SAGINAW VALLEY STATE UNIVERSITY

SCIENCE AND ENGINEERING SYMPOSIUM

PIONEER HALL

FRIDAY, APRIL 24TH, 2015

8:30 A.M. - 4:30 P.M.

SVSU Science and Engineering Symposium

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SVSU Science and Engineering Symposium

Program

8:00 a.m.	**Registration**	Pioneer First Floor
9:00 a.m.	**Opening Remarks** Dr. Andrew Chubb Interim Dean College of SE&T	Pioneer-240
9:05 a.m.	**Keynote Lecture** Mr. Tel Ganesan President and CEO of Kyyba	Pioneer-240
10:00 a.m.	**Poster Session**	Pioneer First Floor
	Biology Posters Chemistry Posters Computer Science Posters Electrical Engineering Posters Mechanical Engineering Posters Mathematical Science Poster SBESI Posters	
12:00 p.m.	**Lunch**	Pioneer First Floor
	Oral Presentations	
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Keynote Lecture

Entrepreneurship for the Millennials

Speaker: Mr. Tel Ganesan

Tel Ganesan is the president and CEO of Kyyba, a Michigan headquartered global IT, engineering services and a software product company focusing on education and manufacturing domain. He has an Executive MBA degree from the University of Michigan – Stephen M. Ross School of Business (2014).

Tel is on the Advisory Committee for the National Veteran Business Development Council, Board of Directors for Global Detroit and also is a member and Board of Advisors of Ann Arbor-SPARK, Global Talent Retention Initiative of Southeast Michigan (GTRI - strengthening and diversifying Michigan's economy through the retention of top international talent) and Astia (to propel women's full participation in fueling innovation and driving economic growth and where women innovators succeed). Tel is currently the President of The Indus Entrepreneurs (TiE) Detroit, reprising his role as he was previously the president of the chapter for two consecutive years (2008-2010). He served as the Chairman of TiECon and led the development of TiE's flagship conference on Entrepreneurship in Detroit during turbulent times. Tel is the Founder & President of the Kyyba Kidz Foundation to assist orphaned children and underprivileged individuals by providing job training for job placement resulting in gainful long term career. He served as the past VP of American Society of Engineers of Indian Origin (ASEI).

Tel has appeared on several TV and radio interviews such as FOX 2 News, Detroit Public TV, NPR, WWJ News Radio and Indian TV Channels. In addition, Tel has been featured in numerous digital and print media such as Financial Times, Detroit News, Oakland Press, Dbusiness Magazine, and Corp Magazine. Tel has received several awards of excellence & honor such as Diversity Business Leader, Ernst & Young Entrepreneur of the year finalist - 2014, 2013, 2012, Outstanding Young Asian American of Michigan, and Special Tribute for Excellence - Michigan State Senate, Outstanding Service & Contribution Award, and Leader & Innovator Award. In addition, Tel is a public speaker and has spoken at several conferences and seminars.

Biology Posters

B01. Population genetics of sturgeon chub in the Missouri River

Meagan McNinch (Advisors: Jerrod Hall, Dr. Cal Borden, and Gerald Mestl)

Approximately 39% of North American freshwater fishes are listed as vulnerable, threatened, endangered, or extinct. One of the prime culprits is the loss and degradation of habitats. The Missouri River basin contains six dams that have radically altered its hydrogeographical profile and consequently reshaped the native fish fauna and population sizes negatively. For example, sturgeon chubs are relatively small [7.5 cm], non-descript benthic fish adapted to high turbidity and oscillating flows, former characteristics of the Missouri River. Consequently, population sizes have declined and longitudinal migration routes blocked, raising questions as to the genetic health of remaining populations. We now possess >300 DNA samples from populations on either side of all six dams and are using microsatellite markers to evaluate population-level phenomena such as genetic drift, gene flow, and population structure as related to their genetic diversity. The sturgeon chub could serve as a sentinel species to track environmental changes and their effects on the health of all aquatic species in the Missouri River.

B02. Curation of Great Lakes vertebrates and Japanese special collections

Katie Priest, Rachel Lokajtys, Qing Qing Dong, Jackie Luthardt, and Kayla Terwilegar (Advisors: Prof. Katie Cottrell-Donahue and Dr. Cal Borden)

Museum collections play a vital role in the documentation of natural and cultural changes in our environment. As such, they are an integral part of education in the natural histories. SVSU has a small but wonderful collection of vertebrates and invertebrates including a unique collection from our sister institution [Shikoku University] in Japan. However, this collection needs to be repaired and managed before more specimens are lost to deterioration. We triaged the Japanese collection and existing collection of Great Lakes vertebrate and then instituted proper preservation and archival techniques. Despite its rather mundane description, curation requires specialized skills, time, and financial support to ensure the longevity of specimens, which in some cases are literally priceless. The diversity we found will support numerous, organismal-based courses in Biology and student research.

B03. Postglacial dispersal of smallmouth bass into Michigan
Jarrett Page (Advisor: Dr. Cal Borden)

As the Wisconsinan glaciation subsided ~12,000 years ago, the nascent Great Lakes were being colonized by aquatic fauna using temporary corridors of glacial meltwater. Previous studies of smallmouth bass in the Great Lakes revealed multiple mitochondrial lineages originating from different glacial refugia south of the glacier's edge. In Lake Huron, smallmouth bass from the northern, southern, and eastern [Georgian Bay] borders carry different mitochondrial sequences indicating multiple refugial sources. However, through which corridors smallmouth bass accessed Lake Huron is unknown because inland populations in Michigan have not been genetically typed. We begin to unravel their history by sequencing bass from the Saginaw River basin in order to determine if present day distributions of mitochondrial alleles better reflect current or historical drainage patterns. Specifically we evaluate to what extent bass used the Grand River basin [a corridor between Saginaw Bay in the east and glacial Lake Chicago in the west], glacial Lake Arkona [a massive temporary lake covering the western half of present day Lake Erie and southern Lake Huron including Saginaw Bay], Georgian Bay in the east, or some combination thereof to populate Lake Huron and inland Michigan. Inferences from smallmouth bass are applicable to other aquatic organisms experiencing the Pleistocene glacial cycles.

