

Student Research Symposium 2003

Abstract Proceedings

Prepared by

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**Farquhar College of Arts and Sciences
Nova Southeastern University**

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Math, Science, and Technology

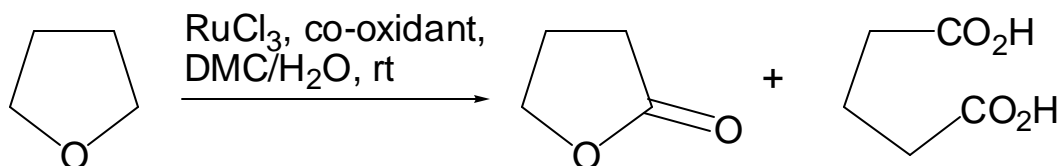
Ruthenium Tetraoxide Oxidation of Ethers

David E. Meade

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Veljko Dragojlovic**

Abstract



It has shown that, among ethers, tetrahydrofuran (THF) is difficult to oxidize to the corresponding lactone due to competing ring opening and formation of glutaric acid. Herein we report results of the study to examine the effects of various co-oxidants and phase transfer catalysts on the oxidation of THF.

Synthesis of Chemiluminescent Esters: A Combinatorial Synthesis Experiment for Organic Chemistry Students

Robert Duarte and Janne T. Nielsen
Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Veljko Dragojlovic**

Abstract

In this laboratory exercise a peroxyoxalate chemiluminescence experiment has been integrated with a combinatorial synthesis experiment. Students prepare a number of esters, in reactions between acyl chlorides and phenols, and test them for chemiluminescence. Each student prepares 1-2 esters if the experiment is parallel combinatorial synthesis, or two mixtures of esters if the experiment is split and mix combinatorial synthesis, and tests them for chemiluminescence. Results from the entire class are combined and, based on their results, the students identify general structural features of an active (chemiluminescent) ester. In addition to rubrene, which gave off the most intense light, a number of inexpensive fluorophores are suitable for this experiment including chlorophyll and anthracene. The laboratory exercise is suitable for introductory organic chemistry students and can be modified for more advanced students.

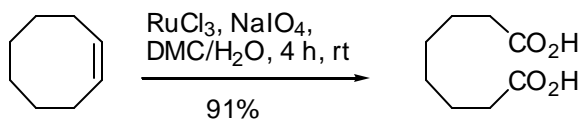
Dimethyl Carbonate–Water: An Environmentally Friendly Solvent System for Ruthenium Tetraoxide Oxidations

Judith Cornely

Division of Math, Science, and Technology
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Faculty Advisor: **Dr. Veljko Dragojlovic**

Abstract



Dimethyl carbonate (DMC)–water is an environmentally benign solvent system for ruthenium tetraoxide oxidations of various substrates including alkenes, alkynes, arenes, alcohols, ethers and aldehydes. Either hydrated ruthenium trichloride or hydrated ruthenium dioxide can be used as sources of ruthenium, while suitable cooxidants include sodium periodate, bleach and Oxone[®].

Gray Code Representation of Genetic Triplets

Krisn Ramcharitar

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Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Matthew He**

Abstract

Since the completion of the mapping of the human genome, much research has been undertaken in the area of genetics to discover which genes govern which aspects of human development. Due to the complexity of this task, researchers must rely on computers to perform a variety of computations. However, DNA does not easily lend itself to representation on computers and must be translated to a different form.

The objective of this project is to represent the triplets in the genetic code of humans as special binary codes, known as Gray Codes. The aim is that the large body of research already available on gray codes can be applied to DNA thereby revealing new perspectives on genetic code. Furthermore, gray codes are a natural way for computers to represent information, meaning that once a triplet sequence has been represented as a gray code sequence, all manner of data manipulation can be applied to it. This has the capacity to accelerate the rate at which research on genetic code can be performed, because software can take advantage of the gray code representation.

Enhancing Algorithm Efficiency Using Simplification Techniques

Leeor Geva

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Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Matthew He**

Abstract

Smart algorithms are the essential key in making computing faster and more efficient. Different techniques are used to optimize today's applications. Such techniques are using Horner's Method and Preprocessed Coefficients method to simplify algorithms. These methods break down advanced forms of polynomials in algorithms to simpler forms. I will demonstrate the benefits of using simpler polynomials in algorithms and the controversial overhead that goes along with breaking down the polynomials into simpler forms.

Generation of Fibonacci and Lucas Polynomials via Determinants

Bernd Losert

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Matthew He**

Abstract

Number sequences such as the Fibonacci numbers or the Lucas numbers can be expressed using matrices and determinants. For example, the determinant of a $n \times n$ matrix whose diagonal is made up of 1s and the super- and subdiagonals of i such that $i^2 = -1$, has been shown to give the $(n + 1)^{\text{th}}$ Fibonacci number. This paper will show how this representation can be extended so that the sequences generated by such determinants produce the Fibonacci and Lucas Polynomials.

Adhesion of Albumin to FDA Group I Contact Lenses

**Ogine Lo, Denise Gonzalez, Jessica Smith, Sanober Tapia, Chris Drennen and
Andrea Janoff**

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Edward O. Keith**

Abstract

Tear protein adhesion can contaminate contact lenses and reduce their effectiveness for the treatment of vision abnormalities.. Protein adhesion depends upon the type of contact lens material, and fluctuates with tear secretion rate and pathology. We examined the adhesion of albumin, a major tear protein, to FDA Group I contact lenses over a four day period. Never worn Optima FW contact lenses (Bausch and Lomb, Inc., Rochester, NY) were incubated in albumin dissolved in optical saline (0.2 mg/ml) contained in borosilicate glass vials. The concentration of albumin in the vials, and adhering to the lenses, was monitored with bicinchoninic acid (BCA). Albumin concentration in the vials decreased on day three, and then regained initial levels. After one day of incubation, albumin adhesion to lenses reached a plateau that was stable through the remainder of the incubation period. This pattern is in contrast to that of lysozyme, which adheres to lenses in an up-down-up-down pattern regardless of lens material. Both albumin and lysozyme adhered to a lesser degree to these lenses than to FDA group IV lenses. These results clearly indicate the need for further studies of this complex interaction.

