

**MONMOUTH
UNIVERSITY**

SCHOOL OF SCIENCE

TWELFTH ANNUAL

STUDENT RESEARCH CONFERENCE

Wednesday, April 17, 2013

**Great Hall
Wilson Hall**

**Poster presentations of student
research projects in**

Biology

Chemistry, Medical Technology and Physics

**Computer Science and
Software Engineering**

Mathematics

**MONMOUTH UNIVERSITY
SCHOOL OF SCIENCE**

**TWELFTH ANNUAL STUDENT RESEARCH CONFERENCE
WEDNESDAY, APRIL 17, 2013
WILSON HALL**

Presentations by Department

Department of Biology

Diel and Seasonal Trends in the Ichthyoplankton Community of Barnegat Bay, NJ
Katherine Markowitz, Chandler Shaeffer and Peter Chace
Faculty Mentors: Dr. Ursula Howson and James Nickels

Effect of Resveratrol Treatment on Fibrosarcoma Cells
Kaveri Kaushal
Faculty Mentor: Dr. Dorothy Lobo

Excitatory and Inhibitory Imbalance in the Receptor Preteome of Adolescent Alcohol Dependency
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Gelatinous Macrozooplankton and Abiotic Factors of Barnegat Bay
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The Effect of Reduced Visual Stimulus during Catching and Throwing a Lacrosse Ball
Shivam Patel and Stephanie Wargo
Faculty Mentor: Bernadette Dunphy

The Utilization of Rope Undulations as an Alternative to Traditional Shoulder Strengthening Techniques in Young Athletes
Shivam Patel and Stephanie Wargo
Faculty Mentor: Bernadette Dunphy

Department of Chemistry, Medical Technology and Physics

Ligand-Bridged Bimetallic Compounds

Omkan Menon, Vivek Patel, and Heather Siebert

Faculty Mentor: Dr. Gregory Moehring

Modelling of Thermochemical Isomerization in Eight-Coordinate Rhenium Complexes

Omkan Menon

Faculty Mentors: Dr. Dmytro Kosenkov and Dr. Gregory Moehring

Molecular Modeling of a DNA Binding Potential Anti-Cancer Drug: Napthaline Diimide

Samantha Silvent and Gary Prato

Faculty Mentors: Dr. Dmytro Kosenkov and Dr. Massimiliano Lamberto

Reactivities of Organic Arsenical Pesticides on Natural and Engineered Adsorption Surfaces

Brenda M. Lobb, Lauren s. Lechner, Shaharyar Ahmad

Faculty Mentor: Dr. Tsanangurayi Tongesayi

Theoretical Treatment of Solvent Effects on the Electronic Transitions in Viologens

Kevin Wioland

Faculty Mentor: Dr. Dmytro Kosenkov

Towards the Design of Solar Cells: Modeling of Peridinin-Chlorophyll Protein Chromophores

Erik Braunstein, Anthony Cappadona, Scott Anton, and Daniel Chang

Faculty Mentor: Dr. Dmytro Kosenkov

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Put-A-Tag: A Generic Tagging Tool

Steven Cregan, Garrett Haas, Gage Jackson, and Patrick McDonald

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The Mark -- A Commenting Application

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ANOVA vs. Kruskal-Wallis Test on Dune Grass Biomass and Diversity

Daniel Brownridge, Casie Illig, Brenda Lobb, Alex Moncman, Axhi Popinara

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Department of Mathematics

Determining the Effectiveness of Blood Pressure Cuffs Used on Dogs

Kaitlyn Kramer and Lauren Johnson

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Faculty Perceptions of Information Literacy