B04. An Experimental Design: Effects of Aromatase Inhibition and Endocrine Disruption on Neural, Morphological, Reproductive, and Behavioral Differentiation in the Norway Rat (*Rattus norvegicus*)
Cassidy Florey, Emily Greeson, Stephen Holihan, and Nicholas Toupin
(Advisor: Gary M. Lange)

The genetic sex of an organism usually drives phenotypic development of sexual morphology. However, experiments involving manipulation of embryonic environments in oviparous avian and fish models, has demonstrated that phenotypic sex expression opposite genotype is possible. However, currently no viviparous organism has been experimentally induced to develop phenotypic sex opposite of genotype. The significant difference in the viviparous mammalian model preventing phenotyic experession opposite of genotype may involve the robust chemical stability of the intrauterine environment. We theorize that use of a triplet chemical cocktail, specifically use of an aromatase inhibitor plus two categories of endocrine disrupting compounds, may reshape the mammalian intrauterine environment enough to allow phenotypic expression of sexual morphology opposite that of genotype in mammals. We present a detailed look at our experimental design in which we strive to induce phenotypic sex development opposite of genotype in the Norway rat. In our proposed research model, sexually indifferent morphology is maintained through gestational day 10 following fertilization. Our chemical mixture will be introduced to the subjects during this undifferentiated stage and continued through parturition. Administration of the chemical triad to the intrauterine environment will impact gestation in ways we suspect may alter development resulting in changes in performance on a variety of post-natal behavioral and morphological tests. By comparing control and treatment populations at the neural, morphological, reproductive, and behavioral levels, we hope to gain a better understanding of the mechanisms driving sexual differentiation in mammals.

Chemistry Research Posters

C01. Detection of the *cp4 epsps* gene in maize line NK603 and comparison of related protein structures
Nicole Swope and Patrick Fryfogle (Advisor: Dr. Tami Sivy)

A two-part laboratory experiment exploring the NK603 maize line (Roundup Ready) was designed and completed by undergraduate students during the 2013-2014 academic year. This exercise allowed students to conduct a gene to protein study of a genetically modified crop that is frequently seen in agriculture and food products. Students used standard Polymerase Chain Reaction (PCR) to detect the gene responsible for Roundup Ready herbicide resistance in several maize samples. Computer-based 3D models of the translated protein were then compared to the wild-type protein found in plant and bacteria species.

C02. Synthesis of Hydrazide Heterocycle for Development as an Organocatalyst
Tim McMillan (Advisor: Dr. Stephanie Brouet)

The development of new catalysts capable of enantioselective induction is an ongoing effort at the forefront of organic chemistry. We are interested in developing catalysts that can be used in water. Hydrazides are highly hydrophilic and could potentially fulfill these goals if displayed in an organic molecule. There is evidence in the literature that other hydrazides have behaved as catalysts and readily form iminium ions. Platinum catalysis was used to promote cyclization of a hydrazideto synthesize a proline-like potential organocatalyst. The structure has some promising features that could lead to an effective organocatalyst, with the ultimate goal of developing a catalyst capable inducing high levels of enantioselectivity in reactions such as the Diels-Alder. The acetamide substituent of the structure supports the formation of an iminium ion due to the alpha effect of the N-N bond.

C03. Synthesis, Characterization, and Electrochemical Investigation of Rhodium Complexes
Jacob Turner, Andrea Weinrick, and Bradley Ross (Advisor: Dr. Adam Warhausen)

The complex tris(triphenylphosphine)rhodium(I) chloride ($RhCl(PPh_3)_3$) is a very well-known and extensively studied complex. This is due to the wide range of reactions that it can be involved in. It was the first complex discovered that allowed the catalytic hydrogenation of alkenes and other unsaturated substances.

Our research presents an area of investigation that is lacking from current literature, more specifically, the redox properties of neutral Rh(I) Wilkinson's catalyst and analogues, the synthesis and isolation of the catioinic Rh(II) complexes, and the reactivity of the cationic Rh(II) complexes which will be isolated from chemical oxidation reactions. All redox properties are examined using cyclic voltammetry techniques. Our goal is to have our reactivity studies lead to a new class of catalysts. The poster will present our current progress on this project.

C04. Synthesis of Bioactive Cyclic Peptides

Patrick Fryfogle, Kathy Warrick, and Vanessa Wolf (Advisor: Dr. Jennifer Chaytor)

Researchers have spent a considerable amount of time establishing treatment strategies for cancer and osteoporosis. Cyclic peptides exhibit useful biological activities, which make them appealing to the health industry and pharmaceutical companies. The chemical synthesis of the cyclic peptides Stylissamide X and Dianthins G and H has potential for use as anti-cancer and osteoblast proliferation agents, respectively. Cancer affects large portions of the population, resulting in more than 7 million deaths annually. Metastasis is responsible for 90% of these deaths. Stylissamide X, originally isolated from an Indonesian marine sponge, has been shown to inhibit cancer cell migration. Dianthins G and H are believed to exhibit osteoblast proliferation. Osteoblasts function in groups of collected cells to produce a matrix that is mineralized to form bone. Osteoblast proliferation can aid in the treatment of bone density loss and osteoporosis. In this project, FMOC-solid phase peptide synthesis will be used to synthesize both compounds. The structures of the synthesized compounds will be verified using various spectroscopic techniques, including High-Performance Liquid Chromatography, IR spectroscopy, NMR spectroscopy, and mass spectrometry. The products will be purified and biological testing will ensue to further study the properties of these compounds for their applications as pharmaceutical agents.

C05. Synthesis of C-glycosides as potential anti-hyperglycemic agents

Bryant Pero and Craig Tucker (Advisor: Dr. Jennifer Chaytor)

Type II diabetes mellitus is a disease characterized by hyperglycemia which is becoming of increased prevalence in the world. The goal of this project is to synthesize potential anti-hyperglycemic agents, specifically, C-glycosides with variations on the aromatic moiety. One proposed compound is shown in Figure 1. These variations will provide understanding in regards to their effectiveness and potential for further research as an anti-hyperglycemic treatment. Synthesized compounds will be evaluated using an alpha- glucosidase assay to test for efficacy of inhibition of this enzyme. This particular enzyme is responsible for breaking down polysaccharides, such as starch, into its monomers. This allows the small intestine to absorb monosaccharides that can lead to an increase in blood glucose levels which is characteristic of diabetes. The synthesis and characterization of these C-glycosides will be discussed in this presentation.

Chemistry Class Project Posters

C06. Bioremediation of Motor Oil Utilizing *Bacillus subtilis*
Heather Beasley, Morgan Snider, and Jessica Palinsky (Advisor: Dr. Tami Sivy)

In this experiment, the ability of *Bacillus subtilis* to remove varying concentrations of motor oil from soil was analyzed. The bacteria was first grown and then transferred in equal amounts to three different Mason jar containers, each filled with 60 grams of soil and varying amounts of oil. After the bacteria had been in the soil for two weeks, the hydrocarbons were extracted out of the soil using methylene chloride and measured using a GC/MS. The concentrations of hydrocarbons at the end of the experiment were compared to the starting concentration of hydrocarbons in each sample and to the controls, to determine how much oil the bacteria had digested. The results between the varying oil concentrations were also compared to determine in what concentration of oil the bacteria digested the highest percentage of hydrocarbons. It was predicted that the bacteria would digest the hydrocarbons in the soil differently depending on the concentration of the oil. This information will suggest what the optimum concentration of oil is for *Bacillus subtilis* to maximize its digestion abilities in order to help improve bioremediation techniques.