Adhesion of Albumin to FDA Group IV Contact Lenses

**Akashi Patidar, Niki Hector, Premal Smart, Sheneeza Ishmael, Sanober Tapia and
Andrea Janoff**

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Edward O. Keith**

Abstract

Contact lenses are essential for the treatment of vision abnormalities. Tear protein adhesion can contaminate lenses and reduce their effectiveness. This adhesion depends upon the type of contact lens material, and fluctuates with tear secretion rate and pathology. We examined the adhesion of albumin, a major tear protein, to FDA Group IV contact lenses over a four day period. Never worn Acuvue contact lenses (Bausch and Lomb, Inc., Rochester, NY) were incubated in albumin dissolved in optical saline (0.2 mg/ml) contained in borosilicate glass vials. The concentration of albumin in the vials, and adhering to the lenses, was monitored with bicinchoninic acid (BCA). Albumin concentration in the vials decreased after one day of incubation, and then regained initial levels. Albumin adhesion to lenses increased to a plateau during the first two days of incubation. In contrast, lysozyme adhesion follows a consistent up-down-up-down pattern over four days of incubation, regardless of the type of contact lens. Both albumin and lysozyme adhered to a greater degree to these lenses than to FDA group I lenses. Much about this dynamic interaction remains a mystery, indicating the need for further study.

Formulation and Testing of a Low VOC Tile Adhesive

Alex Munoz

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Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Skip Pomeroy**

Abstract

Ceramic tile sales in the United States have experienced a period of eight years of uninterrupted growth. Sales have increased from 85.1 million square meters in 1991 to 206.9 million square meters in 1999. This is an increase of 143.1% in eight years. Mastic is a pasty cement used as an adhesive that provides a highly flexible, fast-setting, adhesive for setting floor and wall tile in indoor applications.

In November 1986, California voters overwhelmingly approved an initiative to address growing concerns about exposures to toxic chemicals. That initiative became The Safe Drinking Water and Toxic Enforcement Act of 1986, better known by its original name, Proposition 65. Proposition 65 requires the Governor to publish a list of chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm. Agents that cause cancer are called carcinogens; those that cause birth defects or other reproductive harm are called reproductive toxicants. Much current commercial mastic contains solvents that fall under this provision. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage (sometimes referred to as Solvent or Painters' Syndrome). In order to Prop 65 compliant it is necessary to re-formulate tile adhesives in such a way as to decrease or eliminate the use of solvents while still maintaining the properties of the material from a construction point of view. This report describes a new formulation using newly available polymer systems that allow low VOC mastics to be manufactured without a loss in performance.

Development and Application of a New Plasticizer for the Formulation of Self Leveling Underlayments with Improved Performance

Nick Straccione

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Skip Pomeroy**

Abstract

A high performance self-leveling underlayment is expected to flow and level like water and then hardens rapidly to allow foot traffic in the shortest time possible after it is poured. The additives that are necessary to produce the self-leveling flow, retard the hydration and hardening of the cement. The key is to create a material that will promote the flow without retarding the set. This study investigates the mechanisms of deflocculation and the comparison of a natural deflocculant, Casein, an electrostatic deflocculant and electrosteric deflocculation. The self-leveling underlayments are evaluated on flow, self-healing, time until ready for foot traffic and strength development.

Chemical Sciences Honor Society and the Pittsburgh Conference on Analytical Chemistry & Applied Spectroscopy

D'Vano Forbes, Mary Chrisochos, Tina Mehta and Angeli Niravel

Division of Math, Science, and Technology

Farquhar College of Arts and Sciences

Faculty Advisors: **Dr. Skip Pomeroy and Dr. Vic Shanbhag**

Abstract

The newly founded Chemical Sciences Honor Society (CSHS) is a unique, progressive chemistry honor society which fosters excellence in the field of chemistry as well as sciences in general. The CSHS boasts very rigorous requirements for induction as well as maintaining membership within the society. Although the society is new, there are many great things in its future. Recently, a group of CSHS members, along with Dr. Shanbhag and Dr. Pomeroy, attended the annual Pittsburgh Conference (PITTCON) in Orlando, Florida. PITTCON 2003 was a conference focusing on analytical chemistry and applied spectroscopy. A myriad of laboratory equipment manufacturers showed off their latest and most technologically advanced tools. In addition, interesting lectures on many different and novel concepts in the fields of analytical chemistry and applied spectroscopy were given. PITTCON 2003 was a wonderful experience that words cannot fully express, it was something only to be taken in by one's self in order to realize the magnitude and greatness of this conference.

Can Non-invasive Genetic Sampling Reveal the Identity of Felid Species on the Verge of Extinction?

Brigitte D. Shaw

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Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Emily Schmitt**

Abstract

Thirty-seven of the thirty-eight species of extant felids are listed as endangered or threatened. This work is an attempt to determine the identity of one of these threatened species living in a zoo in Baños, Ecuador. Based on the individual felid's history and physical features, it is hypothesized that it is a Florida panther (*Puma concolor coryi*). We also tested known domestic cat samples as a control. Collecting sources of DNA (such as blood or other tissue samples) for analysis of species identification is difficult when wild carnivores such as felids are the sample population. A more accessible noninvasive method for collecting DNA is hair sampling from either plucked or shed hairs. Although hair samples contain smaller amounts of DNA than blood or other tissues, the Polymerase Chain Reaction (PCR) can be used to amplify highly conserved mtDNA sequences of felids. Individual felid species and subspecies can be determined from one another by using conserved universal primers, PCR, and restriction enzymes. Restriction digest analysis of the amplified mitochondrial regions (using restriction enzymes that target known species mutational differences in these mtDNA regions) is one method used to identify the species of subspecies of unknown felidae samples. This is done by comparing the unknown samples with sample where the felid identity is known.