Monica Kuegler, Matthew Hand, and Danielle Trancucci

Faculty Mentor: Dr. Richard Bastian

Retrospective Survival Analysis of Tracheal Stent Surgery

Kaitlyn Shields

Faculty Mentor: Dr. Richard Bastian

MONMOUTH UNIVERSITY
SCHOOL OF SCIENCE
DEPARTMENT OF BIOLOGY

DIEL AND SEASONAL TRENDS IN THE ICHTHYOPLANKTON COMMUNITY OF BARNEGAT BAY, NJ

Katherine Markowitz, Chandler Schaeffer, and Peter Chace

Department of Biology

Faculty Mentors: Dr. Ursula Howson and James Nickels

ABSTRACT

Ichthyoplankton are a vital component in estuarine ecosystems, as a necessary prey source for higher trophic levels and as indicators of ecosystem health. However, little information is known about the abundance and distribution trends of ichthyoplankton in Barnegat Bay, the largest estuarine ecosystem in New Jersey. The purpose of this study is to gain a better understanding of larval fish populations and assemblages in this region by enumerating and identifying the ichthyoplankton collected from three stations in Barnegat Bay. Our data and information will provide further insight on the health of Barnegat Bay.

Sample collection occurred biweekly from May 2012 through March 2013 at three sites on Barnegat Bay, ranging from Seaside Park to Beach Haven. Diel sampling events were done in July and October, where samples were taken at four and six hour increments. Surface tows were conducted with two bongo nets (200 μ m and 500 μ m mesh) separately for two minutes, with flow meters measuring volume of water sampled. Water quality parameters measured included temperature, salinity, conductivity, transparency, and dissolved oxygen. In the lab, ichthyoplankton were identified to the lowest taxonomic level, enumerated, and measured.

EFFECT OF RESVERATROL TREATMENT ON FIBROSARCOMA CELLS

Kaveri Kaushal

Department of Biology

Faculty Member: Dr. Dorothy Lobo

ABSTRACT

Resveratrol, an antioxidant found in the skin of grapes, has been known to decrease the proliferation of human HT-1080 fibrosarcoma cells. Resveratrol may prevent tumors by inducing apoptosis in HT-1080 cells. Mitogen-activated protein kinase phosphatases (MKPs), signaling molecules known to play a role in regulation of apoptosis and cell cycle control, may play a role in the response of HT-1080 cells to stress and may be involved in the response of cells to resveratrol. The objective of this project is to study the negative regulation of signaling pathways by phosphatases and their role in the stress response of HT-1080 fibrosarcoma cells.

Previously, HT-1080 cells were treated with resveratrol, and a decrease in proliferation of cells was observed as expected. In order to determine whether MAPK family members were involved in the decrease in proliferation, phosphorylated ERK and total ERK levels were studied and it was determined that these levels did not change upon resveratrol treatment. Thus, ERK is not involved in helping resveratrol to slow tumor formation.

Currently, phosphorylated p38 levels in resveratrol-treated HT-1080 cells were found to remain unaltered. Phosphorylated JNK levels show a slight decrease in HT-1080 cells treated with resveratrol for 24 hours. However, the total JNK levels do not change. A current objective of this project is to determine whether the change in JNK activity is due to MKP-1, and whether altering MAPK activity or MKP-1 activity levels influences cell proliferation. Western blots will be performed to detect MKP-1 levels, as well as levels of other phosphatases. HT-1080 cells will be transfected with phosphatase-resistant MAPK expression vectors or with MKP-1 expression vectors; respectively, these cells will thus have enhanced MAPK activity or decreased MAPK activity, and the resulting effect on the resveratrol response will be determined.

EXCITATORY AND INHIBITORY IMBALANCE IN THE RECEPTOR PROTEOME OF ADOLESCENT ALCOHOL DEPENDENCY

Krystal Orlando

Department of Biology

Faculty Mentor: Dr. Dennis E. Rhoads

ABSTRACT

Human alcohol abuse frequently begins in adolescence. The age when alcohol consumption begins and the duration of consumption are correlated to the severity of alcohol withdrawal symptoms and dependency. The adolescent rat brain has parallels to the human adolescent brain and serves as an important model to study alcohol withdrawal and dependency. Long-Evans (LE) rats beginning alcohol consumption during adolescence develop a severe withdrawal syndrome, consistent with alcohol dependency. The present study is part of our continuing efforts to screen known targets of alcohol in the adult brain to attempt to understand adolescent alcohol dependency. Glutamate is the major excitatory neurotransmitter in the brain with ionotropic NMDA (N-methyl-D-aspartate) and AMPA receptors. Other students have shown that glutamate AMPA receptors are upregulated and adenosine A1 receptors, that inhibit glutamate release, are downregulated during chronic alcohol consumption. We hypothesized that a change in expression of NMDA subtype R1 receptor during chronic alcohol consumption contributes further to imbalance of excitatory and inhibitory receptors and to over-excitation of the brain. Levels of expression of NMDA R1 receptor were analyzed by Western blotting of adolescent LE brain extracts following an alcohol-containing liquid diet for 4, 11, 18, and 25 days. Expression levels of NMDA R1 receptor increased significantly at day 4 and maximally by day 18. Severe alcohol withdrawal symptoms, including seizures, coincide with the maximal upregulation of the NMDA R1 glutamate receptors. Therefore, the upregulation of NMDA R1 glutamate receptors contributes to a critical imbalance in the receptor proteome of alcohol-consuming adolescents.