C07. Determination of Effects Caffeine may have on Bacterial Replication
Lydia Williams, Jeremy Marchand, and Joe Swider (Advisor: Dr. Tami Sivy)

The object of this experiment is to determine the inhibitory effect caffeine has on bacteria growth. This was tested using gram negative *E. coli* and gram positive *Bacillus subtilis* in the LB Broth containing varying amounts of caffeine. The hypothesis was that the caffeine was going to affect both types of bacteria by limiting the growth. The bacteria was then grown on an agar plate and the growth of the bacteria was observed. The amount of caffeine uptake was measured using emission spectroscopy and the caffeine binding agent, Acridine Orange.

C08. Putting Stereotypes to the Saliva Test: A Comparison of Alcohol Dehydrogenase Levels Among Ethnicities
Kristi Lizyness, Ashli Maser, and Dylan Kosaski (Advisor: Dr. Tami Sivy)

Alcohol Dehydrogenase is an essential enzyme for the degradation of alcohol in humans. Previous studies have encouraged the notion that the amount of alcohol dehydrogenase can vary depending on one's ethnicity. This imbalance is believed to play a role in the variances among alcohol tolerances. This experiment will use aldehyde dehydrogenase in the presence of NAD+ to measure the amounts of aldehyde produced after each person rinses with Listerine mouthwash. The product of this reaction, NADH, will be measured using UV-Vis spectrometry and recording the absorbances. It is expected that the absorbance should be directly proportional to the levels of aldehyde, which, in turn, is related to the levels of alcohol dehydrogenase. It is hypothesized that these levels of alcohol dehydrogenase will vary depending on the ethnicity of the subjects producing the saliva sample.

C09. Glucose Oxidase Activity in Honey

Chelsea Bates, Emily DeShano, and Alec Scorey (Advisor: Dr. Tami Sivy)

Honey has been known for its medicinal properties for centuries. It is applied to topical wounds, such as burns and lacerations, and has been observed to reduce infection and accelerate the healing process. The purpose of this experiment is to compare relative antimicrobial properties of various-sourced honeys through glucose oxidase activity. Variously sourced honeys contain glucose oxidase and by a dilution series, this glucose oxidase can be activated to produce hydrogen peroxide. This activity is measured by colorimetric procedures based upon the color change due to the hydrogen peroxide production. These colorimetric changes are measured using a spectrophotometer. It is expected that the samples more diluted with a NaCl solution will yield higher hydrogen peroxide levels. Furthermore, we expect that the local honey will show more glucose oxidase activity because it is less processed.

C10. Evaluating the Lactose and Glucose Content of Various Milks, Milk Products, and Milk Substitutes

Elizabeth Haiderer, Rachel Louks, and Sarah O'Boyle (Advisor: Dr. Tami Sivy)

The goal of this experiment is to analyze the sugar content of several milk products and milk substitutes. Thin layer chromatography, titration techniques, and absorbance spectroscopy will be used to analyze the lactose and glucose content in each product. Thin layer chromatography will qualitatively determine the presence of several kinds of sugars. Lactose content will be determined by titrating a solution of Benedict's reagent with milk extract. Glucose content will be determined by absorbance spectroscopy. Experimental glucose levels can then be compared to the reported amount of total carbohydrates on the product label.

Computer Science Posters

CS01. Analyzing rejected packets of the CSIS server
Josh Braun (Advisor: Dr. George Corser)

Dr. Corser and I have been looking at the firewall logs of the CSIS server to see who is trying to attack the CSIS server. Before we started we knew that the university has 3 ports open and they are 22, 80, and 443. We got the log of all the rejected packets over a 24 hour time period and pulled at all of the IP address that were rejected. We also had the log off accepted packets to see if any of the rejected packets were able to make a connection. Once all the IP addresses were pulled out we looked up the IP address to see where they were assigned from. We also wanted to see what kind of attacks people were trying to do on the server ranging from a DDOS attack or if they were trying to abusive one port.

CS02. VisuTrace
Dustyn Tubbs and Anthony Ventura (Advisor: Dr. George Corser)

Privacy researchers today simulate vehicular ad-hoc networks (VANET) using software tools that can be platform-dependent and difficult or time consuming to configure. Internet-accessible solutions have not emerged as standard, perhaps because processing power and high customization may be required to simulate network performance issues like congestion, overhead, and routing performance delay. However, in the subfield of VANET privacy research Internet-hosted software is possible to implement for the visualization purposes. This work presents one such implementation, called VisuTrace. This tool not only enables individual VANET privacy researchers to perform what-if analyses of privacy protocols. It also facilitates collaboration among teams of researchers.

CS03. Development of a custom software system for Smitty's Towing
CIS 424 Class (Advisor: Dr. Scott James)

The 2015 CIS capstone class concentrated on building a commercial grade application software system for a towing company located in Burton, Michigan. The system is database driven and allows dispatchers to send tow vehicles in response to customer calls. The system allows real time updating of dispatching information along with the ability to track completed calls. The company maintains a storage lot in addition to the towing service and the software system provides lot management as well. Finally, reporting and the ability to historically track calls for periods of seven years are also enabled in the software.

CS04. Integrating Facial Expression Analysis Into Facial Recognition Systems
Dustyn Tubbs and Cody Allen Brown (Advisor: Dr. Khandaker Abir Rahman)

When it comes to the use of bioinformatics in the field of security, reliability and novelty are topics of great concern. Currently in the field of facial recognition, there are a variety of easy to use methods that allow intruders to gain restricted access to an area, such as using a picture or mask of a legitimate user. The research we are currently engaged in seeks to solve this issue by integrating facial expression analysis into facial recognition systems. We believe that this novel solution will lead to a more robust system that is resilient to such attack.