Using Mitochondrial DNA to Study Human Evolutionary Migration Patterns

Maya Georges

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Emily Schmitt**

Abstract

By examining differences within the control region of mitochondrial DNA, this research project attempts to link individuals to one of three original human migratory groups (L1, L2, and L3 haplogroups) originating in Africa. From previous research, it has been determined that the L1 and L2 haplogroups stayed in Africa and the L3 haplogroup spread out and eventually populated the rest of world. From the L3 haplogroup, many additional haplogroups can be identified (based on additional point mutations). DNA samples were obtained from volunteers through a mouthwash DNA extraction procedure. All subjects signed a consent form. The successful extraction of DNA was confirmed using Sybr Green dye and UV light. Once the DNA has been successfully isolated, the particular sequence of the mitochondrial control region containing the mutational difference between the L1/L2 and L3 human lineage can be targeted using specific primers and amplified following standard polymerase chain reaction (PCR) procedures. The PCR products will be cut with a particular restriction enzyme, HpaI, which targets the mutational difference between the L1/L2 haplotype and the L3 haplotype. The size of the fragments provides the distinction between the L3 haplotype and the other two haplotypes. Additional tests with other primers and restriction enzymes can then be used to further differentiate whether a sample contains the L1 or the L2 haplotype marker. If a person from our small sample group of NSU students has the L3 haplotype we would hypothesize the person to have been descended from one of the tribes of Africa that migrated out of Africa approximately 90,000 years ago. If the L1 or L2 haplotype is detected we would hypothesize that the person is more likely to have been descended from peoples who remained in Western and Eastern Africa.

Approaching the Standard of Excellence: Pre-pharmacy Society at NSU

Betsy Ojeda, Cynthia Jean, Christina Hung and Monica Todd
Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Vic Shanbhag**

Abstract

The Pre-pharmacy society at Nova Southeastern University was designed to unite students who are interested in pursuing a career in the pharmacy profession. It gives students an avenue to express their true passion for the field of pharmacy. The club serves as a channel for information to be spread from student to student and pharmacist to student. The Pre-pharmacy society also has the goal of triggering a student interest to become a pharmacist and commit to their profession. This organization welcomes speakers from local pharmacies, Professors, as well as students who are currently enrolled in the Pharmacy programs to speak about their experiences and any tips and ideas to give the students a little push in the right direction. The Pre-pharmacy society is a stepping-stone for a future in pharmacy that is characterized by compassion, empathy, expertise, and consideration for humanity.

Research Methods for the Isolation and Analysis of Essential Oils from Natural Resources

Bindu Niravel

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Vic Shanbhag**

Abstract

The purpose of this research is to carry out the extraction of essential oils from their natural sources using steam distillation, to assess the purity of these products using physical and chemical properties, to examine the practicality of alternative collection methods, and to assess the relationship between these products and compile the information about their medical uses—including alternative therapies. Since essential oils are mixtures, absolute separation is not an easy task. We isolated essential oils from several natural sources and characterized them with the use of IR and when appropriate compared our results with standards available.

Comparison of Natural Product Isolation Techniques

Nirav Patel

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Vic Shanbhag**

Abstract

Isolation techniques are used to separate compounds from a mixture. Natural products are isolated by a variety of methods depending on the property of the compound being isolated. This study attempted to evaluate isolation techniques and their efficiency and applicability. Two isolation techniques were used on five natural product samples that often possess medicinal uses. The two techniques were extraction with methylene chloride and simple distillation. The isolated products were partially characterized with the use of IR spectroscopy.

Serum Leptin Levels in Goldfish (*Carassius auratus auratus*)

Elizabeth Rosonow, Niki Hector and Milhenka Auguste

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Robin L. Sherman**

Abstract

Recent studies have begun to elucidate the physiological functions of Leptin, a hormone produced primarily by adipocytes. Serum Leptin levels have been tested in a wide variety of freshwater fishes which have been shown to produce Leptin. We will be testing blood serum from goldfish (*Carassius auratus auratus*) for Leptin. Goldfish are extremely hardy freshwater fish native to tropical and temperate waters throughout Asia and have been introduced world wide. After acclimation to the experimental tanks, blood will be drawn from 20 goldfish, allowed to clot, and the serum will be tested for the presence of Leptin using a commercial Leptin ELISA kit (ALPCO Diagnostics). Since Leptin has been found in other species of freshwater fish we expect that serum from goldfish will also be positive for Leptin.

Differences in Serum Leptin Levels in fed and Non-fed Goldfish (*Carassius Auratus Auratus*)

Milhenka Auguste, Elizabeth Rosonow and Niki Hector
Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Robin L. Sherman**

Abstract

Leptin, a hormone associated with fat metabolism, appears to play an important role in how the body regulates its fat supply. Previous studies have shown a positive correlation between serum Leptin levels and the amount of fat stored in the body, with greater levels of Leptin found in mice that were being fed regularly and reduced Leptin levels found in mice that were not fed. Other studies have verified the presence of Leptin in fish as well as in mammals. In this experiment, we will attempt to show a similar correlation between serum Leptin levels among fed and non-fed goldfish (*Carassius auratus auratus*). Following acclimation, 12 goldfish will be fed daily for one week while food will be withheld from an additional 12 goldfish. Following this manipulation of feeding, blood samples will be drawn from all fish. The blood will be allowed to clot and serum will be collected for testing using a commercial Leptin ELISA kit (ALPCO Diagnostics). Given the previously established correlation between feeding and Leptin levels in mammals, we expect to find a similar difference between fed and non-fed goldfish.

