



YOUNGSTOWN
STATE
UNIVERSITY
OFFICE OF RESEARCH

Quest

*a forum for
student scholarship*

2018 Program Guide & Abstracts

Welcome to QUEST 2018

Welcome students, faculty, and guests to QUEST: A Forum for Student Scholarship.

Now in its 29th year, QUEST has become a Youngstown State University (YSU) tradition of excellence in academic achievement, innovation, discovery, and scholarship. QUEST recognizes the outstanding scholarly achievements by YSU students, working in collaboration with YSU's faculty members. This year's program includes nearly 400 student participants.

The QUEST committee and University administration are grateful for the guidance and commitment of YSU's dedicated faculty in providing inspiration, motivation, and support for their students and making these presentations possible. Many of these presentations represent scholarly endeavors made possible through individual faculty grants, and through support from the Office of Research University Research Council grants.

We extend a special welcome to our keynote speaker, Dr. Donna Nelson. Her expertise in chemistry and her research in student and faculty diversity aligns with QUEST values.

We also welcome a collaboration with AGEP (Alliance for Graduate Education and the Professoriate) students who bring diversity to advanced degrees in the STEM fields, and who are both presenting and judging at QUEST.

We welcome area College Credit Plus (CCP) students to QUEST, and encourage them to network with AGEP students and YSU students and faculty.

We encourage all QUEST participants to actively engage in and appreciate each other's scholarly activities, seeking to discover new knowledge within those exciting interdisciplinary collaborations. In addition to serving as a forum summarizing prior success, we hope that QUEST serves as a starting point for new partnerships, collaborations, and discovery among students and faculty from all our academic disciplines.

Michael A. Hripko
Associate Vice President for Research
Youngstown State University

Keynote Speaker

Youngstown State University welcomes Dr. Donna Nelson as the QUEST Keynote Speaker at noon in the Chestnut Room, Kilcawley Center.

Dr. Nelson is professor of chemistry at Oklahoma University. She obtained her PhD in chemistry at UT-Austin, and completed her post-doctorate work at Purdue University. Her areas of interest include nanoscience, communicating science to the public, organic chemical education, and scientific workforce development.

She serves as an advisor for television programs, such as *Breaking Bad*, in order to present accurate science to TV audiences.

In 2011, she organized the highly-popular “Hollywood Chemistry” symposium at the Anaheim ACS Meeting, and the “Science on the Hollywood Screen” symposium at the Denver ACS Meeting.

She has authored over 100 publications and has received numerous honors, including being named an American Chemical Society (ACS) Fellow, a Ford Fellow, and an AAAS Fellow.

She was also named a Fulbright Scholar.

Her awards include the ACS Israel Award, ACS Nalley Award, Oklahoma Chemist Award, Guggenheim Award, Sigma Xi Faculty Research Award, and the National Science Foundation (NSF) ADVANCE Leadership Award.

In addition, Dr. Nelson has been recognized as one of the “21 Leaders for the 21st Century” by Women’s eNews, and a “Woman of Courage” by the National Organization for Women (NOW).

Her scientific workforce surveys—of faculty race/ethnicity, gender, and rank in science and engineering at research universities—revealed that women and minorities are much less represented among professors than degree recipients.

QUEST 2018 Advisory Committee

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Mr. Michael Hripko	Associate VP for Research	Office of Research
Ms. Sarah Ferguson	Graduate Assistant	Office of Research Services

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Dr. Diana Fagan	Professor	Department of Biological Sciences
Dr. John Hazy	Professor & Graduate Coordinator	Department of Criminal Justice and Forensic Sciences
Dr. Dr. Matt O'Mansky	Associate Professor & Chair	Department of Sociology, Anthropology, and Gerontology
Dr. Clovis Linkous	Professor	Department of Chemistry
Ms. Sharon Schroeder	Assistant Director	Metro Credit

Honors College Students

Ms. Lexi Rager	Mathematics Major	College of STEM
Mr. David Gessler	Chemical Engineering & Mathematics Major	College of STEM

Acknowledgements

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- YSU Board of Trustees
- YSU Faculty Members
- Keynote Speaker Dr. Donna Nelson
- YSU President, Mr. James P. Tressel
- YSU Provost, Dr. Martin A. Abraham
- YSU Foundation President, Mr. Paul McFadden
- YSU Honors College Students and Director Dr. Amy Cossentino
- NOA-AGEP Students and Advisors
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- College of Creative Arts and Communications
- College of Science, Technology, Engineering, and Mathematics
- Williamson College of Business Administration
- Kilcawley Center Staff



The Unintended Consequences of Innovation

Visit the LASS 1510, Critical Questions in LASS Poster Display

In Bresnahan from 8:30 a.m. to 10:00 a.m.

Congratulations PenguinThink Contest Winners!

From the College of Science, Technology, Engineering & Mathematics

May Lynn Einfalt, *Contamination of Water*

Major: Biology

Logan Burrows, *The Effects of Early Media Exposure on Children*

Major: Biology, Pre-Med

SPECIAL THANKS TO THEIR MENTOR: Ms. Sarah Eisnaugle

YOUNGSTOWN STATE UNIVERSITY



***First Year
Experience***

QUEST 2018: A Forum for Student Scholarship Sessions, Topics, and Rooms

8:30 – 10:00 – Session 1 – Posters (Biology) – Ohio Room.....	1
8:30 – 10:00 – Session 2 – Oral Presentations	
▪ Respiratory Care – James Gallery	8
▪ Dental Hygiene – Coffelt	11
▪ Creative & Liberal Arts / Education / Business – Humphrey	15
10:30 – 12:00 – Session 3a – Posters (Engineering Topics) – Ohio Room	17
10:30 – 12:00 – Session 3b – Posters (AGEP – STEM Topcis) – Bresnahan 1 & 2	22
10:30 – 12:00 – Session 4 – Oral Presentations	
▪ Respiratory Care – James Gallery	28
▪ Creative & Liberal Arts / Education – Jones.....	31
▪ Mechanical / Industrial Engineering – Coffelt	33
▪ Health & Human Services / Liberal Arts – Humphrey.....	35
12:00 – 1:15 – Luncheon & Keynote Speaker – Chestnut Room	
1:30 – 3:00 – Session 5a – Posters (Various Topics) – Ohio Room	38
1:30 – 3:00 – Session 5b – Posters (STEM Topics) – Bresnahan 1 & 2.....	46
1:30 – 3:00 – Session 6 – Oral Presentations	
▪ Mechanical Engineering – James Gallery.....	51
▪ STEM Topics – Jones	53
▪ Physics / Engineering – Coffelt.....	56
▪ Mechanical/Industrial Engineering – Humphrey	58
▪ Biology – Esterly.....	60
3:30 – 5:00 – Session 7a – Posters (Chemistry) – Ohio Room	62
3:30 – 5:00 – Session 7b – Posters (Civil Engineering / Environmental Studies) – Bresnahan 1 & 2	66
3:30 – 5:00 – Session 8 – Oral Presentations	
▪ Anthropology / Geography– Jones	72
▪ Health & Human Services / Liberal Arts / Business – Coffelt.....	74
▪ Mechanical Engineering – Humphrey.....	76

Identification of Proteins Putatively Secreted by the Yeast Phase of *Talaromyces marneffeii*

(Project ID: 221)

Victoria Silvis, Cole McKenry

Biology - Faculty Sponsors: Dr. Chester Cooper, Dr. Xiangjia Min

The virulence of *Talaromyces marneffeii*, a pathogen endemic to Southeast Asia, is associated with the yeast phase of this thermally dimorphic fungus. The yeast phase of *T. marneffeii* thrives in the intracellular milieu of host macrophages. This ability to survive within a normally harsh environment prompted us to hypothesize that the yeast phase of *T. marneffeii* may secrete proteinaceous factors which hinder the normal defensive response of the host macrophage.

To assess this hypothesis, 538 putatively secreted *T. marneffeii* proteins were identified using the Fungal Secretome KnowledgeBase. DNA primers were designed to a selected number of these proteins and their functionality confirmed in a polymerase chain reaction (PCR) using *T. marneffeii* genomic DNA. Functional primer pairs were then used to evaluate gene expression by both the mycelial and yeast phases of *T. marneffeii*. RNA collected from these phases after incubation for 24-96 hours was employed in a reverse transcription PCR (RT-PCR) in conjunction with a specific pair of primers. Those RT-PCR results indicating exclusive or increased gene expression by the yeast phase were further subjected to quantitative RT-PCR (qRT-PCR) analysis.

Of 73 primer pairs initially screened, 24 produced results that warranted further examination of gene expression. RT-PCR analysis employing different primer pairs demonstrated that three distinct genes were preferentially expressed during yeast-phase growth of *T. marneffeii*. These genes encode a multicopper oxidase, a catalase, and an unknown cell-wall protein. The first two genes are known to have roles in fungal virulence, whereas cell-wall changes are known to be associated with dimorphism as well as virulence. Subsequent qRT-PCR analysis revealed that each of these genes exhibited statistically significant increased expression in the yeast phase of *T. marneffeii* as compared to the mycelial phase. Further efforts shall be directed towards demonstrating the relationship of these yeast-phase specific proteins to virulence.

Cloning and Sequencing of Mercury Resistance genes from the *Enterobacter* sp. YSU and *Stenotrophomonas maltophilia* OR02 (Project ID: 249)

Stephen Muhindi

Biology - Faculty Sponsors: Jonathan Caguiat. Ph.D, David Asch. Ph.D, Xiangjia Min. Ph.D

Enterobacter sp. YSU and *Stenotrophomonas maltophilia* OR02 (*S. maltophilia* O2) were isolated from a heavy-metal contaminated site in Oak Ridge, TN. Both strains are resistant to salts of copper, cadmium, zinc, selenium, arsenic, gold and mercury. Known primers for the mercury resistance genes, *merR* and *merP*, were used to PCR amplify, clone and sequence DNA segments from each strain. Then, Basic Local Alignment Search Tool (BLAST) analysis of the sequences identified reference sequences used to sequence the rest of the *mer* genes in each strain. These reference sequences contained the genes, *merRTPCADE*, for *Enterobacter* sp. YSU and the genes, *merRTPADE*, for *S. maltophilia* O2. Alignments using other related *merR* and *merE* genes were used to design PCR primer to amplify both *mer* operons which were cloned into the plasmid, pSC-A-amp/kan, from the StrataClone PCR Cloning Kit. Liquid culture experiments in LB broth showed that the minimal inhibitory concentrations (MICs) were 150 μM and 190 μM HgCl_2 , for the *Enterobacter* sp. YSU and *S. maltophilia* O2 cloned fragments, respectively, and 30 μM HgCl_2 for the vector control. The bioinformatics tool, Molecular Evolutionary Genetic Analysis (MEGA 7), generated a phylogenetic tree that showed that the MerA protein from *Enterobacter* sp. YSU is related to other *Enterobacter* MerA proteins and that the MerA protein from *S. maltophilia* O2 is related to other *Stenotrophomonas* MerA proteins.

The expression of sarcomeric proteins during myogenesis in the C2C12 myogenic cells*(Project ID: 262)*

Angela Mossor, Victoria Silvis, Nick Osborne

Biology - Faculty Sponsor: Dr. Gary Walker

Myogenesis is a tightly regulated process resulting in the sequential change in gene expression leading to the expression of muscle cell specific proteins. During the process of myogenesis the basic units of contraction, sarcomeres, are assembled into to the extremely precise structures that provides for the slide filament mechanism of muscle contraction. This study examined the timing of expression of a number of muscle specific proteins that are relevant to myogenesis/ sarcomerogenesis over the course of myotube development, using C2C12 mouse myogenic stems cell in culture. Using quantitative PCR, titin expression and specifically expression of the cardiac specific isoform, N2-B, was studied. The expression of several myosin isoforms were also examined. In addition to these sarcomeric components we also looked at the expression of myogenic transcription factors and the cell cycle regulator of the G2/M phase transition (cdk1). At the onset of myogenesis (confluency and lowered growth factors) the expression of cdk1 as well as a transitory increase in the myogenic transcription factor MyoD. In this study we have taken two approach to assessing gene expression in myogenesis and sarcomere genesis, normalize to the expression of GAPDH (expression relative to the cell) or actin (expression relative to the sarcomere assembly). Gen

Prevalence and Cost of Obesity *(Project ID: 278)*

Jason Lee, Abdel Rahem Yusuf, Ramandeep Gill, Hunter Flati, Vi-Trinh Luu

Biology - Faculty Sponsor: Dr. Charles McGowen

Studies have shown America has spent about one hundred fifty billion dollars to help treat obesity a year. Looking at the past six months, data was taken from several clinics in northeast Ohio to estimate the amount of money was being spent to treat obesity in the region as well as the commodities associated with the disease. With over a hundred patients in the area considered morbidly obese, the cost is over twenty thousand dollars a year for just obesity. There are easy solutions, both for those suffering from obesity and those who want to help.

3D Bio-Printing of Muscle Tissue *(Project ID: 291)*

Ashley Labatte, Sreya Brahmandam, Evan Leek, Randah Abuhashim, Allison Rea

Biology - Faculty Sponsor: Dr Gary Walker

Myoblasts, Myogenic stem cells are capable of differentiating into functioning contractile myocytes (muscle fibers). In skeletal muscle, myocytes are aligned in parallel arrays. This allows for contraction in only one direction, all myocytes working together collectively to provide contractile force in a functional manner. This geometry cannot be achieved by traditional culturing methods. Bio-Printing offers a method of achieving this geometry, aligning cells in parallel arrays in culture. Using the Inkredible® bio-printer to print out grid like structures containing myoblasts allows us to control the tissue geometry. After cross linking the matrix, we feed and grow the cells inducing them to form muscle tissue will parallel arrays of muscle fibers. In order to confirm we have live muscle tissue we utilize a number of assays: nuclear staining to observe the present nuclear morphology by microscopy, scanning electron microscopy to observe structure of the matrix, qPCR to access biological function and muscle specific gene expression.

Session 1	8:30 – 10:00	Biology	Room: Ohio	Poster
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Transposon Mutagenesis of *Stenotrophomonas maltophilia* Oak Ridge Strain 02 (Project ID: 310)

Hanna Gilligan, Haley Gianfrancesco, Dionne Trammell, Gabriella Hosack

Biology - Faculty Sponsor: Dr. Jonathan Caguiat

A multi-metal resistant strain of *Stenotrophomonas maltophilia* OR02 (*S. maltophilia* 02) was isolated from a metal contaminated site in Oak Ridge, TN. An EZ-Tn5 transposome was introduced into *S. maltophilia* 02. Approximately 880 transformants were replica plated onto plates containing copper sulfate, sodium selenite, mercuric chloride, sodium arsenite, and M-9 minimal salts medium to see if the transposon interrupted genes required for selenite resistance, arsenite resistance, mercury resistance, chromate resistance or growth on minimal media. 13 mutants were discovered. Of the 13 mutants discovered, 5 failed to grow on minimal media, 1 failed to grow on selenite, 1 failed grow on copper, 1 failed to grow on zinc, and 5 failed to grow on 2 or more metals. The transposon contains a kanamycin resistance genes and an R6K³ replication origin. The genomic DNA from the mutants was purified, digested, ligated and transformed into *E. coli*. These transformants will contain new plasmids consisting of the transposon flanked by the interrupted genes. We expect DNA sequencing to identify genes involved in oxidative stress response, metal efflux, metal transformation (reduction and oxidation) and sequestration.

The Physiology of Sloth Hindlimb Muscles (Project ID: 315)

Amanda Svenson, Abdel Ruhman Yusuf, Taylor Rogers, Lydia Johnson

Biology - Faculty Sponsor: Dr. Michael Butcher

Three-toed sloths (*B. variegatus*) have reduced muscle mass; however, they exhibit below branch suspensory behaviors that require both muscular strength and endurance. Our previous work revealed that sloths express only two myosin heavy chain (MHC) fibers in their forelimb muscles: slow MHC-1 and fast MHC-2A. Also, we found that regardless of the MHC expressed, both twitch fiber types primarily rely on anaerobic metabolism for powering muscle contraction by elevated activity of the enzymes creatine kinase (CK) and lactate dehydrogenase (LDH). In this study, we quantify the physiological properties of the hindlimb musculature and test the hypothesis that characteristics of the forelimbs are systemic and represent specializations in sloth muscles. Taking into account the differential roles of limb pairs during sloth locomotion, specifically we predict the hindlimbs will have properties similar to the forelimbs, but with a broader distribution of slow-twitch muscles having greater aerobic enzyme activity for sustaining force production.

The effect of yakA deficiency in *T. marneffeii* infection of THP-1 and J774 macrophage cell lines

(Project ID: 324)

Kayla Parr

Biology - Faculty Sponsors: Dr. Chester Cooper, Dr. Diana Fagan

Talaromyces (*Penicillium*) *marneffeii* is a thermally dimorphic fungus that causes talaromycosis (penicilliosis), the third most common AIDS-defining opportunistic infection in Southeast Asia. The rapid uptake and killing of *T. marneffeii* conidia by alveolar macrophages, along with production of effective concentrations of inflammatory cytokines, is critical for disease eradication. We sought to examine the host cytokine response to a mutant strain (*yakA*) of *T. marneffeii*. The *yakA* mutant has been shown to have a weak cell wall but have increased, albeit abnormal chitin expression. The cell wall has been shown to be critical in the development of fungal infections. Therefore, in the present study, conidia of the *yakA* mutant were co-cultured with the human monocyte cell line THP-1 or the macrophage-like

Session 1	8:30 – 10:00	Biology	Room: Ohio	Poster
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murine cell line J774 to investigate whether the weakened cell wall has an effect on cytokine production. However, the levels of the proinflammatory cytokines TNF- α , IL-1 β and IL-6 from cell lines infected with the *yakA* mutant did not show any significant difference in comparison with wild-type conidia. This suggests that cell-wall defects caused by the *yakA* gene do not affect host cytokine response.

Towards a Better Understanding of Emergency Department Bouncebacks: Could timely access to a primary care physician be a factor (Project ID: 325)

Lindsay N. Hofer, Christopher S. Riwniak

Biology - Faculty Sponsor: Dr. Jill M. Tall

A better understanding of the factors that lead to an emergency department (ED) bounceback, a patient returning to the ED within 30 days of an initial visit, will reduce healthcare costs and improve patient care. The purpose of this study was to collect data regarding: 1) the earliest time a "new patient" could have an appointment with a primary care physician (PCP) based on their ability to pay and 2) the response of PCP offices to patient calls after business hours. It was hypothesized that PCP offices show patient preference for insured as compared to uninsured individuals. Additionally, PCP offices may add to ED congestion by being unavailable after business hours and/or instructing patients to visit the ED for non-emergency situations. Investigators contacted, via telephone, each PCP office (n=150 total PCPs) during normal business hours (9:00 AM to 5:00 PM) on three separate occasions. The "patient" described themselves as new and looking to make an appointment for an annual check-up. When asked the investigator stated they were uninsured, had private insurance, or public/government insurance. Investigators asked for the earliest available appointment time and the number of days until the appointment was recorded. A fourth call was made to the PCP office during afterhours (between 7:00 PM to 10:00 PM). The response to after hour calls and the directions provided to the caller were recorded (e.g., automated answering machine, call 911, etc.). Analysis demonstrated a difference in the number of days to the first available appointment time among the three insurance types, with uninsured "patients" having to wait longer than the insured. Most PCP offices had an automated phone system to take calls afterhours, and provided instructions to call 911 or go to the ED if this is an emergency (n=113). These data reveal a disparity between uninsured and insured patients and their ability to seek primary care in a timely fashion. The delay in primary care may be a direct contributor to the growing issue of bouncebacks in the ED.

Identification of Proteins Putatively Secreted by the Yeast Phase of *Talaromyces marneffe*

(Project ID: 341)

Justina M. Stanislaw

Biology - Faculty Sponsor: Dr. Chester R. Cooper, Jr.

Talaromyces marneffe is a pathogenic fungus endemic to Southeastern Asia which primarily infects individuals with compromised immunity such as AIDS patients. *Talaromyces marneffe* is a thermally dimorphic fungus and exists in a mold phase at room temperature (25°C) and a yeast phase at human body temperature (37°C). In the yeast phase, the fungus subsists in the intracellular milieu of host macrophages and can survive in extreme environments. This led to the hypothesis that the yeast phase of *T. marneffe* secretes proteins that encode an alteration of the normal defense mechanism of host macrophages. Further investigation of this hypothesis was facilitated using a software package developed by Dr. Xiangjia Min of Youngstown State University. Using this tool, a total of 538

Session 1

8:30 – 10:00

Biology

Room: Ohio

Poster

genes identified as encoding potentially secreted proteins. DNA primers were then designed using a selected number of these proteins. A Polymerase Chain Reaction (PCR) confirmed the functional application of these primers, which were then employed in a reverse transcription PCR (RT-PCR) to assess gene expression. In the present study, a gene encoding a putative antigenic cell wall galactomannoprotein was preferentially expressed during the yeast phase of *T. marneffeii*. Particular cell-wall proteins are known to be associated with dimorphism and virulence. Future endeavors shall include quantitative reverse transcription polymerase chain reaction (qRT-PCR) analysis in addition to focusing on the relationship between the yeast-phase-specific proteins and the virulence of the *T. marneffeii*.

Analyzing the Inhibition of Bacterial Growth on Turf Grass via Copper Solution (Project ID: 352)

Sara O'Kane, Curtis Burns

Biology - Faculty Sponsors: Dr. Tony Vercellino, Dr. Felicia Armstrong

Artificial turf receives a variety of human excretions from athletes, wet and dry atmospheric deposition, dirt, debris, and runoff water. This creates a breeding ground for a variety of bacteria that can lead to infections such as MRSA (Methicillin-resistant *Staphylococcus aureus*). Many treatments that could reduce or kill these pathogenic bacteria are damaging to the artificial turf or ineffective in this type of environment. This research was done in order to test different copper solutions on artificial turf and determine how they affected the bacterial growth. The turf is composed of a grass-like mat and rubber particles which were separated and analyzed separately. Three different varieties of copper solution were used in the process; a copper only solution, a copper solution with 0.5% surfactant added, and a copper solution with 1% surfactant added. The copper solution has been found to be effective in the control of bacterial growth. Two types of bacteria, *Staphylococcus aureus* and *Escherichia coli*, were used with each copper treatment. The bacterial analysis was performed by inoculating samples of turf and rubber, with either *S. aureus* or *E. coli* broth. An artificial saliva was also applied to each sample to give the bacteria a food source that mimics real world factors. Each copper solution was applied in triplicate to each of the materials and bacteria then incubated at 37°C for 24 hours. After incubation, the samples were "washed" with a saline solution and multiple subsamples were taken, filtered through a sterile membrane filter, then plated on a specific agar plate and incubated for another 24 hours. The colonies were counted and compared to determine the effectiveness of the different copper solutions on artificial turf.

Assessing Fern Community Structure Along an Environmental Gradient at the Youngstown State University Arboretum (Project ID: 356)

Megan Brown, Leah Bayer

Biology - Faculty Sponsors: Dr. Richard Ciotola, Dr. Colleen McLean

This research was completed to determine the biodiversity of ferns present at the Youngstown State University Arboretum; specifically, we were interested in the effect of the Sharon Conglomerate rock outcropping on fern community structure. Data were collected between 09/29/2017 and 10/13/2017. Four 30 meter transects were chosen for study. Transect 1 was placed uphill from the rock outcropping, Transect 2 ran along the top of the outcropping, Transect 3 was located one meter from the base of the outcropping, and Transect 4 was located downhill from the outcropping. Along each 30 meter transect line, 10 one-meter quadrats were equally spaced on alternating sides of the transect, giving us a total of 40 quadrats for study. For each quadrat, the number of fern individuals, the identification of each fern,

and percent cover of each fern species, was determined. In addition to the biotic data collected, soil samples were taken from every other quadrat on the four transect lines using a soil core sampler. Soil cores were analyzed for soil pH, percent moisture, loss on ignition, and particle size. The percent canopy cover of the quadrat was also recorded using a densiometer. Data were analyzed using cluster analysis and principal component analysis.

Value of cardiac MRI for assessment of aneurysm of the ascending aorta in patients with aortic valve Insufficiency (*Project ID: 396*)

Ellianna Hoff

Biology - Faculty Sponsor: Dr. Andy Chang

Background: The current ACC/AHA and ESC guidelines recommend yearly monitoring of aneurysm size for patients with aneurysm of the ascending aorta > 3.5 cm diameter, measured perpendicular to flow. Recent data from Park et al (*Eur J Cardiothorac Surg* 51:959-964, 2017) suggest that co-existing aortic regurgitation (AR) may be an independent risk for progression of aneurysm size. However, Park et al used axial measurements, not perpendicular to flow dimensions, and included only moderate (2+) or worse AR, using CT as the imaging modality. Cardiac MRI (CMR) is ideal for assessing AAscAo size on a serial basis, without ionizing radiation. This study was designed to assess the long-term progression of AAscAo in patients with and without AR, using CMR.

Methods: An institutional cardiac imaging database was queried for all patients with AAscAo, defined as an ascending aorta diameter > 3.5 cm measured perpendicular to flow, who had 2 or more serial CMR studies. This patient cohort was divided into Group A (patients with AR) and Group B (patients with no AR). Serial ascending aortic diameter data were used to determine the mean diameter and rate of annual growth for four years after the initial diagnosis.

Results: Patients with aortic valve insufficiency had a mean growth in the diameter of the ascending aorta of 0.06cm/year from years 1 to 3. From year 3 to 4, however, this value was 0.14cm/year. In contrast, those patients without aortic valve regurgitation had annual growth rates that remained static for both years 1 to 3 and year 3 to 4 (0.05cm/year for each). The mean radiation dose for a CT of the chest is 7 mSv with a cost of \$486.10 (Medicare 2017 reimbursement). CMR has no radiation with a cost of \$254.82 (Medicare reimbursement 2017). The 5-year cost savings of this approach is \$115,640 per 100 patients with a radiation dose conservation of 35 mSv.