EXPRESSION OF THE D1 AND D2 DOPAMINE RECEPTORS IN THE ADOLESCENT BRAIN

Vivek Angara

Department of Biology

Faculty Mentor: Dr. Dennis E. Rhoads

ABSTRACT

The neurotransmitter dopamine is capable of binding to five different types of receptors in the human brain. The two most abundant, D1 and D2, have been implicated in important neurological functions in animal models of human disorders and drug use. Previous studies have shown that the dopamine D1 receptor plays an important role in the body's response to caffeine, and may be involved in the interaction between caffeine and the adenosine A1 receptor in the adolescent brain. Previous behavioral studies of the dopamine D2 receptor suggest that the D2 receptor may play an important role in the disruption of spontaneous alternate behavior (SAB) observed in adolescent rats. The disruption of this behavior in rats seems to induce symptoms similar to that of obsessive-compulsive disorder (OCD) in humans.

In the present study, Western blotting has been used to detect and quantify D1 and D2 receptors in the adolescent rat brain and to make a comparison between Long-Evans and Sprague Dawley strains. Previous work in this lab has shown that these adolescents respond differently in their behaviors to caffeine and to buspirone, which disrupts SAB. Preliminary results suggest inherent differences in adolescent D1 expression between the two strains, which may affect their response to caffeine, as well as their expression of the A1 receptor. Preliminary results also suggest inherent differences in adolescent D2 expression between the two strains, which may play a key role in their susceptibility to SAB disruption. This may have implications for the treatment of OCD-like symptoms in humans.

GELATINOUS MACROZOOPLANKTON AND ABIOTIC FACTORS OF BARNEGAT BAY

**Bryan Hewins, Katie Smedley, Kimberly Rogan, Rebecca Leitt,
Erik Bugenhagen, Allison Bennett, and Jenna Methven**

Department of Biology

Faculty Mentors: Dr. Ursula Howson and James Nickels

ABSTRACT

Water quality in Barnegat Bay has become poor throughout the years due to an increase in anthropogenic input. This poorly flushed ecosystem has been affected by an array of human impacts that threaten its ecological integrity, including nutrient enrichment, algal blooms, alterations of freshwater inputs, and extensive development. Due to these conditions, some macrozooplankton such as the species *Mnemiopsis leidyi*, *Beroe ovata* and *Chrysaora quinquecirrha* have been able to thrive. *M. leidyi* is a nuisance species that has caused declines in fish populations because of their predation on larval fish. *Beroe ovata* have been known to feed on *M. leidyi*, which could ultimately help fish populations. Human recreation in Barnegat Bay has expanded over the last several decades. This has increased interactions with *C. quinquecirrha*. This species is a nuisance to humans and can cause a painful, lasting sting if left untreated.

This two-year project started in May 2011 with support from the New Jersey Department of Environmental Protection and still has one remaining year. The goal of this study is to provide a baseline assessment of the zooplankton community in Barnegat Bay. Surface tows were conducted with 200 and 500 micron bongo nets at five stations in Barnegat Bay every month (winter) or bimonthly (spring, summer, fall). Two 24-hour intensive sampling events were conducted (July and October 2012). Abundance, size, and volume were tracked for three species of gelatinous macrozooplankton. All species are prevalent in the northern bay. Large pulses of *M. leidyi* occurred in May and October. *B. ovata* is uncommon throughout most of the bay, but most were collected in the northern bay, shortly after the May pulse of *M. leidyi*. Highest abundance of *C. quinquecirrha* occurred in the northern bay in June. Sample processing has not yet been completed for all other zooplankton.

