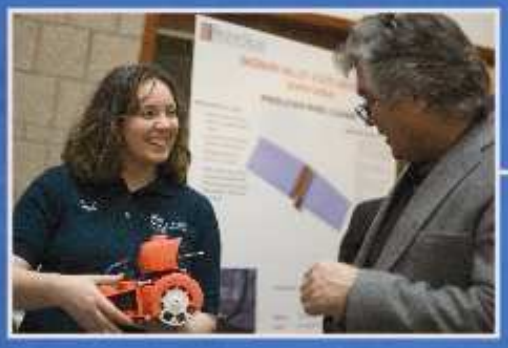

SVSU

Science & Engineering Symposium

Pioneer Hall, Friday April 22 , 2011 8:30 a.m. - 4:30 p.m.

SVSU Science and Engineering Symposium

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SVSU Science and Engineering Symposium

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9:05 a.m.	**Keynote Lecture** Dr. Lilianna Aniola-Jedrzejek Poznan University of Technology, Poland	Pioneer-240
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Keynote Lecture

Are Alternative Energy Resources the Answer?

Lilianna Aniola-Jedrzejek, Ph.D.
Poznan University of Technology, Poland
International Guest Professor at Saginaw Valley State University

As energy consumption has increased over the past decades, the issue of alternative energy resources has been vital. Growing concern over climate change, and global warming in particular, resulted in strategies leading to reduction of GHG pollution. The Kyoto Protocol treaty, for those countries that ratified it, enforced limits on all GHG gases, which must be reached by 2012. As a consequence, a carbon market was established and is growing strong in Europe with government imposed caps, whereas in the US regional initiatives are at various stages of planning and execution. China, as the world's #1 consumer of coal and #2 of crude oil, has started to invest billions of dollars in renewable energy. This presentation aims at providing insight into the mechanisms of carbon market trading and their impact on current energy policies of EU countries and worldwide, as well as presenting possible scenarios for future developments of alternative energies production and consumption.

Biography

Dr. Lilianna Aniola-Jedrzejek, senior lecturer at Poznan University of Technology (PUT), Poznan, Poland. With the background of a Ph.D. in Physics from Jagiellonian University, Krakow, Poland, she became interested in teaching/learning on-line when she took a one semester online course on designing Internet courses at Heriot-Watt University, Edinburgh, Great Britain, in 1999. Since then she managed 7, and coordinated 2 European Union educational projects within the Leonardo da Vinci programme framework, with the purpose of introducing ICT component to science and language learning. She was also a content developer in these projects. Since 2002 she has been co-instructor in online projects between students of Saginaw Valley State University, USA, and Poznan University of Technology. Since 2008 she has been an instructor of writing courses for academic staff at PUT. Since October 2010 she has been the head of English Academic Writing Centre at PUT. Her main interests are in implementing technology support into English teaching in the fields of physics, mechanical engineering and computer sciences. In 2007 she received the national award for didactic achievements.

Independent Research Posters

P01. Emulsion Technology for Fuel Oil/Glycerin Emulsions
Anthony J. Lucio (Advisors: Dr. David Karpovich and Dr. Lanny Robbins)

When soy biodiesel production peaked in the last decade, excess byproduct glycerin overwhelmed the market. Research began to find uses for the impure glycerin with considerable interest in its use as a heating fuel. However, glycerin alone is difficult to burn with its low volatility and high flash point. We have experience in producing stable emulsions of No. 2 fuel oil in crude glycerin obtained from biodiesel processing. Our results suggest it would be of interest to study the unique surfactant systems required to produce a similar emulsion with a heavy fuel oil (HFO). No. 6 fuel oil is a HFO that has a relatively high viscosity. It needs to be pre-heated prior to pumping otherwise it will congeal and clog fuel lines. Its undesirable characteristics result in lower demand, thus making it an inexpensive fuel for power-plants and ocean-going vessels. By producing an oil/glycerin emulsion we can generate a lower viscosity fuel compared to No. 6 fuel oil alone. This would utilize the waste crude glycerin and could expand the utility of the low cost fuel.

P02. Raman Spectroscopy Analysis of Cellulose and Soy Protein: Bioplastic Building Blocks
Steven Mankoci and Fredy Pratama (Advisors: Dr. David Karpovich and Dr. Tami Sivy)

Recent research at SVSU by Schilling, Karpovich, and Tomasik has resulted in an innovative biodegradable plastic created from soy protein isolate and polysaccharide-rich corn cob powder. After treating corn cob powder with hypochlorite to oxidize the C6 of each glucose monomer to a negatively charged carboxylate, the soy protein isolate is added. Then, the components are compression molded at high temperatures. It is hypothesized that electrostatic interactions or an amide bond forms between positively charged amines of the protein and carboxylates of the polysaccharides. The purpose of this study is to further investigate the chemistry behind this process using recently procured analytical equipment, including Raman spectroscopy. The chief focus of this study was to better understand the building blocks of these intriguing bioplastics. Cellulose, carboxylated cellulose, soy protein (from isolate, meal, and whole bean), and bioplastic composites were analyzed. Elucidation of the specific structural and chemical changes incurred by these carbohydrates and proteins shall serve an important part in the complete understanding of these bioplastics on the molecular level.

P03. The Chemistry of Hand Made Neem Oil
Amanda Foote (Advisors: Dr. David Karpovich and Dr. Lanny Robbins)

In many countries of Africa, low income and poverty is very common. The research of neem oil, which comes from neem tree seeds, requires the study of the chemistry to develop technology and culturally sensitive methods for aiding in the production of food and income in these impoverished areas. This would help increase the standard of living for the people. It would be beneficial for the people to hand-make the popular oil where the neem trees grow naturally because it would be a positive way to utilize this resource, and produce a source of wealth and income. This presentation will include background information on what neem oil is and where it comes from, how to make hand-made neem oil and the importance of this method, some of the mechanisms on how the oil is produced, and a conclusion of what may come from further study.

P04. Preliminary Studies on Cost and Energy Cycle Analysis of Ethanol Production from *Miscanthus x giganteus*

G. Roekle and A. Bond (Advisor: Dr. Chris Schilling)

Kettering University's Mechanical Engineering Department asked SVSU to assist in a U.S. Department of Energy research project that has an overall scope of developing high temperature proton exchange membrane fuel cells. SVSU's role is to perform a cost and energy cycle analysis of currently available methods to convert the perennial grass, *Miscanthus x giganteous*, into ethanol, which is suitable for fuel cell use. We structured this task by starting with a literature review on key energetic and agricultural-economic factors associated with production of Miscanthus and its main competitor energy crop, *P. virgatum*. In parallel, we are reviewing the literature on the economics and energy efficiency of two competing methods to scale up production of ethanol from perennial grasses to ethanol: advanced enzymatic hydrolysis followed by fermentation; and gasification followed by fermentation.