Conclusion: Patients with aortic valve insufficiency in conjunction with an aortic aneurysm have an accelerated growth of the ascending aortic diameter as compared to those who do not have aortic regurgitation. The accelerated growth rate appears to begin 3 years after the initial diagnosis. Serial monitoring of these patients can be accomplished with CMR at a lower cost to the healthcare system, without the need for ionizing radiation.

Session 1

8:30 – 10:00

Biology

Room: Ohio

Poster

Preliminary results from fungal characterization of biological soil crusts (BSCs) from Peruvian coastal desert (*Project ID: 404*)

John Morocco, Sarah R. Clark, Nick P. Piccirillo

Biology - Faculty Sponsor: Carl G. Johnston

Molecular methodologies were used to characterize the fungal assemblage of biological soil crusts (BSCs) from the Peruvian coastal desert. This is one of three coastal deserts in the world. Soil crust samples were collected from multiple sites and fungal isolates were prepared from them and subjected to DNA extraction. The internal transcribed spacer 2 (ITS2) region was amplified via PCR using universal primers ITS4 and ITS86F. Molecular cloning we conducted using pSC-A-amp/kan vector and Sanger sequencing results were obtained. Additional samples are still being processed and await analysis.

Are You Ready for Your Exam? (*Project ID: 293*)

Noelle Miller

Respiratory Care - Faculty Sponsor: Amanda Roby

Introduction: It has long been known that sleep is vital for all living beings. As a student, I have noted the effects of not doing well on a test due to lack of sleep. The topic interested me, and I would like to do more research as I feel like sleep plays a bigger component with memory than previously thought. There does seem to be quite a few resources that correlate memory retention and hours slept and I would like to explore the issue further. Hypothesis: I plan to propose that those participants/students who get less sleep will retain less information and therefore do poorly on a test. I would also similarly think that those students would also take longer to focus on the task. I plan to use a sleep study which will involve students to see how well they will do on a test based on their sleep hygiene. I will get a variety of students involved in this study to make it as un-biased as possible. I plan to use a quasi-experimental design as this will involve students who will take a test. I will ask for volunteers at the University. After I gather volunteers/participants I will conduct a sleep study which will both gauge sleeping habits and then have my participants take a test to see if sleep relates with memory. Not only will this study assess sleep but will see if amount slept will have effect on memory and therefore test scores following the study. Methods: The research design I plan to use would be quasi-experimental as I plan to choose my subjects for the experiment. My experiment will focus on the importance of sleep and Respiratory Therapy students to see how it will affect the outcome of taking their boards. I plan to test both the junior and senior class at Youngstown State University. I will create a test of moderate difficulty gathered from material either learned in class or on quizzes, and I will have the students take the test after they sleep. The students will undergo an at home sleep study before taking the quiz which will measure how well and long they slept. Once the sleep study is complete, I will administer the same test to each student. I will use the data from both their sleep study and test scores to see how sleep correlates with success. Results: Pending. Discussion: Pending

Timing is Everything (*Project ID: 294*)

Beatrice Norton

Respiratory Care - Faculty Sponsor: Amanda Roby

Introduction: Pulmonary rehabilitation is typically done on patients with stable lung diseases like COPD, but research is now supporting that pulmonary rehabilitation is beneficial for patient's days after an acute exacerbation of COPD. The problem being researched is the timing issues that lie in pulmonary rehabilitation programs. The longer the timeline from the date the patient is ordered pulmonary rehabilitation to the day that they start rehabilitation the more stagnant the patients can become. This stagnation can lead patients to develop more severe forms of pulmonary diseases. It is important to get these patients into rehabilitation as soon as possible so they can learn the correct modalities to cope with their diseases and lead more productive lives. The purpose of this research is to review pulmonary rehabilitation charts to see if there is a timing issue between order dates and the dates that patients start pulmonary rehabilitation. Hypothesis: There is a timing issue from when patients receive an order for pulmonary rehabilitation that can exceed weeks to months before they start a pulmonary rehabilitation. This prolonged period of time can result in increased health issues for patients'. Methods: The research design used to complete this project was by collecting historical data by chart review. The information that was collected were ages, sex, insurance company, order date for pulmonary rehabilitation, date starting pulmonary rehabilitation, how many sessions they attended pulmonary rehabilitation, patients insurance companies and how many visits the insurance would allow for pulmonary rehabilitation, how many days/weeks between order date and start of rehabilitation, and hospital admissions after pulmonary rehabilitation if applicable. Results: Pending. Discussion: Pending.

Who's Sleeping on Campus? (Project ID: 295)

Alexis Mamonis

Respiratory Care - Faculty Sponsor: Amanda Roby

Introduction: As most people know, attending college is a very stressful, time-consuming journey in one's life. Not to mention, adding 12+ hours of classes to an already busy schedule with a family, a job and other personal responsibilities can make it seem almost impossible to balance. It is easy to assume that college students don't get much sleep, but what people don't take into consideration is the amount of sleep that the faculty members are also losing out on. Hypothesis: Faculty who teach in programs that incorporate shift work will have less sufficient sleep. Methods: The research design that was used to facilitate this project was a survey design. The nature of the information allowed the student-researcher to collect the data through the use of anonymous surveys in order to improve the response, both in number and in the level of accuracy. The study is being conducted to examine the lack of sleep that faculty members of the Youngstown State University may be experiencing, instead of focusing on the student population. The survey consisted of questions that gathered information to understand not only how much sleep the participants get each night, but information about their everyday routine and work load as well. Results: Pending. Discussion: Pending.

E-cigarettes (Project ID: 296)

Madeline Nagy

Respiratory Care - Faculty Sponsor: Amanda L. Roby

INTRODUCTION: Electronic Cigarettes also known as E-Cigarettes is a form of vaping and use age of them has increased over time especially among the young adult generation and college students. The purpose of this study is to give better insight into college students perception of e-cigarettes and if their increased use age of e-cigarettes is associated with lack of proper education on the health effects using e-cigarettes could cause. HYPOTHESIS: If college students that have more knowledge about the harmful of electronic cigarettes will be more likely to have a negative perception of them. METHODS: Using a survey-based questionnaire, 100 college students anonymously gave their thoughts on their education, understanding, and use age of e-cigarettes. Two surveys were utilized with identical survey questions the only difference is one survey contained a fact sheet regarding e-cigarettes that was published by the surgeon general and the other survey just contained the survey questions. The surveys were completed and immediately submitted upon completion by an online survey tool known as survey monkey; 50 students answered survey A and 50 students answered survey B. RESULTS: Pending. DISCUSSION: Pending.

Effectiveness of Pulmonary Rehabilitation Program with COPD Patients in Saudi Arabia, in Contrast with Other Countries. (Project ID: 365)

Sara Alhayk

Respiratory Care - Faculty Sponsor: Dr Kelly L Colwell

Introduction: The presence of chronic obstructive pulmonary disease (COPD) is continuously rising while its occurrence is increasing in old age. COPD is one of the serious diseases that can affect patients' physical activity as well as mental status, specifically, when it progresses with patients who have poor health care; it can lead to poor quality of life and disability. Therefore, a lot of studies show that pulmonary rehabilitation (PR) programs can improve the quality of life of the people with COPD by a personal customized program of exercise, education, and mental support. Moreover, there are proof supports the use of pulmonary rehabilitation programs in managing of patients with chronic obstructive

pulmonary disease (COPD) has a huge success. Such evidence is based on studies showing better productive exercise capacity and enhanced quality of life following pulmonary rehabilitation program In these patients Methods: Collecting Data will be accomplished by utilization of a survey via email to respiratory therapists in Saudi Arabia and other countries through cooperation agreement with the American Association for Respiratory Care (AARC). The questions will be focused on the type of provided pulmonary rehabilitation program if any, the demographic of the patients attended the programs (Age, gender, disease, etc.), and whether those programs are perceived as helping COPD patients. Results: The results are still pending. Discussion: On this research we are collecting data from respiratory therapists in Saudi Arabia and other countries to find out that increasing pulmonary rehabilitation programs can improve the current COPD intervention status and enhance the quality of life. Also, if there are more people participate in the pulmonary rehabilitation programs; hence that can decrease the development of COPD.

Are sleepy college students experiencing more stress? (Project ID: 373)

Heidi Wingler

Respiratory Care - Faculty Sponsor: Mary L. Yacovone

Introduction: College students face stress everyday whether it's school related or a life event (such as a death, financial struggles, or illness). This stress can lead to a decrease in the quality of sleep, causing excessive sleepiness. In turn, being more tired can cause stress. Both of which can be detrimental to the health of a student. The purpose of this study is to evaluate the connection between stress and sleepiness. The hypothesis for this study is that students who score higher on the Epworth Sleepiness Scale will also have a higher level of stress indicators on the stress survey.

Methods: The Institutional Review Board of Youngstown State University approved this study.. Permission was obtained for use of the Epworth Sleepiness Scale from Murry W Johns, The Epworth Sleepiness Scale. A stress survey was developed to assess the students' perceived stress. A brief explanation with consent along with the two surveys (stress scale and Epworth Sleepiness Scale) were sent out via campus email to the students at YSU. Results: Pending..

Patient and Family Education Training in Respiratory Care Programs (Project ID: 410)

Stacia N. Brodie

Health Professions - Faculty Sponsor: Mary L. Yacovone

Lung disease and infection affects many patients worldwide. Respiratory therapists are the primary care giver when treating patients with lung disease. The best way to prevent unnecessary treatment and/or hospitalization, as well as help those with lung diseases or infection is through patient and family education. Proper patient and family education has shown to be beneficial to reducing healthcare cost, readmissions and overall patient quality of life. Respiratory therapist must learn how to offer effective patient and family education. The hypothesis of this study is that respiratory care programs provide less than fifty percent of current patient and family education that is needed to manage patients with cardiopulmonary disorders. Methods: The Institutional Review Board of Youngstown State University approved this study. A survey instrument will be sent to Entry Level Program Directors of accredited respiratory care programs, inquiring about patient and family education training currently being taught in their program. Results: Pending.

Session 2	8:30-10:00	Dental Hygiene	Room: Coffelt	Oral
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Heavy Duty Utility Gloves (*Project ID: 253*)

Taylor Kilbert, Kristin Davila, Amanda McCandless

Dental Hygiene - Faculty Sponsors: Jennifer A. Pieren, RDH, MS, Diane P. Kandray, Ed.D, RDH

Heavy-duty utility gloves are used to handle and process contaminated dental instruments and protect dental hygienists from possible infectious material. These gloves are meant for multiple uses; however, there is no uniform protocol on how to effectively disinfect them and no guidance as to which disinfection methods are recommended.

The objective of this study was to determine the effectiveness of different cleaning and sterilization methods at destroying bacteria inside of heavy-duty utility gloves. Six sets of gloves were tested from clinical assistants and students working in the clinical setting. Different processing methods, i.e. hand-washed with antimicrobial soap and autoclaved, only hand-washed with antimicrobial soap, or neither washed nor autoclaved, were applied to the gloves before the inside of the gloves were swabbed from fingertip to palm. Swabs were then transferred to agar plates, tested and incubated for 24-72 hours, after which they were observed for staphylococcus aureus, e-coli, and non-specific bacterial growth. While the plates were negative for e-coli growth, positive results were found for both general bacteria and staphylococcus aureus. The only gloves without growth were students' gloves that had been washed with antimicrobial soap and autoclaved. The gloves with the most bacteria growth were clinical assistant gloves that had been neither washed nor autoclaved. Clinical assistant gloves showed more growth than gloves used by students in the clinical setting, regardless of disinfection method. Further research should be completed to compare the effectiveness of different disinfection processes at removing bacteria from utility gloves.

Erosive Potential of Beverages Sold on a College Campus (*Project ID: 281*)

Courtney Smith, Merritt Heinrich, Erin LaFrance

Dental Hygiene - Faculty Sponsor: Dr. Diane Kandray

Beverages sold on a college campus and consumed by college students can be harmful to the enamel of the teeth. The purpose of this study was to determine the enamel erosive potential of various drinks sold on Youngstown State University's campus by measuring the pH of each substance. The 18 beverages tested in this study are those available for purchase from a cafe and various vending machines in Cushwa Hall on Youngstown State University's campus. A digital pH probe was used to determine the pH of each beverage at room temperature. Each beverage was tested three times to determine an average score. Of the 18 beverages tested, 11 measured a pH of 6.0 (acidic), while seven were tested with a pH above 6.0 (basic). Pepsi tested as the lowest pH at 2.57 while tap water had the highest pH at 9.31. The seven beverages that were tested and considered basic were Aquafina water, Coffee with Cream and Sugar, Filtered Water, Life WTR, Starbucks Caramel Frappuccino, tap water and TruMoo Chocolate Milk. All the other beverages, including fruit juices, flavored waters and sodas have erosive potential based on their low pH levels. The majority of beverages available to college students may be detrimental to tooth enamel. Dental hygienists should recommend beverages that have the lowest erosion potential to reduce the damaging effects on tooth enamel.

Session 2	8:30-10:00	Dental Hygiene	Room: Coffelt	Oral
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How Patients Perceive Body Modifications (*Project ID: 282*)

Jessica Morgan, Jessica Bassil, Jordyn Patterson

Dental Hygiene - Faculty Sponsors: Jennifer A. Pieren, RDH, MS, Diane P. Kandray, Ed.D, RDH

Existing studies on healthcare professionals show that providers with visible body modifications can be perceived to be less professional and hygienic compared to healthcare providers without body modifications. The purpose of this study was to determine patients' perceptions on body modifications, such as tattoos, facial piercings, and unconventional hair color. Surveys were distributed to patients at the Youngstown State University dental hygiene clinic with 7 questions regarding patients' perception of various body modifications, including 3 picture comparisons of the same individual both with and without body modifications, to anonymously collect quantitative data. Thirty nine surveys were collected. Out of all the participants, 67% were females and 33% were males. The majority of participants in this study were in the age range of 18-30. Participants indicated that facial piercings were the body modifications that were most likely to make the patient perceive the dental hygienist to be less professional. When presented with pictures of the same individual both with and without facial piercings, patients more often perceived the individual without facial piercings to be the more professional of the two. The tattoo picture question results suggested that the majority of the participants did not have a negative perception of the professionalism of a dental hygienist with visible tattoos. As the demand for hygienists continues to grow, more research needs to be completed to further understand the impact that body modifications have on patient perceptions.

Food Factors That Influence Cariogenicity (*Project ID: 284*)

Aubrey Schnur, Jamie Vamosi

Dental Hygiene - Faculty Sponsor: Dr. Diane Kandray

Oral salivary pH has a direct effect on the incidence of tooth decay. When carbohydrates are consumed, saliva breaks the molecules into simple sugars causing the pH level of the saliva which is normally neutral (7) to become acidic (below 5.5). Studies have demonstrated that demineralization of tooth enamel occurs when saliva falls below the critical range of 5.5. However, there is evidence that suggests when a single food item contains a carbohydrate and a protein the protein helps to buffer the saliva and prevent the production of an acidic oral environment. For the purpose of this study, several foods were consumed including those that contain both a protein and a carbohydrate. The foods were evaluated for their impact on oral salivary pH. Two subjects were used in this study. The subjects drank eight ounces of tap water and waited two-three minutes and then tested their pH to cleanse the oral cavity. The selected food was consumed by each participant in the same quantity. After 5 minutes the saliva pH was tested using pH test strips, and the results were recorded. The hypothesis that proteins in selected food items buffered the saliva was not supported. The test strips did not prove to be sensitive enough to record measurable changes in saliva pH. Perhaps this study could be improved by testing different foods with more subjects under controlled conditions.

The Delivery of Local Anesthesia and Nitrous Oxide by Dental Hygienists (*Project ID: 286*)

Paige Krug, Casey Gibbs, Sydney Beck

Dental Hygiene - Faculty Sponsor: Jennifer A. Pieren, RDH, MS, Diane P. Kandray, Ed.D, RDH

The delivery of local anesthetic (LA) and nitrous oxide (NO₂) are within the scope of dental hygiene practice. In Ohio, dental hygienists are permitted, with appropriate training, to administer local anesthesia (LA) and administer/monitor nitrous oxide (NO₂). Registered dental hygienists can benefit by

administering local anesthesia and/or nitrous oxide to decrease dental anxiety, sensitivity, and to make certain procedures more comfortable for their patients. However, it is unclear how often dental hygienists administer local anesthesia and nitrous oxide in practice. The purpose of this study was to determine how many dental hygienists in the tri-county area have their LA license and/or NO2 certification and how often they administer these services. For this study, 270 members of the Tri-County Dental Hygienists' Association were emailed electronic surveys. A fourteen percent (n=38) response rate was achieved. The results indicated that the majority of the study population worked in general dentistry (76.3%). A majority of dental hygienists have the following in combination with their dental hygiene license: LA license (42.8%), NO2 monitoring (35.7%), and/or NO2 administration (21.5%). Forty percent indicated they administer LA on a weekly or daily basis in practice. Most participants reported they are not certified or licensed in NO2 and/or LA. In conclusion, there are more dental hygienists licensed to administer LA than NO2. It is necessary to conduct additional research on LA and NO2 in the field of dental hygiene to obtain a better understand the implementation of these services.

Collaborative Care for Orthodontic Patients (*Project ID: 297*)

Jamie Bakalar, McKenzie McMurray, Shazina Qaisar

Dental Hygiene - Faculty Sponsors: Jennifer A. Pieren, RDH, MS, Diane P. Kandray, Ed.D, RDH

Communication between care providers is a key factor for the successful treatment of patients. Many patients receive care from both dentists and orthodontists, but little literature currently exists to document the level of collaborative care and communication between these professionals when caring for the same patient. This study evaluated the collaborative care and communication between general dentists and orthodontists. Seven general dentists that work at the Youngstown State University were interviewed. The dentists were individually asked a series of open-ended questions about the level of communication and collaboration they have with orthodontists to collect qualitative data. Each interview was recorded and transcribed. The results indicated that six out of the seven interviewed dentists felt that the amount of collaboration and communication with the orthodontists with which they have worked was adequate; however three of the seven indicated they only communicated with the orthodontist if the case was considered severe. Three dentists reported that not communicating in timely fashion was the biggest barrier. Most dentists indicated that orthodontists needed to enforce more oral hygiene education for their patients. The findings indicated the there are some challenges that exist in the area of communication and collaboration between dentists and orthodontists, which could impact patient outcomes. Further research needs to be completed to better understand the challenges and barriers to effective communication and collaboration between dentists and orthodontists.

A study on the Prevalence of Digital vs. Conventional Radiography in Northeast Ohio (*Project ID: 382*)

Diana Deehr, Diamonto Heberling, Jessica Passas

Dental Hygiene - Faculty Sponsors: Dr. Diane Kandray, Mrs. Jennifer Pieren

Dental radiographs for diagnostic purposes are considered a standard part of dental treatment. Digital dental radiography was introduced in the 1980s and has been gaining in popularity compared to traditional film radiography. Digital radiography offers less radiation to the patient and better diagnostic quality for the practitioner. The purpose of this study was to investigate the prevalence of digital vs. conventional radiography in the tri-county area which includes Trumbull, Mahoning, and Columbiana counties in Northeastern Ohio. This study surveyed dental hygienists who are active members of the Tri-County Dental Hygienists Association. An electronic survey was created using the software Survey Monkey. The 10 question survey was e-mailed to 270 dental hygienists. Forty-four surveys were returned for a 16% response rate. Participants report that digital radiography is favored and more prevalent among the participants. Participants report that 27.27% (n=12) use conventional (film), while 75% (n=33) use digital. Some report to using both digital and traditional. Most of the respondents, 63.64% (n=28) report that they prefer digital over conventional (film). Only 18.18% (n=8) of the respondents reported that they prefer conventional (film). Even though most participants use digital radiography in their professional practices, they feel that traditional film techniques should still be taught in the dental hygiene education curriculum.

Session 2	8:30-10:00	Creative & Liberal Arts / Education / Business	Room: Humphrey	Oral
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The Communicational Divide Between Generations (*Project ID: 223*)

Gianna Pishotti

Communication Studies - Faculty Sponsor: Amy Crawford

In the world today, there is so much strife among people in politics, religion, world views, etc., and a lot of this conflict is between the older and newer generations. Much of this problem stems from the large technological wave that swept up Millennials and Generation Z, but that left previous generations like the Baby Boomers and Generation X behind. This project analyzes this large generational divide and seeks solutions to the problem of miscommunication.

The Improvement of the English Language and Technology (*Project ID: 250*)

Brooke Jonas

Middle Childhood Education - Faculty Sponsor: Jennifer Behney

This presentation explores linguistic research conducted on the relationship between technology and language, and the reasons why the relationship is a good one. Topics of discussion in this presentation include the growth of language, creative ways of communicating, improvement in writing and literacy skills, and the creation of computer programs designed specifically for education. Since the subject matter that follows is still relatively new, it is often up for debate. Many people believe that modern innovations (primarily cell phones and the Internet) are destroying the English language along with many others. While it is easy to say that new slang, social media, and emojis are taking over language in a negative way, it is simply not true. Due to the invention of computers and cell phones, new words have been added to the English language. Emojis and gifs have given people more creative ways to speak to one another because they are wonderful forms of expression that give language playful characteristics. Cell phones and computers also give more opportunities to practice reading and writing. There are many texts to read online, and many companies have made computer programs for the specific purpose of helping both native and non-native speakers of English with language skills. These technological advancements often thought of as useless inventions that cause trouble in our lives all contribute to the English language becoming significantly larger, easier for non-native speakers to understand, and a lot more creative.

English Learning Students From Puerto Rico in the U.S. Education System: A One School Study

(*Project ID: 259*)

John S. Rozum

English - Faculty Sponsors: Dr. Cynthia Vigliotti, Dr. Alena Kirova

The purpose of this project was to research English Learners from Puerto Rico within the United States education system. Through synthesized research in Sociolinguistics, Language Acquisition, and TESOL Practicum field work, the intentions are to discuss the implications of English language teaching policies in the U.S. and why/how it must adapt to these students.

Session 2	8:30-10:00	Creative & Liberal Arts / Education / Business	Room: Humphrey	Oral
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A Brief History of Barriers to Education in the United States from 1600 to Present-Day

(Project ID: 260)

Diana Bodrogi-Podoaba

Social Studies - Faculty Sponsor: Dr. Patrick Spearman

This presentation is a brief history of the barriers to education faced by children in the United States from 1600 to 2018. The obvious barriers are mentioned: gender discrimination, racism, and socioeconomic class. But the less apparent ones are also analyzed: societal values, physical access, disability status, xenophobia, and transphobia. We will examine the steps and time required for societal progress to take place. The most critical of the national and state legislation addressing school attendance will be identified as how they either increased accessed or inhibited it. Furthermore, the listener will discover what events were results of opposition to legislation, and how they affected history. Through the examination of this topic, we will observe how eliminating educational barriers was not a straightforward process. Especially for students who experienced more than one type of discrimination, advancements they experience were often negated again with more restrictions. Keywords: educational access, schooling, children, U.S. history, race, racism, gender, sexism, classism, ableism, classism, transphobia, xenophobia.

The Trauma of the Black Body in African Diaspora Literature *(Project ID: 267)*

Shemya R Wilson

English - Faculty Sponsor: Dr. Tiffany M Anderson

The hauntings of the black body are explored in my interdisciplinary study of trauma in African diasporic literature. Yaa Gyasi's "Kojo", Richard Wright's *Native Son*, and Angie Thomas's *The Hate You Give* are works of literature that probe the suffering black people in America have undergone during the last three centuries. Although each story is written about different time periods, together they illustrate the lack in progression of black struggles and the expectation for black people to cope with systemic racial trauma. I ask: what toils the black mind? How does a black individual keep hope? I use the stories to analyze Ta- Nehisi Coates's book, *Between the World and Me*, to examine the trauma of living black. This project seeks to define black trauma: the trauma of the black body is the inability to live with hope and the obligation to live with struggle.

A New Beginning for Schools *(Project ID: 316)*

Bailee Wolanzyk

Advertising and Public Relations - Faculty Sponsors: Russel Brickey, Linette Stratford

It is imperative to understand and recognize how bullying affects both the victim and the perpetrators because once it is recognized; methods to address and respond to those behaviors can be taken. By teaching children social skills on how to cope with their feelings, children can learn how to effectively solve problems without violence. The information of this study is important to all schools and people associated with the educational system, as well as parents, advocates, community members, and politicians. When bullying behaviors are addressed school attendance improves, school crimes are reduced, and students overall feel more safe.

Manufacturing Facility Design (*Project ID: 240*)

Matthew Manna

Industrial / Systems Engineering - Faculty Sponsor: Hojjat Mehri

Facility design plays a key role in the economics of a company. Proper designing and planning of a facility can have major effects on cost savings. An estimated 20%-50% of total costs in manufacturing are material handling related. With planning and analysis, bottlenecks, excessive idle times, and efficient employee/labor utilization can be determined and addressed accordingly. In order to create the most efficient facility, you must accommodate for current production, employees, machinery, and future production. Many procedures and methods have been developed in the past 100 years in order to create the best possible facility given the conditions and limitations. Methods to help complete the process include location analysis, forecasting, process flow charts, operation flow charts, and depreciation calculations. The use of AutoCAD is also very important in determining the layouts and dimensions of the facility.

Taylor Winfield Ergonomic Improvement (*Project ID: 245*)

Alexander Fitzgerald, Carmen Marinucci, Richard Ferry

Mechanical Engineering - Faculty Sponsor: Anthony Viviano

The purpose of this project was to redesign and ergonomically improve tooling adaptors used for mounting and dismounting components on and off of a train axle (i.e. gearbox and bearings). The adaptors are used with a horizontal wheelset press machine that press fits (interference) the components onto the axle with a high amount of compressive load. The main issues with the adaptors were the parts exceeding the OSHA weight standards and the handles not being operator friendly. The team was also tasked with creating a mechanism that corrects the wheel alignment as it is moved into position with the cylinder shaft. The current process created issues for the operator of the overhead crane because the wheel was loaded out of plane and did not slide onto the shaft easily. All new designs on the components and mechanism met the OSHA weight standards and industry design standards as well.