THE EFFECT OF REDUCED VISUAL STIMULUS DURING CATCHING AND THROWING A LACROSSE BALL

Shivam Patel and Stephanie Wargo

Department of Biology

Faculty Mentor: Bernadette Dunphy

ABSTRACT

A study will be conducted to analyze the athletic performance in lacrosse through individuals induced with impaired visual stimuli. The experiment performed will be a continuation of acquired data from previous studies. The sample size will include 15 females from Monmouth University's lacrosse team. The population, selected, will have accurate parameters due to the individuals being at the same athletic skill level. The population will be participating in a training program over the course of 6 weeks. The sample size will be divided into three groups; a control group that will do no training, a group who will actively train without any visual impairment, and a group who will actively train with reduced visual stimuli. The equipment used for reducing visual stimuli will be Nike *sparq* strobe eyewear.

The training program will involve throwing a lacrosse ball against a concrete wall, and catching the ball using a lacrosse stick repeatedly. Training for the two groups will be 20 minutes per day, three days per week for six weeks. There will be three examination periods (a pre, mid and post) over the span of six-week to observe each group's progress. Each examination will record consecutive catches and total number of catches within a limited time.

The expected outcome will be that the group treated with reduced visual stimuli will present improved coordination and athletic ability in comparison to other groups. The group using the eyewear will initially have a low score of consecutive catches, but progress at a quicker pace than other groups by relying on muscle memory. Muscle memory will allow for faster reflexes and coordination simply by not relying on vision. The results are expected to show drastic improvement in all groups except the control, but higher inclination of progress in the group introduced to the visual feedback system.

THE UTILIZATION OF ROPE UNDULATION AS AN ALTERNATIVE TO TRADITIONAL SHOULDER STRENGTHENING TECHNIQUES IN YOUNG ATHLETES

Shivam Patel and Stephanie Wargo

Department of Biology

Faculty Mentor: Bernadette Dunphy

ABSTRACT

Shoulder strength is an important factor in maintaining shoulder stability. The shoulder is capable of movement in all planes and is more susceptible to injury. It is important to maintain appropriate technique when performing shoulder-strengthening exercises. Our experiment is a continuation of a previous study and will focus on shoulder strength by comparing different methods of training and their efficacies. We will compare the effectiveness of rope undulation training with traditional training involving dumbbells. Rope undulation training involves attaching a long rope to a stationary object and holding the opposite ends while making a variety of movements to strengthen shoulder muscles. Unlike traditional training, rope undulation training focuses on strengthening integrated muscles due to the movement in multiple planes.

For shoulder strength, individuals in a large population will perform a series of shoulder exercises. The study will consist of two experimental groups; one group will train with dumbbells and the other will train utilizing rope undulations. The training will be for 20 minutes a day, three days a week, for six weeks. Furthermore, there was a control group that did not partake in any training in order to serve as a baseline and discount improvement from the tests themselves. The strength and efficacy will be tested using a Right Weight Exercise Guidance System (RWEGS) apparatus. The data will be analyzed by using a multiple ANOVA test. A power calculator was used to determine a sample size for future research.

The expected outcome will be that the group utilizing rope undulation training will exhibit in more strength in comparison to the other groups. Both experimental groups are expected to show improvement throughout the experiment, however the group training with rope undulations are expected to have a higher inclination of progress.