P05. Engineering and Economic Viability of Manufacturing Biodegradable Sporting Clays from Lignocellulose Residues

G. Roekle and J. Cotton (Advisors: Dr. Chris Schilling and Dr. David Karpovich)

Traditional sporting clays are made of petroleum pitch, which makes them non-biodegradable, a source of litter, and also toxic when ingested by animals. Another concern is that the manufacturing cost of sporting clays continues to rise as petroleum prices increase. The Corn Marketing Program of Michigan asked SVSU to research and develop an environmentally-friendly solution to the above problems while also providing a value-added application for lignocellulosic residues that are abundant in the corn industry. The project was divided into two tasks: (1) proof-of-principle experiments to assess product manufacturability by two methods of thermoplastic molding; and (2) a patent search and market analysis to identify barriers and opportunities in scaling up manufacturing.

P06. Thermal Densification of Anaerobic Digestate

G. Roekle and L. White (Advisor: Dr. Chris Schilling)

Over the past two decades, European corporations have become world leaders in the desing of commercial systems of methane production by anaerobic digestion. A key attribute of that industry has been the miniaturization of traditional, large-scale, municipal wastewater treatment technology to much smaller systems suitable for individual farms, greenhouses, meat processors, milk product manufacturers, and so on. Such small digesters are not yet common in the U.S., however, U.S.D.A. leaders predict a shift in this direction is likely. A voluminous by-product of this technology is so-called digestate - a fibrous soil amendment, consisting of lignocellulose and several agricultural nutrients. We received samples of anaerobic digestate from Phase 3 Renewables, LLC, of Cincinnatti, Ohio - an affiliate of one of Europe's top system developers, Organic Waste Systems, of Belgium. Experiments were performed to fabricate strong and stable pellets of this material for shipping and storage.

Class Project Posters

CP01-05. Nuclear Energy and the Crisis in Japan
Hassan Alhantosh, Danielle Dodge, Jennifer Fegan, Yingxu Hao, Jeremy Hassen, Joshua Herek, Steven Hurney, Alan Malott, Ashley Meyer, Michael Morrow, and Justin Scherzer (Advisor: Dr. Deborah Huntley)

After the recent tragedy in Japan, nuclear energy has become a hot topic. We will be looking at how nuclear chemistry, how nuclear power is generated, the history of nuclear power and the possible benefits compared to other energy generation technologies. In the history of nuclear power, we will be looking at significant events such as Chernobyl and Three Mile Island and the environmental impact caused by these to disasters. From these two events we will also look into what problems might arise in Japan with their recent disaster and how they have affected nuclear energy regulations.

CP06. Wind Power
Chelsea Bates, Brady Crandall, and Ashley Rush (Advisor: Dr. Lilianna Aniola-Jedrzejek)

Today wind turbines are used around the world to collect and reuse wind power. The blades of wind machines are powered by the wind flow and when the blades turn the drive shaft will power an electric generator and produce electricity. Wind power is a dependable source of reusable energy for many regions, but it is limited to areas where there is a steady supply of wind. This makes it overlooked and underestimated as an eco-friendly energy source. Society is having a difficult time transitioning to wind power because of the complexity of comparing fossil fuels to the costs of wind turbines. Discussing the advantages and disadvantages of wind power will help decide whether or not this type of energy should be further developed. In Michigan one hundred and forty-four megawatts of wind power is identified as of 2009. It is currently projected to increase by enormous amounts in the next five years. Along with the reusable energy benefits, wind power is projected to bring more employment to the Michigan economy by 2030. With all of these factors, wind energy has the potential to become an extremely valuable source of reusable energy. Michigan's economy could use a new investment and wind energy could help uplift and help circulate the economy once again.

CP07. Global Prospects of Fusion
Patrick Fryfogle, Dylan Jaskolski, and Tyler Kosaski
(Advisor: Dr. Lilianna Aniola-Jedrzejek)

Fusion is a power continuously releasing energy into the solar system and the universe. Man is trying to harness fusion technology to generate about three times as much energy in a reactor compared to fission. Fusion uses cheap fuel consisting of hydrogen and helium isotopes and creates virtually no radioactive waste. Fusion is an efficient reaction, and merits further research and development.

CP08. Solar Energy
Kelly Larner, Stephanie Smith, and Jessica Bonardelli
(Advisor: Dr. Lilianna Aniola-Jedrzejek)

Solar energy represents a practical, economical, and important source of renewable energy. The basis of solar energy is solar cells, or photovoltaics. Solar cells are used in solar panels, which are in turn used to power houses and satellites. Although Michigan's weather changes frequently and does not receive as much sunlight as other states, the cooler temperatures help with the efficiency of solar panels. By increasing its utilization of renewable resources through increased solar panel use, Michigan would improve the environmental and economic aspects of producing power.

CP09. Geothermal Energy

Adam Dupuis (Advisor: Dr. Lilianna Aniola-Jedrzejek)

Geothermal energy is a form of green energy. There are two main purposes for geothermal: To heat and cool homes/commercial buildings and to create electricity. The principle behind geothermal energy is that the underground temperature of the earth maintains a constant temperature; certain depths will always have relatively the same temperature. To harness this constant temperature water pipes are buried at least 8 feet in the ground. In the heating and cooling perspective a geothermal unit pumps water through the pipes in the ground to either extract or emit heat. While cooling the water is cool from the ground and warm air from the home is blown over it to cool the air and warm the water. The water is then pumped back into the ground in a continuous loop to be cooled again. The opposite occurs in the winter while the unit is taking warmth from the water. From an electrical energy generation standpoint there are three main methods: Dry steam, Flash steam, and Binary cycle. These three types of generators are basically steam generators, and with a combination of heat from the earth and pressure create steam to turn turbines and create electricity.

CP10. Biofuels

Amy Beckman and Michelle Railling (Advisor: Dr. Lilianna Aniola-Jedrzejek)

Renewable energy resources like biofuels have generated much interest as the world realizes that our supplies of petroleum and natural gas are limited. Biofuels hold the promise of reducing our dependence on the combustion of fossil fuels for energy. Increased replacement of fossil fuels with biofuels can result in a positive impact on the reduction of greenhouse gases. Reducing these harmful gases could lessen global warming with its associated harmful effects on our planet. Exciting new processes are available to utilize agricultural by-products and refuse to produce useful fuels to power automobiles, fuel industry, and generate electricity. Instead of filling landfills, these products can safely be recycled to create power. Emphasis is centered on second generation biofuels that can be obtained without high input energy requirements. The use of biofuels and other renewable resources is expanding within our own state as well as throughout the nation.