Vallourec Deox Nozzle (*Project ID: 248*)

Justin Stellmar

Mechanical Engineering - Faculty Sponsor: Stephan Moldovan

Analyze and optimize the current deox nozzle being used at Vallourec in Youngstown, Ohio. The deox nozzle is a critical step in the seamless tube making process. Before a shell of steel can be milled into a finished pipe, a dosage of nitrogen and deox powder is sprayed into the shell to melt any oxidized steel and lubricate the mandrel during the milling process. Optimization of the nozzle involves using complex geometries that can only be achieved by using additive manufacturing processes to distribute the deox solution as evenly as possible across the shells inner surface.

Session 3a	10:30 – 12:00	Engineering Topics	Room: Ohio	Poster
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Diffusion Performance of 3D Printed Kidney Filter (*Project ID: 251*)

Robert Dixon

Chemical Engineering - Faculty Sponsor: Dr. Pedro Cortes

The purpose of this project is to improve the efficiency and effectiveness of biomedical renal dialysis filters. We will be using additive manufacturing and biological printing techniques to run experiments in order to do so.

Youngstown Temperature Forecast (*Project ID: 273*)

David Gessler, Nicole Zimmerman

Mathematics - Faculty Sponsors: Dr. Thomas Wakefield, Dr. Moon Nguyen

The Actuaries Climate Index (ACI) has recorded weather patterns between the years 1961-2017, allowing people to access past climate changes in North America through multiple aspects. The ACI gave us the idea to create predictions for the weather in Youngstown over a 30- year period (1987-2017). We used regression to fit several different models to the data and determined the error between the values predicted and the actual values to ultimately predict the best value.

Manufacture of Dimethyl Ether For Transportation (*Project ID: 274*)

Samuel Cappelli

Chemical Engineering - Faculty Sponsor: Dr. Douglas Price

Dimethyl ether (DME) is considered to be a step towards near-zero particulate emission of motor vehicles when utilized as a transportation fuel. With several various means of production, many of which are sustainable, DME possesses key characteristics that lend itself to a preferable alternative to common fuels used. Consequently, this project aims to perform a production analysis of a plant producing high volumes of DME, and whether it is a viable substitute to gas or diesel. This is accomplished by the ground-up design of a functioning plant, with final recommendations made based on considerations surrounding overall costs, human and environmental safety, and technical/business risk analyses.

Design of a Cyclone Separator for Optical Flow Measurements (*Project ID: 299*)

Elise Eckman, John Berndt

Mechanical Engineering - Faculty Sponsor: Kevin Disotell

Despite its wide-ranging uses in separating powder coatings, sawdust, wood chips, sand, and other particulate in various scrubbing and drilling operations, the cyclone separator has proven to be a difficult device to analyze. In particular, sparse data exist regarding the spatial distribution of flow parameters inside the cyclone. This information is crucial in determining the structure of the vortex flow, which has a direct effect on how well the device separates particulate from liquids and gases. Insufficient spatial resolution of this structure is an inherent limitation of point-based sensors used in previous experiments. In order to leverage modern optical-based flow measurement techniques, a custom cyclone separator has been designed with provisions for optical access to the internal flow. The measurements enabled by the design of this apparatus will be useful for validating computer models of the vortex flow.

Exploiting the Low CTE Properties of Materials in High Temperature Composite Tooling via Additive Manufacturing (*Project ID: 337*)

Michael Maravola

Chemical Engineering - Faculty Sponsor: Dr. Pedro Cortes

The use of additive manufacturing (AM) provides an opportunity to fabricate composite tooling rapidly and cost effectively. This project appears to have demonstrated the use of an additive technology for the production of composite processing tools. In particular, this work has addressed tooling that is functional in the full range of autoclave temperatures from 350°F up to 550°F (or higher). This has led to the use of Invar and ceramic materials for use in molding tools because of their relatively low coefficient of thermal expansion (CTE) at elevated temperatures, which is in range to that commonly displayed by high-temperature carbon fiber reinforced composites during their solidifying-curing process. In this project, three approaches have been taken. The first approach consisted on using Binder jetting for 3D printing sand molds to cast molten Invar for producing the composite tooling. Indeed, 3D sand printing offers the ability to cast complex geometries without the geometric limitations associated with conventional pattern making. The second approach was based on printing the mold based on ceramics and infiltrating it with high temperature polymers to yield a robust ceramic composite tooling. The third methodology concentrated on using a Hybrid Direct Energy Deposition (DED) System for cladding Invar upon a steel molding structure. This unique approach seems to be represent a promising technology for producing low cost composite tooling since only a small layer of the Invar is printed on the process. The aforementioned processes have successfully resulted on a low CTE composite tooling mold.

Corrosion reduction using two coating methods on magnesium (*Project ID: 345*)

Rana Abu-Hashim, Amber Deming

Chemical Engineering - Faculty Sponsor: Dr. Holly Martin

In an effort to lightweight vehicles, magnesium is a metal of interest due to its low density and high weight-to-strength ratio. It is easily corroded, though, so it cannot be used in exposed areas of vehicles, including most of the engine area. Polyetherimide (PEI), a hydrophobic polymer resistant to aqueous solutions and hydrocarbons, has been successfully shown to delay the corrosion of magnesium, specifically AE44, which contains 4% aluminum and 4% rare earth elements. However, an uneven thickness using solution casting or a very thick shell using additive manufacturing greatly affected the delay of corrosion. In an effort to improve the corrosion resistance imparted by PEI, two different ways to deposit the polymer were investigated and the corrosion resistance in 3.5 wt% saltwater was determined.

Session 3a	10:30 – 12:00	Engineering Topics	Room: Ohio	Poster
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YSU Dyno (*Project ID: 357*)

Saleh Alfreidi, Abdullallah Alqarni, Saleh Alsaleh

Mechanical Engineering - Faculty Sponsors: Dr. Stefan Moldovan, Prof. Anthony Viviano, Dr. Hazel Marie

The first phase of the project is to reassemble a 5.7L GM engine and measure its performance using a Dynamometer, which will be part of a heat and thermal lab experiment. The second phase is to analyze the exhaust by using a gas analyzer and see the condition of the engine on emissions which will help to determine if there are misfires or compression loss during the combustion .

Evaluation of 3D Printed Lattice Structures for Energy Absorption (*Project ID: 364*)

Emili Bonanno, Efrain Velez, McKenzie Scheckelhoff, Trevor Leonard

Mechanical Engineering - Faculty Sponsor: Dr. Jason Walker

Using 3D-printed Onyx specimens of varying gyroidal porosities and grades, we tried to establish relationships between the distinguishing features and mechanical properties as well as resorption energies. Primarily focusing on conventional compression testing to achieve this, the data collected determined that adjusting the geometry, porosity, and material of the specimens can provide for great advantages with respect to mechanical properties, such as stiffness and toughness, and resorption rates. On a larger scale, these results also verify that the modification and reconstructive methods of these specimens through CAM and automated systems are superior to old methods and are useful in many industries, such as plastic surgery/tissue engineering, aviation and automotive.

The fracture properties of a hybrid laminate based on a 3D printed composite material

(*Project ID: 374*)

Bridger Kowalczyk

Chemical Engineering - Faculty Sponsor: Dr. Pedro Cortes

The present work has investigated the static and dynamic properties of a novel hybrid laminate based on a 3D printed carbon fiber composite. Here, a Markforged printing system has been employed for the manufacturing process of a continuously reinforced material that was used as the composite system on a hybrid laminate structure. The incorporation of 3D printing on these kind of laminated systems could represent a new breed of multilayered structures with unique configuration and designs, since the use of the additive manufacture technology can overcome almost any configurational processing constraint. Initial testing has shown that an enhanced bonding between the metal and the composite material can be achieved by incorporating a tough thermoplastic adhesive material at their common interface. Single Cantilever Beam tests have shown that the interfacial strain energy release rate of the layered system seems to be superior than conventional bi-material based thermoset systems. Tensile tests on the laminates have also shown that the tensile strength of these hybrid structures can be successfully predicted using a simple rule of mixture. High velocity impact tests on these novel 3D printed based Fiber Metal Laminates have shown promising perforation energies. It has been observed that the incorporation of composite material into the hybrid structure appears to enhance the impact properties of the hybrid system.

Session 3a **10:30 – 12:00** **Engineering Topics** **Room: Ohio** **Poster**

Impact Testing on 3D Printed Kevlar-Reinforced Onyx Specimens (*Project ID: 388*)

Mackenzie Scrocco, Logan Weinreber, Edward Ellks, Timothy Chamberlain

Mechanical Engineering - Faculty Sponsor: Dr. Brett Conner

Kevlar reinforced materials are commonly used in ballistics defense applications. The group utilizes 3D printing to reinforce nylon infused carbon fiber material with Kevlar to design specimens and perform various impact tests, such as Charpy impact testing and gas gun ballistic testing. The group hopes to use the data collected to better understand how various properties of these materials, when 3D printed, perform under impact.

Diffusion Performance of 3D Printed Kidney Filter (*Project ID: 405*)

Mason Shaulis

Chemical Engineering - Faculty Sponsor: Dr. Pedro Cortes

Our source for the filter has pushed the delivery date back yet again, to the end of march. We will be 3D printing the internal structure of a kidney out of some water soluble material (yet to decide) and then coat it in a permeable membrane of our choosing. We will then dissolve the inside in water, and use the shaped membrane to simulate the structure of a kidney itself and run our filter tests on this instead. We have recently met with Dr. Walker to discuss how to complete this, and have sat in on a demonstration of his bio-printing process for reference.

Extraction of Microcystins from Plasma and Serum and their Quantification by LC-MS (Project ID: 224)

David Baliu-Rodriguez

Chemistry - Faculty Sponsor: Dragan Isailovic, University of Toledo

Exposure to microcystins (MCs) during harmful algal blooms (HABs) has gained a great deal of attention due to human and animal health and safety concerns. Sensitive and precise analytical strategies for MC quantification in biofluids are essential for accurate assessment of potential health effects. Herein, sample preparation and solid-phase extraction (SPE) protocols were optimized to quantify MC-LR, MC-RR, MC-YR, MC-LA, MC-LF, and MC-LW in mouse plasma and human serum using LC-MS and LC-MS/MS. The average recoveries of all MCs from mouse plasma and human serum ranged from 90.4-106.9% and 90.0-104.8%, respectively, with relative standard deviations (RSDs) \leq 6.3% and \leq 5.0%. Quantification of MCs from spiked plasma and serum was achieved at \leq $\mu\text{g/L}$ concentrations using an HPLC coupled to an Orbitrap Fusion MS in selected ion monitoring (SIM) mode. Additionally, an UHPLC binary gradient with multiple reaction monitoring (MRM) MS/MS method was used for the separation and detection of MCs extracted from serum using a triple quadrupole (QqQ) MS. The sample preparation and SPE methods were applied to extract MC-LR from plasma of mice that had been orally administered MC-LR. The LC-MS results indicated that increased MC-LR dosage leads to a larger amount of MC-LR in plasma. The described sample preparation, SPE, and LC-MS methods can be implemented to quantify MCs in plasma and serum.

Can you smell that predator? Different sensory ecologies of two prey species (Project ID: 225)

Ana Jurcak

Biology - Faculty Sponsor: Paul Moore

Non-consumptive effects (NCEs) of predators can influence prey as much or more as consumptive effects (CEs). NCEs are mediated through the prey's knowledge of a predator's presence via sensory signals. The purpose of this study was to investigate a predator odor dose-response curve for different prey species (two native and one invasive crayfish). We used a controlled flow-through model stream to deliver odor to test subjects. Bass were chosen as the donor for the predatory odor. Crayfish were placed in the arena with a predator odor source and allowed to move throughout the arena as well as interact with resources. The movement pattern and different behaviors of prey (crayfish) were digitized for the entire 15 minute period. Anti-predator behavior exhibited by the prey were both concentration and prey species dependent. This work demonstrates that models of non-consumptive effects need to include differences in prey sensitivity across different species.

CHARACTERIZATION OF DEFECTS IN In^{2-} -Ga₂O₃ THIN FILM GROWN BY METAL ORGANIC CHEMICAL VAPOR DEPOSITION (Project ID: 226)

Armando Hernandez Jr.

Physics - Faculty Sponsor: Farida A. Selim

In^{2-} -Gallium(III)oxide (Ga₂O₃) is emerging as a semiconducting material of great interest for fabrication and advancement of high powered devices because of its very wide bandgap, excellent electrical properties and high breakdown voltage. In this work, epitaxial films of as-grown and Si doped In^{2-} -Ga₂O₃ were fabricated by Metalorganic Chemical Vapor Deposition (MOCVD) and were characterized by X-Ray Diffraction (XRD), Thermoluminescence (TL) and Hall Effect measurements. The XRD patterns revealed formation of pure epitaxial In^{2-} -Ga₂O₃ phase. Luminescence was recorded in the range of 200-800nm using TL between -190 oC to 360 oC to detect all emission centers. An electron trap was identified at very low temperatures. Electrical properties including resistivity, density and mobility were determined using Hall Effect measurements. This study illustrates an efficient method to grow pure epitaxial In^{2-} -Ga₂O₃ as well as identify its fundamental properties and investigate the role of defects.

Defining the brush border targeting mechanism of the enterocyte scaffold ANKS4B (Project ID: 237)

Maura Graves

Biology - Faculty Sponsor: Dr. Scott W. Crawley University of Toledo

Intestinal enterocytes interact with their luminal environment through specialized actin-based microvilli created on their apical surfaces. Microvilli are organized into a tightly-packed array on the apical surface of each enterocyte during differentiation, forming a structure known as the intestinal brush border. The intestinal brush border functions as the sole site of nutrient absorption in the gut, and also contributes to the defense against toxic compounds and pathogenic microbes that may be present in the lumen of the intestine that could harm host tissue. It was previously discovered that enterocytes employ a protocadherin-based adhesion complex, known as the intermicrovillar adhesion complex (IMAC), to assemble their brush borders. Specifically, the IMAC is used to physically link neighboring microvilli together at their distal tips in order to control microvillar organization during brush border assembly. The IMAC is comprised of two calcium-dependent protocadherin adhesion molecules (protocadherin-24 and mucin-like protocadherin), a myosin motor protein (Myosin-7b), and two scaffolding proteins (Harmonin and ANKS4B).

The long-term goal of my project is to elucidate the role of the scaffold ANKS4B in IMAC-mediated apical assembly of enterocytes, specifically focusing on how ANKS4B targets to the brush border.

The structure of ANKS4B consists of an N-terminal ankyrin repeat domain (ANKRmin; aa 1-126), an uncharacterized segment after the ANKR domain (ANKRC-tail; aa 127-252), a central unstructured region (CEN; aa 253-346), and a C-terminal sterile alpha motif (SAM; aa 347-412) that ends with a canonical PDZ-binding motif (PBM; aa 413-417). In a previous study, an N-terminal fragment of ANKS4B (aa 1-252) was found to robustly target to the brush border (Crawley et al, 2016), but the underlying mechanism of this targeting was not elucidated. In my project, we seek to characterize the brush border targeting properties of this N-terminal region of ANKS4B. By comparing the localization of an EGFP-tagged construct encoding the N-terminal region of ANKS4B to the endogenous localization of the other IMAC components, we discovered that the N-terminus of ANKS4B targets to the brush border in a manner independent of the other IMAC components. We performed a detailed sequence analysis of the N-terminal region of ANKS4B and have identified previously unappreciated structural motifs including a coiled-coil motif (CC; aa 126-168), a serine rich patch (SRP; aa 169-197), and a putative basic-hydrophobic-basic membrane binding motif (BHB; aa 203-213). Our analysis suggests that the N-terminal region of ANKS4B localizes to the brush border using the targeting properties of the ANKRmin domain and the putative BHB motif. Furthermore, we discovered that ANKS4B exists as a highly phosphorylated species in non-polarized enterocytes and that it becomes dephosphorylated at the onset of polarization and apical assembly. By employing mass spectrometry, we have mapped these phosphorylation sites to the SRP of ANKS4B. Going forward, we will test whether phosphorylation of the SRP can regulate apical targeting of ANKS4B and the assembly of the IMAC. Through this research, we will gain a better understanding of the function and regulation of ANKS4B in promoting apical assembly of enterocytes, and how dysfunction of ANKS4B may lead to perturbed brush border structure ultimately resulting in GI disease.

Synthesis and characterization of AlxSc2-xMo3O12 using non-hydrolytic sol-gel methods

(Project ID: 244)

La'Nese Lovings

Chemistry - Faculty Sponsor: Cora Lind-Kovacs, University of Toledo

Materials that possess positive thermal expansion (PTE) have been highly studied. However, some materials possess negative thermal expansion (NTE). When the thermal expansion properties of two materials that are in intimate contact in a device are mismatched, the outcome can be detrimental and lead to stresses or device failure. NTE materials can be utilized to counteract the undesirable PTE of a material by forming a controlled expansion composite. Here we study NTE materials in the A2M3O12 family (A= trivalent cation, M= Mo, W). Within this family some materials undergo a phase transition from an orthorhombic NTE phase at high temperatures to a monoclinic PTE phase at low temperatures.

A suppression of this phase transition could be beneficial if one phase is desired, for example the NTE phase as a component for composites. For example, $\text{AlScMo}_3\text{O}_{12}$ shows a much lower transition temperature than either $\text{Al}_2\text{Mo}_3\text{O}_{12}$ or $\text{Sc}_2\text{Mo}_3\text{O}_{12}$. Further exploration is necessary to expand the knowledge necessary to tailor these materials to exhibit specific properties for use in composites. The goal of this research is to synthesize mixed A-site occupancy materials and probe their phase transition behavior as a function of composition. Various $\text{Al}_x\text{Sc}_{2-x}\text{Mo}_3\text{O}_{12}$ compounds have been synthesized using non-hydrolytic sol-gel methods, and their variable temperature behavior characterized.

Investigating substrate recognition in targeting mRNAs to nonsense-mediated mRNA decay (NMD)

(Project ID: 246)

Savannah Mills

Biology - Faculty Sponsor: Dr. Kristian Baker, Case Western Reserve University

The accurate transmission of genomic information is essential for cell survival and proliferation. For this reason, intricate regulatory mechanisms exist throughout gene expression to ensure quality. One such surveillance pathway, Nonsense-Mediated mRNA Decay (NMD), is a translation-dependent pathway that rapidly degrades mRNAs whose termination codons are recognized as premature, preventing the accumulation of truncated polypeptides with potentially deleterious effects to the cell. An essential attribute of this pathway relies on the ability of the NMD machinery to accurately differentiate between aberrant and normal translation termination events, preventing the degradation of proper mRNAs. However, the mechanism of NMD-substrate selection is still poorly understood. The goal of this work is to elucidate the determinants and modulators of substrate recognition in NMD.

Examining the Interactions of Novel Furoxans Using Techniques in Chemical Biology (Project ID: 275)

Ethel Tackie-Yarboi

Chemistry - Faculty Sponsor: Isaac Schiefer

Nitric oxide (NO) plays a critical role in neuronal survival and essential for normal synaptic function. Indeed, molecules capable of enhancing NO signaling have shown promise as potential therapeutics for neurodegenerative disorders. We are engaged in the development of a novel class of NO mimetics known as furoxans. Furoxans are commonly described as thiol-dependent NO mimetics- which must react with biological thiols to exhibit NO effects. In an effort to harness the benefits of NO, we have created a series of furoxans with attenuated reactivity, which do not readily react with generic thiols, such as glutathione or L-cysteine. However, we have showed that furoxan neuroprotection is reversed upon blockade of NO/sGC (soluble guanylyl cyclase) signaling with ODQ, a selective sGC inhibitor. We hypothesize that furoxan activation is due to a subset of relatively reactive thiol proteins that induce NO mimetics effects. To assess this hypothesis, this work will focus on the synthesis and evaluation of novel furoxans containing 1) a photoaffinity labeling group for transient covalent modification of interacting proteins and 2) a terminal alkyne for conjugation with a fluorophore in an effort to identify and analyze the protein(s) responsible for activating the NO release of our compounds.

In Situ IR study of Photo-generated Electrons in TiO₂ thin films via Polyelectrolyte Doping and CO₂ Adsorption (*Project ID: 305*)

Jaelynn King

Chemical Engineering - Faculty Sponsor: Steven S.C Chuang

Abstract: Despite the popularity of polyelectrolytes, the mechanism of charge transfer between polyelectrolytes and semiconductors like TiO₂ is seldom studied. To determine the mechanism, poly(allyamine) (PAH), a cationic polyelectrolyte, is deposited on various TiO₂ thin films.

Amine-containing polymers are commonly studied in carbon dioxide (CO₂) capture processes due to the affinity of the amine to bond with CO₂ [1]. PAH is able to donate electrons onto TiO₂ films that enhances photoconductivity under UV-irradiation. Further enhancements to conductivity are made with CO₂ flow across the PAH/TiO₂ thin film to induce CO₂ capture on the film. Adsorption of CO₂ on PAH produced carbamic acid, which further increases the photoconductivity. Removal of CO₂ from the system causes the current to decrease, an indication of the current dependence on the number of CO₂ molecules adsorbed to the surface.

References: [1] Yu, J. and S. S. C. Chuang (2016). "The Structure of Adsorbed Species on Immobilized Amines in CO₂ Capture: An in Situ IR Study." *Energy & Fuels* 30(9): 7579-7587.

3D Printed Mechanochromic Materials for Aerospace Applications (*Project ID: 309*)

Adam Woods

Manufacturing Engineering - Faculty Sponsor: Dr. Eric Amis, University of Akron (Research Mentor)

The intensity of color is prevalent in the world around us. Aerospace repairs are known to be costly and time-consuming task for the industry. We proposed to aid in the detection of mechanical failure by introducing 3d printed mechanochromic materials. These stimuli responsive materials are triggered by a mechanical force and yield a visible color change under UV light. The material blend will consist of polycarbonate (PC) and an aggregachromic dye of Bis (benzoxazolyl stilbene) (BBS).

The structure property relationship will be investigated by combinatorial library (CL) approach which creates gradient polymer library to pinpoint useful interactions between the components. The gradient CL introduces gradual and incremental changes across the sample. The usefulness of CL gradient composition allows all iterations of the binary blend to be tested and monitored simultaneously. The CL will aid in the discovery of correct blend ratios, explore the effect of temperature on emission and duration of the dye, and determine critical mechanical properties of the polymer matrix. A high-throughput methodology will allow for real time feedback of mixing the binary blend. This project aids in the detection of aircraft failure by investigating structural analysis of material, processing, and nondestructive evaluation.

Photochemical Relaxation Pathways in O⁶-Methylguanosine and S⁶-Methylthioinosine upon Absorption of Ultraviolet-B Radiation (*Project ID: 323*)

Luis Ortiz

Chemistry - Faculty Sponsor: Carlos Crespo

O⁶-methylguanosine and S⁶-methylthioinosine are byproducts resulting from the interaction of exogenous and endogenous alkylating agents with DNA and from enzymatic reactions of sulfur-substituted prodrugs in cells, respectively. Their photochemistry has not been investigated and it is

unknown whether absorption of ultraviolet-B radiation by these byproducts may pose any threat to the integrity of DNA. In order to start filling this gap, steady-state absorption and emission spectroscopies and transient absorption spectroscopy were performed for both O6-methylguanosine and S6-methylthioinosine in aqueous solution and in acetonitrile. The experimental results were complemented with ground- and excited-state calculations. Possible photochemical relaxation pathways are proposed and the results are compared with those reported in the literature for the guanine and 6-thiopurine monomers. It is shown that O6-methylation red-shifts the absorption spectrum of guanosine and decrease the internal conversion rate to the ground state in aqueous solution and in acetonitrile by ~40-fold and ~10-fold, respectively. The decrease in the internal conversion rate to the ground state may increase the probability of DNA damage. S6-methylation blue-shifts the absorption spectrum of 6-thiopurine and decreases the intersystem crossing rate to populate the lowest-energy triplet state. The population of the triplet state in S6-methylthioinosine suggests that ultraviolet-B radiation may lead to oxidatively-generated cellular damage, as has been shown for the thiopurine prodrugs.

Using computer vision to track spatter of 3D laser printer (Project ID: 350)

Carolyn Carradero

Electrical Engineering - Faculty Sponsor: Dr. Eric MacDonald

In this research work, we will develop a script that will be able to track the spatter ejection trajectory of a laser 3D printer, as it produces a particular specimen. This will be done using a computer vision library, OpenCV, with a python interface. Two high speed cameras will be used to take simultaneous images. These cameras take a thousand frames per second. The script will be able to track the spatter on two concurrent images, determine the length of the spatter and with its 2D vector coordinates, we will be able to determine the position of the spatter in 3D and subsequently its speed.

A comparison of serotonergic innervation of the amygdala within the genus *Macaca*: Implications for the evolution of primate sociality (Project ID: 409)

Danielle Jones

Biological Anthropology - Faculty Sponsor: Dr. Mary Ann Raghanti (graduate advisor), Dr. Gail Fraizer (AGEP advisor) – Kent State University

The genus *Macaca* represents the most widely dispersed, behaviorally diverse nonhuman primate taxon. Much is known about the variation in social style among the nearly two dozen macaque species; however, our knowledge of the neurobiological variation within the genus is limited. The current study presents a comparison of serotonergic innervation of the amygdala among four species: rhesus (*M. mulatta*), Japanese (*M. fuscata*), pigtailed (*M. nemestrina*), and moor (*M. maura*), all of which have been classified as having different social styles based on the rigidity of their dominance hierarchies and aggressiveness. Being that serotonin is an inhibitory neurotransmitter, we hypothesized that the highest density of serotonergic axons in amygdala would exist in the least aggressive, most egalitarian species, the pigtailed and moor macaques. To our surprise, we found the opposite trend. The highest amount of serotonergic innervation was found in the most aggressive, hierarchical species, the rhesus and Japanese macaques. Our results suggest that unlike findings from a similar study in chimpanzees and bonobos, differences in serotonergic innervation of the amygdala among macaques may not reflect differences in social style and temperament.