CS05. Authenticating computer users by mouse activities
Ryan Moormann and Danielle Dierich (Advisor: Dr. Khandaker Abir Rahman)

User authentication through computer activities such as typing, mouse events, application usage behavior is gaining momentum in recent days. Among these modalities, young but promising mouse dynamics remains as an active area of research. In this research, we are developing a user authentication system based on mouse dynamics. Using our developed mouse-logger program, we collected mouse events (2D position of cursor, mouse button up-down with associated timestamp) from 60 volunteers. Each volunteer was asked to perform their regular computer activities for one hour in two different machines on two different days allowing us to record 225,000 mouse events. After preprocessing (outlier filtering) the events, we defined six features: cursor speed, acceleration, jerking, single left-click interval, double left-click interval and time length of a mouse movement before pausing. Each user's training template containing feature values was compared against test samples (collected on second day) of all 60 users. Therefore, in total, we are experimenting with 60 genuine and 3540 impostor authentication attempts. We designed our own pattern matching algorithm that generates matching score falls between 0 (for perfect mismatch) and 1 (for perfect match). Our initial results found to be promising showing higher genuine authentication scores compared with impostor authentication scores.

CS06. [Scrap] Open Source Programming Contest System
Jacob Gorney, Spencer Kokaly, Matt Mossner, and Max Savard
(Advisor: Dr. Il-Hyung Cho)

[Scrap] is an ambitious open source project geared at replacing or complementing the popular programming competition software PC^2. [Scrap] is a geared towards teachers and institutions that want to provide an easy to use competition/testing environment for programming problems in which students can write code in an IDE like environment and submit to a server for processing and judging. [Scrap] will be open source from the start, using the MIT license, to encourage widespread use and contribution from others around the world.

Electrical Engineering Posters

E01. Green Energy
John Vandenbossche and Nicholas Gizinski
(Advisors: Dr.Rajani Muraleedharan and Dr. Yu Zou)

Renewable energy is desired because of its capability to limit the over consumption of fossil fuels and to make nuclear power unnecessary. In this senior design project solar energy will be converted to electrical energy using a variety of high/low power electrical components. In addition, we will maximize the solar power extraction through the design of these components. To further increase efficiency all excess power not being consumed by the owner is transferred to the electrical grid. The project will imitate smart grid technology where the consumer can be credited for hours of unused solar power and only consume on a need basis thus increasing the stability of the energy market.

E02. SolarVeillance App and Dual Axis Active Solar
Farah Hazimeh Soueidan, Jacob Misiolek, Ryan Thomas, and Ziyad Alarfaj
(Advisor: Dr. Rajani Muraleedharan)

Renewable energy is a growing interest worldwide, and solar panels are a large source of clean energy. The project describes our Android mobile app and dual axis active solar tracker design that will increase the efficiency of a solar bank. The proposed "SolarVeillance" App will detect malfunctioning panels that are operating at a significantly lower efficiency and notify the user to perform necessary inspection of the solar panels. Our app is cost free, user friendly, and provides on-the-go monitoring. The combination of the solar tracker and the App aims at improving the plant's overall solar power production.

E03. Cadence Control
Christopher Summersett, Jaymes Knight, and Bradley Whitfield
(Advisors: Dr. Rajani Muraleedharan and Dr. Il-Hyung Cho)

The goal of our student research project is to make an application that specifically targets runners with Android devices. Research has shown that music in rhythm with a runners pace can improve performance – our application intends to automate this task. By using the beats per minute (BPM) of the music on a device, we can select a set of songs that will pair well with the runner's current pace. The pace will be determined by interpreting data from a variety of sensors that are contained in smartphones and smartwatches. The application will grant tighter control by allowing the users to increase or decrease the BPM while maintaining a user-friendly environment with quick controls through the notification system, effectively enabling the users to optimize their cadence at their own discretion.

E04. Smart Biometric Building Access System

Abdulmajed Alharbi, Abdulrahman Alharbi, and Mohammed Aldossary
(Advisor: Dr. Rajani Muraleedharan)

Security is critical in any environment, and requires prior knowledge of user to provide appropriate access and functionality. In this project, we investigate the reliability of biometric access system to enhance the physical security using advanced technology features. The biometric building access paves way for cost-effective solution performed with limited human intervention. Furthermore, the smart biometric security system can be used for various applications such as smart home, federal and commercial buildings with need for credential replacements at any time. Therefore, providing building owners scalable solution with reducing installation, labor and maintenance cost.

E05. Smart Sprinkler System

Bruce Lowrie, Daniel Olson, Matthew Van Parys, Othman Althabet,
and Mohammed Al Dahnim (Advisor: Dr. Rajani Muraleedharan)

The concept of this Senior Design Project is to have a smart irrigation system. This system uses moisture sensors in the soil that connect to the Internet via Arduino Wi-Fi Shields. The sprinkler system will function only when the soil is below a calibrated moisture threshold and there are no anticipated rain storms. The system also has the ability of manual override by notifying the user through a phone app before activating system. In addition, the pump that provides water to the sprinkler heads will be powered through an inverter and a battery, which is charged by of a solar panel. The benefits of this project include optimized water usage and energy conservation, resulting in more efficient resource usage.

E06. Self-regulating Aeropendulum Controller Design

Jason Ugartechea and Mattew Koepke
(Advisor: Dr. Young-Man Kim)

In this research, self-regulating controller design technique is developed for aeropendulum. The aeropendulum is composed of a DC motor, an angle sensor, an extension rod, and a stand. It has a simple structure but, useful for learning control theory. The angle sensor provides the position information of DC motor to controller. Using sensor data, controller generates control signal for DC motor and its position is properly controlled. However, electromechanical parameters of aeropendulum are not always constant but, change from various reasons. The proposed self-regulating controller monitors the health of aeropendulum system and reconfigures its control signal if any parameter change occurs. Matlab simulation is used to verify its effectiveness.

Mechanical Engineering Posters

M01. Fullerton Tool Vial Collector

Ahmed Alkhatam, Joshua Ratledge, and Adam Pijaszek
(Advisor: Dr. Thomas Mahank)

An automated collector and sorter was designed for Fullerton Tool Company to organize labelled vials, delivered by conveyor, into bundles of ten. The collector and sorter was to have a capacity of 150 vials and be gravity fed. Three concepts were developed. The first concept consisted of a motorized loading platform to catch, accumulate, and deposit the vials as a bundle into a container. The second concept employed a grating mounted to a motorized translation table to accumulate the vials into bundles arranged horizontally. The third concept relied on a motorized rotating platform to accumulate the vials into bundles arranged circularly. All three concepts were designed to optimize operator comfort and safety. A decision matrix was employed and a final concept was selected. The final concept will become a physical prototype that will be fabricated and tested next semester.

M02. Cardinal Formula Racing Composite Manufacturing Vacuum Bagging Table

Adam Johnson, Zach Haveraneck, and Musalam Alsamkhan
(Advisor: Dr. Brooks Byam)

Cardinal Formula Racing has a need for a manufacturing procedure which is easily repeatable and less time consuming than their current process. This will be achieved via a Composite Manufacturing Vacuum Bagging Table (CMVBT) including a standardized procedure for operation. This CMVBT is a new design.