CP11 Water Quality, Conservation and Consumer's Energy: Great Lakes Stewardship in the Classroom

Meaghan VanWert (Advisors: Prof. Amanda Ross and Dr. David Karpovich)

GLISTEN (Great Lakes Innovative Stewardship Through Education Network) is a program that includes community-based organizations, local governments and educational institutions to foster stewardship of the Great Lakes. Various SVSU faculty participate as members of the Saginaw Bay GLISTEN cluster and seek to achieve goals for water quality, conservation and other environmental improvement in and along Lake Huron. Through classroom projects and research, students engage with the general public to share with and empower citizens to engage more effectively in scientifically informed stewardship behaviors. In order to contribute to this endeavor, the Biology 105B class (Environmental Dynamics) traveled to Consumer's Energy in Essexville, MI. The purpose of this trip was to gain exposure to one of the most prevalent industries in the United States – the production of usable energy to fuel the many processes of American life which require it. Different energy conversion methods were available for inspection, as well as the steps taken to address environmental concerns. An unusual aspect of this site is its location on the Saginaw Bay. While at the plant, students noted why this position is important to the industrial process, as well as to the natural aspects of the area.

Chemistry Posters

C01. Electron transfer kinetics
Alan Malott and Matt McClelland (Advisor: Dr. Jason Pagano)

We are currently developing potential low-cost experiments for the Physical Chemistry laboratory course (CHEM 321L/322L) at SVSU. In this particular experiment, we are concerned about the effect of ionic strength on the rate of the reaction between ascorbic acid and the hexacyanoferrate(III) ion. This experiment is an example of quantum mechanical tunneling for redox reactions and was proposed by Rudolph A. Marcus, Nobel Prize in Chemistry, 1992. In this poster, we provide background information, experimental design, materials and/or equipment, treatment of data, and a grading rubric for assessment purposes.

C02. Growth dynamics of nickel-silica precipitation tubes
Aaron Bond (Advisor: Dr. Jason Pagano)

Silica gardens, a reaction-precipitation system, involve the growth of tubular structures from metal salt crystals seeded into sodium silicate solutions. In this study, we replace the seed crystal with a seed solution using a flow injection method. This experimental method allows for the creation of highly linear precipitation structures grown in reproducible fashion. We present data based on the growth dynamics of precipitation tubes generated from the nickel-silica system.

C03. Adsorption from solution
Alan Malott and Matt McClelland (Advisor: Dr. Jason Pagano)

We are currently developing potential low-cost experiments for the Physical Chemistry laboratory course (CHEM 321L/322L) at SVSU. In this particular experiment, we are concerned about the adsorption of acetic acid molecules onto a fine divided solid of sized charcoal particles in the solution. This phenomenon is the basis for such processes such as heterogeneous catalysts, column chromatography, and the dyeing of textiles. In this poster, we provide background information, experimental design, materials and/or equipment, treatment of data, and a grading rubric for assessment purposes.

C04. Dual-action Antibiotics
Yingxu Hao (Advisor: Dr. Stephanie Brouet)

Antibiotics are important pharmaceutical agents widely used to treat bacterial infections. Nowadays, a significant amount of bacteria are showing resistance to the currently existing antibiotics creating a need for more antibiotics to be developed. During this research, a β-lactam antibiotic ring will be modified and joined to a second antibiotic to form a dual-action antibiotic structure. Stryker's reagent will be used first to form a double bond on α position of a ketone and trap it at the same time. Then the π bond will be employed to form an unsaturated linker using the Heck reaction. The double bound on α position of the linker will be used to attach another antibiotic to synthesize the dual-action antibiotic.

C05. Going Greener: Using "On Water" Reactions to Recycle Catalytic Species
Danielle Schian (Advisor: Dr. Stephanie Brouet)

The aim of this project is to determine if it is possible to recycle catalytic species through the utilization of an immiscible mixture of aqueous and organic solvent. Additionally, this research aims to determine if the rate of reactions and enantiomeric excesses are affected by the usage of the aqueous/ organic solvent mixture. Two lines of chemical research are combined in this project; that of using water as a solvent for organic chemical reactions and that of recovering and reusing catalysts. The reaction utilized by Otto et al. (1998) has been shown to proceed at an enhanced rate and provide a large enantiomeric excess in water; therefore, this reaction (a Diels-Alder cycloaddition of 3-phenyl-1-(2-pyridyl)-2-propen-1-one with cyclopentadiene using a Lewis-acid catalyst) was chosen test the hypotheses of the current project. The methodological framework of the experiments performed by Otto et al. (1998) are being replicated, but varying ratios of organic solvent: aqueous solvent in place of a uniform solvent will be used to observe any effects this may have on reaction rate and enantiomeric excess. By using an immiscible mixture of organic solvent and aqueous solvent, the Lewis-acid catalyst may be recycled and used repeatedly instead of becoming chemical waste. Not only does this project aim to make use of water as an environmentally safe solvent, but it may also prove useful in recycling chemical compounds and could potentially cut costs for chemical industries if it is found to be generalizable to other organic reactions.

C06. Separation and detection of the methylbutenol isomers responsible for a dose-dependent cytotoxicity
Marvin Pollum (Advisor: Dr. Tami Sivy)

Isoprenoids receive a great deal of attention because of their impact on atmospheric chemistry, as well as their applications in the pharmaceutical industry. In recent studies, cytotoxicity was observed with increased flux through either of the two biochemical pathways from which isoprenoids are biosynthesized, i.e., the methylerythritol phosphate and mevalonic acid pathways. This suggests the presence of intermediates that are common to both acting as toxic metabolites, most likely dimethylallyl diphosphate (DMAPP) and/or isopentenyl pyrophosphate (IPP). We have observed the cytotoxicy in both prokaryotic and eukaryotic cells in a dose-dependant manner with treatment by the DMAPP and IPP cell-permeable alcohol analogues, the methylbutenols. To monitor the uptake of the methylbutenols, we have developed a novel GC-MS quantitative method that separates and detects the two isomers after derivatization with a silylating agent. This method is used for further analysis of the underlying cause for the isoprenoid-pathway related cytotoxicity.

C07. Detection of cystathionine ketimine and lanthionine ketimine in the urine of those with Down Syndrome
Hannah Robinson (Advisor: Dr. Tami Sivy)

Down Syndrome (DS) is a disorder resulting from an extra chromosome number 21, leading to birth defects, intellectual disabilities, and multiple health issues. We have hypothesized that the overexpression of the gene coding for cystathionine β-synthase (CBS) (located on chromosome 21) increases flux through the metabolic pathways in which it is active, leading to increased levels of pathway products cystathionine ketimine (CK) and lanthionine ketimine (LK). An increase in the levels of LK may cause oxidative damage, resulting in some of the symptoms associated with DS. We have devised an HPLC-MS method to detect and quantify derivatized LK and CK in urine samples. Deuterated LK is used as an internal control, and creatinine is detected as a measure of urine clearance. Future implementation of this method will allow for the comparison of the levels of LK and CK in urine control samples to urine samples from those with DS.