Chain-like Particles: Mapping Malignant Tumors (*Project ID: 413*)

Gil Covarrubias

Biomedical Engineering - Faculty Sponsor:

Hard-to-reach tumors, such as dormant and brain tumors, are amongst the most lethal of malignancies due to their exceedingly diffuse – difficult to deliver chemotherapeutics or have surgical intervention – and their invasive behavior. Current interventions often result in poor prognosis as seen by the lack of patient response. The treatment path and disease management are not necessarily the point of contention but rather the inadequate disease monitoring techniques that follow it (i.e. imaging techniques – MRI and CT). Clinical imaging often provides misleading information as the tumoral topology is often misrepresented as, distant disease dispersion and tumoral margins are not appropriately identified. Here we look at developing an iron oxide-based nanoparticle that is able to function as a contrast agent in MR imaging to alleviate such issues. Our technology is comprised of 4-5 linearly linked iron oxide spheres called a nanochain [1-3]. This chain-like structure has a shape, size and flexibility that helps aid the encapsulation and uptake into the tumor microvasculature. Furthermore, beyond just simply using the physical features of the nanochain we can also link ligands that will specifically target either the vasculature or the matrix of the tumoral region [3]. The vascular targeting of particles is key in identifying the exact topology of the malignancies using clinical imaging techniques. This identification may lead to improved prognosis as surgical resections and image-guided radiotherapy can be appropriately applied to the exact tumoral space.

The Question of Y: An Analysis of Spermatogenesis Y-Chromosome Genes Between Two Species of Macaque Monkeys (*Project ID: 414*)

Cody Ruiz

Biology - Faculty Sponsor:

Macaque monkeys live in multimale-multifemale social groups, and the males exhibit some of the largest testis:body weight ratios among the primates. They are believed to experience intense levels of sperm competition. Several spermatogenesis genes are located on the Y-chromosome and, interestingly, occasional hybridization has led to the introgression of the rhesus macaque (*Macaca mulatta*) Y-chromosome deep into the range of the cynomolgus macaque (*M. fascicularis*). These observations have led to the hypothesis that the successful introgression of the rhesus Y-haplotype is due to selectively advantageous functional differences in sperm genes compared to those of the native cynomolgus Y-haplotype. The hypothesis is tested here at four Y-chromosomal genes. The genes were surveyed in representative animals from north, south, and within the rhesus x cynomolgus introgression zone. Amino acid differences were uncovered in some genes; however, statistical analyses did not detect a definite signal of positive selection. Yet, because such differences yield distinct protein folding structures, they may indeed present selective advantages in the context of sperm competition. Implications of these results are discussed, as are directions for future study.

Session 4	10:30-12:00	Respiratory Care	Room: James Gallery	Oral
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Vaccinations - Opinions by Age Group (*Project ID: 276*)

Stephanie Perno

Respiratory Care - Faculty Sponsor: Kelly Colwell

Introduction: The importance of vaccinations in children, which has long been a controversial topic, is hampered by the debate of disease caused by the vaccines and the cultural melting pot of beliefs that make up the United States. Within our investigation we aim to ascertain what age population agrees less with the vaccination of children and possible insight into their beliefs. We strive to find their opinions based upon age groups as there is a dearth of specifically optimized ideal within recent literature. Methods: This study was conducted by way of an email survey with permission of Youngstown State University and responses were completely anonymous. Within our study, we analyzed the survey responses of each participant and will disseminate the data to ascertain the different opinions by age groups and gender and parent or non-parent respondents. Results: Final results in response to the survey are pending and will be reported as soon as they are obtained. Discussion: Pending.

The Effect of Waist trainers on Lung Function (*Project ID: 292*)

Terrence Green

Respiratory Care - Faculty Sponsor: Amanda L. Roby

Introduction: Having and sustaining a perfect body is a goal that many people are trying to reach due to increasing interest in social media. Today, celebrities and social media personalities' jobs are to sponsor and promote merchandize through their online accounts. Among these products is a popular trend that has spread rapidly: corset-like belts, or "waist trainers." These belts are designed to slim the waist, while providing the illusion of an hourglass silhouette. Because of where the belt sits in relation to the diaphragm, the purpose of this research is to discover what kind of effect it has on breathing. In addition, the research will investigate what motivates women to purchase them. Hypothesis: Waist trainers can have a minimal-to-moderate effect on breathing, especially during strenuous activity. Methods: A pre-test survey was administered to collect non-specific information and to analyze beliefs towards waist trainers and social media. The participants were then instructed to perform a series of breathing techniques while wearing the "waist trainer" and without it. Afterwards, a second survey was administered to analyze subjects' subjective responses to the test. Results: Pending. Discussion: Pending.

Surface Disinfection in Respiratory Care Labs (*Project ID: 303*)

Marissa Simon

Respiratory Care - Faculty Sponsors: Mary Yacovone, Joan O'Connell Spalla

BACKGROUND: There is evidence that the environment plays a role in transmission of Health Acquired Infections (HAI's), and therefore more attention is being focused on environmental cleaning and improving the efficacy of cleaning practices. The key components using a bundle approach to create and sustain a successful cleaning and disinfection program should include written policies and procedures, selecting an appropriate cleaner and disinfectant, selecting the method of application of the products, education of the staff, monitoring cleaning practices, and providing feedback to the environmental service personnel. Supporting a successful cleaning and disinfection program requires ongoing commitment within the institution to effectively decrease the spread of HAIs from environmental contamination. Cleaning and disinfecting are part of a wide-range approach to preventing infectious

diseases in many places, especially schools. A survey instrument was developed to assess the use of disinfection in teaching labs of respiratory programs. The hypothesis of this study is that fifty percent of the respiratory programs surveyed do not disinfect their teaching labs. METHODS: The Institutional Review Board of Youngstown State University approved this study. Respiratory Program Directors across the country were emailed asking them to complete a survey consisting of 13 questions about surface disinfection in their respiratory care teaching laboratories at the college/university. RESULTS: Pending.

Yoga exercises for Pulmonary Rehabilitation (Project ID: 321)

Brent Gray

Respiratory Care - Faculty Sponsor: Dr. Kelly L. Colwell

Introduction: The purpose of this investigation is to ascertain if introducing yoga exercises into the world of pulmonary rehabilitation is helpful in patients who have been approved to undergo pulmonary rehabilitation but are unable to use conventional rehab equipment due to age, coordination, or disabilities and if these type of non-conventional pulmonary rehabilitation exercises could help increase patient compliance for pulmonary rehab programs while recruiting and strengthening lung functions. During an observation of pulmonary rehab Some patients came in to preform conventional exercises they were elderly or in a wheel chair and some had walkers. This leads me to believe that the conventional exercises could be harder to perform for these patients and that yoga would be preferred. Methods: My data was collected by utilization of a survey of pulmonary rehabilitation respiratory therapists to ascertain if they were part of a pulmonary rehabilitation program and if in fact the utilization of Yoga was implemented and if there were appreciable benefits to the patient by a measurable outcome and if individuals were more apt to participate Results: results from my emailed survey are pending. Discussion: In this section of my investigation I will be discussing the use or lack of yoga exercises on elderly patients with chronic lung diseases such as COPD are able to gain the full benefits of pulmonary rehabilitation programs verses using conventional pulmonary rehabilitation equipment. If yoga exercises are introduced into the pulmonary rehab then elderly patients or patients with disabilities will be able and more willing to gain the full benefit of the pulmonary rehab programs, increasing lung function and strength, and increasing patient compliance.

Hand size and grip strength effects on volume delivery with two bag valve mask devices

(Project ID: 393)

Austin Nitzsky

Respiratory Care - Faculty Sponsors: Mary Yacovone, Lucy Kearns

Background: The Bag Valve Mask Device (BVMD) plays an important role to ventilating patients in the health care setting. There are many disposable BVMD's that are marketed for their ability to produce acceptable volume ventilations. In this experimental study two bag valve mask devices will be evaluated to determine the effect of participant's hand size and grip strength on volume delivery. The hypotheses for this study are: 1. Grip strength will affect volume delivery. 2. Hand size will affect volume delivery.3. The strength of the grip will have more effect on volume delivery than the hand size. Methods: The Institutional Review Board of Youngstown State University approved this study. Senior and junior students in the respiratory care program at YSU will participate in this study. After consent is obtained, the volunteers hand size (hand length and width) will be measured and recorded. Grip strength will be tested and recorded before and after the ventilation with BVMD . Instructions with the

Session 4 **10:30-12:00** **Respiratory Care** **Room: James Gallery** **Oral**

BVMD will be demonstrated to the participant and repeated until good technique is observed on the Quick Lung RespiTrainer by the investigator. Participant will begin respirations on the Quick Lung RespiTrainer with BVMD - A and investigator will record the results. After the end of 5 minutes grip strength will be measured and recorded. The participant will be asked to rest 30 minutes before procedure is repeated with BVMD - B.

Results: Pending

Secondary Traumatic Stress in Respiratory Therapists (*Project ID: 402*)

Brittany Carrier

Respiratory Care - Faculty Sponsors: Mary Yacovone, Lucy Kerns, Ph.D.

BACKGROUND: Secondary traumatic stress (STS), also known as compassion fatigue, is described as a syndrome of symptoms, such as avoidance, intrusions, or arousal, that occur due to having indirect traumatic exposure such as having interactions with persons or patients who are having direct traumatic exposure. Secondary traumatic stress can lead to physical, emotional, and work-related symptoms that can affect patient care and relationships with coworkers and patients. The indirect traumatic exposure is often linked with negative consequences such as higher compassion fatigue, increased negative cognitions about the self and the world, higher job burnout, and lower job satisfaction. Professionals that experience this may believe they can no longer serve their clients or patients and leave their job. There are many strategies that can help professionals prevent themselves from developing secondary traumatic stress, as well as intervention strategies that can help one reduce the impact of secondary traumatic stress if they are experiencing it. The hypothesis for this study is that the Secondary Traumatic Stress Scale score will be in the high to severe range for Respiratory Therapists. **METHODS:** The Institutional Review Board of Youngstown State University approved this study. Respiratory Therapists voluntarily took the "Secondary Traumatic Stress Scale" (STSS) in which consisted of 17 statements. The STSS was used with permission obtained from Brian E. Bride. This STSS was presented to the voluntary participants on a Facebook page called "Respiratory Therapy Breakroom" in which is a private Facebook group for future, present, and past Respiratory Therapists. **RESULTS:** Pending.

Bride, B.E., Robinson, M.R., Yegidis, B., & Figley, C.R. (2004). Development and validation of the Secondary Traumatic Stress Scale. *Research on Social Work Practice, 14*, 27-35.

Session 4	10:30-12:00	Creative & Liberal Arts / Education	Room: Jones	Oral
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The Effects of a Survival-Horror Video Game on Anxiety (*Project ID: 229*)

Natalie Ricciutti

Counseling - Faculty Sponsor: Dr. Amy Williams

This study examined the relationship Survival-Horror video games have on anxiety. Exactly 29 college-aged participants played the video game Layers of Fear twice a week, for four weeks, each for exactly 15 minutes. The Hospital Anxiety and Depression Scale (HADS) was used to acquire a baseline on each participant's anxiety level. It was later employed at the end of the time span to note any significant change. It was hypothesized that after having played the Survival-Horror video game the average anxiety level of the participants would increase, and that there would be no difference, which respective scores on the HADS would reflect. Statistical significance between the pre-test and post-test anxiety sub-scales was found, as well as statistical significance between the pre-test and post-test depression sub-scales. The results can assist counselors and other mental health professionals in assessing and creating treatment plans for anxiety and depressive disorders developed through video game play.

Organists at the Royal Institute for Blind Youth and Changing Perceptions of the Disabled in Nineteenth-Century France (*Project ID: 298*)

Maria Koch

Music History / Literature - Faculty Sponsor: Randall Goldberg

After witnessing the mockery of disabled street musicians, Valentin Haüy dedicated his life to the amelioration of the blind in France. Chief among his labors was the establishment of the Royal Institute for Blind Youth in 1774. Literature on the Royal Institute is lacking, but existing resources provide great insight into the significant role it had in the lives of the blind in Paris. Haüy sought to change the way the blind lived and were seen and he used music as the means to achieve this goal. The success of the Royal Institute for Blind Youth led to a new perception of the blind in France, spearheaded innovations in musical notation, and created a legacy of teachers and students who made important contributions to the French organ repertoire. Instead of trying to shelter the blind from the public Haüy devised a way for them to face daily life. His Institute demonstrated that those once perceived as inhuman had the innate potential to be great contributors to society.

The Reichstag is Burning: Economic Populisms Threat to the Free World (*Project ID: 317*)

Dylan Edwards

Political Science - Faculty Sponsor: Dr. Keith J. Lepak

In 2007 and 2008, the American economy crumpled under the weight of its own risky financial practices setting into effect a chain reaction of market crises globally. While America came to grips with the flaws of a deregulated financial system another potential crisis began to arise in the political forum. The Culture War a non-issue for mainstream American politics since the early 1990's began to gain attention and prominence as a trend of social liberalization soared to new heights. In the decade between 2007-2017, America witnessed the rebirth of left and right economic populism each heavily influenced by the social climate created by The Culture Wars. This era that culminated in the election of a populist American president Donald Trump has been called unprecedented; but is it?

This paper seeks to examine the relationship between economic and cultural crises and their normalization of extremist tendencies using the example of Weimar Germany. In each case crises in economics and culture exacerbated existing prejudices and led to the normalization of these views held

Session 4	10:30-12:00	Creative & Liberal Arts / Education	Room: Jones	Oral
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by a fringe minority of voters. In comparing the parallels and divergences between these institutions this paper hopes to highlight this alarming political correlation and its implications.

Unlocking Magical Doors in Chrono Trigger (*Project ID: 332*)

Shaun A. McCune

Music - Faculty Sponsor: Dr. Steven M. Reale

An emerging field of study, ludomusicology is the study of video game music and sound, its implementation, and the unique ways it can contribute to the structure of a video game. Taking one event from the Super Nintendo game Chrono Trigger, the musical background symbolizes the mystery of a locked, magical door. Using Neo-Riemannian analysis, we find symbolic clues embedded within the score that hint at the method of unlocking the door. In this way, the music interweaves with Chrono Trigger's story and gameplay to express progressive motion and accomplishment.

Thought in Action (*Project ID: 361*)

Kaitlin McClendon, Emily Erb

Psychology - Faculty Sponsor: Dr. James Juergensen

The present study was designed to explore the relationships between construal level, self-control, global and local focus, and automatic approach-avoidance behavior. Participants' construal levels were reported; contrary to expectations from previous research, those with higher level construals displayed an approach bias toward desserts ($r(95) = .276, p = .007$), as did those displaying global attentional focus ($r(95) = .198, p = .054$).

Session 4	10:30 – 12:00	Mechanical / Industrial Engineering	Room: Coffelt	Oral
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Hybrid Manufacturing of Functionally Graded M300 and 316L Steels (Project ID: 306)

Tim Daugherty

Manufacturing Engineering - Faculty Sponsor: Brett Conner

Functionally graded materials (FGMs) are an emerging class of material that have potential uses in a wide variety of fields, but are traditionally very difficult to fabricate. In recent years, additive manufacturing (AM) techniques have proven to be an effective way of producing FGMs. In this work, an FGM of 316L stainless steel and M300 maraging steel was produced using a Hybrid Manufacturing Technologies AMBIT system in a Haas V3 CNC mill. SEM and light microscopy analysis were performed to investigate the structure and properties of the resultant FGM.

Engineering time: A learning analytics initiative to understand first-year engineering student's time (Project ID: 319)

John Gaboriault-Whitcomb

Industrial / Systems Engineering - Faculty Sponsor: Dr. Cory Brozina

Time management is one of the most important aspects of a student's success in college. Analyzing time management practices of students can provide valuable information about how they work and what helps them succeed. Past studies on student time management have administered questionnaires with Likert scale responses in order to gather data from students about their time management habits. Current literature has a lot of valuable information, but none that include what students specifically do with their time. This project focused on finding just that by having First-Year Engineering students participate in a study in which they documented what they did during every half-hour of a two-week period. The data collected was analyzed along with participant interviews to determine the most common practices of successful students and how to best help students manage their time. A "learning dashboard" mobile application meant to satisfy the needs of students found by this study is currently under development. This research is substantial because it will give students specific guidance on how to succeed and will help ease the stressful transition from high school to college.

Mist Collector Design (Project ID: 351)

Dominic Eusanio, Steven Sveda, Nathaniel Martin

Mechanical Engineering - Faculty Sponsor: Dr. Stefan Moldovan,

Imperial Systems is a dust collection company that is looking to expand into the mist collection industry. The company would like to design a mist collector that is a converted form of their dust collector, meaning it should have the same look and consist of many of the same components, but should be able to function for the appropriate application. Mist collectors are used to capture oil mist that is released into the air from wet machining processes. Wet machining uses coolant to splash and cool off tools and the work piece during the wet machining process. The oil mist is harmful to breathe in and can cause skin defects and respiratory problems. OSHA permits no more than 5mg/m³ of oil mist in the air at any industry. Most mist collectors typically reduce that level to roughly 0.5 mg/m³. The goal with this design is to exceed that efficiency, while coming up with a revolutionary design for a mist collector.

Session 4	10:30 – 12:00	Mechanical / Industrial Engineering	Room: Coffelt	Oral
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Design and Fabrication a Submersible Remotely-Operated Vehicle (*Project ID: 355*)

Pui Y. Chan, Hassan R. Alqanber, Joshua J. Lever, Hector L. Torres

Mechanical Engineering - Faculty Sponsors: Jason A. Zapka, Kelsey R. Lyda

The purpose of this project was to design and construct a Remotely-Operated Vehicle (ROV) according to the competition rules specified by The Marine Advanced Technology Education (MATE) center. The ROV was constructed according to the EXPLORER class specifications. These specifications include that the ROV must fit within a ninety-two centimeter diameter circle, must weigh fifty-five kilograms or less and must utilize a forty-eight-volt power source. The specified design goals include the ability to locate the wreckage of a vintage aircraft and return its engine to the surface. Also, a seismometer and tidal turbine needs installed to monitor the motion of the seafloor and determine its efficiency.

To evaluate the efficacy of the presented design, the fundamental concepts of programming, buoyancy, fluid dynamics, heat transfer and machine design were used. The ROV was programmed using an Arduino micro controller. The Arduino received human input from a USB Microsoft dual analog controller, and used this input to activate the motors, enabling locomotion. The concepts of buoyancy and fluid dynamics were used to evaluate the drag behavior of the ROV. This analysis was done using commercial Computational Fluid Dynamics (CFD) software, ANSYS Fluent. The concepts of the machine design were used to evaluate the stability of the frame and claw design. This analysis was done using commercial Finite Element Analysis (FEA) software, ANSYS and Autodesk Mechanical. Finally, the fundamental concepts from heat transfer were used to analyze the heat dissipation in the circuitry. This analysis was done using a commercial electronic cooling software to evaluate the steady-state thermal performance of the electronics to determine whether the maximum junction temperature of the associated chip was reached, ANSYS Icepak.

Hydraulic Aluminum Dovetail (*Project ID: 367*)

Thomas Oliver, William Hughes, Jake Oliver

Mechanical Engineering - Faculty Sponsor: Anthony Viviano

This project was to design and test a 10-foot hydraulic aluminum dovetail trailer. A dovetail trailer has a flat tail which is attached at a pin behind the axle. The tail able to rotate down or up making it quick and easy to load and unload equipment. The first step in the design process is to locate the problem and the problem was how to engineer the hinge and tail so that it does not fail using aluminum components. The tail must be able to lift 10,000 lbs and be able to support 5,000 lbs in the middle of the tail. The process of designing the tail to be able to hold what is required makes it difficult since its made of mostly aluminum. Using Simulation Mechanical to do finite element analysis (FEA) on each component of the tail to test the material before submitting the prototype was crucial. Doing that, along with hand calculations to verify our FEA was critical in the design process.

Vallourec Deox Nozzle (*Project ID: 400*)

Justin Stellmar, Abdullah Almazni, Lawerance Pawlik

Mechanical Engineering - Faculty Sponsor: Stefan Moldovan

Optimization of deox powder distribution across the internal surface of a steel shell by redesigning the nozzle that applies the powder and verifying the results through the computational fluid dynamic software FLUENT from ANSYS Workbench 18.1.

Session 4	10:30 – 12:00	Health & Human Services/ Liberal Arts	Room: Humphrey	Oral
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Depression, Suicide, and Social Isolation (*Project ID: 279*)

Dimitra Symbolik

Sociology - Faculty Sponsor: Dr. Greg Rocheleau

Studies have shown that suicide is the tenth leading cause of death. We also know that depression is sometimes a precursor to suicide. However, few studies have looked at how social isolation mediates the relationship between depression and suicide. The main goal of this research was to see if there is in fact a correlation between depression and suicide. This research is also aimed at focusing on the goal social isolation plays in mediating depression and suicide. This study used data from the National Longitudinal Study of Adolescent Health (Add Health) to look at these relations (n = 4,241). Results show a correlation between depression and suicide. Results also show partial support for the mediating effects of social isolation.

Understanding and Applying HIPAA in the Healthcare Arena from a Student's Perspective

(*Project ID: 326*)

Andrew J. Hover

Allied Health - Faculty Sponsor: Cara Carramusa

The purpose of this research is to discuss the challenges healthcare providers and students face in maintaining compliance with the Health Insurance Portability and Accountability Act (HIPAA). With HIPAA violations steadily increasing, students must take into consideration the necessary requirements and purpose of HIPAA to ensure patients' privacy. Research was completed through a literature review on PubMed, Medscape, and the U.S. Department of Health & Human Services website to examine the moral and ethical justifications for an individual's right to privacy, how the right to privacy is incorporated into HIPAA, and HIPAA's current limitations in protecting that privacy. This research also investigates large-scale violations of HIPAA and explains the potential punishments including financial and licensure implications for all parties involved. The outcome of this research is an assessment of how students can be more effectively educated about HIPAA to avoid future violations and decrease the risk of future violations of patients' privacy.

How effective is the Music and Memory program for the treatment of neuropsychiatric symptoms such as depression, agitation, and (*Project ID: 331*)

Amanda J. Parsons

Gerontology - Faculty Sponsor: Christine Ratvasky, LNHA, MA, MSHA

How effective is the Music and Memory program for the treatment of neuropsychiatric symptoms such as depression, agitation, and wandering affecting dementia residents in nursing homes?

The goal of this research project is to see how effective the Music and Memory program is with dementia residents' neuropsychiatric symptoms such as depression, agitation, and wandering. Music and Memory is a program developed in 2010 that helps individuals in nursing homes with dementia use personalized music to reconnect to life by re-awaking memories from the past that have not been lost to dementia. In nursing homes it is a continuing challenge assisting dementia patients with neuropsychiatric symptoms. Because of this large-scale challenge, this research explores if and how Music and Memory's effectiveness is measured in nursing homes. It also explores the specific impact it may have in improving residents' lives.

Session 4	10:30 – 12:00	Health & Human Services/ Liberal Arts	Room: Humphrey	Oral
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Perceptions of health care providers on their own end of life care (*Project ID: 381*)

Andre Miller

Allied Health - Faculty Sponsor: Dr Kelly L Colwell

Introduction: The purpose of this investigation is to acquire a baseline knowledge from community professionals, health care providers and health care educators regarding end of life care. It is a known fact that although we are living longer as a society, the quality of life is not always evident. I am attempting to ascertain if given a choice, would those with health care experience or a greater health literacy have a consorted acceptance of end of life issues for chronic or untreatable health problems or would they want extensive measures perform on themselves at the end of life My thoughts are that those who work in critical care and emergency related fields will have planned end of life care. Methods: My methodology will include utilization of an investigational email and one on one surveys with and cooperation agreements with the Youngstown Fire dept. and Youngstown State University. Data will be totaled in categories that are related to the survey questions and then further disseminated based on demographics, and geographic region Results: results are pending tabulation and dissemination of the surveys. Conclusion: It is my pre conceived thoughts that those who work in critical care, acute emergency care and those who educate healthcare providers will have planned end of life care.

Elder Abuse: Recent Trends In Reporting, Causes and Risk Factors (*Project ID: 392*)

Kaitlyn Kay

Gerontology - Faculty Sponsor: Christine Ratvasky, LNHA, MA, MSHA.

The purpose of this study is to examine the rate of physical abuse amongst the elderly in nursing homes and examine the potential causes of such abuse. Cooper, Selwood and Livingston (2008) previously found instances of nursing home elder abuse, risk factors, causes and reporting rates in their literature review. This current project seeks to determine if the same or similar trends in physical abuse hold true today. It will consist of a more current literature review along with an analysis of nursing homes' publicly available health inspection reports. The analysis of the inspection reports that pertain to physical abuse will be compared to trends identified in the current literature. Conclusions will be drawn regarding any recent improvements in the detection and reporting of abuse.

Cooper, C., Selwood, A. & Livingston, G. (2008), The prevalence of elder abuse and neglect: a systematic review, *Age and Ageing* 2008; 37: 151-160. <https://doi.org/10.1093/ageing/afm194>

Session 4	10:30 – 12:00	Health & Human Services/ Liberal Arts	Room: Humphrey	Oral
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A Survey of COPD Patient's in Saudi Arabia. (*Project ID: 394*)

Fatimah Alnemer

Allied Health - Faculty Sponsor: Mary Yacovon M Ed, RRT

BACKGROUND: Patient education plays an important role in disease management of COPD patients. This research project is aimed at surveying COPD patients in Saudi Arabia to assess their knowledge and understanding of the disease and disease management. The hypothesis for this study is that patients with COPD in Saudi Arabia have minimal knowledge of the disease and disease management. METHODS: IRB Approval is pending for this research project. The Practice Assessment In COPD survey will be used with permission of Dr. Paul Hernandez. After IRB approval is obtained a twelve question survey will be distributed to patients in Saudi Arabia. RESULTS: Pending

Hernandez, P., Balter, M. S., Bourbeau, J., Chan, C. K., Marciniuk, D. D., & Walker, S. L. (2013). Canadian practice assessment in chronic obstructive pulmonary disease: Respiratory specialist physician perception versus patient reality. *Canadian Respiratory Journal: Journal of the Canadian Thoracic Society*, 20(2), 97-105.