Photoperiod Effects on Leptin Levels in Goldfish *(Carassius Auratus Auratus)*

Niki Hector, Milhenka Auguste and Elizabeth Rosonow
Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Robin L. Sherman**

Abstract

Previous studies have shown a relationship between photoperiod and hormone production in vertebrates. Goldfish (*Carassius auratus auratus*) are freshwater fish commonly found in tropical and temperate waters in Asia with exotic introduction world wide. During different seasons of the year these fishes are exposed to wide variations in light intensity and duration. These variations in photoperiod cause hormone levels to fluctuate triggering seasonal changes in the fish's physiology. Leptin, an adipocyte-derived hormone, promotes weight loss through energy expenditure. In this experiment we will examine the effects of these variations in photoperiod on Leptin levels in goldfish. Sixteen goldfishes will be exposed to an extended (16 hour) photoperiod. Following a two week acclimation to this light cycle, blood samples will be collected from all fishes. Over the next two weeks the photoperiod will be gradually reduced to eight hours. The fish will be acclimated to this second, shortened photoperiod and additional blood samples will be collected. All blood samples will be permitted to clot and blood serum will be isolated. The blood serum will be tested for Leptin levels using a commercial Leptin ELISA kit (ALPCO Diagnostics). We anticipate significant differences between Leptin levels with long (high Leptin levels) and short (low Leptin levels) photoperiods and expect that this difference will correlate with the increased body fat necessary for seasonal reproduction.

Investigation of Genetic Connectivity Among Marine and Freshwater Populations of the Atlantic Stingray (*Dasyatis Sabina*)

Veronica Akle and Vince Richards
Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Mahmood Shivji**

Abstract

The Atlantic stingray is one of the few elasmobranchs to have conquered freshwater, establishing the only known permanent batoid population in the rivers and lakes of North America. The purpose of this project is to study the breeding and migration patterns of *D. sabina* over evolutionary time scales. It is hypothesized that the Florida freshwater populations were isolated in the St. Johns river basin when sea level fell during the Pleistocene. A major question we will address is whether marine and fresh water populations have been genetically isolated since that time. We are collecting mitochondrial DNA control region sequences from *D. sabina* in the following three locations: Florida west coast (Tampa Bay; marine animals), Florida east coast (Melbourne; marine animals), and the St. Johns River basin (fresh water animals). Comparing genetic variation within and among these populations will reveal the population history and allow inferences on the extent of genetic connectivity among *D. sabina* from these environments. Using PCR protocols developed at NSU's Oceanographic Center, we have successfully sequenced approximately 720 bases from three individuals from each geographic location. More animals are being sequenced to determine the utility of the chosen locus for population genetic studies. Our results will reveal the extent of genetic diversity present in *D. sabina*, and also have direct conservation and management applications because this stingray has been targeted as an environmental indicator species for anthropogenic factors in the St. Johns River basin system.

Caffeine and the Reduction of the Spontaneous Activity of A₁ Adenosine Receptors

Tina Mehta

Division of Math, Science, and Technology
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. John Shryock (University of Florida)**

Abstract

Caffeine is one of the most widely consumed stimulants, and has an attendant addiction liability. It also may be a factor in causing human disease.

The research was conducted to determine the effect of caffeine on the A₁ adenosine receptor in the presence of an allosteric enhancer, which increases the activity of the receptor. Increased A₁-adenosine receptor activity activates an inhibitory G protein, which leads to a decrease in cyclic AMP (cAMP). The amount of cAMP indicates the level of intracellular activity of the cell.

Chinese hamster ovary (CHO) cells were grown in culture medium, and the effect of the adenosine receptor agonists and antagonists was determined by cAMP level. Acute incubation was used to conduct the experiment and the incubation was impeded by hydrochloric acid (HCl). cAMP level was calculated by radioimmunoassay (RIA), which determined the affect of the drug on the cells.

Results indicated that caffeine does antagonize the effect of endogenous adenosine. Drug companies are planning to market allosteric enhancers, and those individuals that consume caffeine with the intake of these medications will experience a decreased in the effect of the drug.

Social and Behavioral Sciences

Predatory Behavior and Web Orientation of the Golden Orb-Weaving Spider, *Nephila clavipes* Linnaeus

Regina L. Vesci

Division of Social and Behavioral Sciences
Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Michael Justice**

Abstract

Nephila clavipes is a type of orb-weaving spider. This means that their web comprises a hub, radii, and a sticky spiral in an orb shape. Orb weavers typically have poor vision and feel vibrations in their web to detect prey. *Nephila clavipes* is mostly found in the southern U.S. and in tropical climates. Adult female *Nephila* webs are usually very large, averaging 1 m (39'') or more in diameter. These spiders are not poisonous to humans but may seem intimidating because of the large size of the female, which varies but is about 25 mm (1'') body length. The purpose of this study was to describe their predatory behavior and web orientation. Searches were conducted in Tree Tops Park and because of their size they were spotted fairly quickly along nature paths. The date, time, location, temperature, and weather were noted first. The first measurements were done at a distance and include measuring the angle of the plane of the web with a clinometer, noting missing legs, measuring the compass direction of the dorsum, noting wrapped prey, barrier webs, *Argyrodes* (kleptoparasitic spiders), male *Nephila*, and any damage to their web. The next measurement was touching a 100Hz tuning fork to the web to simulate prey. Responses were scored 0-6 (no response to full response). Leg segments were measured as an index of size of the spider, along with how high the hub of the web was from the ground, the spiral height, and the spiral width. The results found the *Nephila clavipes* typically have webs that face east. Their webs were found to be only slightly inclined from vertical. The response to the 100Hz tuning fork usually was an approach and bite of the fork. The tendency of the spiders to build their webs facing east may be related to thermoregulation or prey capture. The response to the 100Hz tuning fork closely resembles the *Nephila* response to relatively small, nonthreatening prey.

Are People Involved in InterCouple Dating Relationships More Intimate than Those in IntraCouple Relationships?