C08. Compounds in *Helianthus tuberosus* as possible antifeedants against *Leptiontarsa decemlineata* on *Solanum tuberosum* cultivars
Kristina Stilson (Advisor: Dr. Tami Sivy)

A bioassay was conducted to evaluate Jerusalem artichoke, Helianthus tuberosus, solutions to serve as possible antifeedants against Leptinotarsa decemlineata, the Colorado potato beetle. The artichoke are naturally resistant to the beetle, as well as many other pests, thus we hypothesized that there are compounds in the artichoke that could give the same resistance to potato. H. tuberosus foliage and roots were ground and extracted in methanol to enrich for possible terpene compounds. Solutions were sprayed onto Kennebec potato plants, where L. decemlineata were allowed to feed. Methanol served as the control. For the three trials conducted, it was calculated on average that the plants sprayed with the root solution received the least damage from the beetles. Solutions were analyzed using GC-MS to determine differences in chemical composition that could account for the beetle behavior. Continued chemical analysis will be done to correlate antifeeding with specific compounds.

C09. Banana Polyphenoloxidase (PPO) Activity
Eric Traub and Michelle Burgess (Advisor: Dr. Tami Sivy)

Polyphenoloxidases (PPO) are enzymes that are responsible for the browning of bananas. PPO catalyzes the oxidation of dopamine into its corresponding quinone which polymerizes to form melanin, the brown pigment observed after damage. We will extract the PPO enzyme and observe enzymatic activity with dopamine and determine Km. We will be able to observe activity with other orthodiphenol substrates and show specificity for dopamine. The viability of different inhibitors to this reaction will be determined since this has a huge impact on the banana industry. Furthermore, the PPO activity of organic and inorganic banana will be compared with the expectation that the activity of the organic banana will be higher. In this experiment PPO will be extracted from both an organic and inorganic banana using a mortar, pestle, and phosphate buffer. PPO Activity with the substrate dopamine will be observed at 470nm using a UV-Vis and Km will be calculated. This will then be compared to PPO activity with the substrate catechol using the same method to determine the specificity of the enzyme. The inhibition of PPO with EDTA, sodium disulfite, and phenylthiourea will be shown using the same absorbance method as before but by exhibiting a decrease in Km or no enzymatic activity.

C10. Mutagenesis of pUC18 DNA in *E. coli*
Juliette Barcelos and Lisa Oravetz (Advisor: Dr. Tami Sivy)

The purpose of our experiment was to mutate pUC18 plasmid with Ethidium bromide and determine the presence of mutation with chain terminator DNA sequencing. Exposure to UV light, which is a known mutagen, was used as a positive control, while untreated cells were a negative control. We hypothesize that both the UV and the Ethidium bromide samples will have increased rates of mutation in comparison to the negative control group. Competent *E. coli* was transformed with pUC18 plasmid and grown on ampicillin-agar plates. After growth in liquid medium, colonies were permeabilized with 0.5% Triton X-100, to promote uptake of the cell-impermeable Ethidium bromide upon exposure to small amounts of the potential mutagen. Other permeabilized cells were exposed to UV light or underwent no treatment. After growing, the plasmids were isolated and sequenced. The expected results are that both mutagenic samples will have increased rates of mutation in comparison to the control group. Because bacteria frequently have spontaneous DNA mutations, some mutation is expected for the control group as well and will be determined by comparison to the published pUC18 sequence.

C11. Analyzing Antibiotic Properties of Allicin, a Compound Present in Garlic
Christi Shiffman and Kaitlyn Collison (Advisor: Dr. Tami Sivy)

Allicin, a strong, natural antibiotic is present in garlic and synthesized by the enzyme alliinase with the substrate alliin. While some antibiotics work only on gram-positive or gram-negative bacteria, allicin has been known to inhibit the growth of both. Allicin, when introduced into a cell, can inhibit sulfhydryl-dependent enzymes and disrupt RNA synthesis which would not allow protein synthesis. In this experiment, the antibiotic will be synthesized and analyzed for whether or not the compound does indeed harbor such properties. The enzyme alliinase will be extracted from garlic and then tested for concentration by Bradford assay. The basic precursor of alliin, deoxyalliin, will be derived, and then alliin itself. Combining alliinase and alliin should derive allicin, which will be applied to E. *coli* cultures. For comparison, alliinase and pureed garlic will also be added to separate E. *coli* petri dishes, along with a negative control. It is hypothesized that the E. *coli* cultures will have stunted growth when the synthesized allicin or pureed garlic is added. It is also believed that the E. *coli* samples that had alliinase added will continue to grow uninhibited. Alliinase is an enzyme and cannot produce its product, the antibiotic allicin, unless its substrate alliin is present.

C12. Studies on the inhibition of lipase by Orlistat
Danielle Schian and Yingxu Hao (Advisor: Dr. Tami Sivy)

This research aims to explore the effect of varying amounts of Orlistat (the active ingredient in Alli) on the activity of pancreatic lipase. Orlistat is an over-the-counter weight loss supplement that exerts its effects by inhibiting lipase activity. Lipase is the main enzyme in the body that breaks down dietary fats into a usable form of energy. By inhibiting pancreatic lipase activity, Orlistat effectively reduces caloric intake by decreasing the absorption of ingested fats. The goal of this project is to determine whether inhibition of pancreatic lipase by Orlistat is linearly proportional to the concentration of this drug. Previous research has established that doses of Orlistat greater than the recommended 120 mg three times a day provide no additional weight-loss benefit (Xenical Drug Description, 2011). However, this study aims to explore the enzyme / inhibitor relationship *in vitro*, whereas the previous research has looked at the clinical effects that result from testing *in vivo*.

We hypothesize that increasing concentrations of Orlistat will be linearly proportional to enzyme inhibition until a maximum inhibitory Orlistat concentration is reached. At this maximum inhibitory concentration, adding increasing amounts of Orlistat will have no effect on lipase activity (although some uninhibited enzyme exists in solution). GC-MS and titrimetry will be employed to assess pancreatic lipase activity. Both of these analytical methods are useful in the determination of free fatty acid concentration; therefore, lipase activity will be studied through the formation of the products of the reaction that lipase catalyzes.