The Examination of the Relationship Between Concussions and Mental Health Issues in Division I College Athletes (*Project ID: 227*)

Sarah Dowd

Counseling - Faculty Sponsor: Dr. Amy E. Williams

The proposed research study will examine the relationship between multiple concussions and mental health issues in Division I athletes. The present study aims to analyze the effect that sustaining multiple sports-related concussions has on mental health disorders and their symptoms in the long-term. Also, the present study will involve sports that are not traditionally linked to concussions. For the present study, the hypothesis is that participants who have experienced a concussion will be more likely to report experiencing mental health issues than those who have not. Additionally, those who report having multiple concussions in their life will be even more likely to report mental health diagnoses. Participants will be volunteers from the student-athlete body at Youngstown State University. All participants must be at least 18 years old in order to participate, but as long as they are 18 and have competed as a member of a Division I sports team at the institution, they will be eligible for the study. Participants will be sent an email asking them to participate in the study and providing a link to access the first survey. The survey will collect information concerning the individual's concussive history and mental health history prior to the beginning of his or her competitive season. The survey will also collect information concerning whether concussion was sustained during their season and if so how, when, and what symptoms were experienced. They will also be asked if they experienced any mental health issues following their concussion, and if so if he or she was referred to treatment. Data will be kept and analyzed by researchers to determine whether the hypothesis should be supported or rejected. Participants in this study will have the opportunity to receive a presentation about mental health issues, including how to recognize them early on and how to cope with them. The presentation will be for the team as a whole, since NCAA rules prohibit individual rewards to athletes. Since it is as a team, each team's coaching staff will be able to accept or refuse the offer to provide these services for the team.

An individual's sense of grit: a characteristic of powerful influences that is used to be proven

(*Project ID: 230*)

Alexis Vogler

Psychology - Faculty Sponsor: Dr. Jeffrey Coldren

In this research study, we are studying the association of an individual's sense of Grit upon various personality traits, including locus of control (internal and external), goal orientation (prove, avoid, and learning), mastery focus, demographic, and academic characteristics and also combining it to learning tasks. Undergraduates at Youngstown State University were to complete three learning-based tasks. The first was solvable (with a fixed criterion for success); the second involved overtraining (in which the learner persisted until they felt confident that had solved the problem); the third was non-solvable (the correct outcome was randomly determined and could never be solved). Finally, the participants were to complete surveys based on the previous personality characteristics listed. The goal of using the learning task determinants were to assess the aspect of learning persistence within a student. The results that have been found to support the component of one's grit being correlated to orientation and goals towards learning. Surprisingly, in the sense of self-reported grit, the greater amount of grit was associated to prove goal orientation and external locus of control. However, it was found that the actual learning tasks for persistence was unrelated to one's sense of grit.

Session 5a	1:30 – 3:00	Various Topics	Room: Ohio	Poster
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Evaluation of a Mobile Dental App by Dental Hygiene Students (Project ID: 236)

Christina Litvak, Chantale Richards

Dental Hygiene - Faculty Sponsor: Dr. Diane Kandray

An important role of the dental hygienist is to educate and motivate patients on proper oral hygiene including toothbrushing and flossing. One of the current and trendy ways to engage individuals is through mobile technology. Dental applications (apps) are available to prompt patients to brush their teeth for two minutes and improve toothbrushing compliance with music and reminders. The purpose of this study was to test the usability of a mobile dental app among dental hygiene students. Forty dental hygiene students were provided instructions on how to download the application, "Brush DJ", a free toothbrush reminder mobile app. A survey was distributed to users at the end of a brief test period. Participants rated their thoughts, opinions, and suggestions for the app. There were a total of eighteen surveys returned for a 45% response rate. Fifty-six percent of the participants rated the app as "user friendly and easily accessible." Seventy eight percent (n= 14) of participants would recommend the app to their patients. Mobile dental apps have potential for improving home care compliance, but further research is needed.

Family Functioning on Family Quality of Life Among College Students (Project ID: 257)

Adrienne Boudrey

Family and Consumer Studies - Faculty Sponsor: Dr. Abel Waithaka

The focus of this study is to investigate family functioning on family quality of life among college students. The study used three scales. The family functioning Scale (FFS) with 20 items, Family Quality of Life scale (FQOL) with 16 items and Perpetual Indicators of Family Life Quality with 35 items. A total of 182 undergraduate students participated in the study with age range of 18-56 years. The sample was made up of 45 (24.7%) males and 136 (74.7%) females participants. Data was collected in a classroom setting during class time in spring 2018 in a university college. The findings indicates participants with low social support and concerned financially scored lower on Intimacy and parenting style, but higher in conflict. Also participants with low social support and concerned financially scored lower on family interaction, parenting and emotional well-being. On the perpetual indicators of family life quality scale, participants with low social support and concerned financially scored lower in love, status, services, information, goods, and money.

HURT POUNDS: Family Meals, Eating Behaviors, and Self-Care in Counselors (Project ID: 261)

Katerina Mallias

Dietetics - Faculty Sponsors: Dr. Jeanine L. Mincher, Dr. Sherri Harper Woods, Dr. Priscilla Gitimu

A workshop (Hurt Pounds) for social workers/therapists (n=64) was held at Youngstown State University in June 2017. Hurt Pounds include the emotional weight that we carry which may affect our interactions with others. It was important to determine whether the caregivers themselves were affected by these phenomena. A survey regarding wellness practices (including family meals), self-care behaviors and emotional characteristics was distributed. Analysis of variance was conducted to determine the relationships between variables of family meal participation and healthy behaviors. Results indicate that this group was not at risk of an eating disorder (n=3, 5%) and that family meal participation was high (n=78%). However, family meal participation did not predict forgiveness, self-compassion, BMI body appreciation, acceptance or action. Research indicates that family meal participation promotes health and well-being (Skeer & Ballard, 2013, Larson 2008) as does social support (Escobar-Koch, et. al, 2010).

Session 5a	1:30 – 3:00	Various Topics	Room: Ohio	Poster
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How the Wealth of a City Affects Violent Crime (Project ID: 268)

Jennifer Muhlenkamp

Criminal Justice - Faculty Sponsor: Dr. John Hazy

Violent crime is a significant issue that police and many others deal with on a regular basis. Violent crime consists of four different types of crimes: murder, rape, assault, and robbery. There are several theories that explain why certain places have more violent crime compared to others. This study focuses on the theory of social disorganization which states that the wealth of a city influences its violent crime rate. A sample of 20 different cities from Ohio were used to test the hypothesis that cities with a higher income will have lower violent crime rates compared to cities with a lower income. These cities were diverse in their size, income, employment and education levels. Descriptive and correlation statistics were used in the analysis. The findings from this study may help guide community developers in efforts to make their neighborhoods safe.

ACEs in Relation to Behavioral Health Screening Tools (Project ID: 287)

Hannah Haynie, Ashley Amendol, Isna Khaliq, Samantha Koullias, Konnor McCoy

Pre-Medical - Faculty Sponsor: Dr. Ronald Dwinnells

Adverse Childhood Experiences, or ACEs, have a tremendous impact on lifelong health: physical and behavioral, as well as future violence victimization and perpetration. As such, ACEs are an important public health issue being the fastest growing health concern in the country. However, most people are unaware that they exist. According to Dr. Robert Block, former president of American Academy of Pediatrics, "ACEs are the single, greatest, unaddressed public health threat facing our nation today."² Our group hypothesized that ACEs scores would correspond with behavioral health screening tools measuring depression, addiction, and trauma. After collecting the behavioral health history from 100 adult patients, a correlation was commonly present. The importance of individuals seeking help to overcome trauma and develop resiliency is crucial but not limited to, combatting future health issues such as physical illness or mental illness (including addiction) which may lead to early death.

The People vs. The Law: A War On Color (Project ID: 313)

Shannon Noark, Blake Davis, Alena Limperos

Criminal Justice - Faculty Sponsor: John Hazy

The story of racial profiling is not a new concept, for it has been around since the Civil Rights Movement and long before. Our Nation, especially Law Enforcement officials, continue to feed off of this hatred by stereotyping most if not all African Americans as so called "thugs". The main issue lies within our criminal justice system, police do not go through any specific or special training on how not to "racially profile" people. It is established within the code of ethics for professions, that racial profiling is unjust and against the rules. Until steps have been taken to fix the system, our country will continue to be caught in this war between the people and law enforcement.

Session 5a

1:30 – 3:00

Various Topics

Room: Ohio

Poster

Older Adults' Perception of Dementia in the Older Adult Population, A Literature Review*(Project ID: 320)*

Ashley Krueck

Long-Term Care Administration - Faculty Sponsor: Christine Ratvasky, LNHA, MA, MSHA.

The perception of dementia is usually negative in the general population, with variance in those who have had a loved one who suffered from dementia. In the older adult population, the perception is quite the same, but for different reasons. The older adult population has experienced dementia in loved ones, peers, others close to them, and in some cases, themselves. The purpose of this project is to determine why there are such negative perceptions surrounding dementia, especially the reasons for the negative perceptions from older adults themselves. This project will be conducted by means of extensive literature review of scholarly works regarding dementia perception in the older adult population. The goals of this comprehensive literature review are to determine what the research has shown are causes of these negative perceptions, to make recommendations to change the existing negative perceptions, and to determine implications for future research on the subject.

Grow It Green YSU *(Project ID: 322)*

Ashley Amendol, Lydia Mashburn

Pre-Medical - Faculty Sponsor: Angela Brodie

The issue of poverty is a growing concern throughout the Mahoning Valley. Numerous Mahoning Valley residents, due to living in a food desert, do not have access to affordable, fresh, local produce. Grow It Green YSU is committed to bettering the health of our community and providing affordable produce options. We partnered with the Youngstown Environmental Sustainability Society (YESS) to revitalize the Ward Beecher Greenhouse, hoping to enact change. The lack of availability to fresh produce carries with it a multitude of alarming health consequences. According to the Center for Disease Control's Physical Activity and Obesity Profile, in Mahoning County, 42% of the population are overweight and 25% are obese. Each of these behaviors increase the risk of developing a chronic disease, such as diabetes and heart conditions. With this in mind, we began growing fresh produce in the campus greenhouse to distribute to those in need, beginning with the YSU Food Pantry and local Youngstown Rescue Mission. Thus far, approximately ten pounds of lettuce were distributed to the Rescue Mission.

Vulnerability to Elder Abuse *(Project ID: 327)*

Diondra Reed

Long-Term Care Administration - Faculty Sponsor: Christine Ratvasky, LNHA, MA, MSHA

Research has shown that people with dementia are at greater risk of elder abuse than others. According to the Alzheimer's Association (2017), "1 in 10 people age 65 and older has Alzheimer's dementia" (pg.18), which factors out to be 5.3 million elders age 65 and older. This literature review focuses on financial elder abuse and the factors that may be associated with the risk of an individual with dementia becoming a victim. The frequency of people reporting financial abuse, the steps associated with reporting abuse and the outcome of the abuser will be investigated. Recommendations for further research as well as a recommendation for improving ways to avoid financial abuse will be made.

Session 5a	1:30 – 3:00	Various Topics	Room: Ohio	Poster
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Youngstown State University Students Comprehension of Old and New Label Designs (*Project ID: 333*)

Jonathan Francis, Mary Witnauer, Kathryn Polito, Claire Tevis, Brianna Grande

Dietetics - Faculty Sponsor: Dr. Jeanine L. Mincher

Food labels provide nutrition information for consumers to make informed food purchases. In May 2016, the FDA redesigned the food label to assist Americans in making healthier choices (2017). Seventy-five students at Youngstown State University were randomly surveyed regarding serving sizes, calories, saturated fat and specific nutrients on the old and new food label designs. More students were able to correctly identify added sugars on the new food label compared to the old food label ($t(74) = -7.302, p < .001$). Using a frequency test, results indicated that 80% of students struggled to identify the amount of saturated fat content on both the old and new labels. Students scored higher overall on the new food label (77.52%) design compared to the old food label design (70.03%). This was also significant ($t(74) = -5.465, p < .001$).

Campus Carry: How It Affects Campus Safety (*Project ID: 335*)

Allison Bator, Neil Clark

Criminal Justice - Faculty Sponsor: John Hazy

The safety of students is a number one concern for those looking to find the perfect college to attend. This research study intends to explore the relationship between concealed carry laws on campus and how they affect the safety of college campuses. Most recently, laws permitting or prohibiting concealed carry on campus is a topic of debate. This project will look at 20 different colleges; ten colleges with laws permitting concealed carry and ten colleges with laws prohibiting concealed carry and then compare them to the number of aggravated assaults on campus per year.

College Students' Perceptions Regarding Food, Food Choices and Mood (*Project ID: 353*)

Haley Grimwood, Logan N. Sullivan, Celina Vidman, Hadeal Yusuf

Dietetics - Faculty Sponsor: Dr. Jeanine L. Mincher

The influence that mood has on food and vice-versa includes psychological and physiological cues such as emotion and hunger (Köster and Mojet, 2015). Studies have demonstrated that individuals in a depressed emotional state tend to choose foods that contain high levels of fat and sugar, whereas those who tend to be in a more positive state of mind choose healthier foods (Hendy, 2012). A questionnaire was distributed to students attending Youngstown State University and inquired about eating habits and perceptions regarding mood and food consumption. Seventy-six percent of students surveyed stated that their mood affected their food choices. Fishers exact test revealed that there is no difference in the proportions of mood eaters to non-mood eaters by health status ($p = 0.653$). There was also no difference in the distribution of reported lunch quality based on mood and non-mood responders ($p = 0.350$).

An Examination of Class Rank and Lifestyle Habits Among YSU Undergraduate Students

(Project ID: 366)

Charin George, Monica Crowe, Rachel Bielecki, Chantelle Dominguez, Lindsey Swanson

Dietetics - Faculty Sponsor: Dr. Jeanine Mincher

Recent research demonstrates that 35% of college students are overweight or obese with the majority of weight gain and obesity occurring in individuals between ages 18 and 29 (Mokdad, et al., 2001). This suggests that college campuses can be a setting for health-related interventions. Weight also increases in the freshman year, continuing into the sophomore year, and possibly beyond (Huang, et al., 2003). Students at Youngstown State University (n=100) were surveyed to determine health behaviors and dietary habits. Students were compared by rank using a one-way ANOVA. Results showed no significant difference between rank and weekly fast food consumption ($F(3,96,99)=1.240, p=.299$). Rank and weight change were also examined using Fishers Exact Test. Results indicated that there was no significant difference in weight patterns across academic rank ($p=.369$).

The "GoLift" Club (Project ID: 370)

Abdel Rahem Yusuf, Zoser Chijide

Public Health - Faculty Sponsor: Angela Brodie

Within Youngstown State's community, many students live an unhealthy lifestyle because of a lack of adequate physical activity. This is due to a myriad of reasons, including, but not limited to, a lack of experience, knowledge, and motivation. As a beginner at the gym, one may not know how/where to start, or they may experience feelings of intimidation in being surrounded by others more experienced than them. Together, this can lead to discomfort and alienation in an otherwise beneficial environment, turning them away from achieving a healthier lifestyle. The mobile application "GoLift" is designed to alleviate these students' problems by implementing a system in which the user can be matched with a workout partner. A pairing system is in the process of development, one that would perfectly match users while illustrating a simple layout to understand and enjoy. The app, which is currently under construction, will be advertised to YSU students in order to encourage them to engage in a healthier lifestyle.

Detection Rate of Aneurysm of the Ascending Aorta in Hypertensive Patients (Project ID: 378)

Jordan Long

Pre-Medical - Faculty Sponsor: Dr. Andy Chang

Background: Hypertension (HTN) is a known risk for development of aneurysm of the ascending aorta (AscAoA). AscAoA is among the top 10 cardiovascular (CV) disorders resulting in claim payment in malpractice actions. However, AscAoA has the highest claim payment (\$417 K) of any CV diagnosis, making detection and treatment of this disorder clinically pertinent. Echocardiography (2-D) is Class II indication for assessment of patients with HTN when there is suspicion of structural disease or CHF. However, because 2-D has a limited 90 degree imaging field, the ascending aorta is often not well visualized. Cardiac MRI (CMR) does not suffer from this limitation. This study was designed to assess the detection rate of AscAoA in a cohort of patients with HTN, using 2-D and CMR.

Method: An institutional cardiac imaging database was queried for all patients with hypertension. The study cohort was composed of hypertensive patients who had a 2-D and CMR within a 6-month period. The number of patients with AscAoA, defined as ascending aorta diameter > 3.5 cm measured

perpendicular to flow, were computed for both 2-D and CMR modalities. Detection rates for AscAoA were analyzed and statistically compared.

Results: Of 3,543 patients in the cardiac imaging database, 2,283 had a diagnosis of HTN, of which 342 had both a 2-D and CMR within a 6 month timeframe, constituting the study cohort. 2-D detected 96 aneurysms of the ascending aorta for a detection rate of 28.1%. CMR detected 240 aneurysms of the ascending aorta for a detection rate of 70.2%. The detection rate of AscAoA was significantly greater than 2-D ($p < 0.01$). The Medicare reimbursement for 2-D was \$406.43 and \$845.32 for Private Insurance. The Medicare reimbursement for CMR was \$254.82 (CPT 75557) for Medicare and \$496.20 for Private Insurance.

Conclusion: Although 2-D and CMR provide similar diagnostic information regarding left ventricular function and valve status in hypertensive patients, CMR detects co-existing aneurysm of the ascending twice as often as 2-D. A “missed” diagnosis of AscAoA has significant medico-legal implications. Given the cost of 2-D and CMR to the healthcare system (i.e. actual reimbursement), CMR may be the preferred and less costly imaging modality for hypertensive patients, both with Medicare and Private insurance.

Sight for All United: Bringing Global Care to Your Community (Project ID: 385)

Saidah Yusuf, Rayann Atway

Public Health - Faculty Sponsor: Dr. Deborah Benyo

The purpose of our work is to evaluate a method of providing ophthalmic care on a daily basis and bring global initiatives to local communities through a retrospective review of all clients assisted since establishment of Sight for All United in October 2016. Sight for All United is a local nonprofit organization that provides financial assistance to members of the community in need of vision care services. The structure of Sight for All United was reviewed, and results of vision and outcome will be discussed. We found that community foundations such as Sight for All which is directly accessed by ophthalmologists can bridge the gap in access to care in at-risk populations, providing a means for these patients to receive care not otherwise available to them.

How has music as a remedy for dementia advanced through the years? (Project ID: 395)

Alexandra Kithcart

Long-Term Care Administration - Faculty Sponsor: Christine Ratvasky, LNHA, MA, MSHA.

Dementia is a disease that does not discriminate based on race, age, or gender; it can affect nearly any individual. If one is not affected directly, it is a societal norm for people to be indirectly affected by dementia through family and friends diagnosed with the disease. Unfortunately, dementia does not yet have a cure although there are ways to slow and improve the diminishing process. Music has been found to improve the human brain's functioning processes. There have been new studies in the works that delve into the idea that music can provide vast benefits for those suffering from dementia. The aim of this literature review is to examine the progression of this therapeutic remedy for dementia patients and make recommendations for future research.

Session 5a **1:30 – 3:00** **Various Topics** **Room: Ohio** **Poster**

The Impact of Service and Family Life on Body Image (*Project ID: 397*)

Megan Crees

Merchandising: Fashion / Interiors - Faculty Sponsor: Priscilla Gitimu

Many factors influence how one sees and values their body. This study investigates how helping attitudes and family quality of life impact body appreciation. After receiving approval from the Institutional Review Board, a survey was passed out to Youngstown State University students of a variety of majors during various classes. The survey included scales to measure the student's Body Appreciation, Helping Attitudes, and Family Quality of Life. One hundred and twenty-eight people took the survey. Fifty-eight of them were male, sixty-eight were female, and two preferred not to answer. Analysis of variance (ANOVA) results showed that the Body Appreciation means did not differ significantly between individuals high in Helping Attitudes, and those low in helping attitudes. On the contrary, ANOVA results showed that the Body Appreciation means differed significantly between individuals high in Family Quality of Life, and those low in Family Quality of Life. Those higher in Family Quality of had higher body appreciation means than those low. This research suggests that while many students have helping attitudes, those attitudes do not impact how they view their body, but there is a correlation between how they view their body and their family quality of life.

Session 5b	1:30 – 3:00	STEM Topics	Room: Bresnahan 1 & 2	Poster
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Remote Control Military Cargo Plane (*Project ID: 218*)

Annie Reese, Tyler Schrecengost, Jacob Henry
Electrical Engineering - Faculty Sponsor: Dr. Jalal Jalali

We are designing an RC airplane for our senior capstone that will reflect the appearance and capabilities.

Automated Greenhouse (*Project ID: 219*)

Christian Morales, Jacob Jones, Christian Kinder, Aaron Phifer
Electrical Engineering - Faculty Sponsor: Jalal Jalali

A portable miniature greenhouse that retracts it's cover, similar to a convertible car top, depending on temperature or via remote. The purpose of the project being to conveniently protect plant life from dying to frost in cases where the gardener is unable to manually cover each plant.

Guided Remote Interactive Prosthetic (*Project ID: 228*)

Katelyn Brady, Alexander Bonnette, Thomas Paprocki
Electrical Engineering - Faculty Sponsors: Dr. Jalali, Mr.Caven

The goal of this project is to develop an exciting and educational robotic hand to help encourage potential YSU students enroll in the Electrical Engineering Biomedical option. Faculty and staff for the Biology and Electrical Engineering departments have shown interest in seeing a functional prototype of this and could possibly use it in demonstrations to attract new students. The team decided on a design with user input via muscle sensors that are transmitted to G.R.I.P. wirelessly and the perceived hand action is produced. Since the budget is a big consideration, limitations were made with actual grip strength and less expensive servos were chosen for this application. The hand shell will be 3D printed and fitted with the servos in the forearm region. Fishing line will act as muscle tension to form the user hand's shape.

Intuitive Reflow Oven (*Project ID: 231*)

Brian Zellers, Benjamin Wilson, Dillon Kennedy
Electrical Engineering - Faculty Sponsor: Jalal Jalali

The goal of the intuitive reflow oven is to provide the YSU Electrical Engineering department with a easy to use reflow oven that can be used by professors and students. The knowledge and experience gained from such exercises will give students a better understanding of the complications of manufacturing electronic boards. This knowledge can be used in the design of such PCBs to prevent design complications, and flaws. In addition to class and lab exercises, the reflow oven will enable students to design their own PCBs for their future Capstone and IEEE projects.

Session 5b	1:30 – 3:00	STEM Topics	Room: Bresnahan 1 & 2	Poster
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Automated Quality Control System (Project ID: 232)

Joseph Schafer, Richard Bucci, Ahmed Awad

Electrical Engineering - Faculty Sponsor: Dr. Jalal Jalali

Senior Design Project - A conveyor system using computer vision to determine quality of objects. Additionally, it will sort these objects into separate bins based on their characteristics, such as color, shape, and pattern.

The Electromechanical and Non-Pneumatic (Project ID: 233)

Chaz Burger, Claudio Fernandes Dias, Nezar A Alhashim, Bryan Martinez, Donald Adams

Electrical Engineering - Faculty Sponsor: Jalal Jalali

Industry today uses air-filled tires for commercial and personal applications, all ranging from construction to conventional vehicles that motorists drive every day. A new development in airless tires holds several advantages over their air-filled counterparts and may be incorporated into mass production using 3D printing. Implementation of electromagnets and 3D printing allows the concept of changing tire tread pattern while a vehicle operates to become a reality.

"Follow Me" Delivery Box (Project ID: 238)

Karim Mohamed, Sanzio Luna, Rakan Alaqil, Abdulaziz Alotaibi

Electrical Engineering - Faculty Sponsor: Dr. Jalal Jalali

During last semester, our group met frequently to discuss senior design project ideas. After evaluating everyone's interests, we all had the same interest around automation that would make life easier for physically challenged people, elderly people, as well as any other customer. We came up with the automated follow me delivery box idea. This requires the use of microcontrollers/microprocessors such as Arduino and Raspberry Pi. Since employees have to do deliveries or replace inventory, boxes can be heavy to push around, we wanted to create something that would overcome this problem. Our project is an automated delivery box that will follow employees everywhere, will avoid collision, and will avoid pushing the box around the place. Using computer vision to determine the location, when the person moves, the box moves and when they stop, the box stops. We are going to build our prototype box with plywood in order to have a durable, but light prototype. Two 12V high torque 150rpm DC motors will be connected to the front wheels and they are going to be controlled by an Arduino Uno microcontroller. To power the motors, we will be using a 3S Lipo Battery with approximately 1000/1500mAh. As a rear wheel we are going to use one 3 to 4 inches swivel wheel. A raspberry Pi controller will be connected to 2 cameras placed on the front side of the box. The box will be programmed to follow a person with a certain shirt design/color. If the cameras detect a person, the raspberry pi will trigger the arduino and the Arduino will then control the motors adequately making the box turn. It will also stop if it encounters an obstacle or loses sight of the person the box is following.

Transient Magnification Transformer - Rife Resonator (Project ID: 243)

Adam Tewell

Electrical Engineering - Faculty Sponsor: Edward Burden

-Generates High Voltage by $V=L*(di/dt)$
 -Uses high voltage at various frequencies for the disassociation for bacteria or tattoo ink

Physical and Digital Analysis of a Lulzbot Mini (*Project ID: 269*)

Sara Cole, Kevin Yacucci, Hugo Mendel

Electrical Engineering - Faculty Sponsors: Dr. Eric MacDonald, Evan Harris

The usage of 3D printing is rapidly increasing in most industries, as companies are now able to rapidly prototype and iterate product designs. The accuracy and capabilities of 3D printers vary largely by printer models. Determining the limits of a 3D printers capabilities allow for more resilient designs. Locating these limits extends the use of 3D printing in manufacturing. To challenge the accuracy of the Lulzbot Mini repeated prints at the observed limits were conducted. After performing our experiment, the data collected pertaining to the limits were then compared to the factory specifications.