CFR's current procedure for manufacturing these parts is underdeveloped and varies greatly from part to part. The crude 'Bag and Pump' method is situationally dependent. The main issue with the current method is that only one composite part can be manufactured at a time. The new CMVBT will allow for multiple parts to be produced together. The current method uses the only table available to cover all molds in carbon fiber fabric and then coat in resin. This process leaves the table covered in excess residue which cures and cannot be removed, permanently damaging the table. There is scarce storage for the composite manufacturing process tools. Waste removal is virtually nonexistent. The current process is not standardized and there is too much room for error. The new design will address these problems, eliminate most of these variables and increase the throughput by making the process standardized. This will free up manpower to be spent researching, designing, or manufacturing other systems for the race car.

M03. Duro Last Roofing Outside Corner Welding Fixture
Daniel Reyes Jr., Shawn Murphy, William Montpellier, and Hussain Almuhanna
(Advisor: Dr. Brooks Byam)

The design team selected a project for Duro-Last® Roofing Inc., which had a need to redesign their outside corner welding fixture. The new design will allow technicians to load and weld PVC base and insert membranes faster. The technician first loads the base membrane onto the fixture plate where it is held and formed in place by plastic clips. Then the insert membrane is aligned into position over an air suction manifold. Next the technician steps on a foot pedal to turn on the Piab vacuum generator where the vacuum holds and forms the insert membrane in the correct position. This allows for an aluminum v-block die to be placed on the fixture plate where the membranes overlap. After both stations are loaded the sliding table can then be rolled into the radio frequency welder. Duro-Last® Roofing Inc. produces approximately 500,000 outside corner roof flashing a year and the new design with vacuum will allow them to produce parts faster, have a no tool change over, decrease training time, while maintaining the current scrap rate.

M04. Fullerton Tool Fixture for Balancing Grinding Wheel Packs
Jacob Sharpe, Kyle Flint, and Austin Len
(Advisor: Dr. Brooks Byam)

The design, construction, and testing of a fixture for balancing grinding wheel packs for Fullerton Tool, as part of Senior Design II.

M05. SBESI Sampling from a Remote Location – UAV Drone
Carson Beauchaine, Justin Krenzke, Troy Quenneville, and Chris Rush
(Advisor: Dr. Thomas Kullgren)

The Saginaw Bay Environmental Science Institute (SBESI) is responsible for taking water samples, currently done via boat. In order to increase sample locations as well as take 100-250mL samples year round, they require a solution. We have developed a safe, easily navigable and operable system with low development cost that is able to fly from shore and take samples both in summer and winter conditions. The process is done using a UAV drone equipped with a peristaltic pump, as well as a drill to conquer ice conditions.

M06. Teamtech Motorsports Safety Adjustable Helmet Halo
Khalil Alkhatam, Het Kapadia, and Melvine Usi
(Advisor: Dr. Brooks Byam)

We are making an adjustable helmet halo for TEAMTECH motorsports safety for Mr. Curt Tucker. This would be an add-on device along with the HANS device which would be mounted on the seat such that the helmet arms will hold the drivers neck and head from restraining, protecting the race car drivers from fatal injuries. One of the main features of this device is that it's adjustable. It means that the same device can be used by different drivers having different helmet sizes, the arms would also the movable giving the driver place to move in and out of the car in case of an emergency.

M07. Hydrocyclone Solids Separation Performance
Joshua R. Wilson (Advisor: Dr. Thomas Mahank)

A hydrocyclone was designed, built, and tested at Saginaw Valley State University over academic year 2014–2015 to explore solids separation performance for the remediation and volume reduction of fouled sediment from the Saginaw Bay Watershed. Solids of wide size distributions (0.5–300 microns) were effectively separated by the hydrocyclone over a range of flow rates (0.5–1.2 kg/s) as determined by sieve analyses of the overflow and underflow. The project was supported by the Dow Science and Sustainability Education Center and by an SVSU Undergraduate Student-led Research Grant.

Mathematical Science Poster

MS01. A Model for Superior Risk-Adjusted Returns

Juan Sancen (Advisor: Prof. Curtis Grosse)

Most people buy stocks hoping for the price to go up; but what about when you think the stock price will go down? We have developed a hedge fund Investment Model for people with a low risk appetite. It uses market neutral strategies which protect returns from adverse market moves. The model pairs 10 "long" stocks, expected to outperform the market, with 10 corresponding stocks sold "short" that are expected to underperform the market. Our model uses various ratings to decide what stocks to long and short: A and B indicates a potential long stock, and D and F a potential short stock. During periods of high volatility we expect the model to perform its best and demonstrate its effectiveness. Through MS excel data analysis toolkits and formula worksheets we have been able to create an expected return table and covariance matrix that allows us to determine a risk-return tradeoff. Furthermore, we have been able to use MS Excel t-tests and hypothesis testing to test the validity of our current ratings database and discover various relationships that potentially allow us to increase our risk-adjusted returns. Over the last 3-year and 5-year periods we have achieved a 15% and 17% annual return with a fraction of the market risk. This compares well to the S&P 500.Given that this model benefits during declining markets, it is expected to have low risk, and as a result it makes it a beneficial model to be applied in future scholarships for under-served SVSU students.

Saginaw Bay Environmental Science Institute Posters

ES01. Development of a Paper-Based Fluidic Device for Phosphorus Detection

Patricia Rusch (Advisor: Dr. Kyle Cissell)

Phosphorus is an essential nutrient for maintaining a healthy ecosystem; however, heightened levels of phosphorus can have negative effects, including algal blooms, which upon decomposition, can lead to oxygen depletion, resulting in regions lacking aquatic life. It is therefore important to monitor phosphorus levels in bodies of water. Current quantitative methods for phosphorus detection in water are based on the standard method 4500-PE, which detects phosphorus colorimetrically through the reduction of an antimony-phosphomolybdate complex. This standard method, however, often requires sample preservation along with large volumes of harmful reagents. In addition, an absorbance spectrophotometer must be employed for sensitive detection. In order to develop a more rapid, low-cost, on-site device for detection, a paper-based fluidic device (PFD) has been developed requiring microliter reagent volumes for detection of phosphorus as phosphate using a modified ascorbic acid reduction method. These PFDs are smaller than a business card, and are fabricated on cellulose filter paper using a wax printer and a hotplate to develop channels for reagent mixing. Upon mixing of phosphate-containing sample and a combined reagent consisting of sulfuric acid, ammonium molybdate, potassium antimonyl tartrate, and ascorbic acid, a blue color develops. The intensity of the blue color is related to the phosphorus concentration, which was measured visually or through densitometer software. It has been found that as little as 300 parts-per billion phosphorus (PO_4^{3-}- P) can be detected. Device optimization/fabrication, detection limit, and the selectivity against potential interfering ions will be presented.