Electrical Engineering Posters

Senior Design Posters

E01. Alternative Energy Subsidized Refrigeration Unit
Matthew Clark, Curt Chalabian, Lauren Mott, and Asha Afreen (Advisor: Dr. Russ Clark)

Obtained a behind the bar refrigerator from Glasstender, Inc. A Photovoltaic system will be used to subsidize power draw from the grid. The amount of power saving and cost savings will be analyzed. The photovoltaic system will include an 180W solar panel, deep cycle battery, DC/AC inverter, and charge controller. The system will power the evaporation fans and LED lights.

E02. Programmable Battery Simulator
Jay Light (Advisor: Dr. Russ Clark)

This project was designed for Wineman Technology, Inc, a Saginaw based company. The programmable battery simulator uses a PIC microcontroller to control the output of the device to have a voltage curve and discharge time similar to an alkaline, lithium or Ni-Cd battery. The device receives an input from LabView through RS-232 communication. The data received consists of the initial battery charge, voltage and type. An external 5 VDC power source is passed through a buck converter to the output. Based on the inputs received from LabView, the microcontroller outputs a PWM signal to the buck converter to vary the output. The device was designed to be used in standard enclosures used by Wineman Technology, or to be used as a benchtop device.

E03. Solar Powered Portable Water Filtration Unit
Vishal Parimoo (Advisor: Dr. Russ Clark)

For a species that has a significant dependence on water for its survival, it is astonishing that water problems affect approximately half of the human population. Humans need at least a gallon of water every day in order to survive. Over a billion people in developing countries, however have inadequate access to water whereas more than two billion lack basic water sanitation. The situation is even direr in disaster areas where clean water is scarce due to contamination of municipal water systems. Floods in the Mississippi, for example affect the lives of millions of people in terms of their access to clean drinkable water. It is evident that weary survivors, following a disaster will set drinking water as their main priority. A relatively cost-efficient, user-friendly and self-sufficient design is needed that, when completed will have the potential to supply stranded bodies in disaster areas with approximately five hundred gallons of clean water every day while at the same time, also complying with military and EPA standards. This design comprises of a water-tight case that when "deployed", will utilize the energy from the sun via two-30 Watt panels in order to power a 1 gpm water pump, three 5-micron carbon filters, a UVC bulb and lastly, a parts per million sensor with status LEDs. Upon successful completion, this unit can bring clean water to hundreds of families per day.

E04. Intelligent Ground Vehicle Competition 2011

Bryant Barnes, Addney Biery, Paul List, and Matthew Plachta (Advisor: Dr. Russ Clark)

The Intelligent Ground Vehicle Competition is held at Oakland University each year. Our group designed a vehicle that could navigate autonomously through various courses in the allocated amount of time. The vehicle had to meet competition specified requirements which include: Overall Size, Safety Requirements, and Speed Requirements. This project is the pinnacle of a compilation of four years of electrical engineering design theory applied to a real life application.

E05. Visual Measuring Device

Joseph Nitz, Jamey Hackel, Jodie Hebeler, and Arlene Winfield (Advisor: Dr. Russ Clark)

This presentation covers how the visual measuring device that we created works and its overall effectiveness. This machine is a prototype for Hemlock Semiconductor which weighs and calculates the longest dimension of poly crystalline silicon pieces. The weight and dimensions of the pieces are exported into an excel file. The excel file can then be used to create a histogram for comparing Hemlock Semiconductors variation in their month to month breaking processes of this material.

E06. Solar Powered Sterling Engine

Abbas Alabbas, Ali Alghafli, Jessica McKeith, and Wade Sheets (Advisor: Dr. Russ Clark)

The project that we are undertaking is a solar powered sterling engine, that will power a generator to store energy.

Need: In our current times, alternative energy is becoming more important every day. In 2005 if was calculated that 2.6 billion pounds of CO_2 was emitted from coal power plants**.**
Objective: Our goal for this project is to find an inexpensive way to harness solar energy to further reduce that amount of coal that is needed. The use of solar energy saves an average of 160,000 tons of coal a year. Solar currently contributes to over 800,000 Megawatt hours per year, and if it was more cost efficient it could easily be much higher. The current limitations on solar are cost of the PV panels and limited hours of sunlight. The average installation of solar panels cost between $35000-$45000, which is too costly for most people.

Background: The sterling engine is a closed cycle engine containing gas, in this case non compressed air. As the gas is heated it expands pushing a piston providing the power stoke. Simultaneously the gas flows around the piston to the cool side of the engine where heat exchangers cool the gas causing it to condense and power a flywheel. When the flywheel starts to turn it powers a second sealed piston which then recycles the gas to the hot side where the process is repeated. Once the sterling motor is powered its energy will be used to power a generator, which will output energy.

Other Electrical Engineering Posters

E07. Standalone Wind Power Generation System for Remote Locations
Brandon Jones, Matthew Gehrcke, and Tamadrion Houston
(Advisor: Dr. Mohammad Saad Alam)

This project will provide electricity generated from commercially available wind generators. The targeted consumer will be based for small, remote locations such as seasonal cottages or hunting camps where land owners have adequate space and are approved by local municipalities for construction. The load will require adequate power for operation of a water well pump, indoor and outdoor lighting, receptacles for recharging electronic devices (cell phones, flashlights, etc.), and small countertop appliances (coffee maker, toaster, etc.). The system will incorporate a battery storage device for low wind activity, and a charge regulator to prevent over-charging of the battery system during times of no power draw. Power electronic converters will be utilized for conversion from AC to DC for storage, and then back to AC to power the load.

E08. Off Grid Wind Power for a Vacation Cottage
Matthew Douglas Whiteing, Hassan Al hajji, and Sohail Qumar
(Advisor: Dr. Mohammad Saad Alam)

This project is designed as a wind turbine to generate enough power to supply a cottage with electrical energy even when there is very little wind or no wind at all. There will be a series of batteries that storage electrical energy and will supply the house when the wind energy is not there. There has been a major increase in wind turbines over the past several years, making it possible for people in remote area's to have a house that is fully operational. The houses will have the same service that a residence in an urban area with has. With 240 volt service that will power their well all the way to 120 that will power their receptacles. This implementation will be fed from almost 2 miles away to allow the sound from the wind mill to be completely unheard. Lastly there will be a storage element that will store DC voltage that will later be used when wind fails to produce enough energy.

E09. Wind power generation for lighting SVSU parking lot
Robby Linton, Mutwakil Mohamed, and Mohammed Alqarni
(Advisor: Dr. Mohammad Saad Alam)

This design project proposes the design for a power generation system using a wind turbine to provide power to the lights of a parking lot. This system requires converting and storing power from a wind turbine to power the lights at night. Therefore this system requires a three-phase AC to DC converter and a DC to AC inverter for single phase AC to power the lights. This system will be designed to the specifications for powering the Ryders Center's main parking lot, Lot E which requires 7300 watts of power to power its lights.