Percolation Through Voids Around Structurally Disordered Sand Grains (*Project ID: 277*)

Nicholas McGuigan

Physics - Faculty Sponsor: Dr. Donald Priour

Fluid flow or charge transport through porous materials takes place within voids around impermeable grains. With increasing density of grains, fluid flow diminishes, ultimately ceasing at the percolation transition separating configurations macroscopically navigable; and those which block fluid flow in the bulk limit. Theoretical studies of void networks have generally been confined to monodispersed systems of identical particles, with no calculations of percolation thresholds for geometrically diverse grains. In addition to positional and orientational disorder, we incorporate structural disorder by imposing random variations in the geometries and sizes of grains, akin to realistic porous materials. We consider cubes distorted into rectangular solids with random proportions. More comprehensively, we also examine configurations of structurally disordered tetrahedra and parallelepipeds with both random perturbations in edge lengths and dihedral angles. Reflecting the fact that grains in practice are irregular polyhedral with various numbers of faces, we also implement structural disorder by using Voronoi tessellation to carve out irregularly shaped grains. Intuitively, this approach mimics the formation of grains in nature from fractured larger objects.

Natural Language Based Neural Activity Classification Using Neural Network (*Project ID: 289*)

Firous Odeh, James Hayes, Anthony Hill, Cameron Howard, Elizabeth Durflinger

Computer Science - Faculty Sponsor: Dr. Coskun Bayrak

Neural activity recording is the process of scanning individual neurons in the brain, and recording their activity in response to specific stimuli. The team has put together a language based neural activity study, where bilingual and monolingual test subjects are assessed with a 14 point brain scanning device that allows the team to monitor, and record, neural activity of each subject while being presented with language specific stimulus. This data is used to analyze differences in neuron activity between bilingual and monolingual subjects. The team expects to observe greater neural activity in bilingual subjects while assessing a visual stimulus.

Session 5b	1:30 – 3:00	STEM Topics	Room: Bresnahan 1 & 2	Poster
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Fee Inclusive Tuition (*Project ID: 304*)

Michael Kacir, Mitchell Franko, Alexandra Ballow, Hannah Senediak
 Mathematics - Faculty Sponsor: Dr. Sturuss

Currently college tuition itself is frozen, but the college needs to keep up with the market, so to match inflation, colleges charge fees. Students know what their tuition itself will cost but with added fees ever growing and changing, students don't know how much they will actually owe. In an attempt to solve this problem, we looked at a way to consolidate college tuition and their fees. To do this we looked at the average fee cost per student per major and divided that total fee cost among the number of projected years that student will be in college. So, each major will have a different tuition price. To ensure our method works we created a hypothetical university with two colleges and seven majors. Once we had a mock university we were able to run different simulations and comparisons to see if charging tuition this way is better than the way universities have been charging tuition.

Digital Conversion of a Pressure-Switching Data Acquisition System (*Project ID: 334*)

Kayla Fisher, Daniel Martin, Lauren Lottier
 Electrical Engineering - Faculty Sponsor: Dr. Kevin Disotell

The Scanivalve Pressure Scanner is a fluid pressure measurement device enabling an array of ports (channels) to be sampled using a single, shared transducer, thereby lowering the number and cost of dedicated transducers for the data system. The legacy scanner model at Youngstown State University (YSU) requires a user to manually press a button on the device to switch the pressure port to be sampled by the transducer. To reset the switch to the first port, the user must press a different button on the device. In order to enable remote operation of the device and automated data acquisition for flow pressure measurements, digital controller logic has been implemented in the current work to convert the analog switches to digital input/output (I/O) using data acquisition software. In this project, the push-button manifold has been replaced with a National Instruments USB-6008 data acquisition device for digital I/O. Connection from the USB to the pressure scanner is made using BNC adapters. Custom software developed with MATLAB's Data Acquisition Toolbox controls communication between the USB-6008 and the pressure scanner. User-defined sampling parameters allow the user to select the ports to be sampled, as well as sampling rate, record length, and number of records. The deployment of digital controller logic will enable automated data acquisition routines to be programmed for wind tunnel experiments in the YSU Flow Physics Laboratory.

Searching for Photometric Variability in Stars from the Sloan Digital Sky Survey in comparison to HETDEX (*Project ID: 369*)

Ashley Lemasters
 Astronomy / Physics - Faculty Sponsor: John Feldmeier

We report on ongoing research to search for photometric variability in faint stellar sources by comparing two large data sets: 1) the Sloan Digital Sky Survey (SDSS) and 2) the HETDEX (Hobby Eberly Telescope Dark Energy Experiment) g-band imaging survey. HETDEX is a five year spectroscopic survey of 400 square degrees of sky, and will find one million Lyman-alpha galaxies at redshifts from 2-4. The g-band imaging survey, taken with the 4-meter Mayall telescope, is an important component of the overall project. We construct source catalogs of the g-band data using the Source Extractor software, and then match each source astrometrically. Photometric comparisons will be shown and possible sources of uncertainty will be discussed.

Comparing the Tractor Program in the MzLS for use in the HETDEX Survey (*Project ID: 376*)

John King V

Astronomy / Physics - Faculty Sponsor: Dr. John Feldmeier, HETDEX Project Team

The Tractor analysis program (Lang, Hogg, & Schlegel 2016) generates probabilistically justified astronomical catalogs from multi-pass, multi-band imaging. The HETDEX (Hobby-Eberly Telescope Dark Energy Experiment) Survey uses a set of spectrographs to map the three-dimensional positions of a million galaxies. Tractor has been operated by the MzLS (Mayall z-band Legacy Survey) in their data releases. The testing and analyzing of the Tractor program has been used to compare it to the generative model used in the HETDEX Survey. We give a progress report on our tests so far. Our current research shows that the Tractor program spanning the survey seems to fit the object types fairly accurately. However, there are cases where Tractor is not a good match to the MzLS data, and we show some examples of these cases. It appears that Tractor should be a useful tool for the HETDEX survey, when attention to systematic effects is taken.

GENI: A Knowledge Assessment and Skill Measurement Approach (*Project ID: 408*)

Swetha Yelamanchi

Computer Science - Faculty Sponsor: Dr.Coskun Bayrak

Technology has a huge impact in our daily lives. Using it towards our advantage in the field of learning is something known to be very effective, with respect to the various forms encountered. However, within the focus of this proposal the idea of technology-based learning will be taken to another level where learning can done on-the-fly, with the adaption of mobile platforms such as smart phones and ipads. The proposed system is called MILAS, composed of two parts: firstly, the analysis and secondly, the implementation. The statistical computing and data analysis is carried out in the R language with 2000 entry-level IT job advertisements, resulting 40 percent knowledge gap lacking from the computer science course curriculum skill set. Therefore, within the focus of the first part of this proposal a knowledge repository containing data from the industry and students skill sets will be created. In the second part, implementation of game oriented environment is created where questions are distributed to the members from a centralized repository. The system will assess the knowledge skills based on the responses provided so that additional help and guidance are provided. The advantage of creating such an environment for these platform help students learn and keep themselves updated with current IT job market trends and advancements that is useful to match up to the current job market skill set.

Restoration and Characterization of a Sub-critical Assembly: A Middle Act (*Project ID: 412*)

Steven D. Littell, Brandon Sharp, Joseph Shives

Physics - Faculty Sponsor: Donald J. Priour

Sub-critical assemblies are devices which undergo a chain reaction only with an external neutron source incorporated. Building on earlier efforts, we have completed the mechanical support hardware to wirelessly maneuver a multiprobe detector (i.e. sensitive to gamma and beta rays and capable of photograph and video acquisition) in the context of the assembly. The detector will be part of an apparatus to accompany a Nuclear Chicago Model 9000 Chamber on a permanent basis. As a test of the multiprobe, we have measured spatially dependent gamma counts in the vicinity of irradiated sources. Theoretical simulations and calculations are presented in support of our experimental measurements. We make concrete projections as to the role the reaction chamber apparatus will play in research efforts and its ability to enhance educational opportunities for the broader community.

Session 6	1:30 – 3:00	Mechanical Engineering	Room: James Gallery	Oral
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Shorting Connector Assembly Process (*Project ID: 301*)

Mark Fredrickson, Matthew Osiniak, John Pechatsko

Mechanical Engineering - Faculty Sponsor: Dr. Jason Walker

The student design team was tasked with creating and implementing a new process and machine to assemble a small electrical component for electrical manufacturer Delta Systems, Inc. An issue with the current machine's capability to produce a part efficiently warrants the need for a new machine. The well-rounded project requires the collaboration of many engineering aspects for completion. Throughout the project, the team has been subjected to a multitude of different engineering elements including mechanical, industrial and electrical design. Throughout various stages of the manufacturing design process, the team and company have come to a solution and are working to finish the physical completion of this project.

Vallourec Pipe Drifter and Mandrel Rod Connections (*Project ID: 339*)

Jarrod Ellenberger, Matthew Ciccone, Zachary Venzeio

Mechanical Engineering - Faculty Sponsor: Dr. Jason Walker

The purpose of this project was to redesign an inspection unit used by the finishing quality and maintenance department at Vallourec Star Youngstown, OH. This device utilizes a pinch roller system to propel a critical diameter plug through each seamless pipe to verify the minimum inner diameter. The current system, has issues with wear, strength, and overall function. The design team will redesign the entire system to solve each of these issues, and will guide the project from initial concepts through analysis, manufacturing, and installation.

Design and Analysis of an Exhaust Silencer for YSU's Supersonic Wind Tunnel (*Project ID: 340*)

Michael Manginelli, Eric Haake, Michael Ramunno

Mechanical Engineering - Faculty Sponsors: Dr. Stefan Moldovan, Dr. Kevin Disotell

The purpose of this project is to design and analyze an exhaust silencer system for Youngstown State University's blowdown supersonic wind tunnel so that the wind tunnel can be safely integrated into the Mechanical Engineering curriculum for future classes. Once operational, the wind tunnel will allow students to gain an understanding of air's compressibility at supersonic speeds. This design project involves heavy usage of computational fluid dynamics (CFD) to perform flow path analyses that allow the team to ensure test section stability as well as acceptable outflow conditions. The exhaust system must also attenuate harmful noise generated by the wind tunnel so that it may be operated safely. The performance of stress analyses on the design's structural members is an additional feature of the design that is of high importance to ensure the safety of the students and professors who will run the wind tunnel. As with most designs, cost is being considered by the design team in order to make the design worthwhile for YSU to manufacture. The project was started in September of 2017 and will reach completion in May of 2018. Come May, a completed design of the exhaust silencer with CFD and FEA analyses for validation will be submitted to YSU, along with machine drawings and cost estimations to promote YSU's ability to manufacture and assemble the supersonic wind tunnel's exhaust silencer.

Session 6	1:30 – 3:00	Mechanical Engineering	Room: James Gallery	Oral
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Determination of Human Skin Friction Coefficient (*Project ID: 342*)

Sarah Cash, Mayah McCuen, Maria Lacatena

Mechanical Engineering - Faculty Sponsor: Dr. Walker

This project will determine if the physical characteristics of certain individuals are predisposed to be better rock climbers than other individuals. The project team has designed a device to measure the skin friction coefficient. Once the machine is constructed, the device needs to be able to produce reliable and repeatable results of the measurement of the friction coefficient between human finger and various rocking climbing surfaces such as rock holds, wood, and real rock. The coefficient of friction according to Oxford Dictionary is “the ratio between the force necessary to move one surface horizontally over another and the pressure between the two surfaces.” The coefficient of friction can be found by taking the ratio between the tangential force (vertical direction) and the normal force (horizontal direction). The coefficient of friction will be tested using a device comprised of two load cells measuring the force in the horizontal and vertical direction.

Columbiana Boiler Internal Tank Cleaning (*Project ID: 343*)

Nicholas Ghiates, Ethan Keller

Mechanical Engineering - Faculty Sponsor: Kelsey Lyda

The goal of this project was to improve upon Columbiana Boiler Company’s (CBC) existing internal tank cleaning process. Through use of innovative equipment and analysis of existing equipment, a new methodology of cleaning the inside of the produced pressure vessels was to be proposed.

Columbus McKinnon Gearbox Test Stand (*Project ID: 344*)

Dominic DiVencenzo, Jared Marton, Cory Mengel

Mechanical Engineering - Faculty Sponsor: Anthony Viviano, P.E.

The design team was tasked by the Columbus McKinnon Corporation to redesign their gearbox test stand. This test stand must be able to perform a pressure test and sound test while a load is being applied to five uniquely shaped gearboxes. This project was broken down into three different areas of focus. The first was to take the current method for applying the load and replace it with a hydraulic brake system to regulate pressures and meet torque requirements. The second area of focus was the overall spacing and positioning of the gearboxes and brake disk setup to improve the strength in the brakes and to make switching of the gearboxes easier for the operators. The final area of focus was on the test stand structure itself. The redesign of the stand was to make room for the new hydraulic components, motor, safety guards, and any other improvements that needed to be made.

Convergence of an Infinite Series (*Project ID: 252*)

Rabin Thapa

Mathematics - Faculty Sponsor: Dr. Padraic W Taylor

The infinite series of the form

$$\sum_{n=1}^{\infty} \frac{1}{n(n+1)(n+2)\dots(n+k)} \quad \text{i.e.} \quad \sum_{n=1}^{\infty} \left[\prod_{i=0}^k \frac{1}{(n+i)} \right]; \quad k \in \mathbb{N}$$

appears frequently in various problems related to series. This paper discusses an approach to find precisely what those series converge to by developing a general pattern to resolve them into their equivalent partial fractions followed by the telescoping forms of the series. Meanwhile, the connection of those series with the "Pascal's Triangle" illustrates the underlying mathematical beauty and symmetry. In addition, the presentation contains applications of similar infinite series in various other scientific fields.

A Gaze-Based Exploratory Study on the Information Seeking Behavior of Developers on Stack Overflow (*Project ID: 255*)

Natalie Halavick, Sahaj Bhattarai

Computer Science - Faculty Sponsors: Dr. Bonita Sharif, Dr. Alina Lazar

Developers use the Stack Overflow website daily to find answers to questions they might have while coding or debugging software. Many developers answer questions, but most use the website to ask or find answers to their own technical problems. We present an exploratory study on how developers seek information on Stack Overflow. We use iTrace, an eye-aware Eclipse plugin to collect fine-grained eye tracking data. The quality of the summary depends on the selection of the phrases and keywords that a programmer would choose. Our goal is to learn via eye tracking how developers summarize code. We ran the study as a pilot with three developers. The results of the study show that the participants completed the tasks correctly when both the source code and Stack Overflow were primarily used to complete the tasks. Developers that spent more time on relevant Stack Overflow questions and their corresponding answers gave complete and accurate answers to the summary and also focused on pages that had code snippets on them. This is indication that if Stack Overflow posts have code snippets, they are more useful to developers. Our main contributions are the use of eye gaze to determine what developers look at and how they navigate between source code and Stack Overflow for code summarization tasks. We also show what developers look at while they are on Stack Overflow pages.

An Empirical Study Investigating Source Code Summarization using Multiple Sources of Information (*Project ID: 300*)

Sama Sanjana

Computer Information Systems - Faculty Sponsor: Dr. Bonita Sharif

Software developers rely on good source code documentation to understand existing source code. Manual documentation is usually missing or outdated. While several works on code summarization

Session 6	1:30-3:00	STEM Topics	Room: Jones	Oral
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leveraged source code to generate summaries, very little work exists on using other information sources. A lot of tacit knowledge is exchanged between developers in discussion forums or bug reporting sites that can be very useful for summarization. We conduct an eye tracking study to investigate the effect of multiple sources of information for code summarization. Each participant is asked to summarize four code elements in their own words using different contexts. We evaluate the summaries against a human oracle to find similarity and analyze the developers' eye gaze patterns to see what they look for and how they switch between different contexts. Our results indicate that Stack Overflow and Bug reports are as helpful as source code in supporting code summarization tasks.

A Mathematical Investigation of a Biophysically Based Neuronal Model *(Project ID: 336)*

Natalie Halavick

Mathematics - Faculty Sponsor: Dr. Jozsi Jalics

Much research on neuronal activity patterns is being conducted by biologists using electrophysiological recordings as well as mathematicians using modeling and numerical techniques. These experimental recordings may become time-consuming, whereas modeling allows for quick computations and results. We investigated a biophysically based mathematical model of a single neuron consisting of both a 2-dimensional and 3-dimensional system of ordinary differential equations. These models are based on the Hodgkin-Huxley equations and include parameters that have been obtained from experimental recordings. We explored the activity patterns in this model using analytical and numerical techniques including bifurcation analyses. In particular, we studied how varying the parameters in the model leads to changes in the observed activity patterns such as bursting and spiking behavior and analyze the dynamical mechanisms underlying these changes.

Using Deep Learning to Play Rocket League *(Project ID: 375)*

Zack While

Computer Science - Faculty Sponsor: Dr. John R. Sullins

Deep learning has become increasingly prevalent in various research domains in the past few years, with a proven record of outperforming traditional machine learning approaches in tasks such as image classification, natural language understanding, and facial recognition. In this project, video gaming is used as an analogue of image classification, where a picture's associated label is the button(s) that should be pressed based on the current screen. This allows us to make an automated player that does not intrude on the game's files, playing like a human by only pressing buttons. Various deep learning architectures for image classification are trained, evaluated, and used to play 1 vs. 1 matches of Rocket League, a physics-based soccer game played with rocket-powered cars. Comparatively superior in-game performance is found with the ResNet image classification architecture, which shows the strongest notions of ball-tracking and in-game awareness.

Session 6**1:30-3:00****STEM Topics****Room: Jones****Oral****Historical Survey of Digital Technology** (*Project ID: 411*)

Bhawana Bhatta, Elie Louisa, Ankit Vaidya, Jerome K Cheeves, Megan McCloskey

Electrical Engineering - Faculty Sponsor: Robert W Caven

The advancement of digital technology today and its application in the various field for the overall convenience in human's life is a result of a great history of trials, failures and success of ideas, potentiality and experiments in science. When the world is now engaged in finding new ideas for more efficient applications of digital technology, we are doing a brief survey of its history. The subjects of our research of the history includes the mechanical, electro-mechanical, vacuum tube, transistor, and quantum methods for implementing digital logic. From the very old vacuum tubes which are now already replaced by transistors to the most recent quantum computing; from the use of mechanical gears to build a logic circuit to the use of semiconductors to amplify electronic signals, digital logic technology has had a long noticeable journey since the early 18th century.

Session 6	1:30-3:00	Physics / Engineering	Room: Coffelt	Oral
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Self-Stability in Proximal Pairs of Planets (*Project ID: 271*)

Stefan Lesnansky

Physics - Faculty Sponsor: Donald J. Priour

Exo-planet systems allow one to examine rich dynamical behavior not currently manifest in our own solar system; in this regard, inherently stable configurations are of particular interest. We implement locally stable simulations adapted from molecular dynamics simulations used on a much smaller scale to probe orbital characteristics over long times (i.e millions of orbits of few body planetary systems). In particular, we find a variety of cases in which two planets of similar mass orbit in proximity in mutually stabilizing configurations which nevertheless exhibit oscillations of mean orbital radii over long times. The oscillations, while regular, are also nontrivial in having a rich non-sinusoidal envelope. In the context of numerical simulations, we examine the extent of the self-stabilizing phenomenon, both with respect to the mass difference and the proximity of the orbits of the two planets. As evidenced by qualitative shifts in Poincare Sections, we find bands of self-stability to be flanked by regimes of chaotic behavior. With only two bodies present we are afforded a unique opportunity to examine, in the context of analytical perturbative treatments, self-stabilizing planetary motion which does not conform to the notion of well-defined separate quasi-circular orbits.

Exploiting Stable Transfer Orbits in Cislunar Space: or How I Built the Lunar Taxi (*Project ID: 280*)

David Bernard

Astronomy / Physics - Faculty Sponsor: Michael Crescimanno

A simplified model of the earth-moon system was used to explore the potential of stable cislunar transfer orbits that could act as a transport mechanism between the earth and the moon. An object of appropriate mass that is bound to this orbit could be exploited to transfer objects in Low Earth Orbit (LEO) or Medium Earth Orbit (MEO) to a Lunar Orbit with the use of an impulse correction to join the two systems. The advantage of this system is the cost efficiency of only having to obtain a LEO or MEO to then be transferred through cislunar space allowing for a greater payload with lower fuel consumption.

Fabrication of One-Dimensional Photonic Crystal arrays using TiO₂-SiO₂ layers (*Project ID: 348*)

Rabin Thapa

Physics - Faculty Sponsor: Dr. Tom N Oder

We report our activities in the fabrication and characterization of one-dimensional photonic crystals. By the process of photolithography, the lens array is fabricated on a sapphire surface coated with 13 alternate layers of TiO₂ and SiO₂. This is followed by thermal treatment (250°C) and plasma etching (RIE) to obtain one-dimensional photonic crystals, with varying refractive index along the radius of the microlens. Experimental results show that a good quality microlens array could be formed by adjusting the flow of reactive ion gases and power (RIE and ICP) to proper values. In our experiment, the flow rate of CHF₃ and O₂ are 50sccm and 2sccm respectively. The power used is 200W. The bottom size and height of the resulting microlens are measured to be 63Åµm and 2.5 Åµm respectively.

Session 6	1:30-3:00	Physics / Engineering	Room: Coffelt	Oral
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Fabrication of One Dimensional Photonic Crystals By Sputtering and Sol Gel Methods (Project ID: 401)

Nick Borucki

Physics - Faculty Sponsor: Dr. Oder

The large difference in refractive indices between TiO₂ and SiO₂ can be used to modulate light in optoelectronic devices. A one dimensional photonic crystal (1-D PC), within the UV-visible spectrum, made of thin multilayers of TiO₂ and SiO₂ was fabricated by two different methods of deposition: magnetron sputtering and sol-gel spin coating. The photonic band gap (PBG) was theoretically and experimentally determined by controlling the refractive index gradient. Additionally, steps towards making a PC with 2-D and omnidirectional band gaps were investigated.

Quantitative determination of residual stress on additively manufactured Ti-6Al-4V (Project ID: 406)

Mercedes Ferraro

Mechanical Engineering - Faculty Sponsor: Dr. Jae Joong Ryu

Additive manufacturing (AM) is a method to build a three-dimensional part through the layering of material. One category of AM, Direct Energy Deposition (DED), is commonly used with the titanium alloy, Ti-6Al-4V, and has shown to be useful for aerospace, transportation, and biomedical applications. However, the DED process induces anisotropic material properties due to the nonuniform temperature distribution, which causes residual stresses. In addition, when handling titanium and its alloys, the processing history and post-heat treatment greatly influences the microstructure, residual stresses, and mechanical properties. Previous research has been done to investigate the residual stresses by methods such as X-ray diffraction, contour methods, and finite element simulations. However, a less established technique for determining the residual stresses is through nanoindentation. Nanoindentation is the use of instrumented indentation to determine the mechanical behavior and properties of a small volume based on load versus depth results. By applying nanoindentation techniques to a DED Ti-6Al-4V, it was found that the nanoindentation results varied based on the cross-sectional height of the sample. This result was used to quantify the residual stresses present in the DED Ti-6Al-4V part. By understanding the material characteristics of this part, it will help to further enhance the structural integrity of the AM parts.

Properties of Sputter-Deposited Gallium Oxide Thin Films (Project ID: 407)

Sundar babu Isukapati

Electrical Engineering - Faculty Sponsor: Dr. Tom N Oder

Gallium oxide (Ga₂O₃) thin films have been deposited on c-plane sapphire substrates by RF magnetron sputtering. Parameters varied included deposition gas composition, substrate temperature (200C to 8000C) and post-deposition annealing temperatures. Preheating the substrate in O₂ offered a better surface for crystal growth. The structural and elemental compositional properties of the films were determined using X-ray diffraction and energy dispersive spectrometry measurements. Single and polycrystalline thin films were obtained by varying the composition of Ar and O₂ gas used in the deposition. (\hat{A}^{-2} 0 1) oriented \hat{I}^2 -Ga₂O₃ single crystal thin film was obtained when deposited in Argon atmosphere at 500C. The optical characteristics obtained by UV-VIS spectroscopy measurements showed excellent transmission of 90 - 95% and optical bandgaps of 4.7- 4.8 eV. Addition of Sn dopants in the films produced a decrease in the optical bandgaps with increasing concentration of the Sn to the films.

Session 6	1:30-3:00	Mechanical/Industrial Engineering	Room: Humphrey	Oral
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Square Pipe Roll Forming Head (*Project ID: 359*)

Kyle Merritt, Kyle Thomas, Joshua Schlueter

Mechanical Engineering - Faculty Sponsors: Anthony Viviano P.E., Dr. Hazel Marie

Before going out business, Union Metal, a leading pole manufacturer in North America, wished to expand their product lineup. Using an existing housing that was mainly used for circular tapered utility poles, they wished to design a removable assembly that would be able to form square tapered poles. The housing would only allow for a 44" envelope in which the assembly would rest inside with multiple 50,000 lbf maximum working loads based on specified hydraulic cylinders that would be used for the design. Using dimensional and failure analysis, a design was created, refined, and verified based on the project constraints and working loads. To go along with the final design, as part of an honors capstone, a plastic deformation analysis was done on the circular tube as it is formed in to a square tube.

Fusion of the Proximal Interphalangeal Joint (*Project ID: 360*)

Lauren Kowal, Christina Seydlorsky, Sam Mistretta

Mechanical Engineering - Faculty Sponsor: Dr. Walker, Dr. Hazel Marie

The purpose of this project is to design a grip that will test multiple sized fingers (phalanges) to determine which fusion method and what angle is most desirable for a patient's daily routine. The grip design must be able to handle the load that will be applied to it as the phalange is being tested in the different strength testing machines. The four different fusion methods are compression screws, dorsal plating (locking and non-locking), and tension band wiring. We hypothesize that the tension band wiring fixation will be the most resistant to flexion and the dorsal plate fixations will be the most resistant against torsion. Prototyping of the grip has been done as well as preliminary testing to ensure that the desired tests could be done on the phalanges and fusion devices. Once the testing is complete, the data will be on Excel and analyzed.