MONMOUTH UNIVERSITY

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DEPARTMENT OF CHEMISTRY, MEDICAL TECHNOLOGY AND PHYSICS

LIGAND-BRIDGED BIMETALLIC COMPOUNDS

Omkaran Menon, Vivek Patel, Heather Siebert

Department of Chemistry, Medical Technology and Physics

Faculty Mentor: Dr. Gregory Moehring

ABSTRACT

Pseudorotational rearrangements are an unusual chemical occurrence in which atoms in a molecule rearrange to produce a new steric relationship. This rearrangement occurs without rearrangement of the entire molecule. Pseudorotation is seen in rhenium (V) polyhydride compounds. In these compounds, the eight atoms attached to rhenium move simultaneously. We believe that the ability of rhenium (V) polyhydride compounds to pseudorotate allows for the synthesis of compounds with novel properties. One interesting type of compound that could be synthesized is a bimetallic teeter totter compound. A bimetallic teeter totter would contain rhenium as well as another metal center such as platinum. These two metal centers would be connected by a ligand. When a solution is heated and a certain activation energy is reached, rhenium will begin to pseudorotate. Since the two metal centers are connected, the stable arrangement of one of the metal centers will be coupled with only one stable arrangement of the other metal center. The different states of a bimetallic teeter totter are analogous to an actual teeter totter. If a catalyst such as platinum is used as the second metal center in the bimetallic teeter totter, its different conformations will be paired with specific conformations of the rhenium (V) polyhydride. By controlling different factors of the system such as temperature, a certain arrangement of platinum can be favored over another. If bulky substituents are added to platinum, the ability for it to be open for binding could be controlled based on the location of the bulky substituent during pseudorotation. The objective of this project is to synthesize a bimetallic teeter totter compound and study the effects of pseudorotation using dynamic NMR studies, computational methods, thermodynamics and kinetics.

MODELLING OF THERMOCHEMICAL ISOMERIZATION IN EIGHT-COORDINATE RHENIUM COMPLEXES

Omkaran Menon

Department of Chemistry, Medical Technology, and Physics

Faculty Mentors: Dr. Dmytro Kosenkov and Dr. Gregory Moehring

ABSTRACT

The controlled movement of chemical groups during the isomerization of metal complexes has potential applications in building nano-motors and even assembling robots at the nano scale. In our current work, the isomerization of the eight-coordinate complex pentahydrido-3-methylpyridinebis (triphenylphosphine) rhenium(V) $[\text{ReH}_5(\text{PPh}_3)_2(\text{CH}_3)\text{C}_5\text{N}]$ complex is being investigated. The transition between E and Z isomers (Figure 1.) of the complex may proceed through two distinct mechanisms: simple rotation through the Re-N bond or via a pseudorotational mechanism when hydrogen atoms, triphenylphosphine (PPh_3), and pyridine groups undergo complex synchronous motion leading to the isomerization. The latter mechanism may have substantially lower activation energy. Present study has been done on the molecular structure of the isomers. Their relative thermochemical stabilities were estimated using quantum chemical simulations using density functional theory (DFT) with *effective core potential (ECP)* triple zeta basis set [LANL2TZ(f)] on the rhenium center.

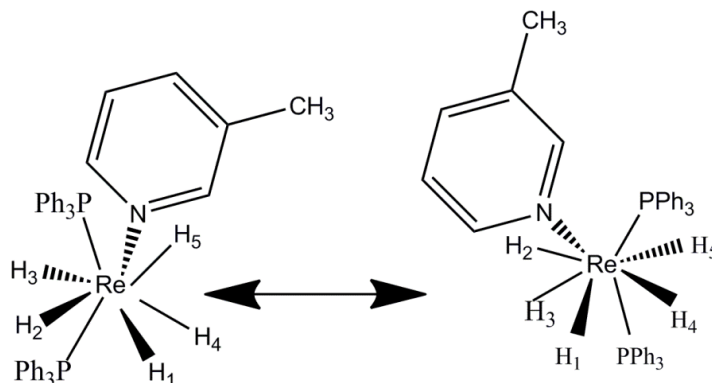


Figure 1. E and Z isomers via a pseudorotational mechanism

**MOLECULAR MODELING OF A DNA BINDING POTENTIAL
ANTI-CANCER DRUG: NAPHTHALINE DIIMIDE**

Samantha Silvent and Gary Prato

Department of Chemistry, Medical Technology, and Physics

Faculty Mentors: Dr. Dmytro Kosenkov and Dr. Massimiliano Lamberto

ABSTRACT

Small organic molecules (ligands) can be bonded to DNA G-quadruplex structures to halt telomere maintenance inhibiting cancer cell growth. In order to provide a non-destructive treatment for cancer, these ligands regulate telomerase activity and thermally stabilize the G-quadruplex. Our research is focused on the exploration of di- and tetra-substituted naphthalene diimide ligands, functionalized by N-methyl-piperazine side-chains of varying length (from 2-5 carbons). The density functional theory (DFT) and docking simulation methods are used to simulate the possible interactions the ligands may exhibit with the telomere DNA G-quadruplex. These techniques model the low energy conformations the ligand may transform into in the gas phase or in solution. By compiling the information that we obtained from these simulations, we can expand our knowledge about how ligands interact with cancer cells and their relation to other medical applications.