E10. Feasibility Study of a Solar Powered Autonomous Airship through Modeling and Simulation

Brent Ryan (Advisor: Dr. Mohammad Saad Alam)

The purpose of this project is to look at the feasibility of a system solar powered autonomous air ship. While there are many applications for this type of device the application to be considered for this design will be that of an airborne mobile communication network that could be deployed during natural disasters when existing infrastructure has been destroyed. This will require the device to remain in a fixed location for extended durations deployed en masse to act as a temporary cell communication structure. An airship with a solar panel can provide a solution to this problem in their ability to achieve lift based on the principles of bouncy which reduces their need for power as well as their ability to be deployed in regions whose terrain would make other options impossible. Photovoltaics can provide a reliable and renewable power source for the system allowing long duration operation.

The initial approach of this project will be to look at the feasibility of the system solely on the power and drive system of such a device. The main goals for this first step are to model a propulsion system and basic controls along with the necessary power storage and a suitable photovoltaic system that will meet its power generation needs for extended duration flights at a fixed location.
The design will be based on flight duration of at least 1 week using worst case yearly average solar irradiance in the continental United States for determining PV panel size requirements. Initially the PV system will be modeled using a horizontal panel orientation. The system will utilize a lithium-polymer battery system, chosen for its high power density and power to weight ratio, with an mppt charging circuit. The charging controller will then feed a power supply to power the motors, communication and navigation control with an added auxiliary load to simulate various devices that could be attached depending on application. For the projects assumed application the auxiliary load will be based on power requirements needed for a cell repeater or other appropriate wireless networks.

Matlab and Simulink will be used to model the system and test control based first looking control to keep the ship located at a point on a single axis based on varying wind speeds. The drag will be calculated assuming the gas envelope to have a rudimentary geometric shape with a size to be determined the necessary volume of helium needed to create lift for the weight. The weight will be determined by taking all drive components and a rough estimate of the ships frame weight. RETscreen will be used to gather climate data and for other various needs as they become apparent.

Mechanical Engineering Posters

Senior Design I

M01. Tile Cart Design Project
Jeremy Wolf, Joseph Gierman, Kristin Zaiki, and Kevin Koepplinger
(Advisor: Dr. Brooks Byam)

This was a mechanical design project which was completed for a local agricultural firm, Gierman Farms. This project utilized skills gained in the Saginaw Valley Mechanical Engineering Program to successfully design and construct a drainage tile cart to compliment a tile plow that the client currently owns and uses. The design process will be presented at the symposium along with presentation of a completed prototype.

M02. Hot plate press welder
Saul Kue, Ron Badarak, and Hassan Abuhussain (Advisor: Dr. Thomas Kullgren)

This project involves designing a hot plate press welder as an alternative to dielectric welders. The material being welded is a commercial roofing material. Features of the welder include but are not limited to, safe handling safety light, temperature monitor and control, dual buttons for single operator, and safety shield. The thermal press welder is to be able to weld accessory items (roof vents) continuously with a production time of less than one minute.

M03. Miscanthus x Giganteous Biomaterial Manufacturing Process
Ali AlMomen, Greg Ratcliffe, and Hussain Al-Hilal (Advisor: Dr. Brooks Byam)

There is a need for a safe and cheap biomaterial alternative. Currently food crops, fossil fuels, and trees are used for making ethanol, generating electricity, and composing the majority of the foundation of construction materials. Trees and food crops have a higher value in other important applications. Coal and oil are not renewable! The use of gasoline needs to be replaced with renewable ethanol sources. This generates a need for dense briquettes made from dry perennial grasses that can be used for producing ethanol, and can be burned in boilers for electricity. Temperature and pressure data compression processing of these grasses is currently limited. The optimum plant option is still to be determined. This project is attempting to expand knowledge on the temperature and pressure compression processing data for forming energy dense biomass briquettes along with how to transport large quantities of a coarse loose plant similar to hay. Forming dense briquettes that could be transported and burned as whole or ground up and burned along with coal may pave the way to eliminate concerns involving transportation.

Mechanical Engineering Posters

Senior Design II

M04. WFARM: Worm Factory: Automation and Recycling Matter
Douglas Butterfield, Jason Haubenstricker, and Brennan MacMillan
(Advisor: Dr. Brooks Byam and Prof. Ed Meisel)

The SVSU Greenhouse is currently on the leading edge of vermicomposting technology. Although several techniques have already been implemented, an all encompassing system that autonomously aerates, irrigates, and separates has yet to be created. This Capstone design project is intended to fill the void left by this missing technology. The WFARM is an autonomous, user-friendly, and economically responsible vermicomposting apparatus. This newly developed system has the potential to change the future of waste disposal.

M05. Design of FSAE Aero Ducting
Kyle Ball, Ali Alsadiq, Haidar Almohammedsaleh, and Ahmed Alghafly
(Advisor: Dr. Brooks Byam)

The objective is to design, build, and test air ducting that will improve braking, cooling, and engine performance of the 2011 Cardinal Formula Racing (CFR) racecar. The system must weigh less than or equal to 5 lbs. The system must cost less than $1000.00. The system must add less than 25 lbs of drag at 35 mph. The plan is to use carbon fiber composite shaped properly to direct airflow to the braking, cooling and engine systems. Mass will be kept as low as possible without sacrificing the ductings' main objectives. Drag force will be calculated and tested in a wind tunnel. The group accomplished a design that will effectively guide air to improve braking, cooling, and engine performance.

M06. Duro-Last Welding Nozzle
Dennis DeRop and Kimberly Wylie (Advisor: Dr. Joseph Shlien)

This project consists of the design and construction of a validation tool for the welding nozzle used to manufacture Duro-Last roof membrane. The presentation will include from the design process through the testing and completion of the project.

M07. Duperon Wind Turbine

Jared Mollan, Lenard Noel, and Nicholas Rowe (Advisor: Dr. Joseph Shlien)

The purpose of this project is to document the accuracy of testing and redesign of the Duperon wind turbine, as a response to the company's desire to branch out into the green technology. This redesign is primarily expected to improve upon the market standard, the Savonius, VAWT. A set of measurable objectives was generated which revolves around this area of improvement. A systematic process was used to develop different concepts that would solve the given objectives. The two designs were then evaluated against the current system using a decision matrix, third party feedback, and the engineering judgment of the design team and the client. A concept was then selected and was justified by the use of 3D modeling, computational analysis, hand calculations, prototyping, testing, safety analysis, and cost analysis.

M08. Duperon Corporation Low Flow Bar Screen Assembly Stand

Jerry Nelson, Krystal Oberski, and Blake Rhynard (Advisor: Dr. Brooks Byam)

Our design team is working with Duperon Corporation, who specializes in liquids/solids separation technologies, to design and fabricate an assembly stand for their Low Flow machine. The assembly stand will make assembly and testing of the machine more safe, ergonomic, efficient, and cost effective. Our design will allow for any height of bar screen to be assembled, provide convenient movement around the warehouse, provide stability, and have a cost savings of $21,000 a year.