Hydraulic Aluminum Dovetail (*Project ID: 362*)

Thomas Oliver

Mechanical Engineering - Faculty Sponsor: Anthony Viviano

This project was to design and test a 10-foot hydraulic aluminum dovetail trailer. A dovetail trailer has a flat tail which is attached at a pin behind the axle. The tail able to rotate down or up making it quick and easy to load and unload equipment. The first step in the design process is to locate the problem and the problem was how to engineer the hinge and tail so that it does not fail using aluminum components. The tail must be able to lift 10,000 lbs and be able to support 5,000 lbs in the middle of the tail. The process of designing the tail to be able to hold what is required makes it difficult since its made of mostly aluminum. Using Simulation Mechanical to do finite element analysis (FEA) on each component of the tail to test the material before submitting the prototype was crucial. Doing that, along with hand calculations to verify our FEA was critical in the design process.

Session 6	1:30-3:00	Mechanical/Industrial Engineering	Room: Humphrey	Oral
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Columbiana Boiler Operational Efficiency (*Project ID: 363*)

Patrick Brown

Industrial / Systems Engineering - Faculty Sponsor: Kelsey Lyda

The purpose of the project is to provide some form of unity amongst the other Columbiana Boiler group projects. This consists of proving quantitative information of the implications of the group projects on the process. In addition to this, the responsibility of the project is to optimize the plant layout for optimal production, as an existing process in the plant is being moved elsewhere. This allows for more room to organize and optimize the existing process that is staying in the plant.

In summary, the project looks to accomplish a bottleneck analysis both before and after the other group projects have been implemented. This provides quantitative information on how the group projects affect the process. Finally an updated plant layout will be constructed with the updated machinery and re-organization of equipment both to minimize cycle and move times.

CBC roll forming (*Project ID: 371*)

Mohammed Alharbi, Mohammad Alsairafi, Mohammed k Al Madlough

Mechanical Engineering - Faculty Sponsor: Kelsey Lyda

Columbiana Boiler Company is more than a century old company dating back to the founding in 1894. The design of a container consists of a long process, but the group is tasked with the following part of the process: tank body rolling process, welding of head to body, and internal tank cleaning. Each of these processes is then broken down into smaller and smaller processes. The design group was tasked with tank body rolling process, which breaks down into plate shearing, pre-bending of edges, rolling, and welding. The project end goal was to make the tank body rolling process much more efficient, with faster cycle time. The machines designed and picked by the team will ensure a reduction in labor and a faster process for the company. A detailed project timeline was created to split the work between the group members equally and to ensure the group work is organized and focused. Also, an engineering characteristics matrix was made after being weighed and considered by the company to ensure the group's work aligns with the company's vision of the project.

YSU Wind Turbine Controller (*Project ID: 391*)

Noah Beal, Charles Zaborsky, Patrick Hyden

Mechanical Engineering - Faculty Sponsor: Jason Walker

In 2011, YSU acquired two 2.5kW wind turbines installed at Melnick Hall for experimental purposes. The control system for one of the turbines was never operational. The engineering team designed and implemented a new controller system capable of uploading real-time data collected from the wind turbines to the YSU network. In addition to the web-connectivity features, the engineering team worked towards optimizing the control scheme to capture the maximum power. Safety and long-term system integrity were emphasized throughout the entire design process.

Session 6	1:30-3:00	Biology	Room: Esterly	Oral
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Post-cranial morphology of The Xenarthra: hindlimb structure and function (*Project ID: 302*)

Sarah Marshall

Biology - Faculty Sponsor: Michael Butcher, PhD

Armadillos, anteaters, and sloths each have distinctive body plans, yet they are classified into one superorder (Xenarthra) due to a few shared characteristics of the skull and spine. Divergence in their morphology is associated with their functional habits ranging from arboreal-suspension in sloths to terrestrial-digging in armadillos. We hypothesized that quantitative differences in hind limb form will be predictive of the lifestyles observed among xenarthrans. A total of 27 functional indices were calculated from 42 measurements of bone length, width, and depth from a sample of N=83 skeletal specimens (18 species). Raw data were log-transformed to account for variability in body size. Logarithmic and index data were mainly evaluated using Principal Components Analysis (PCA) to determine the osteological correlates among extant taxa, which were then used to predict categorical assignments of substrate preference and substrate use. The influence of body size on bone proportions is appreciable. Specifically, PCA on index data show that armadillos have robust femora/tibiae, wide bony condyles, and a long tibial tuberosity, which are associated with joint stability and digging mechanics. These characteristics are intermediate in the anteaters, whereas sloths have long and gracile bones with reduced/absent condyles, which are traits associated with mobility and suspensory function. Also, three-toed sloths have shorter hindlimbs and metatarsal lengths, but longer calcaneus lengths, and group separately from two-toed sloths. The predicted memberships for substrate preferences and uses for each species largely correspond with their previously designated lifestyles. Future analyses will evaluate phylogeny to determine whether the key traits observed are ancestral or derived having evolved for each niche occupied.

Keep Calm and Hang On: EMG Activation in the Forelimb of Three-toed Sloths (*Project ID: 312*)

Marissa Gorvet

Biology - Faculty Sponsor: Dr. Michael Butcher

Sloths exhibit below branch locomotion whereby the limbs are required to support their body weight while in suspension. Suspensory behaviors require great strength and fatigue resistance of the limb flexors; however, the muscle mass of sloths is reduced compared to other arboreal mammals. It is possible that sloths minimize muscle activation and rely on tensile loading of muscle-tendon units to maintain support, thus indicating neuromuscular specializations to conserve energy. Electromyography (EMG) was evaluated in a sample of three-toed sloths (*Bradypus variegatus*: N=6) to test this hypothesis. EMG was recorded at 2000 Hz via fire-wire electrodes implanted into 8 muscles of the left forelimb while sloths performed trails of hanging, inverted walking, and vertical climbing. Video recordings (100Hz) were synchronized with EMG to monitor footfalls for locomotor trials. A total of 117 trials and 227 strides were analyzed. Sloths demonstrate that all flexor/extensor muscles are minimally active during hanging. When inverted walking, sloths move slowly (mean duty factor: 0.83 ± 0.03) and most muscles are active during limb contact except for the elbow and digital extensors, which are active >10% of the stride versus the flexor muscles that are active 15-40% of the stride. For vertical climb, sloths move at a similar speed as walking, however, the majority of muscles show shorter but larger EMG bursts that may occur before or after each footfall. Notably, the shoulder and elbow flexors are observed to have the largest bursts with long burst durations that are indicative of maximum voluntary contraction when sloths climb. Further evaluations will include quantification of EMG burst intensity and assessment of motor unit recruitment patterns using wavelet analysis techniques.

Fiber type expression and energy metabolism in sloth hindlimb muscles (*Project ID: 314*)

Kyle Spainhower

Biology - Faculty Sponsor: MT Butcher, PhD

Sloths are canopy-dwelling inhabitants of American neotropical rainforests that exhibit suspensory locomotion and posture. These abilities involve hanging below branch from hook-like feet, and although they require great strength and endurance, the skeletal muscle mass of sloths is reduced, thus requiring modifications to muscle physiological properties beyond those typical of mammals. Based on our previous findings in sloth forelimbs, we hypothesized that hindlimb muscle properties will be specialized for sustaining torque by expression of slow-contracting, anaerobic fibers. This hypothesis was tested by determining myosin heavy chain (MHC) fiber type and energy metabolism in the hindlimbs of two-toed (*C. hoffmanni*, N=3) and three-toed (*B. variegatus*, N=5) sloths using protein gel electrophoresis, immunohistochemistry, and enzyme activity assays. A primary expression of the slow MHC-1 isoform as well as moderate expression of fast MHC-2A fibers are found in both species. Several muscles express 100% slow fibers, and the MHC-1 fibers measured are larger in cross-sectional area (CSA) than MHC-2A fibers and comprise the greatest %CSA in the twelve muscles sampled. Enzyme assays show elevated activity for two anaerobic enzymes compared to moderately low activity for aerobic metabolism, and enzyme activity and MHC fiber type do not appear to be correlated. These findings support the hypothesis and confirm that slow-contracting muscles in sloth limbs paradoxically rely more on rapid energy pathways for ATP re-synthesis, and further suggest that functional habits are the main determinants of their "fiber type." Thus, the intrinsic properties observed match well with the locomotor requirements of sloth limbs, and these specializations may have evolved in unison with low metabolism and body temperature, and slow movement patterns as means to conserve energy.

Contamination of Water (*Project ID: 222*)

May Lynn Einfalt

First Year Experience - Faculty Sponsor: Sarah Eisnaugle

Hydraulic fracking, or fracking, is used for taking shale oil out from deep inside the earth. The increasing and decreasing of oil prices have various effects on our society. Increases cause booms and decreases cause deductions. Fracking has both positive and negative consequences.

One negative consequence of fracking is water contamination. Water contamination occurs in several different ways. The Environmental Protection Agency (EPA) conducted a 29 million dollar and six year study. The study had tested the effects that fracking has on drinking water. The study found that fracking is partially responsible for water contamination and that there is contamination at every stage of the fracking water cycle. Unfortunately, there were uncertainties and gaps in the data which prevented the EPA from making a national conclusion. There a variety of ways to prevent the contamination of water stemming from fracking. Some of these ways include monitoring fracking fluids, not fracking near a water source, properly treating wastewater, properly storing and disposing of fracking fluids and wastewater, and many more.

Session 7a

3:30 – 5:00

Chemistry

Room: Ohio

Poster

Construction of Fluorinated Metal Organic Frameworks (*Project ID: 241*)

Samuel Dickson

Chemistry - Faculty Sponsor: Dr. Douglas Genna

Construction of Metal Organic Frameworks has been on the forefront of research over the past few decades due to their versatility in medicine and engineering. Fluorinated linkers that are connected to the metal nodes would give more functional possibilities to the framework and, thus, have been the central purpose of this research. Details will be given to how the linkers were synthesized due to the difficulty it presented, followed by the synthesis details of the metal organic framework that followed.

The Reactivity and Clustering of Calcium Beta-Diketonate Complexes in the Gas-Phase*(Project ID: 258)*

Tayah Turocy

Chemistry - Faculty Sponsor: Brian D. Leskiw

The gas-phase ligand exchange reaction of calcium diisopropylacetylacetonate complexes with a series of metal I^2 -diketonates was observed to occur within a triple quadrupole mass spectrometer following co-sublimation. By varying the identity of the ligand and metal center, the gas phase reactivity, as well as the corresponding fragmentation pattern of the resulting species, was investigated. These novel complexes also show the prevalence to form larger clusters through the addition of extra metal, as well as chelation of additional ligand. Further studies were conducted to test the cluster's recurrence with interchanged metal centers. Calcium clusters show promise as new materials with applications in thin film deposition and the formation of nanomaterials.

Studies on the Reactivity of a Bis-Mesityl Imidazolyl Carbene Intermediate with CO₂ and the Stability Characterization (*Project ID: 263*)

Seon Young Ka

Chemistry - Faculty Sponsor: Dr. Clovis Linkous

1,3-Bis(2,4,6-trimethylphenyl)imidazolium carboxylate, an adduct of CO₂ and the N-heterocyclic carbene, 1,3-Bis(2,4,6-trimethylphenyl)-1,3-dihydro-2H-imidazol-2-ylidene, was synthesized to study the characteristics of CO₂ on catalyst, NHCs and the behavior and stabilities of carboxylate on the catalyst using NMR, IR, powder XRD, and TGA. The redundant of CO₂ adduct was studied using GC. NMR data showed that the synthesized zwitterion is stable at room temperature. The zwitterion certainly displayed the shifts in the position at the carbon attached to CO₂ on the imidazolium ring after the adduction with reference to the imidazolyl carbene. Further, clear shifts of the other C and H were detected. IR spectroscopic data showed there was a significant characteristic peak for carbon dioxide at around 1670 cm⁻¹. Powder XRD results were obtained to identify and analyze the newly synthesized imidazolium carboxylate. TGA spectra display that zwitterion's weight loss of 13 % at 155°C consistent with the loss of CO₂. The study of oxidized carbonyl carbon using GC showed the retention time of analyte.

Session 7a

3:30 – 5:00

Chemistry

Room: Ohio

Poster

Electrodeposition of Cadmium Telluride on Stainless Steel 304 Substrates (*Project ID: 264*)

Patrick Rutto

Chemistry - Faculty Sponsor: Dr. Clovis Linkous

The energy we get from the sun is a key factor in electric power production on earth and in space applications. The development of the photovoltaic cells has enabled a new direct method for solar electricity. CdTe is one of the leading candidates used for photovoltaic applications since it has an optimum band gap energy for the efficient conversion of solar energy into electricity. The development of CdTe devices on stainless steel are relatively inexpensive substrates such as is impeded due to the lack of a proper ohmic contact between CdTe and the steel. In this work, Cadmium Telluride (CdTe) thin films were deposited on stainless steel 304 substrate using a three-electrode system at different deposition voltages. Cadmium sulfate and tellurium dioxide were used as cadmium and tellurium sources respectively. The structural and morphological properties of the resulting films have been characterized using X-ray diffraction (XRD), Profilometer, Scanning Electron Microscopy (SEM) and X-ray Photoelectron Spectroscopy (XPS).

Characterization and Synthesis of IMes-Carboxylate Followed by reaction with Hydrogen*(Project ID: 272)*

Solita Wilson

Chemistry - Faculty Sponsor: Dr. Clovis Linkous

N-heterocyclic carbenes have been recently recognized for their ability to capture carbon dioxide. Synthesis and characterization of this carboxylate derivative is described. A reduction with hydrogen is performed and analyzed. Follow up characterization. Current findings are reported and future work is discussed.

Characterization of Chitosan Gel Beads for Protein Immobilization (*Project ID: 307*)

Harley Parker

Chemistry - Faculty Sponsor: Nina Stourman

Enzymes are widely used in industry as catalysts to prepare products and remove waste. The immobilization of proteins onto a solid matrix can potentially increase the enzyme stability against temperature and pH changes and thus enhance the enzyme's catalytic efficiency. In addition, immobilized enzymes could be reused multiple times. Numerous supports for enzyme immobilization have been developed, including agarose gels, silicon plates, and electrode surfaces. Chitosan, a non-toxic derivative of polysaccharide chitin has been used to in various applications. The purpose of this research is to prepare and characterize chitosan beads as a support for immobilization of enzyme. Stability of chitosan beads in a range of temperatures and pH was tested. Lactase from a dairy relief lactase supplement was used as the model enzyme. The chitosan beads have been able to immobilize lactase with retention of enzymatic activity. The immobilized lactase was compared to free lactase in activity and temperature stability studies. The immobilized enzyme showed lower activity than the free enzyme at elevated temperatures. pH stability studies are currently being conducted.

Session 7a	3:30 – 5:00	Chemistry	Room: Ohio	Poster
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Purification of Water by Fatty Acid Linked UiO-66 through Hydrophobic Coating (*Project ID: 308*)

Dante DeChellis, Jordan Zackasee, Monther Nassar, Courtney Platt, Bailey Varga

Chemistry - Faculty Sponsor: Dr. Douglas Genna

The construction of three fatty acid-containing versions of the common metal-organic Framework (MOF) UiO-66 was performed via linker exchange between UiO-66 and each fatty acid: sebacic acid, nonanoic acid, and perfluorooctanoic acid. This functionalization was targeted due to its projected ability to form a hydrophobic layer on the outside, while still having pores that could allow for uptake and retention of water sensitive compounds. The purpose of this is to be able to use this framework for matters such as water filtration or to utilize the hydrophobic properties as a coating to resist water and store sensitive materials.

Site-Specific Oxidation of Proteins by Reactive Oxygen Species: Investigating Relationship Between Structure and Oxidative Damage (*Project ID: 354*)

Charles Amoyaw

Biochemistry - Faculty Sponsors: Dr. Mike Serra, Dr. John Jackson, Dr. Nina Stourman

Reactive oxygen species are a class of compounds that include the superoxide anion, hydrogen peroxide, and the hydroxyl radical. Metal catalyzed oxidation systems generate the highly reactive hydroxyl radical in the presence of a metal ion and hydrogen peroxide. The damage is said to be site-specific because the hydroxyl radical reacts in the immediate vicinity of its site of production. Certain amino acid residues such as histidyl residues are known to form tight complexes with metal ions, e.g. Cu²⁺. Our lab has been investigating site-specific oxidation of a model protein "hen egg white lysozyme. A number of site-directed mutants have been generated. This poster describes the optimization of expression of an H15S lysozyme mutant using the methylotrophic yeast *P. pastoris*.

Immobilization of beta-glycosidase BglX on chitosan gel beads (*Project ID: 383*)

Tara L. Pickens

Biochemistry - Faculty Sponsor: Nina V. Stourman

The enzyme BglX, a beta-glucosidase exhibiting high beta-galactosidase activity produced by *E. coli*, could prove useful in the production of lactose-free dairy products or in the hydrolysis of lactose from whey. BglX is inhibited by the products of lactose hydrolysis; and therefore, may be more efficient in a continuous flow process rather than batch production. Industrially, it is beneficial to immobilize an enzyme on an inert matrix, thus reducing production cost by increasing reusability of the enzyme, and temperature and pH stability. BglX was immobilized on chitosan gel beads, some of which were cross-linked using glutaraldehyde or fortified with silica or activated charcoal; the physical properties and immobilization efficiency of the beads were compared. The immobilized BglX retained catalytic activity towards both the model substrate ortho-nitrophenyl-beta-galactopyranoside and lactose. The enzyme's ability to hydrolyze lactose in milk whey and the efficiency of lactose conversion in a continuous flow process versus batch production will be determined.

The Synthesis and Characterization of Diastereomeric 2-[bis(2-chloroethyl)amino]-1,3,2-oxazaphospholidin-2-ones (*Project ID: 384*)

Laurence N. Rohde Jr.

Chemistry - Faculty Sponsor: Dr. John A. Jackson

The research herein describes the synthesis and stereochemical determination of chiral 2-[bis(2-chloroethyl)amino]-1,3,2-oxazaphospholidin-2-one derivatives in relatively good overall yields (64-80%). Products were obtained as a diastereomeric mixture through the use of enantiomerically pure chiral amino alcohols. All products obtained contain a nitrogen mustard moiety, which is known for its potential chemotherapeutic use as an alkylating agent. Pure crystalline diastereomers underwent single crystal X-ray diffraction (XRD) to determine the absolute configuration of phosphorus.

Heavy Metal Remediation of Water Using Thiophene-Containing Metal Organic Frameworks (*Project ID: 399*)

Alissa Geisse

Chemistry - Faculty Sponsor: Douglas Genna

Clean water is essential for any type of ecological existence on Earth. The persistence of human carelessness has led to an increase of heavy metals in everyday water sources. Metal Organic Frameworks (MOFs) are ideal candidates for water purification due to their heterogeneity and modularity. Herein, select thiophene-containing MOFs have been identified to decrease the concentration of both lead and cesium ions in water.

Session 7b	3:30-5:00	Civil Engineering / Environmental Studies	Room: Bresnahan 1 & 2	Poster
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Degradation of Sanitary Wipes in Sewers (*Project ID: 220*)

Michael Palagano

Civil Engineering - Faculty Sponsor: Dr. Anthony S. Vercellino

Sanitary wipes are often marketed as “flushable” and are rapidly gaining consumption around the world. Despite being marketed under unharmed terms, some wipes have caused extensive damage to sewage and wastewater treatment systems worldwide. They have been shown to damage pumps and accumulate in copious quantities in sewers. These buildups, known colloquially as “fatbergs” have caused major problems in cities across the globe, and can be excessively expensive to remove. The immediate problem is investigated, and experimentation is conducted to find a chemical or biological agent that can degrade fatbergs in a manner that is safe for the environment and public health, cost-effective, and relatively quick. Laboratory experiments are undertaken in manners that realistically simulate wipes in a wastewater system. The effects of various levels of pH is inspected using various brands of wipes, which prove to have different tensile strengths based on a qualitative analysis. Subsequently, the effects of different oxidizing solutions are tested. After household bleach proves to meet the degrading agent criteria, different concentrations are used to find an optimal quantity. Lastly, the wipes are placed in the solution for varying time periods, and then heated in an oven to investigate the effects of heat.

Uniaxial and Biaxial Restrain Stress in Concrete Undergoing Alkali Silica Reaction (*Project ID: 235*)

Romit Thapa

Civil / Construction Engineering Technology - Faculty Sponsor: Dr. Richard Deschenes

Since the first reported case of ASR in the late 1930s, the durability issue has become a major problem for the concrete industry. ASR is a reaction between reactive siliceous phases, present in certain aggregate, the alkaline and pore solution in cement. The reaction precipitates as a gel, which then swells as it draws water from the cement paste. As a result, the gel exerts pressure on to the aggregate particles and cement causing cracking in the concrete structure. ASR is deleterious when swelling of the gel exceeds the tensile strength of concrete causing cracking of structures. A very highly reactive fine aggregate and non-reactive coarse aggregate were used for the research presented herein. The fine aggregate used in this research program was from EL Paso, Texas. The Jobe-Newman Sand has been classified as one of the most reactive fine aggregates in the United States. Concrete cubes were casted using the pavement mix-design. After an initial curing period, external uniaxial and biaxial restraint was applied to reach specimen. The restraint stresses were applied to a concrete cubes and then the cubes were stored at 38° temperature and 95% RH for 6 months to accelerate ASR formation and expansion. A similar load application method as the one developed by Bishnu at el, 2015 was adopted in this research [3]. ASTM C1260 and ASTM C1293 standard test were carried out to determine the reactivity of the aggregate. The damage rating index (DRI) method was also used to evaluate the development of anisotropic deterioration within the concrete.

Flood Inundation Mapping and Damage Assessment in the City of Painesville: A Case Study of Grand River, OH (*Project ID: 239*)

Ekaraj Ghimire

Civil Engineering - Faculty Sponsor: Dr Suresh Sharma

One of the ways to prevent and minimize losses due to flooding is to provide reliable information to the

Session 7b	3:30-5:00	Civil Engineering / Environmental Studies	Room: Bresnahan 1 & 2	Poster
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public on flood risk by means of early flood warning and flood inundation maps based on scientific analysis. This study is conducted to compute the inundation mapping resulting from different flood event that has occurred in Grand River in past. The Grand River is one of such rivers, which has flooded the City of Painesville and nearby cities in Northeastern Ohio time and again. The hydraulic modeling of this river has been carried out in the past using One-dimensional Hydraulic Engineering Center River Analysis System (HECRAS) model. This research is focused on generating inundation maps using more advanced Two-dimensional HECRAS model by improvising the one dimensional model. The damage assessment resulting from flood event will be carried out based on the inundation maps using HAZUS model developed by United States Geological Services (USGS) and Federal Emergency Management Agency (FEMA).

Establishing a baseline of selected shoreline physical features on San Salvador, Bahamas

(Project ID: 283)

Nate Armstrong, Steven Cray, Makayla Hartley, Christopher McFarland, Jodie Mitchell, Kelly Montgomery,

Environmental Studies - Faculty Sponsor: Diana Alexander, MS

The purpose of the research is to establish baseline conditions for selected shoreline areas of San Salvador. The research was conducted February - March, 2018 and the outcome of the work will provide references for determining physical changes of the selected shoreline areas in 2019, 2020, 2021 and 2022. The research consisted of gathering data for these four shoreline areas:

- East Beach
- Holiday Tracks
- Sandy Hook (Snow Bay)
- Sandy Point

The collected data for each shoreline area consisted of: high resolution aerial imagery using small drones (DJI Mavic), high resolution gps mapping of the shoreline and back beach dune line using a Trimble GeoXT receiver and multiple beach profiles from the dune line to the shoreline using laser level methods. The data collected provides measurements essential to quantifying sediment area, volume, morphology and geographic boundaries of the littoral zone.

The above normal hurricane and tropical storm activity of 2017 brought four major hurricanes Irma, Jose, Matthew and Gloria through or close to the Lucayan Archipelago within which San Salvador is located. These hurricanes along with others, such as Hurricane Harvey have raised public awareness of hurricane activity and their impacts on coastal areas. This research is timely in regards to establishing a baseline of shoreline conditions for the study of potential coastal change resulting from tropical storm activity and everyday processes in years to come.

Following the completion of the research in 2018, research extensions will be applied for in 2019, 2020, 2021, and 2022 to return to the same locations and collect new aerial, gps surveys and beach profiles. This proposed research should support research being conducted by Tina Niemi (G-240a and G-240b) on hurricane storm surge and coastal morphology. The findings will be shared with the Gerace Research Center to benefit present and future instructors and researchers doing work on San Salvador

Session 7b	3:30-5:00	Civil Engineering / Environmental Studies	Room: Bresnahan 1 & 2	Poster
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Natural Extraction of Metals by Trees rooted in Contaminated Soils. Phase I: Establishing Standards for Analyzing T (*Project ID: 288*)

Bryan Ortiz, Brandy Peprah, Salam Picard

Environmental Studies - Faculty Sponsor: Dr. Alan Jacobs

We prepared standards that will be used to calibrate a portable x-ray fluorescence spectrometer (p-XRF). This instrument will be used in the field to identify toxic metals in the trees rooted in contaminated soil in the banks of the Mahoning River near Youngstown, Ohio. The standards consist of 50-ml samples in two solvents: maple syrup and pine oil (simulating tree sap) that have been spiked with various known concentrations of a solution of toxic metals. The samples were then analyzed for metals that have been found in the contaminated river banks using two different laboratory spectrometers: an inductively coupled plasma (ICP) and a benchtop XRF. Most of the metal concentration results were similar in the spiked solutions of both maple syrup and pine oil using both the ICP and XRF instruments. Therefore, the solutions will function as standards for calibrating a p-XRF to be taken to the field to analyze the trees rooted in contaminated soil in the banks of the Mahoning River. Tree species that are absorbing toxic metals can be used to remediate the contaminated soils.

A comparison of soil health in the US and Tibet, China (*Project ID: 311*)

Erynn Ruf, Lina Knisley

Environmental Studies - Faculty Sponsor: Dr. Felicia Armstrong

Soil health is a critical aspect of an ecosystem and its ability to sustain the plants, animals and humans that rely on the soil for habitat, food, and ecosystem services. Soils that have been intensively cropped can lack proper aeration, drainage, or fertility affecting plant growth. Whereas, organic farming practices are more sustainable and beneficial to plant growth as well as microbial systems and nutrient cycling. It is hypothesized that rural (Tibet) China's traditional agricultural systems will result in a healthy soil in contrast to United States agricultural systems. To examine the effects of these different agricultural practices, soils were collected from row crop agricultural land in the United States (Ohio and North Carolina) and agriculture land in Tibet Autonomous Region. Various soil parameters, including pH, nutrient level, soil texture, salinity, and organic matter, were used as soil health indicators. Furthermore, the agricultural practices between US states were also examined.