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Faculty Advisor: **Dr. Michael D. Reiter**

Abstract

This research project explored the area of InterCouple dating relationships. InterCouple relationship is defined as a couple who hail from different religions, cultures, and/or races. Rates of InterCouple dating has been increasing, especially on college campuses. This study explores whether there is a difference in how individuals engaged in InterCouple or IntraCouple relationships perceive their relationship in terms of intimacy. It is hypothesized that there will be a difference between these two groups on one or more scales of intimacy due to societal and/or personal expectations. Over 100 individuals participated in this study. The criteria for inclusion was to currently be in a six month heterosexual romantic relationship and be between 18 and 25 years of age. All participants were given the Personal Assessment of Intimacy in Relationships (PAIR) scale (Olson & Schaefer, 2000). There was a good distribution of InterCouple and IntraCouple participants. The data was analyzed to determine if these two groups differed significantly in the area of interpersonal intimacy. Out of nine subscales of intimacy, only the current social intimacy subscale showed a significant difference. Implications of this research will be given.

ADD to ADHD Label Change: Its Effect on a College Population

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Faculty Advisor: **Dr. Marcia E. Silver**

Abstract

Changes in labeling Attention Deficit Disorder (ADD) to Attention Deficit Hyperactivity Disorder (ADHD) were investigated in a college population. Forty students completed a questionnaire. Of the total, 22 students did not know about label changes and 18 students did. The 18 students who answered yes provided evidence that even students who are aware of the label change have little understanding of the conditions involved and the need for a change in labeling. Results supported the contention that most students did not know about changes in labeling. Therefore, more knowledge about ADHD is needed to identify and diagnose the disease.

Suicidal Ideation in Older Adolescents

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Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Marcia E. Silver**

Abstract

As many as 10% of American adolescents have attempted suicide at some point in their life, and the percentages increase in the general population. In an effort to understand the increase in suicide attempts in late adolescence, suicidal ideation was measured in older adolescents between the ages 18 to 21-years-old. Fifty-six participants completed a questionnaire which included both a measure of depression and a negative emotion scale. Although few of the respondents reported that they had contemplated suicide or had thoughts of suicidal ideation due to either depression or negative emotions, it was found that 42.5% of the respondents experienced negative emotions while 70% expressed depressive thoughts. These findings substantiate research stating that adolescents' suicidal attempts are rarely impulsive reactions to immediate distress or upsets, but are well-thought out and they have usually made appeals for help to no avail.

Oceanographic Research Center

Determination Of Different Benthic Reef Communities In Broward County, Florida (Usa) Using Acoustic Remote-Sensing and in Situ Techniques

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National Coral Reef Institute

Nova Southeastern University Oceanographic Research Center

Faculty Advisor: **Dr. Bernhard Riegl**

Abstract

Typical Caribbean reef communities of variable composition and density exist on four parallel ridges, at varying depths along the Broward County (FL, USA) coast. Two of these ridges, at 7-13m and 15-30m depth, are drowned early Holocene coral reefs of 5 ky and 7 ky uncorrected radiocarbon age, respectively. Previous work has shown that the reef communities overlying these reef-ridges can be detected and mapped using acoustic remote sensing and has suggested that different benthic assemblages may exist between each of the reef ridges. In this study, *in situ* community data was taken for each reef-ridge using traditional 50m line-intercept transects. These data were analyzed and clustered using multi-dimensional scaling (MDS) and compared with similarly clustered data obtained from an acoustic survey of the same area. The *in situ* community data show four distinct benthic communities, each corresponding to a single reef-ridge. This clustering agrees well with the acoustic data which, when using principle components analysis (PCA), similarly show a unique habitat type on each of the four reef-ridges. The reef-ridge community closest to shore (5-7m depth) showed 38% live cover, and was dominated by Alcyonaceans (15% total cover). The second reef-ridge (7-13m depth) was dominated equally by Macroalgae and encrusting zooanthids, with each group representing 15% of the total cover. Total live cover on the second reef-ridge community was about 49%. The third reef-ridge community from shore (13-16m depth) had about 60% living cover and was dominated by Macroalgae, which accounted for 30% of total cover. On the fourth and deepest (15-30m) reef-ridge community, Alcyonaceans were the dominant fauna (20% total cover), however, sponges were nearly as abundant (14% total cover). Total living cover on the deepest reef-ridge community was 42%. Total Scleractinian cover was generally low on all reef ridges (4% mean cover for all reef-ridge communities), with the first reef-ridge having the highest total scleractinian cover (6%) and the second reef-ridge having the lowest (3% total cover). This total data set suggests a depth-dependant zonation pattern that does not occur across a single-reef ridge, but rather on a larger spatial scale across the entire reef-ridge system of Broward County.

Pine Crest School

Determination Of Free Insulin-Like Growth Factor, IGF-1, and The Effect of Pastuerization in Milk

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Pine Crest School

Faculty Advisor: **Dr. Skip Pomeroy**

Abstract

The hormone insulin-like growth factor I (IGF-1) is known to have a broad range of effects including promotion of cell survival, stimulation of metabolism, and proliferation of differentiating cells. In 1994, the Food and Drug Administration (FDA) approved the use of the recombinant Bovine Growth Hormone (rBGH). According to rBGH manufacturers, injections of rBGH causes cows to produce up to 20 percent more milk. IGF-1 is the same in humans and cows. The FDA has insisted that, if consumed orally, IGF-1 is not dangerous, and thus does not pose a health risk. It is highly likely that IGF-1 promotes transformation of normal breast cellular activity to breast cancers. In addition, IGF-1 maintains the malignancy of human breast cancer cells, including their invasiveness and ability to spread to distant organs. (IGF-1 has similarly been associated with colon cancer.) Milk Producers have stated that IGF-1 is destroyed in the pastuerization process. This study utilizes Enzyme-Linked Immunosorbent Assay, ELISA, to quantitate the levels of free IGF-1 in milk before and after the process of pastuerization.