REACTIVITIES OF ORGANIC ARSENICAL PESTICIDES AND HERBICIDES ON NATURAL AND ENGINEERED ADSORPTION SURFACES

Brenda M. Lobb, Lauren S. Lechner, Shaharyar Ahmad

Department of Chemistry, Medical Technology and Physics

Faculty Mentor: Dr. Tsanangurayi Tongesayi

ABSTRACT

The contamination of drinking water and food by arsenic is emerging as one of the major public health challenges of modern society. The sources of arsenic in water and food can be both natural and anthropogenic. The anthropogenic sources include the widespread use of organic arsenical compounds such as 4-hydroxy-3-nitrophenylarsonic acid (Roxarsone), monosodium methanearsonate, disodium methanearsonate, calcium acid methanearsonate, and Dimethylarsinic acid (cacodylic acid) in agriculture as pesticides and herbicides. The possibility and extent of contamination of water, both ground and surface, and agricultural crops are dependent on the fate of these chemicals in the natural environment. The major objective of this study is, therefore, to study the reactivities of organic arsenical pesticides and herbicides on natural and engineered adsorption surfaces in the natural environment. Of particular interest will be the release of the toxic inorganic forms of arsenic (As(III) and As(V)) and their speciation. Speciation of the inorganic forms is particularly significant because As(III), the most toxic form of arsenic, is more mobile in the environment than As(V) and its formation will, therefore, increase the chances of groundwater contamination. The presence of arsenic in the water column can also increase chances of uptake by plants. The research is ongoing, and we do not have substantial results to report at this stage.

THEORETICAL TREATMENT OF SOLVENT EFFECTS ON THE ELECTRONIC TRANSITIONS IN VIOLOGENS

Kevin Wioland

Department of Chemistry, Medical Technology, and Physics

Faculty Mentor: Dr. Dmytro V. Kosenkov

ABSTRACT

Viologens are bipyridinium derivatives of 4,4' bipyridyl. They have been of great interest in recent years because of the ability of these compounds to change color as a result of oxidation or reduction. Viologens may perhaps be used in countless everyday applications such as watches and televisions. These compounds have the potential to provide cheaper and improved quality displays for many electronic devices. The purpose of this research project is to study the interactions between viologens and common organic solvents (water, dimethyl sulfoxide, etc.) in order to understand the mechanisms of solvent effect of the electronic transitions in the molecules. Employing time-dependent density functional theory (TDDFT) methods coupled with polarized continuum model (PCM) of solvation the molecular structures and ultraviolet-visible (UV-Vis) spectra of viologens were determined.

**TOWARDS THE DESIGN OF SOLAR CELLS:
MODELING OF PERIDININ-CHLOROPHYLL PROTEIN CHROMOPHORES**

Erik Braunstein, Anthony Cappadona, Scott Anton, Daniel Chang

Department of Chemistry, Medical Technology, and Physics

Faculty Mentor: Dr. Dmytro Kosenkov

ABSTRACT

In recent years, there has been much advancement in improving solar cell technology, and one of the areas being explored is the development of technology based on photosynthetic systems found in nature. One of the most promising models in this field uses the peridinin-chlorophyll-protein (PCP) light harvesting complex. The PCP complex has a very well-studied structure and high efficiency for collecting energy. It contains 1:4 ratio of chlorophyll to peridinin molecules. Peridinin molecules belong to the well-known carotenoid pigment family. The energy of light is absorbed by peridinin molecules leading to the formation of electronic excited states and then transferred to the chlorophyll molecule of the PCP. Peridinins also play a pivotal role in quenching chlorophyll triplet excited states preventing formation of harmful oxygen radicals protecting the entire complex from photodamage.