Oral Session A: Biology

Room: Pioneer-240

B01. Effects of Triclosan on Development and Behavior of the Fruit Fly (Drosophila melanogaster)

Delia Blaschka and Sienna Wallace (Advisors: Dr. Gary Lange)

Triclosan is a chlorophenol compound that has found widespread use as an antibacterial and antifungal agent in a wide array of consumer products. In use for only the last 40 years, triclosan was initially found most commonly in soaps. However, during the last ten years triclosan has been incorporated into many more everyday items including deodorants, toothpastes, mouthwash, and has been infused into plastics used for kitchen utensils, toys, and refuse and food storage bags. The chemical structure of triclosan is in the class of phenols, and the compound is considered a chlorinated cyclic compound. This means triclosan has a strong potential to mimic steroid hormones in the body if ingested, leading to endocrine system disruption in the body. In this study we will use a fruit fly (Drosophila melanogaster) model to determine and assess the endocrine disruption potential of triclosan on development by examining neural growth, behavior and fecundity in these organisms. Behavioral and locomotor tests are reported for larval, pupae, and adult flies following triclosan exposure and compared to control populations undergoing similar tests.

B02. Assessment of the Potential for Use of the Earthworm (Lumbricus rubellus) as a Model for Studying Endocrine Disruption: Effects of Triclosan on Growth, Development, & Behavior

Jessica Short and Brock Humphries (Advisor: Dr. Gary Lange)

In organisms, the endocrine system is arguably the most sensitive to disruption by exogenous exposure to chemical compounds in the environment. The array of compounds that have been found to disrupt the endocrine system is vast and includes many commonly used compounds in agriculture, manufacturing, and even in day-to-day life. Unfortunately, endocrine disruption of this sort may lead to catastrophic effects on growth, development, behavior, and even fecundity in exposed organisms. In the Behavioral Neuroendocrinology Laboratory at Saginaw Valley State University, we have traditionally studied endocrine disruption utilizing a common rodent model. However, recently we have begun to explore additional research models, especially invertebrate models. We have found significant value in a fruit fly model, but there have been some limitations that warrant us to identify an additional invertebrate model to more completely explore the potential effects of endocrine disruption. In the present work, the reddish brown earthworm, Lumbricus rubellus is assessed for its use in testing endocrine disrupting compounds (EDC). The EDC examined in the present work is Triclosan, a chlorophenol compound that has found widespread use as an antibacterial and antifungal agent in a wide array of consumer products. Tests developed to assess endocrine disruption are described and the results of these tests are explored specifically for Triclosan but also for the long-term viability of this species in future EDC work.

B03. A Preliminary Study of the Behavioral Effects of the Endocrine Disruptor Diisononyl Phthalate on Neonatal Rats (Rattus norvegicus)
Brenton Fetting, Delia Blaschka, Kaitlin DuCharme, Ryan Phillips, Toribiong Uchel, and Elizabeth Wall (Advisor: Dr. Gary Lange)

Diisononyl Phthalate (DINP), a known endocrine disruptor, is widely used as a plasticizer in paints, dyes, adhesives, coatings on electrical wires and cables, plastic tubing and plastic food containers. Previous research suggests that exposure to DINP can increase weight gain and insulin resistance in human males and act as an antiandrogen in the body of mammals. Previous research conducted in the Behavioral Neuroendocrinology Laboratory (BNEL) at Saginaw Valley State University suggests that DINP also plays a role in altering an array of behaviors of organisms. This study assesses the effects of DINP exposure at the neonatal level in the Norway rat (Rattus norvegicus). Neonatal exposure could potentially induce far different effects on growth, development and behavior than has been seen in our previous experiments using this compound when exposure was at the prenatal or adult level alone. Anogenital statistics and righting responses are recorded at parturition for all pups. Anxiety, as tested using the elevated plus maze, neuromuscular development, balance and coordination are all tested and recorded. These data are compared to control populations.

B04. Behavioral and Reproductive Effects of Exposure to the Endocrine Disruptor Atrazine
Tyler Beyett, Nancy Lackey, and Alisha Kuhtic (Advisor: Dr. Gary Lange)

Today, a serious problem facing the Great Lakes region is pollution. One of the most toxic classes of pollutants are herbicides, which accumulate from the large volume of agricultural runoff present in the Midwest. The herbicide atrazine has drawn significant attention for its observed adverse ecological and physiological effects. Atrazine is a chlorinated, general purpose broadleaf herbicide which is a known estrogen mimic with strong endocrine disrupting capabilities. Recent studies have shown low-level chronic exposure to atrazine to be capable of reversing sexual development in male frogs. We report on reproductive, developmental, and behavioral effects of chronic atrazine exposure in Long-Evans rats. Rats received a daily subcutaneous injection of 1 μg atrazine suspended in 0.5% methylcellulose. Various behavioral and reproductive tests are performed on pups that were exposed to atrazine in utero. Behavioral tests implemented include elevated-plus mazes, grip strength, and righting response. Reproductive success, litter size, and mating behaviors are also used to assess reproductive related effects. The combination of reproductive and behavioral data can be used to assess the effects of atrazine on organisms in contaminated environments.

B05. A new species of insect discovered in Michigan
Dr. Stephen Taber

A previously unknown insect species was discovered in a western Michigan forest and swamp. It is a small fly that appears in early spring when snow still lingers on the ground, and the flying stages of the life cycle were captured in a Malaise trap that operates continuously. Without the device the species would not have been noticed. Adult males and females and the egg stage are now known but the larval and pupal stages remain unknown. The new species has been named *Boletina michigana*.

B06. Carcinogenicity of Pentachlorophenol on invertebrate and vertebrate cells: *In vitro* and *in vivo* studies

Angela Meyer, Stacie Valentine (Advisors: Dr. Plammoottil Cherian and Dr. Gary Lange)

Several substances such as pesticides, herbicides and other chemicals in the environment are known carcinogens. Although the level of these compounds may be small, in light of the new report of the scientific advisory subcommittee of American Cancer Society many of these pollutants need to be reassessed for their cancer risk. We have undertaken to study the effect of pentachlorophenol (PcP) on invertebrate and vertebrate cells *in vitro* and *in vivo*. *Drosophila melanogaster* embryonic cells were cultured in Snyder's medium. Cells were treated with PcP (50ug/L) after 24-48 hrs of growth. After another 24 hrs, the cells were smeared and stained to assess the morphologic characteristics.