ES02. Development of a Paper-Based Fluidic Device for Nitrogen Detection

Emily DeShano and Jackie Luthardt (Advisor: Dr. Kyle Cissell)

Nitrogen is a key nutrient that is routinely monitored to assess water quality within a watershed. There are different methods for detecting nitrogen in surface water, including electrochemical, chromatographic, and colorimetric methods. The colorimetric methods typically employ Griess reagents, which upon reaction with nitrites, form a magenta-colored compound. In order to detect nitrates, the nitrates must first be reduced to nitrite. The presented research employs these Griess reagents to detect nitrate and nitrite on a single channel paper-based fluidic device (PFD). These PFDs are beneficial compared to other methods of nitrogen detection due their low cost, portability, and on-site detection capabilities. The PFDs presented here were initially designed using Microsoft Power Point, followed by wax deposition onto cellulose filter paper using a wax printer to create a hydrophilic channel as a means for directional reagent wicking. Our laboratory has already developed a PFD for nitrate/nitrite detection that is capable of detecting one part-per million NO_3^- -N and NO_2^--N. To detect the nitrogen, ImageJ densitometric analysis was performed on captured images of the PFDs. The presented research includes results for optimization of metal reducing agent (Zinc, Aluminum, or Tin), as well as metal placement; channel width and channel length optimization; and Griess reagent concentration optimization. Additionally, the PFD's selectivity to other potentially interfering ions including chloride, phosphate, ammonium, and silicates will be presented.

ES03. Rapid Bacteria Quantification in Recreational Waterways of the Saginaw Bay Watershed

April Lukowski (Advisor: Dr. Tami Sivy)

Tawas City, MI is a popular area for water-based recreational activities. The Tawas River flows through the city and into the Saginaw Bay at a beach frequented by many people. Microbial contamination has been detected in the Tawas River and other sites within the Saginaw Bay Watershed, with high levels of Escherichia coli indicating unsafe conditions for fishing and other recreational activities. Water samples from the river and a nearby Arenac County beach were collected over the course of eleven weeks, and the E. coli levels were quantified and compared using the EPA-approved Colilert and a new rapid quantitative PCR (qPCR) method. The Pearson correlation coefficient for the comparison of the two was 0.592. Of the 33 total samples, fourteen were above the minimal allowable level of 300 CFU/100mL as determined by Colilert. Further analysis is underway to perfect the rapid method as well as determine the source(s) of contamination.

ES04. Nutrient and Sediment Loading to the Saginaw Bay from the Ice-covered Saginaw and Kawkawlin Rivers

David Gould, Brooke Vollmer, Marissa Dobulis, Elisa Arrington, Lee Koski, and Dr. David Karpovich

Nutrient and sediment loading can be a major factor in water quality, especially in the Saginaw Bay. During the warmer months of the year, bodies of water interact greatly with the atmosphere, and are influenced heavily by rain events. A great deal of nutrients can be transported from rain run-off, leading to the need for water sampling during spring, summer, and fall. In winter, however, a sheet of ice forms over lakes and rivers, providing a shield from external contaminants. Not much is known about the movement of nutrients during winter, which was the main focus of this project. This work will present the water quality results of samples taken through the ice on the Saginaw and Kawkawlin Rivers and compare them to open water conditions.

ES05. Development of a new decision tool for strategic conservation in the Saginaw Bay Watershed

David Gould, Brooke Vollmer, Marissa Dobulis, Elisabeth Arrington, Miranda Strasburg, Lee Koski, Dr. Arthur L. Martin, and Dr. David S. Karpovich

Since the fall of 2013, the Saginaw Bay Environmental Science Institute has been collaborating with Limnotech, The Nature Conservancy, and several other organizations to develop a decision tool for strategic conservation called the Saginaw Bay Optimization Decision Model (Saginaw Bay ODM). The Saginaw Bay ODM is a toolkit that integrates models, information, and data from the field scale up to the Saginaw Bay scale. The first version of the Saginaw Bay ODM is being developed for the Kawakawlin, Pigeon, and Pinnebog watersheds. SVSU is the P.I. institution for the project that is funded by a Tier II grant from the UM Water Center. In addition to project management, SVSU students and faculty measured water quality conditions from sites that included the Kawkawlin, Pigeon, and Pinnebog Rivers. Nearshore samples were taken from the Saginaw Bay near the Kawkawlin, Pigeon, and Pinnebog river mouths. Additionally, SVSU has been gathering field conservation placement data as well as developing a gap analysis for information in the watersheds. Examples of each aspect of the decision tool will be shown including model outputs, water quality results, and gap analysis strategies.

ES06. Phosphate Adsorption to Soil upon Addition of Natural Soil Amendments
Katarina L. Keel and Dr. David S. Karpovich

Eutrophication is a major problem at many locations in the Saginaw Bay Watershed. Its characteristics include the overgrowth of algae, followed by algal death, and then biochemical degradation, which depletes marine life of essential oxygen. In severe cases it can kill fresh water marine life and create dead zones within lakes and rivers. Large amounts of phosphorus leaching into the water from surrounding soil can encourage algal growth. The purpose of this study is to investigate the phosphate holding capacity of soil as well as soil amendments that may increase the anion holding capacity. Using sand as a base soil, the holding capacity can be compared when adding in various soil components such as organic matter and clay. Additionally, natural soil amendments such as gypsum (calcium sulfate) and lime (calcium carbonate) can be used to investigate if their addition can increase the phosphate holding capacity. This information holds the potential to positively impact the future of fresh water conservation and restoration through a better understanding of fundamental soil conditions and phosphate transport. The experimental design along with results of preliminary phosphate adsorption experiments will be presented.

ES07. Determining the Timing and Cause of a Low-Gradient, Chronically Hypoxic Reach of the North Branch of the Kawkawlin River in Bay County, Michigan, USA
Dr. Rhett Mohler and Nicholas Ross

Measurements by the Michigan Department of Environmental Quality (MDEQ) show that a particular reach of the North Branch of the Kawkawlin River has been experiencing chronic low dissolved oxygen (DO) levels, which have led to fish kills in the past. Within this reach, the river lacks a well-defined channel and swampy conditions exist. While it was clear that this swampy area is directly related to water chemistry and corresponds to low DO levels, it was not clear how long this has been the case or what was causing these conditions. Therefore, we sought to identify when these swampy conditions were first known from this reach of the river, and to identify what the cause is and if that cause is human or natural. Aerial photography from the 1930s revealed that the reach already existed at that time, so excess sediment runoff from the switch to larger-scale agriculture is not the cause. Historical survey notes from the 1840s suggest that the reach was already swampy during that time, meaning that the initial conversion of the area from forest to farmland was not responsible either. Because this survey predated significant human activity in the region, it suggests that the cause is natural rather than human. A visit to the area revealed a deposit of rocks at the head of the swampy reach. This deposit is acting as a dam for the swampy reach upstream. Future work at this site will include identifying the origin of this rock layer.