Correspondence of diatoms to seasonal changes in water parameters in Meander Creek Reservoir

(*Project ID: 318*)

Derek Scott

Environmental Studies - Faculty Sponsors: Colleen McLean, Lauren Schroeder, Richard Ciotola

Seasonality is a major factor influencing freshwater ecosystem dynamics in temperate regions. Diatom taxa attain peak abundances under different seasonal environmental conditions. This study aimed to track seasonal and environmental changes in diatom abundance and water quality parameters over the course of a year (June 2015 - July 2016). Three research questions were investigated: (1) What are the water conditions associated with the most abundant diatoms? (2) In what season are diatoms most abundant? (3) Do diatoms change with seasonal water changes? Results are reported for vertical tow,

Session 7b	3:30-5:00	Civil Engineering / Environmental Studies	Room: Bresnahan 1 & 2	Poster
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van Dorn samples and suspended glass slides that were collected each month and analyzed in the lab. Chlorophyll and biomass measurements were conducted in the lab for diatom productivity. A noticeable shift in relative abundance of diatom taxa occurred in the reservoir (Fragilaria-Asterionella-Aulacoseria). Correspondence of water parameters to relative abundance of diatom taxa were assessed in this study. Both positive and negative correlations were found between water parameters and relative abundance of diatom taxa. Correlations were found between temperature and Cyclotella ocellata and Aulacoseria granulata. The results of this study further reveal seasonal diatom dynamics in reservoirs, and ongoing monitoring in this reservoir will also be useful to paleolimnological investigations.

YSU Campus Green Infrastructure Plan (*Project ID: 329*)

Daniel Bancroft, Joseph Agati, Austin Snovak
Civil / Construction Engineering Technology - Faculty Sponsors: Joseph Sanson, Robert Korenic

Our research group outlined a green infrastructure plan for priority areas throughout the Youngstown State University campus. Overland flow calculations were performed to evaluate the site in its current state and the site after it would be remodeled to improve rainwater flow. Environmental sustainability was kept in mind, through incorporating permeable pavement, rain gardens, and bioswales. The final priority of the project was to make the area more appealing to the campus community. Furthering this, by selecting priority areas campus-wide, a action plan was also completed to summarize the actions we would like to see done in each of the study areas.

Determination of Structural Integrity of the Lincoln Parking Deck at Youngstown State University
(*Project ID: 377*)

Meera Elizabeth Maxy
Civil Engineering - Faculty Sponsor: Dr. Anwarul Islam

Lincoln Parking Deck has been serving as one of the most important structures on the campus of Youngstown State University since the 1970s. This thesis delves into analyzing the structural safety of the parking deck. Due to the aggressive environmental conditions, this structure has undergone corrosion which could be rated as mild in some places and extreme in certain others. Use of advanced geophysical techniques such as Ground Penetrating Radar and the Profoscope has revealed crucial details that could help understand corrosion in a broader spectrum. This study also focuses on the day-to-day parking woes faced by the Youngstown State community. The main objectives of this research shed light on detecting the causes of corrosion of the steel reinforcement and suggesting measures to overcome corrosion for both new and existing structures which could help YSU save quite some money in the maintenance front.

Lead in Shooting Range Soils at Grand Valley Ranch (*Project ID: 379*)

Nicholas Johnson
Environmental Studies - Faculty Sponsor: Dr. Felicia Armstrong

The Grand Valley Ranch field station is located just southeast of Orwell, Ohio. This site is on the northern border of Trumbull County and the southern border of Ashtabula County. The Grand Valley

Session 7b	3:30-5:00	Civil Engineering / Environmental Studies	Room: Bresnahan 1 & 2	Poster
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Ranch was used as a trap and skeet shooting range as well as a hunting club from the early 1990's until 2008. As lead is a major component of the BB's or "shot" that is used for this type of shooting range, there is still lead remaining within the soil today. The scattering of the "shot" has resulted in inconsistent lead contamination at the site. Therefore, there is a need to identify the lead "hot spots" so that the areas can be remediated as strides are made to restore the site to a healthy wetland ecosystem. A 15' by 15' square grid system was developed for sampling with a total area of approximately 135' by 60'. A composite of 5 soil cores (10-15 inches in length) were taken within each square and separated into top horizon and lower horizon. The soils were analyzed for total lead and soil organic matter. The lead content data was mapped using ArcGIS to create a lead contamination "hot spot" map. Sampling will continue until all the suspected lead contaminated areas have been identified.

Extreme Flow Analysis of the United States (*Project ID: 387*)

Alexandra Eisenhart, Jacob Stellers, Cody Holland, Jacob Crawford

Civil Engineering - Faculty Sponsor: Dr. Sharma

Low flow of the stream is crucial for water resources management during low flow periods, whereas high flow estimation is essential for the prevention against the flooding during high flow periods. In this study, we analyzed the long term historical data from the Hydro Climatic Data Network (HCDN) from 1700 stations of the 21 regions across the entire 50 states of the United States. The tool developed by Environmental Protection Agency (EPA), DFLOW, was utilized to estimate 7Q10 low flows, whereas PeakFQ software was utilized to systematically estimate 100- year and 500-year floods. We found a general pattern when comparing the 7Q10 values to the 100-year and 500-year return period peak flow indicating higher 7Q10 values may correlate to 100-year and 500-year return period flows. For example, the data analysis from Region 6 has a minimum 7Q10 value of 0.5882 ft³/sec corresponding 100-year and 500-year flow estimate of 1183 ft³/sec and 1469 ft³/sec. Whereas the max 7Q10 value is 406.62 ft³/sec, corresponding to a 100-year and 500-year flow of 239200 ft³/sec and 285300 ft³/sec.

Risk Assessment of Commercial Brine Water on The Environment (*Project ID: 390*)

Johnson Louigene

Environmental Studies - Faculty Sponsor: Dr. Felicia Armstrong

The purpose of this project is to observe the characterization of brine water, a byproduct of conventional fracking, being used as an anti-icing agent to contest icy slick roads. It consist of analyzing commercial brine water from a several locations for a variety of qualitative attributes including pH, solids, conductivity, metals, etc. Brine water is being sold commercially in several states as a deicer by gas companies as a means to "recycle" the wastewater but in reality it is a profitable method to dispose their industrial waste. It is heaped with numerous constituents such as radon and radium which are radioactive, yet the brine water is doused on the roads with no regulations of any kind. A risk assessment will also be conducted to gain further data in relation to any short term or long term effects from being exposed to these agents.

Spatial and Temporal Variability of Flow and Salinity level in Ungaged catchment using GIS and SWAT Model (Project ID: 398)

Hari Dhungel

Civil Engineering - Faculty Sponsor: Dr. Suresh Sharma

Increasing level of salinity, in wetlands, is a global and growing environmental threat in many parts of the world, in terms of, profound consequences in wetland plants and aquatic habitats. As the standing water on the marshland does not flush easily, the deposited salts from different sources remain for a longer period of time. This problem potential to detrimental impact on wetland ecosystem and landscape dynamics. Moreover, due to lack of observed data, prediction of flow and salinity level in ungauged catchment is relatively more complicated when compared to gauged catchment. The purpose of this study is to develop a rating curve and to establish series of monitoring stations in ungauged Marsh basin to gather flow and salinity data over an extended period of time. This data collection will allow for a deeper insight into how wetland plants are affected or coping with these saline conditions. Prior investigations has not been performed using a hydrological model with continuous data sets for in-depth investigation. Therefore, in this study, a widely used hydrologic model. Soil and Water Assessment Tool (SWAT) has been used to explore the relationship between water flow within the Marsh basins and levels of salinity. This model will include upstream monitoring stations, located in Blackbrook and Marsh Creek, and document the possibility of salinity infiltration downstream. In light of these findings, we make conclusions and recommendations for future research.

Soil Characteristics of a Restored Prairie (Project ID: 403)

Matthew Scott, Ian Matey

Environmental Studies - Faculty Sponsor: Dr. Felicia Armstrong

In 1986, a sand and gravel borrow pit in Greene County, Ohio was transformed and restored to the prairie landscape it once was. The area was initially excavated to extract resources used in the construction of highways. This pit was dug forty feet deep and spanned an area of fourteen acres. Once the area was decommissioned, it was planted with native plant species to return it to its original tall grass prairie ecosystem. This area is connected to a larger nature preserve totaling 108 acres and containing various ecosystems such as wetlands, woodlands, and the newly restored prairie. The Ohio Department of Natural Resources declared the preserve an Ohio Natural Landmark in 1988, shortly after the restoration had taken place.

Soil analysis can be used to determine how the prairie restoration efforts are progressing. Soil samples were taken using a 1 inch diameter corer along perpendicular axes, running north to south and west to east. Samples were taken in May 2004 and were repeated in May 2014, ten years later. Two of the main characteristics analyzed were soil texture and the amount of organic matter present. These two factors are integral in development of the prairie soil ecosystem and will affect the ability of the reintroduced prairie vegetation to flourish.

Archaeological Investigation of Dim Bay (SS-5), San Salvador, Bahamas (*Project ID: 256*)

Kamron Meyers

Anthropology - Faculty Sponsors: Tom Delvaux, Matt O'Mansky

The purpose of the investigation was to determine a more exact location of the Dim Bay site on San Salvador Island in the Bahamas. An exact location of the Lucayan Indian site of Dim Bay (SS-5) remained unknown for years. Previously, the only coordinates that existed for the site were misidentified; they are currently a few feet into the ocean. To determine the location, the Cultural Resource Management (CRM) method of archaeological investigation was utilized. Three transects were placed 15 meters apart (east, west). On each, four shovel test pits were placed 15 meters apart (north, south). Eight judgemental units (five labeled as Exploratory Units based off of location) were also dug in various locations. Each of the aforementioned units was dug until sterile beach sand or the water table was reached; the Munsell color and depth was recorded for each strata. Through the use of these methods, a more exact location of the Lucayan Indian site of Dim Bay was determined. Allowing for future research to test the hypothesis that the Lucayan Indians were using the Dim Bay site as a fishing/food processing site, or an overnight camping site for migration between two larger habitation sites (SS-4 and SS-1).

SS-7 Black Stratum Testing (*Project ID: 328*)

Adam O'Leary

Anthropology - Faculty Sponsor: Thomas Delvaux

San Salvador Island in the Bahamas is an island rich in archaeological resources. Youngstown State University has been excavating prehistoric Lucayan Indian sites on the island for decades, most recently focusing on the site SS-7. This project focused on excavating to the north of previous interest areas where a black stratum of soil was found, which produced heavy concentrations of artifacts. The goal of this project was to excavate additional units in near proximity to where the stratum was originally found in order to better understand this part of the site.

Legacy Cities: A New Future (*Project ID: 338*)

Matthew Rea

Geography - Faculty Sponsor: Ron Shaklee

Legacy Cities are the old industrial cities around the United States that have been forgotten about since the death of American industry from the 1960s and 1970s. These once great cities have now become overrun with urban blight, crime, and economic disaster. This presentation examines four such cities, Youngstown, Ohio, Scranton, Pennsylvania, Allentown, Pennsylvania, and Flint, Michigan and discusses the development of these cities and what exactly lead them to the point they're in today. It also discusses what was right and wrong with those methods of growth, as well as offers a possible solution going forward to prevent anything like this from happening again.

Session 8 **3:30 – 5:00** **Anthropology / Geography** **Room: Jones** **Oral**

Archaeological Typology (*Project ID: 346*)

Lauren Foley

Anthropology - Faculty Sponsor: Thomas Delvaux

I am doing a typology on a collection of points to determine their culture affiliation. I will identify color, culture, region, point type, size, material, and use. The artifacts will be photographed, documented, and bound together in a report for publication. The collection identification will provide a unique background history of the points rather than just a visual description.

San Salvador: A YSU Student's Experience (*Project ID: 347*)

Caroline Constantinovich

Anthropology - Faculty Sponsor: Tom Delvaux

My presentation is on YSU's yearly Bahamas trip. This trip includes students from a variety of backgrounds, but the program is mostly for archaeology and geography students. I will be talking about the program as a whole, but with a focus on the archaeology portion. I will discuss factors like who typically goes on the trips, why YSU is studying San Salvador and how the trip is structured.

Session 8	3:30-5:00	Health & Human Services / Liberal Arts / Business	Room: Coffelt	Oral
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Treating Sex Trafficking Victims: A Qualitative Study *(Project ID: 234)*

Marissa Gray

Counseling - Faculty Sponsor: Dr. Amy Williams

This presentation aims to harness constructive feedback on a proposed research study which I hope to carry out in the near future. I am proposing a qualitative study on the best practice and therapeutic interventions to treat sex trafficking victims. Sex trafficking is a substantial problem, both locally and nationally with a burgeoning number of victims identified every year. In anticipation of the growing need to clinically serve this population, this study aims to gather information as to what strategies will best serve victims seeking counseling and support services. The proposed study is a broad information-gathering effort which aims to stimulate further research and galvanize a much needed discussion on the methodologies used to treat the complex trauma of sex trafficking and, in so doing, begin the healing process for survivors who seek services.

Heroin in Harlem: Frank Lucas and the Country Boys *(Project ID: 242)*

Isaac Carrino

History - Faculty Sponsor: Fred Viehe

My topic is on the impact of Frank Lucas in Harlem during the 1960s. I will discuss his early criminal career, relationship with Ellsworth "Bumpy" Johnson, and the development of his criminal empire in Harlem.

Food Service Company Analysis *(Project ID: 266)*

Morgan Sanner, Lisa LaRocca, David Hancock, Anastasia Hadgigeorge, Kim Gula

Human Resource Management - Faculty Sponsor: Helen Han-Haas

This project encompasses the analysis of both business strategies/objectives and human resource management strategies and how the two of these align. This food service company is the largest family-owned in the industry, so they have problems that are unique to them. We discuss what kind of business type they fall into, using an article written by Miles and Snow, what implications these categories have, and what improvements could be made to improve overall strategy.

Criminal Prosecution and Civil Litigation *(Project ID: 358)*

Kyle McCree

Criminal Justice - Faculty Sponsor: Dr. John Hazy, Dr. Christopher Bellas

In the field of Criminal Justice, criminal prosecution and the search for justice in a crime is the primary factor in all cases. Criminal cases are brought by the state against a defendant who has been accused of committing a crime. Civil cases are brought by the victim against the plaintiff for the purpose of seeking a monetary amount for a wrongful act that has been committed. Victims of a crime do not only want their assailant to be brought to justice, they also want to be compensated for what they have gone through. The two different types of cases, criminal and civil, have different goals, burdens of proof, and consequences but are equally important to the American court system.

Session 8	3:30-5:00	Health & Human Services / Liberal Arts / Business	Room: Coffelt	Oral
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The Effect on the Rise and Fall of Imprisonment Rates (*Project ID: 372*)

Sophie McFarland

Criminal Justice - Faculty Sponsors: Professor Richard Rogers, Dr. John Hazy

My project focuses on the effect that state-level factors have on imprisonment rates in all 50 states. Specifically, it examines the role of education levels, poverty rates, and total population. All of the data was taken from the criminal justice system and the US Census Bureau around the time of the 2010 census.

Surface Finish and Properties of A356-T6 Cast Parts Using Additively Manufactured Sand Molds
(Project ID: 254)

Caitlyn Rodomsky

Mechanical Engineering - Faculty Sponsor: Dr. Brett Conner

The objective of castings and surface finish is to utilize ExOne S-Max sand printer at Humtown Products in Leetonia, Ohio to determine if surface finish influences the mechanical properties of cast heat treated aluminum (A356-T6). The purpose of this research is to maximize additive manufacturing in the casting process and to determine if additive manufacturing affects the static tensile and fatigue properties of cast A356-T6. This process allows for complex molds to be designed and printed to decrease the amount of time, cost and material. The project contains a benchmark casting and testing. This allowed one to determine which angle of print orientation angle has the best surface finish. It was found that different angles of print contain a stair step feature in the casting.

2018 YSU SAE Baja (Project ID: 265)

Tessa Goehring, Andrew Miller, Joseph Mulhair, Justin Boron, Robert Boano, Alex Finocchio
Mechanical Engineering - Faculty Sponsor: Anthony Viviano

Youngstown State University SAE Baja is a school sponsored club geared toward mechanically inclined students. SAE Mini Baja is an off-road vehicle competition sponsored by the Society of Automotive Engineers. The purpose of the competition is to push engineering teams and Mini Baja vehicles to their breaking points to determine the best engineered car. The goal of the 2018 team is to design, analyze, and build a brand new car for competition in May and to place within the top 20 teams. The 2017 SAE Baja team had one of the best finishes in club history at 33rd out of 109 teams and the current team is looking to build off of this success.

Gearcases Assembly (Project ID: 368)

Mohammed Alonizi, Fayiz Alsaadi

Mechanical Engineering - Faculty Sponsor: Kelsy Lyda

The objective of this project is working on redesigning the current workstation cell to improve efficiency. The stand must be suitable for five different sizes of gearboxes, it also should help the operator to build and assemble the heavy gearboxes in a safer and easier way. Team members came up with idea of changing the table that was used in the station to achieve these objectives. The current table has two sections that allow the operator to assemble half of the gear on one side and half on the other. The worker can then manually lift one side of the gearbox and flip it upside down to the other half gearbox to screw them together. The idea that the team came up with is designing a table that can hold half of the gearcase and there will be a scissor table right next to it. The operator can manually apply torque to a hand crank and the plate that was attached on top of the table will flip 180 degree. Then the scissor that has the other half gearcase will come up and meet.

Session 8	3:30 – 5:00	Mechanical Engineering	Room: Humphrey	Oral
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Modernization and Design of an Automated Forge Welder (*Project ID: 380*)

James Sartor, Andrew Skiba, Brian Murphy

Mechanical Engineering - Faculty Sponsor: Dr. Lyda

This project is modernization of a forge welding machine for Columbiana Boiler Company. The company make pressure vessels for hazardous materials. The current machine carries out the process of heating and forge welding the cylindrical body to the tank heads of pressurized vessels one end at a time. The goal of this project was to increase the productivity of this process from 15 to 30 tanks per day. The proposed new design will complete this process on both ends at the same time, as well as minimizing the number of moving parts. This is an improvement from the current machine, which can only operate on one side at a time. Other changes also include modifications to how the tanks are loaded and unloaded to optimize work flow through this station.

Validation of Additive Manufacturing as a Viable Alternative for Tooling Production (*Project ID: 386*)

Donald Hays Jr., Dean Jaric, Joseph Lonardo, Christopher Smith

Mechanical Engineering - Faculty Sponsors: Dr. Hazel Marie, Dr. Stefan Moldovan

The senior capstone project sought to utilize Additive Manufacturing (AM) technology, specifically 3D sand printing (3DSP), to redesign Consumable Tooling (Tooling) which is capable of meeting and exceeding current in-production life expectancy metrics delivered by our Industry Partner (Partner). The tooling represents a fundamental step in the patented production process, whereby Partner would not be able to operate without it. By increasing the expected life of the Tooling, and decreasing the production costs thereof, Partner will not only remain competitive globally, but increase market share. Innovations discovered through this process will allow Partner to invest in further innovation and continue a mutually beneficial relationship between Them and the University. Methods utilized included Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD), MAGMA Casting Simulation, and 3D solid modeling (SolidWorks). At the submission of this Abstract, Partner is in the process of manufacturing the redesigned Tooling.

Vallourec Water-Cooled Rolls (*Project ID: 389*)

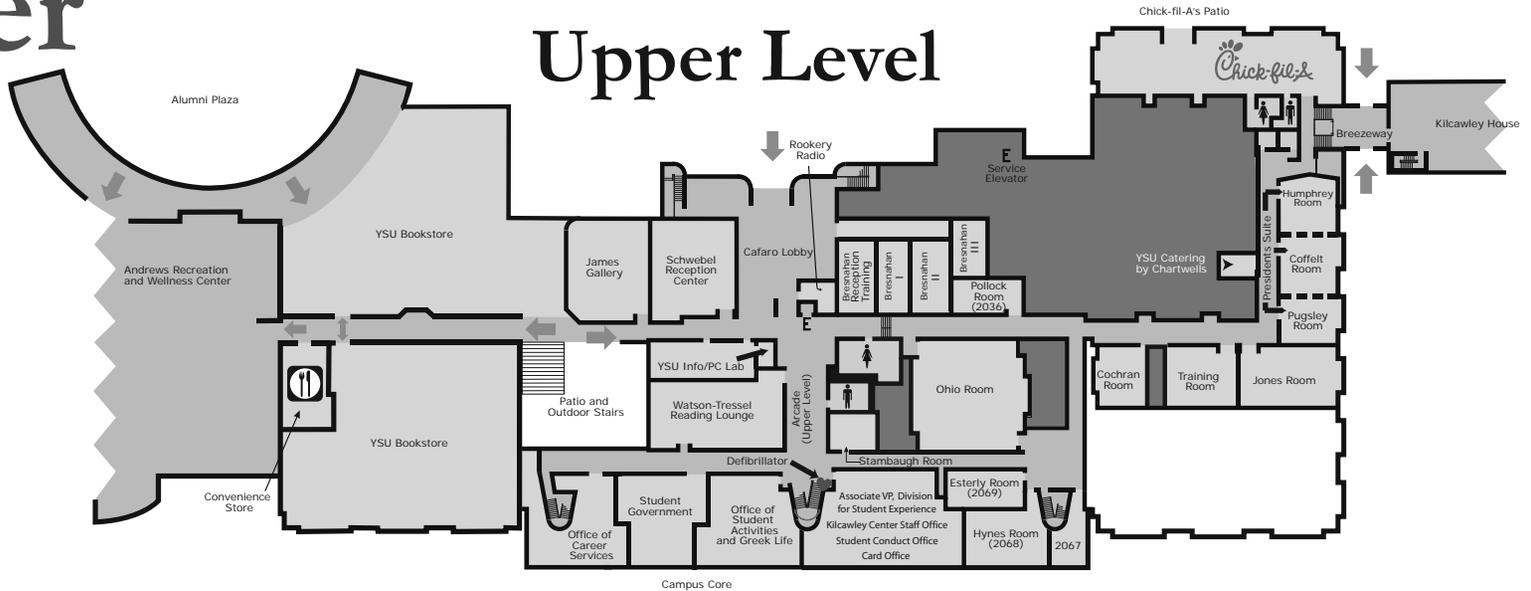
Jake Ohlin, Michael Allgower, Nick Craig

Mechanical Engineering - Faculty Sponsor: Dr. Jason Walker

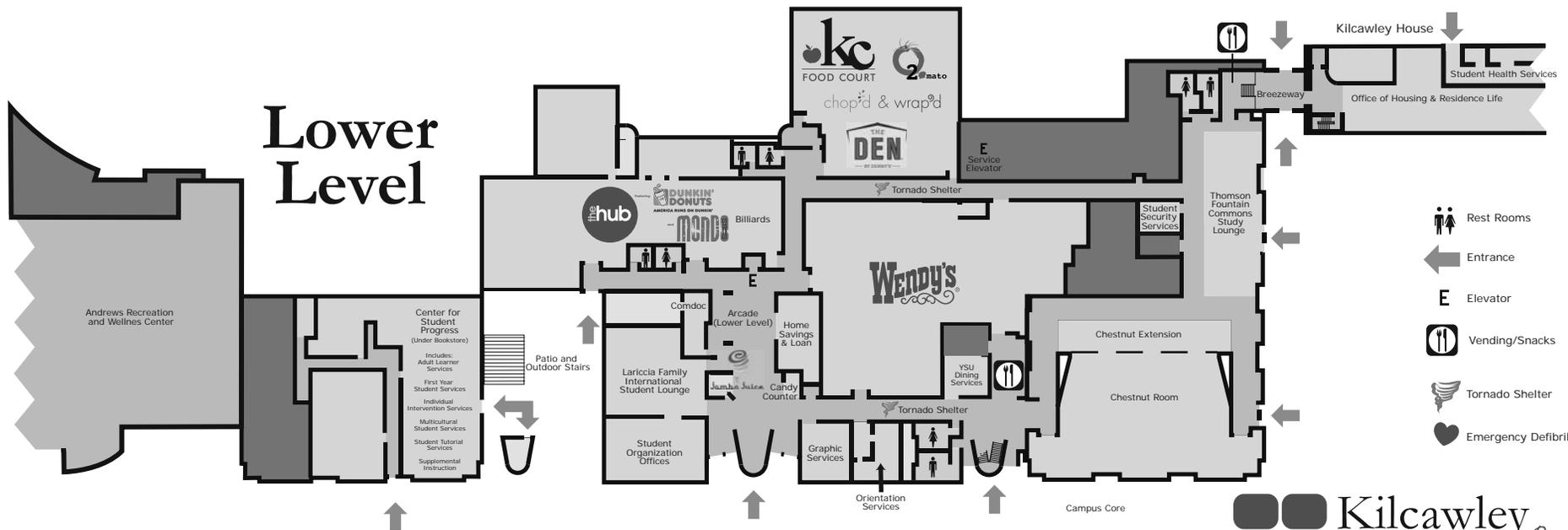
The initial goal of the project is to devise a water system for the exit roll line that will supply enough water in order to cool the rolls. The rolls need to be cooled by an optimized water flow because oversupply will remove too much thermal energy and under-supply will cause failure. The objective is to increase the overall quality of the rolls while trying to reduce the waste. The reason behind switching to water cooled rolls is because as the pipe exits the furnace on the roll line, it always conveys high temperatures and is very susceptible to dents that are caused by scale buildups on the roll. The scale buildups can be reduced if the rolls are cooled by water, for a cool roll will be harder and less likely to contact weld to the hot pipe. The purpose behind this is that if a roll is cooled by water, it can be made from less expensive alloys and should expect a longer bearing life.

Kilcawley Center

Upper Level



Lower Level





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