University School

Detection of Shoreline Fecal Contamination of a South Florida Beach using Traditional Indicator Organisms and a Novel Molecular Approach

Leonard Stein, Lauren Vernon and Randall Wald
University School

Faculty Advisors: **Christina Gwaltney and Andrew Rogerson**

The water quality of recreational bathing beaches in Florida is monitored by the Florida Department of Health who count the numbers of fecal indicator organisms in the water. This is necessary because considerable epidemiological research has shown that there are health risks associated with bathing in sewage-contaminated waters. Recently, the U.S. Environmental Protection Agency (EPA) in their 1999 Action Plan for Beaches and Recreational Waters recognized that the 'swash' zone of the beach may pose an increased health risk for children and other beach users. It was reasoned that sand may filter and accumulate fecal organisms and that the protective sites afforded by the high nutrient sand environment may increase the survival of fecal organisms. Ongoing research at the Oceanographic Center of NSU has shown that sand does indeed harbor higher numbers of fecal indicator organisms, although it is possible that these are 'environmental strains' adapted to life in sand. In short, their presence may not accurately reflect the degree of fecal contamination. The present study sampled a beach that is little used by bathers (i.e. John U. Lloyd State Park Beach). The numbers of fecal indicators (*E. coli*, fecal coliforms, and enterococci) in the water and sand of this beach were enumerated and the counts were compared with available data for the nearby, heavily used, Hollywood Beach. Over a 4-month sampling period, numbers of indicator bacteria varied markedly, however, there were always more bacteria in the sand than in the water (around 5 fold). The numbers of bacteria at Hollywood beach were close to double the levels at John U. Lloyd Park beach. This suggests that the number of bathers influenced the fecal counts. While some of the bacteria may have come from bathers directly, it is likely that the effects were indirect. For example, the sloughing of skin cells from beach users may have added nutrients to the sand and subsequently increased the survival (and number) of indicator bacteria. The flushing out of these bacteria from the sand by wave action would have carried more bacteria into the water column. Therefore, this result suggests that counts in the water column at busy beaches may be elevated and consequently may be overestimating the levels of sewage contamination in the water. In an attempt to substantiate this conclusion, molecular methods were used to try to detect the human fecal bacterium *Shigella* in water and beach sand. Primers specific for a toxin gene in this bacterium were used. Any positive amplification would suggest that the *Shigella* were recent and from sewage since 'environmental' *Shigella* inhabiting the sand would be unlikely to retain this toxin gene. PCR amplifications of water samples and sand samples all failed to detect this *Shigella* on John U. Lloyd beach tentatively suggesting that the levels of indicators were not truly reflecting fecal contamination. At this time, the data is too preliminary for firm conclusions, however, it does show promise for using molecular methods in water quality assessment.

Class Term Projects

Math, Science, and Technology

- BIOL 2600 Medical Terminology, **Dr. Ed Keith**
- CSIS 1400 Discrete Mathematics, **Dr. Matthew He**
- BIOL 1530 Biology II/Lab, **Dr. Emily Schmitt**
- ENVS 4300 Industrial Ecology, **Dr. Emily Schmitt**
- MATH 2200 Calculus II, **Dr. Frank Zhang**

Math, Science, and Technology

BIOL 2600 Medical Terminology: Dr. Ed Keith

Title: Mitral Valve Prolapse
Presenter: **Rhodora Aguinaldo**

Title: Angiogenesis
Presenter: **Veronica Ackle**

Title: Ebola Virus
Presenter: **Michelle Cortes**

Title: Intravenous Pyelogram (IVP)
Presenter: **Marco Gonzalez**

Title: Vitiligo
Presenter: **Jordan Gularek**

Title: Parkinson's Disease
Presenter: **Po-Jui (Bryan) Lin**

Title: Endometriosis
Presenter: **Monica Perez**

Title: Multiple Sclerosis
Presenter: **Abigail Williams**

Title: Angioplasty
Presenter: **Beau Ugarte**

Title: Asthma
Presenter: **Sana Syed**

CSIS 1400 Discrete Mathematics: Dr. Matthew He

Title: Computer and Network Security
Presenter: **Mario Camire and David Doriscar**

Title: Huffman Code and Its Applications
Presenter: **Andrew Lee and Jennifer Martin**

ENVS 4300 Industrial Ecology: Dr. Emily Schmitt

A Life-Cycle Assessment Of Dasani-Brand Bottled Water vs. Brita-Brand Water Filters

Patrick Murphy

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Farquhar College of Arts and Sciences

Faculty Advisor: **Dr. Emily Schmitt**

Abstract

Dasani[®] bottled-water and a popular home water filter kit (Brita[®] Water Filtration Pitcher) were analyzed using a Life Cycle Assessment (LCA). This research concentrates on the complete life-cycle of each product including aspects such as production, price, convenience, disposal or recycling, and the resource inputs and emission outputs. In the end the two products were compared in a summary report card and recommendations for improvement were given. The Coca-Cola Company, who owns Dasani[®], uses reverse osmosis filters to purify local water and deposits the purified water in plastic bottles, whereas the Brita[®] Water Filtration Pitcher uses an activated carbon/ion exchange filter. Dasani[®]'s water is packaged into a recyclable 20 oz. bottle that is composed of polyethylene terephthalate, like most other plastic bottles. The Brita[®] Water Filtration Pitcher is for home use and features few high-density polyethylene components.

Three cycles of the Brita[®] Water Filters (120 gallons) and the equivalent number of Dasani[®] bottled waters (768, 20 oz. bottles) were analyzed. The cost of the Dasani[®] bottled waters to the customer was calculated to be around 17.5 times more than the three cycles of Brita[®] Water Filters. In the initial stages of production the Brita[®] and Water Filters consume more natural resources, however, the Dasani[®] product requires far more natural resources and emits far more pollutants into the environment after repeated cycles of use.

Recommendations to make the Dasani[®] bottled water follow a better design for the environment include using a type of container that can more effectively biodegrade or be reused, and for the company to organize a better recycling system. The Brita[®] Water Filtration Pitcher could be improved by including a recycling system or a way to re-use the used parts instead of just replacing them.