Analysis of cells from the treated cells showed that nearly 25% of cells had abnormality indicative of transformation. These changes included unusually large cells, larger nucleus, multiple nuclei and darker chromatin which are characteristic of cancer cells. In the controls, no significant number of cells with such abnormalities was observed. The result of *in vivo* experiment in mice is being analyzed to correlate carcinogenic changes in tissues. Preliminary results confirm that even low level exposure to PcP can contribute to the cancer burden when large numbers of people are exposed.

B07. Genetic Differentiation among Canada Geese (*Branta canadensis)* from four Mid-Michigan Migration Stopovers

Christi Raines (Advisor: Dr. Gail Kantak)

Migratory waterfowl are an important component of wetland ecosystems and an important recreational resource in Michigan. One of the most noticeable, as well as economically and ecologically important species of migratory waterfowl, is the Canada Goose (*Branta canadensis*). Genetically diverse populations are important for the long term viability of the species and to support sustained harvest by hunters. We sampled Canada Geese from four state wildlife areas in order to assess differences in genetic diversity among these migratory stopover locations. It would be useful for wildlife managers to know if particular sites are more valuable than others in supporting genetically diverse populations. To answer this question, DNA was extracted from feathers using a Qiagen DNeasy kit. Templates were amplified by PCR using primers to highly polymorphic loci. Products were checked on agarose gels and then sized to determine genotype using the Beckman Coulter CEQ 8000 genetic analysis system. The parameters evaluated include number of alleles per population, observed and expected heterozygosity values and genetic differentiation among populations. Preliminary results indicate little genetic distinction among populations, but more samples are needed. More data is needed before incorporating results into management strategies for Michigan migratory Canada Geese.

B08. Assessing Ecosystem Health and Pollution in Saginaw County, Michigan Using Parasite-Host Relationships in Two Species of Ranid Frogs
Brenton Fetting (Advisor: Dr. Richard Trdan)

Evaluating the health of our environment is extremely important for scientists, state and federal agencies, and conservationists who are concerned with improving our environment and maintaining biodiversity. Research which has studied the use of parasites as biological markers of pollutants has increased in recent years, giving rise to a field referred to as environmental parasitology. The information presented is preliminary data providing a brief survey of parasites present in two species of ranid frogs found in Saginaw County, MI. Green frogs (*Rana clamitans*) and bullfrogs (*Rana catesbeiana*) were collected from three separate bodies of water: a stream near the campus of Saginaw Valley State University in Kochville Township; a pond in Wickes Recreational Park in Saginaw Township; and the Kimberly Bayou near the Shiawassee River State Game Area. A large number of lung flukes (Trematoda: Haematoloechidae) were collected, as were few adult tapeworms (Cestoda: Proteocephalidae) and few nematodes. The preliminary work proposes what pollutants may be present based on the parasites found. Further investigation will elaborate on the roles parasites play in our environment, and how their sensitivity to certain pollutants may indicate the presence of pollutants as well as the overall health of their environment.

B09. DNA Fingerprinting of Zebra Mussels (*Dreissena polymorpha*) in Saginaw Bay
Joshua Rivers and Nicole Voltenburg (Advisor: Dr. David Stanton)

Zebra mussels are an invasive species introduced into the Great Lakes from Europe in 1986. They first appeared in Saginaw Bay as early as 1990, where 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. In order to assess genetic variation, population substructure and patterns of gene flow, samples of zebra mussels were collected from the Saginaw and Tittabawassee rivers that empty into the bay, as well as from Gull Island (inner bay), Caseville (middle bay), Port Austin (outer bay) and surrounding areas in Lake Huron (Port Sanilac, Lexington and Alpena). DNA was extracted from frozen samples and PCR was used in order to amplify polymorphic fingerprint loci. The PCR products were checked on agarose gels and 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 and expected heterozygosity, population substructure (F_{ST}) and genetic distance (D). The preliminary results reveal a great amount of genetic variation and allow for the evaluation of patterns of gene flow in zebra mussel populations in Saginaw Bay.

Oral Session B: Electrical Engineering **Room: Pioneer-242**

--From EE Senior Design (See Pages 14-15 for abstracts)

E01. Alternative Energy Subsidized Refrigeration Unit
Matthew Clark, Curt Chalabian, Lauren Mott, and Asha Afreen (Advisor: Dr. Russ Clark)

E02. Programmable Battery Simulator
Jay Light (Advisor: Dr. Russ Clark)

E03. Solar Powered Portable Water Filtration Unit
Vishal Parimoo (Advisor: Dr. Russ Clark)

E04. Intelligent Ground Vehicle Competition 2011
Bryant Barnes, Addney Biery, Paul List, and Matthew Plachta (Advisor: Dr. Russ Clark)

E05. Visual Measuring Device
Joseph Nitz, Jamey Hackel, Jodie Hebeler, and Arlene Winfield (Advisor: Dr. Russ Clark)

E06. Solar Powered Sterling Engine
Abbas Alabbas, Ali Alghafli, Jessica McKeith, and Wade Sheets (Advisor: Dr. Russ Clark)

Oral Session C: Mechanical Engineering – I

Room: Pioneer-243

--From ME Senior Design I (See Page 18 for abstracts)

M01. Tile Cart Design Project
Jeremy Wolf, Joseph Gierman, Kristin Zaiki, and Kevin Koepplinger
(Advisor: Dr. Brooks Byam)

M02. Hot plate press welder
Saul Kue, Ron Badarak, and Hassan Abuhussain (Advisor: Dr. Thomas Kullgren)

M03. Miscanthus x Giganteous Biomaterial Manufacturing Process
Ali AlMomen, Greg Ratcliffe, and Hussain Al-Hilal (Advisor: Dr. Brooks Byam)

Oral Session D: Mechanical Engineering – II

Room: Pioneer-245

--From ME Senior Design II (See Pages 19-20 for abstracts)

M04. WFARM: Worm Factory: Automation and Recycling Matter
Douglas Butterfield, Jason Haubenstricker, and Brennan MacMillan
(Advisors: Dr. Brooks Byam and Prof. Ed Meisel)

M05. Design of FSAE Aero Ducting
Kyle Ball, Ali Alsadiq, Haidar Almohammedsaleh, and Ahmed Alghafly
(Advisor: Dr. Brooks Byam)

M06. Duro-Last Welding Nozzle
Dennis DeRop and Kimberly Wylie (Advisor: Dr. Joseph Shlien)

M07. Duperon Wind Turbine
Jared Mollan, Lenard Noel, and Nicholas Rowe (Advisor: Dr. Joseph Shlien)

M08. Duperon Corporation Low Flow Bar Screen Assembly Stand
Jerry Nelson, Krystal Oberski, and Blake Rhynard (Advisor: Dr. Brooks Byam)