In the present study, the electronic excited states of the chlorophylls and carotenoids (peridinins) that form PCP complex are investigated using time-dependent density functional theory (TD-DFT). The rates of excitation energy transfer between chlorophyll and peridinin molecules are estimated using Förster dipole-dipole model.

MONMOUTH UNIVERSITY
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DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

PUT-A-TAG: A GENERIC TAGGING TOOL

Steven Cregan, Garrett Haas, Gage Jackson, and Patrick McDonald

Department of Computer Science & Software Engineering

Faculty Mentor: Dr. Cui Yu

ABSTRACT

Constant communication becomes a need for the ever-growing society with information sharing and exchanging. Put-A-Tag would become one of the hubs to keep colleagues, collaborators and friends together on the same page. Put-A-Tag is primarily a business-oriented application that gives members of an organization the ability to share any files, websites, and pieces of information among the appropriate group members without duplicating original files and disrupting original access permission. Informal groups and individual users can also use it for collaborating, sharing, or simply for “bookmarking”.

To accommodate Put-A-Tag’s unique feature of tagging various types of files across different platforms requires several different technologies to interact with each other. To resolve potential security issues, Put-A-Tag is designed to use a client to server architecture to interact with database. This system is implemented using Java, PHP and MySQL as the database backend.

Comparing with its previous version, this version of Put-A-Tag has more user-friendly interface, including a new look of main panel of tools that provide users more generic approaches to tag different types of information. It also has a more powerful tag management, for editing, grouping and searching.

THE MARK -- A COMMENTING APPLICATION

Chris Del Fattore, Bruce Lukens and Jesse Rosero

Department of Computer Science & Software Engineering

Faculty Mentor: Dr. Cui Yu

ABSTRACT

The Mark Java application is an incredibly small and powerful tool that can be used by teachers to grade, comment or mark up a student's paper electronically. Other users may also find it useful. For instance, it could be used for instant commenting during a meeting, if the file can be viewed on computer.

For the program design, we started with making sure to only use a small GUI, so that it would not interfere with the functions of the program and viewing area of the file being commented. The second design decision was to design the program small in size, as this would allow most systems to be able to run the program and not to create much burden on memory and storage.

The Mark is a user-friendly application. With a click, it reads in a file of any type, converts it to PDF format, takes an image output, and then it is ready for commenting. The work is done by system, and the user can just focus on commenting. Further, the final output is not a big size image file. It's either a PDF file with comments or glass panel with marks. It can be shared and printed easily.

MONMOUTH UNIVERSITY
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DEPARTMENT OF MATHEMATICS

ANOVA vs. KRUSKAL-WALLIS TEST ON DUNE GRASS BIOMASS AND DIVERSITY

Daniel Brownridge, Casie Illig, Brenda Lobb, Alex Moncman, Axhi Popinara

Department of Mathematics

Faculty Mentor: Dr. Richard Bastian

ABSTRACT

There are two statistical methods to analyze mean values in a population. The first, ANOVA, is a collection of statistical procedures for the analysis of quantitative responses. The second, non-parametric, is distribution-free and requires no assumptions for equal variances and normality. Non-parametric tests compare medians between independent variables. Both analyses were performed over two datasets of dune grass under the predicting variables biomass and diversity.

First two factorial ANOVAs were conducted to test equal variance of biomass among five treatment levels, three locations, and three species; one non-native species and two native species. We failed to reject the null hypothesis that the distributions were normal, but we considered normal distributions because the experiment was a balanced design. The hypothesis that the mean biomass of the three species was equal was rejected and the alternative hypothesis that the mean biomass of the species was not equal was accepted. We found that the mean biomass of the non-native species was greater than both domestic species. We rejected the null that the mean diversities are the same and can assume that at least one of them is different.

Second two non-parametric, Kruskal-Wallis, tests were conducted since the distributions were asymmetric. The Kruskal-Wallis test supported the alternative hypothesis that the mean biomass of the non-native species was greater. The two lowest treatment levels showed a significant difference in mean diversity when compared to the highest treatment level. This suggests that the highest treatment level favors the non-native species when compared to the two lowest treatment levels.