BIOL 1530 Biology II/Lab: Dr. Emily Schmitt

Herbal Medicine: Not Always a Safe Alternative to Traditional Medicine

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Faculty Advisor: **Dr. Emily Schmitt**

Abstract

The objective of this literature research project is to analyze the medicinal effects of three widely used plants (Milk Thistle, Echinacea, and Kava-Kava). It has been observed over the last few years that herbal medicine is being increasingly utilized because our population is becoming interested in its benefits. In a society that is very advanced technologically in every aspect of life, herbal medicine can seem a safe alternative to the powerful drugs and chemicals used today. However, just because the medications contain only plant extracts, this does not necessarily make them safer. For example, Kava-Kava is so potent that it can dramatically damage liver tissue. In reality, very few people know which plants actually work and which do not. Many drugs are being advertised to be miracle drugs, when in fact they have not been proven to have any beneficial effect. Milk Thistle has been used for liver conditions, but studies show patients do not get any significant benefit from taking the plant extract. Although many plants seem beneficial, more research still needs to be done. It is important for us to learn about these herbal drugs and to be extremely careful in selecting diet supplements (which is the form in which most plant extracts are bought) because they do not go through the premarket approval process that is required for other traditional drugs. Because herbal medications are not controlled by the Food and Drug Administration, it is very difficult to accurately assess them. In fact, very few retailers actually put the concentration of the ingredients contained in the different medications. It is imperative for society to be aware that, while herbal medicine in the form of supplements can seem very appealing, it is sold without rigorous testing for safety and efficacy.

The “Jurassic Park” Effect: Can Extinct Species be Brought Back to Life?

Perry Dave

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Faculty Advisor: **Dr. Emily Schmitt**

Abstract

The objective of this literature research project is to determine whether cloning of extinct species can actually occur. In order to examine the feasibility of such a process, a species known as the thylacine was studied. The thylacine has been extinct for seventy years. An embryonic pup along having good quality DNA has been preserved. Cloning of extinct species, also called the “Jurassic Park” Effect, may become a reality within the next 10-15 years if the cloning of the thylacine is successful. In my literature research I discovered one peer-reviewed experiment that tested whether parts of extinct species could be cloned. The experiment used 12 different specimens ranging from pig organs to different Egyptian mummies as well as the thylacine. The experiment showed that cloning parts of ancient organisms was possible, but that it would probably harder to clone the entire organism, as that has not yet been done. The cloning of the thylacine would be a major step toward actually cloning more organisms that could eventually create a real “*Jurassic Park*.” Once cloning of extinct species becomes more feasible, it will undoubtedly raise ethical questions involving heated debates concerning whether or not extinct species should really be brought back to life.

Ebola Virus: What Is It And Should We Be Concerned About It Today?

Natalia Maldonado

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Faculty Advisor: **Dr. Emily Schmitt**

Abstract

The objective of this literature research project is to find out information on the new advances in the search for a vaccine against Ebola and how it contrasts with the potential use of the disease in bioterrorist attacks. The virus, which leads to tissue destruction and massive bleeding, is a very serious and high mortality rate disease which spreads quickly through the air, needles, and contact with infected bodily fluid. The Ebola virus is animal-borne with the natural reservoir still unknown. Emerging in the Democratic Republic of Congo in 1976, no cure has been found for the virus even with the numerous attempts that have been made till the present day. However, Sullivan and the Scripps Research Institute are some examples of scientists desperately searching for methods to vaccinate against the virus. Using antibodies and DNA immunizations can be the missing link for a final cure. There is also the threat that terrorists may use this virus to cause harm. In the past there have been countries, such as the Soviet Union, or terrorist groups, such as the Japanese group Aum Shinrikyo, that have been active in the acquisition of biowarfare agents. Ebola virus should not be taken lightly due to its high mortality rate and no vaccine being currently available. Also the possibility of bioterrorism being used against the Nation is high with the potential for war and past Anthrax deaths. That is why there must be certain actions taken by the government to protect against such attacks anywhere. Funding for the Biosafety laboratories should be given for increased efforts to find effective vaccines for biowarfare agents.

Underwater Noise Pollution & SURTASS LFA

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Faculty Advisor: **Dr. Emily Schmitt**

Abstract

The objective of this literature research project is to determine the effect of sonar noise on whales and to establish why use of such sonars should be condoned. In recent months, the national security of all the countries of the world may be at stake due to the supposed possession of activated nuclear weapons by various countries. The Navy is trying to protect the United States from attack by an underwater missile or submarine through the use of the Surveillance Towed Array Sensor System and Low Frequency Active Sonar (SURTASS LFA). This active sonar that does its work with the use of “pings” in order to detect submarines that are high-tech and more difficult to see underwater. These “pings” create underwater noise pollution as sound travels about five times faster through water than air. These sounds interrupt various whales’ ability to find mates, navigate, hunt for food, avoid predators, and communicate with their young. The Navy admits that the damages incurred on the animals include tissue damage, permanent threshold shift in hearing, and in certain cases, resonance on the animals’ internal organs. The National Resources Defense Council (NRDC) wants to prohibit the use of active sonar by ensuring the Navy is in court, however, the Navy has a duty to protect people and has taken preventive measures to ensure that the fewest possible marine organisms are hurt with the system’s operation. The latest legislation has allotted the Navy a permit for a geographically limited area of operation off the coast of Japan. The benefits of a system that will detect the newer, quieter, deeper traveling submarines (possibly carrying lethal weapons) are ubiquitous and necessary. Especially in times of war, it is quite necessary to operate the SURTASS LFA to aid in detecting potential underwater assaults.

