sun and stars and be able to describe different attributes about them. Once we know these things we will create a mini telescope that they will be able to use to look at the stars at night. They will be given materials and told certain aspects, but otherwise can design and create the telescope.

Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

Marietta College

Lindsay S. Joy

Status: Senior, Early Childhood Education

Project Title: Importance of Our Sun

Advisor(s): Dr. Cathy Mowrer

Biography: I am currently a Senior at Marietta College pursuing a degree in Early Childhood Education with a Fourth and Fifth Grade endorsement and the McDonough Teacher Leadership Certificate. I am the President of Kappa Delta Pi Education Honor Society at Marietta College. I was born and raised in Marietta, Ohio. I enjoy painting, spending time with family, and attending church. I work at the Boys and Girls Club of Washington County with children ages 5-15 years old for both their summer camp and after school program. Marietta College has provided me with many experiences that has fostered a love for teaching children. As a teacher, I aspire to be a positive role model to my students and leave a lasting impact in my community.

Abstract: In the Ohio science curriculum for first grade, students are focusing on the basic needs of living things and how they are obtained from the environment. Students learn that the sun is the principal source of energy and without the sun there would be no life. In this lesson that will require two weeks to complete, students will discover that plants need sunlight in order to grow. We will begin by reading The Day Joshua Jumped Too Much, a suggested book on NASA's website to teach about the sun. This book focuses on the sun's energy and importance to all living things on earth. After reading, we will have a class discussion about how the sun affects earth.

Next, the students will execute the experiment "The Source of Energy Lab" from NASA's Solar Dynamics Observatory – Elementary Learning Unit to apply their knowledge about the sun and basic needs of living things. Students will create a plant box and observe that the plant will grow towards the Sun, its primary source of energy. Students will work in groups and record data on the growth of their plant over a period of two weeks. After this experiment, students will create a booklet about the growth of their plant that includes: drawings of the plant, data they recorded, and why they think the plant grew like it did.

Publication(s): None yet.

Congressional District: 6th

Congressional Representative: Bill Johnson

Ohio Northern University

Rachel E. Sauder

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

Project Title: Extraterrestrial Geology

Advisor(s): Dr. Todd France

Biography: At Ohio Northern University, I am a Biology major with a Chemistry minor studying AYA Integrated Science Education. My inspiration for being a science teacher comes from the Science Olympiad program and an excellent AP Biology teacher in high school. On campus, I am involved in SAE Aero Design, Phi Sigma Rho, Kappa Delta Pi, and Campus Scouts.

After graduation in May, 2019, I hope to teach high school biology or earth science; after school I would like to coach a Science Olympiad team, to give students opportunities to explore science beyond the curriculum. In the not too distant future, I will pursue a Master's Degree in Biology, which will qualify me to teach CCP (College Credit Plus) courses at the high school level, furthering student opportunities in the sciences.

Abstract: My project is intended as a lesson for high school geology or earth sciences classes, and will focus extraterrestrial geology, and will include information from other planets and moons in our solar system, such as Venus and Ceres. Background knowledge and figures for the lesson will be drawn from NASA resources, such as images collected from the Dawn spacecraft in 2011. Students will observe and analyze images and maps to better understand geologic features and relate them to previous analyses of Earth's geology.

Publication(s):

1. NASA/Ohio Space Grant Consortium 2017-2018 Annual Student Research Proceedings XXVI, Page 253.

Congressional District: 14th

Congressional Representative: David P. Joyce