Oral Session A: Biology

Room: Pioneer-242

Presentations are 15 minutes each, starting at 1:00 p.m.

B01. The Effects of Shelter Density/Abundance on Aggression in the Rusty Crayfish, *Orconectes rusticus*

Taylor Rupp (Advisor: Dr. Art Martin)

An important outcome of agonistic interactions is the allocation of resources. Shelters are an important resource and animals will often escalate the intensity of an agonistic bout to obtain or sustain shelter ownership. However, the distribution of shelters in natural settings is often unknown, and in many animal systems it is not well understood how the abundance of shelters impacts aggressive behavior. Crayfish are known to readily compete with conspecifics in order to gain access to key resources, including shelters. For this reason, crayfish have often served as a model organism for examining both aggression and social relationships. In this study, populations of four size-matched (within 10%) male crayfish, *Orconectes rusticus,* were presented with equally spaced arrangements of two, four, or six shelters. Video analysis was used to quantify shelter usage and evictions as well as the intensity, frequency, duration, and outcomes of fights over a 24-hour period. These observations were quantified and correlated between the three experimental designs. Data analysis has revealed that populations of crayfish generally exhibit a decrease in aggression as the number of available shelters is increased; rates of shelter evictions, fight intensity levels, and fight frequency decreased in the presence of abundant shelters, but fight duration increased. This study provides important information about the effects of resource abundance on social dominance and aggressive behavior within populations.

B02. The Effects of Hypoxia in the Crayfish, *Orconectes rusticus*

Miranda Strasburg (Advisor: Dr. Art Martin)

Many different aquatic species exhibit changes in behavior when exposed to hypoxic waters. Crayfish are a highly diverse species that are found in a variety of waters both hypoxic and normoxic. Crayfish experience adverse physiological effects in hypoxic waters, but it is unknown if crayfish exhibit a preference to areas with higher oxygen concentrations. The purpose of this study was to analyze the responses of the crayfish, *Orconectes rusticus*, when exposed to varying levels of oxygen. Each animal was placed in a y-maze (working section: 30.5 x 61 x 30.5cm, arms: 30.5 x 43 x 30.5cm) with each arm containing water of different oxygen concentrations, ranging from 2 to 8 mg O_2/l. A current of 25 cm/sec was streamed through each arm of the y-maze. After each set of initial trials, data was analyzed based on initial arm choice, time spent in each arm, and time spent at the furthest upstream position. This allowed us to determine if *Orconectes rusticus* exhibits an oxygen preference, thus demonstrating its potential habitat selection based on a range of oxygen levels.

B03. The Induction of Contact Inhibition in Human Cells by Gene from Naked Mole Rat
Scott Baughan (Advisor: Dr. Bing Yang)

With cancer being the second leading cause of death in the developed world, investigations into ways to prevent cancer become increasingly important. The mechanism of resistance to cancer in animals may provide new ways to prevent cancer in human. Naked mole rat, *Heterocephalus glaber*, a subterranean African rodent with an exceptionally long life span and natural resistance to cancer is an animal model to study the resistance to cancer. Studies in recent years have shown that hypersensitivity to contact inhibition, mediated by the CDKN4B gene of the naked mole rat (homologous to human's p16ink4a, and sharing the same locus), is the key mechanism for cancer resistance. While research into the cellular mechanics of the early activation of CDKN4B in contact inhibition is ongoing, whether or not this mechanism can be extrapolated to human depends on the activity of the naked mole rat's protein in human cells. We thus constructed a lentiviral vector that can express CDKN4B induced by the presence of tetracycline. Lentiviral vector can permanently insert CDKN4B gene into human cells. MCF10A cell is a non-malignant human cell line that was chosen for this study. The cells were transfected and are being selected for the inserted CDKN4B. We will then insert the gene that can induce the expression of CDKN4B. After the cell line expressing CDKN4B inducibly is established, we will investigate whether or not CDKN4B is able to arrest the growth of non-malignant human cells.

B04. DNA fingerprinting of walleye (*Stizostedion vitreum*) from Saginaw Bay and spawning populations
Stephanie Zawacki (Advisor: Dr. David Stanton)

There is a large population of walleye in Saginaw Bay that is both economically and ecologically important. The population is heavily managed and has undergone significant variation in size in recent years. In order to properly manage this population, genetic information is required. We obtained fin clips from walleye captured in Saginaw Bay in the summer by trolling and in the winter by ice fishing. With the help of the Department of Natural Resources (DNR), we also obtained fin clips from a spawning population of walleye on the Tittabawassee River and another population on the Shiawassee River. In total, over 300 fin clips were obtained. DNA was extracted, using a DNeasy kit. PCR amplification and capillary electrophoresis were performed in order to determine genotypes for six fingerprint loci. This data provides genetic markers that allow for the assessment of genetic diversity and population substructure, as well as the determination of important spawning sites and assessment of spawning site fidelity. This information will aid management decisions regarding stocking programs, as well as decisions regarding damming of rivers and the construction of ladders to be used by spawning walleye.

B05. DNA fingerprinting of zebra mussels (*Dreissena polymorpha*) from Higgins Lake, Michigan

Jacob Beasecker (Advisor: Dr. David Stanton)

Zebra mussels are an invasive species introduced into the Great Lakes from Europe in 1986. Since then, they have spread aggressively throughout the United States and they have had a dramatic effect on water quality and biodiversity. Genetic studies of invasive species are critical in determining the viability and potential ecological impact of these populations. Samples were collected from Higgins Lake over the past seven years and from several populations in Lake Michigan and Lake Huron. We tracked changes in genetic composition over time and determined possible source populations for migrants. DNA was extracted from frozen samples and PCR was performed in order to amplify polymorphic fingerprint loci. The PCR products were analyzed using the CEQ 8000 automated DNA analysis system from Beckman-Coulter. Fragments sizes were determined and genotypes were identified using internal reference standards. The parameters investigated included number of alleles, observed (H_o) and expected (H_e) heterozygosity, population substructure (F_{ST}) and genetic distances (D) between populations. The results show that Higgins Lake has most likely received migrants from many different locations, including distant sources and that gene flow is continues to occur. Human transport is undoubtedly responsible for the pattern observed.