DETERMINING THE EFFECTIVENESS OF BLOOD PRESSURE CUFFS USED ON DOGS

Kaitlyn Kramer and Lauren Johnson

Department of Mathematics

Faculty Mentor: Dr. Richard Bastian

ABSTRACT

This study involves an experiment with two veterinarians from Garden State Veterinarian Specialists in Tinton Falls NJ to determine the effectiveness of blood pressure cuffs used on dogs. The veterinarians wish to determine if their method of using tape to secure the blood pressure cuff on a dog still provides an accurate blood pressure reading. The veterinarian wants to test new cuffs against used cuffs that will be held together using varied lengths of tape. We have begun analysis on the data the veterinarians have collected thus far and have statistically significant results that are relevant clinically as well. Thus far we have statistically significant results supporting that blood pressure cuffs held together with tape give an inaccurate reading. Since our study has such a small sample size, further data will strengthen our results statistically and help the veterinarians determine if their methods of taking blood pressure on dogs is truly accurate.

FACULTY PERCEPTIONS OF INFORMATION LITERACY

Monica Kuegler, Matthew Hand, and Danielle Trancucci

Department of Mathematics

Faculty Mentor: Dr. Richard Bastian

ABSTRACT

Information literacy is the set of abilities that require individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. The skills associated with information literacy are whether one can identify and address information needed, access information effectively and efficiently, evaluate and think critically about information, use information effectively for a specific purpose, and use information ethically and legally. Most research on this topic has focused on students' perceptions of information literacy, but this study evaluated faculty perceptions of students' abilities.

In coordination with a librarian at Monmouth University, 633 New Jersey college faculty members' perceptions were analyzed. The objective of this project was to determine what factors influenced faculty perception of students' information literacy abilities. More specifically, this study looked at perceptions of the skills associated with information literacy, whether students should be information literate by the time they graduate, and whether students are information literate by the time they graduate.

Chi-square tests were used to compare the proportions of faculty's opinions on the competency level of students' research abilities by categorizing them into various factors. These factors including gender, whether they teach at a two year or four year college, amount of teaching experience, faculty status (part-time or full-time), and type of discipline. In general, most faculty perceptions on the five skills were significantly different depending on gender and whether they taught at a two year or four year college. When looking at faculty's perception on whether students should be information literate by the time they graduate, results showed that significantly more male faculty disagreed than female faculty ($p = 0.002$). Also, significantly more part-time faculty disagreed than full-time faculty ($p = 0.038$).

This study will benefit higher education by showing where improvements can be implemented in order to better prepare students for using research after graduation.

RETROSPECTIVE SURVIVAL ANALYSIS OF TRACHEAL STENT SURGERY

Kaitlin Shields

Department of Mathematics

Faculty Mentor: Dr. Richard Bastian

ABSTRACT

This project involves a retrospective statistical analysis of data collected on patients that underwent tracheal stent surgery at Red Bank Veterinarian Hospital. Dr. Stephanie Rosenheck wishes to determine if tracheal stent surgery prolongs the patients' life span. The retrospective data includes 23 stent surgery patients and quantitative variables that measure distances in relation to the stent, the trachea, and the carina. To determine if the surgery was successful in extending the patients survival time a series of statistical tests were completed which analyzed survival time based on one predictor variable at a time. These tests consist of Kaplan Meier Survival Analysis and Cox Regression.

The Kaplan Meier Survival Analysis test measures the time to an event. Survival Analysis allows for censoring of cases. The censored cases can be seen on the output survival curve. The results from the test show the median survival time and the 95% confidence interval. Also, the survival curve shows what percent of the non-censored cases are surviving after a certain period of time.

Cox Regression is a more advanced method of survival analysis. It builds a model for time-to-event data. With Cox Regression the event must be a binary variable, meaning that it only has two outcomes. The event being measured in the stent surgery data is binary because the outcomes are alive or dead. The Cox Regression model is a survival function that predicts the probability of death based on values of the predictor variables. The survival function or hazard function gives a baseline hazard when there are no predictors. Adding factors in the Cox Regression changes the baseline hazard by the hazard ratio for that predictor. The hazard ratio means that for every increase in the predictor the odds of death increase or decrease by a certain percent.