Bananas Under Attack

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Faculty Advisor: **Dr. Emily Schmitt**

Abstract

The purpose of this literature research is to understand the issues surrounding the possible extinction of bananas by finding a way to stop the fungus, *Fusarium oxysporum f. sp. cubense* also known as Fusarium wilt from getting into the vascular tissue of bananas and eventually causing death. Since bananas are sterile and clones of one another they are not as genetically diverse as most species. As a result, a pathogen such as *Fusarium oxysporum* has a great advantage when its host is a banana. Research on this issue has been in progress for several decades and is still continuing. Bananas with different genotypes have been bred in laboratories in an attempt to create diversity and resistance to the fungus. Gros Michel (a breed of bananas) was susceptible to *Fusarium oxysporum* and had to be replaced by wilt-resistant Cavendish clones. The Cavendish cultivars were popular and unaffected for a while but are now the victims of *Fusarium oxysporum* as well. The fungus has been studied extensively around the world. It has been subdivided into four races, with Race 4 being the most common. Genetic markers such as vegetative compatibility groups (VCGs) are used in an attempt to determine which cultivars fall into different VCGs. If fungi belong to the same VCGs, exchange of genetic information can occur. Contrarily, if the fungi are incompatible, they are genetically isolated. Along with the continuous research on *Fusarium oxysporum*, scientists are attempting to find different ways to breed bananas and save them from extinction. Techniques such as genetic recombination, modification of diverse triploid genotypes, and production of new triploid recombinants are being developed.

Hanging On By a Thread: The Human Genome Project

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Faculty Advisor: Dr. Emily Schmitt

Abstract

The objective of this literature research project is to examine some of the scientific, social and legal implications as well as applications associated with the Human Genome Project (HGP). A recent application of the HGP involved the determination of gene loci for specific conditions such as bipolar disease. A review of several population studies, written by Mark Escamilla, revealed the prominence of bipolar disorder via the analysis of pedigrees. There is currently no conclusive evidence of a specific bipolar disorder locus, however, Escamilla states that research involved with finding the locus is promising.

Additionally, by identifying specific genetic markers, the origins of humans and particular phenotypic and genotypic trends can be followed. This will help shape and redefine evolutionary theories. For instance, research performed by E. Aranson, disclaimed the idea of homogeneity in the Iceland population. Despite the statistical analysis put forth by E. Aranson, scientists still rely on the hypothesis that the Iceland population is a result of the bottleneck effect and/or the founder effect, both of which are migratory mechanisms that imply genetic homogeneity.

Aside from the advantages of this endeavor, the allocation of limited funds into this research is heavily disputed. Certain consequences of this research are the potential for genetic discrimination and the lack of genetic privacy. Also, ownership and access to the genome need to be delegated. Furthermore, possibilities such as “designer people” could be imminent with the unraveling of DNA. No one is sure of the full impact of the Human Genome Project, but decisions made about this research will be long-lasting.

Robots in Medicine

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Faculty Advisor: **Dr. Emily Schmitt**

Abstract

The objective of this literature research project is to show how robots are becoming more and more part of our lives in medicine. Today robots are able to operate from the brain to the hip. Robots are also starting to play a significant role in the pharmaceutical industry. There are many different types of robots and they all do a wide range of tasks. Some examples are autonomous robots, which perform fixed functions, and microbots that are tiny experimental devices that perform tasks like delivering drugs within the body. In my literature research I discovered two different peer-reviewed experiments that tested how well robots function in medicine. The first experiment involved individuals using robot-assisted therapy, which was compared to manual physical therapy done by a therapist. Individuals using robot assisted therapy showed larger improvements in their proximal movement after one month of training and an increase in strength after two months. The second experiment performed involved testing simple laparoscopic maneuvers on seven pigs and there were no complications. This experiment showed how with the use of a robot surgical dexterity can be enhanced. Robots improve the quality of physical therapy, make smaller incisions, enhance technique, and remove natural hand tremor. Further innovations in instruments for robotics should make devices more user-friendly, thus improving ergonomics, tactile perception, and force feedback. The role of robots in medicine is developing at a fast pace, however there are still many more obstacles to overcome.

Transgenic Plants: Environmental and Agricultural Issues

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Faculty Advisor: **Dr. Emily Schmitt**

Abstract

The purpose of this literature research project was to investigate the impact transgenic plants may have on the environment, U.S farmers, and third world farmers. This was done through an assessment of a number of peer-reviewed journal articles. Transgenic plants are rapidly being developed through the use of biotechnology for a variety of agricultural, pharmaceutical, and industrial uses. Others are being developed specifically for environmental purposes. Transgenic *Arabidopsis spp.* plants were reported to function as pollution cleaners by effectively absorbing heavy metals. With crops engineered to produce their own *Bacillus thuringiensis* (Bt) toxins, pesticide use is expected to decrease. Herbicide-resistant crops reduce the applications of herbicide needed, although the Union of Concerned Scientists reports that some farmers experienced more herbicide usage and incurred more expenses with bioengineered crops such as Monsanto's RoundupReady[®] soy and Bt cotton. Some transgenic crops may pose possible environmental risks. A major risk is the accelerated development of insect resistance to the Bt toxins. Resistant pest populations would not only undo the environmental benefit of no longer needing to use pesticides, but also harm organic farmers, as Bt sprays are one of their main resources for natural pest control. Third world farmers would benefit from the engineering of frost, drought, and pest resistant crops, obtaining higher yield, with less management effort. However, paying for the expensive technology (sometimes annually) might cancel out some of the third world farmers' financial gain. Not many field studies have been performed as of yet, but transgenic plants do have potential to alter our environment at a grand scale.

MATH 2200 Calculus II, Dr. Frank Zhang

Using Mathematica to Illustrate Volumes of Revolution

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Faculty Advisor: **Dr. Frank Zhang**

Abstract

Mathematica is a system for Doing Mathematics by Computer. It is used by a wide range of industries to help in complex calculations for precise results. For this Calculus 2 project we will demonstrate volumes of revolution. Volumes of revolution are used today in industries such as plastics and container manufacturing, yet not limited to these two applications. We will present the steps and processes to perform these calculations and show the ease and agility of the Mathematica software application.