B06. DNA fingerprinting of Michigan emerald ash borers (*Agrilus planipennis*)

Jeremy Schultz (Advisor: Dr. David Stanton)

The Emerald ash borer is native to northeast Asia but was found in Michigan in 2002. It had most likely been transported in infested pallets. In the last twelve years it has spread throughout the Great Lakes region and to much of the eastern United States. The larvae feed on vascular tissue in many species of ash and already have been responsible for the destruction of at least thirty million trees in Michigan. They have had a significant impact both ecologically and economically. Samples were collected from four locations in Michigan. Specimens were frozen at -20^{O} C or stored in a 70% ethanol solution until DNA extraction was performed on leg tissue using a DNeasy extraction kit. DNA fingerprinting was performed using PCR and capillary electrophoresis. Data analysis included determination of the number of alleles per locus, allele frequencies, observed (H_o) and expected (H_e) heterozygosities, Hardy Weinberg equilibrium (HWE), genetic distance (D) and population substructure (F_{ST}). Genetic distances between populations were found to be low and population substructure was also low. The results indicate that only a portion of the genetic variation present in native populations has been transported to Michigan.

B07. Effects of Nicotine on Development, Metamorphosis, and Behavior of the Fruit Fly (*Drosophila melanogaster*) Within and Across Generations

Thomas Beechum, Jennifer Buchner, Audrey Jeglic, Diane Marion, Jamie Roggenbuck, and Thomas Trinklein (Advisor: Gary M. Lange)

Nicotine is a potent cholinergic alkaloid found in the nightshade family of plants, with tobacco being the major plant source for this chemical worldwide. Nicotine serves as an antiherbivore chemical for the plant, but recreational consumption by humans is widespread due to its stimulant effect on the brain. Nicotine consumption is dependence-forming due to its effects on dopaminegic pathways, where it increases levels of dopamine in the reward circuits of the brain. It is also known that nicotine inhibits histone deacetylases systemically. These enzymes affect the position of acetyl groups, altering the wraping properties of histone interaction with DNA. Therefore, nicotine may exert potential epigenetic effects. In our understanding of the effects of nicotine, little assessment of the potential for this chemical to affect growth, development and behavior in invertebrates has been undertaken. This is because most invertebrate work examines much higher dosage exposures associated with nicotine's use as an insecticide. In this study, we examine how chronic, low-level nicotine exposure in the fruit fly (*Drosophila melanogaster*) affects development, morphology, metamorphosis, fecundity, and behavior. Additionally, we examine effects chronic nicotine exposure may exert across multiple generations of the fly.

B08. Effects of the Enzyme Inhibitor, Thiouracil, on Measures of Development, Metamorphosis, and Behavior in Two Species of Fruit Flies

Kelsey Gere and Vanessa Wolf (Advisor: Gary M. Lange)

Endocrine disrupting compounds are those that exert effects on aspects of the neuroendocrine system in organisms, and may alter an organism's physiology, morphology, development and behavior. Thiouracil is an historically relevant compound used in human medicine since the early 1940's to treat cases of hyperthyroidism and Grave's Disease. The chemical nature of thiouracil is such, that it inhibits the enzyme. thyroid peroxidase. Thiouracil behaves as a thyrotoxic agent, inhibiting oxidation of iodine leading to supressed or inhibited thyroxine production in the thyroid gland. Thiouracil has also seen application in comercial agriculture, where it has been used as a fattening agent in cattle. This study assesses the effects of thiouracil in the invertebrate animal models of two species of fruit fly (*Drosophila melanogaster* & *Drosophila virilis*). Physiologically relevant exposures could induce effects on the timing of growth, development and behavior in the invertebrate system even though their hormone profile is vastly different than that seen in mammals. Specifically in this presentation, focus is on how thiouracil exposure has affected the developmental time line of the fruit fly, and comparisons of rover/sitter behavior in larvae, pupation heights in pupae, and locomotor measures in adult flies.

Oral Session B: Electrical Engineering Senior Design — Room: Pioneer-240

Presentations start at 1:00 p.m. (see Pages 12-13 for abstracts)

E01. Green Energy
John Vandenbossche and Nicholas Gizinski
(Advisors: Dr.Rajani Muraleedharan and Dr. Yu Zou)

E02. SolarVeillance App and Dual Axis Active Solar
Farah Hazimeh Soueidan, Jacob Misiolek, Ryan Thomas, and Ziyad Alarfaj
(Advisor: Dr. Rajani Muraleedharan)

E03. Cadence Control
Christopher Summersett, Jaymes Knight, and Bradley Whitfield
(Advisors: Dr. Rajani Muraleedharan and Dr. Il-Hyung Cho)

E04. Smart Biometric Building Access System
Abdulmajed Alharbi, Abdulrahman Alharbi, and Mohammed Aldossary
(Advisor: Dr. Rajani Muraleedharan)

E05. Smart Sprinkler System
Bruce Lowrie, Daniel Olson, Matthew Van Parys, Othman Althabet,
and Mohammed Al Dahnim
(Advisor: Dr. Rajani Muraleedharan)

Oral Session C: Mechanical Engineering Senior Design I Room: Pioneer-243

Presentations are 30 minutes each, starting at 1:00 p.m. (see Page 14 for abstracts)

M01. Fullerton Tool Vial Collector
Ahmed Alkhatam, Joshua Ratledge, and Adam Pijaszek
(Advisor: Dr. Thomas Mahank)

M02. Cardinal Formula Racing Composite Manufacturing Vacuum Bagging Table
Adam Johnson, Zach Haveraneck, and Musalam Alsamkhan
(Advisor: Dr. Brooks Byam)

Oral Session D: Mechanical Engineering Senior Design II Room: Pioneer-245

Presentations are 30 minutes each, starting at 1:00 p.m. (see Pages 15-16 for abstracts)

M03. Duro Last Roofing Outside Corner Welding Fixture
Daniel Reyes Jr., Shawn Murphy, William Montpellier, and Hussain Almuhanna
(Advisor: Dr. Brooks Byam)

M04. Fullerton Tool Fixture for Balancing Grinding Wheel Packs
Jacob Sharpe, Kyle Flint, and Austin Len
(Advisor: Dr. Brooks Byam)

M05. SBESI Sampling from a Remote Location – UAV Drone
Carson Beauchaine, Justin Krenzke, Troy Quenneville, and Chris Rush
(Advisor: Dr. Thomas Kullgren)

M06. Teamtech Motorsports Safety Adjustable Helmet Halo
Khalil Alkhatam, Het Kapadia, and Melvine Usi
(Advisor: Dr. Brooks Byam)