



# UNION UNIVERSITY

FALL POSTER SESSION

**November 28, 2011**

## **Geographical Distribution of Larval Eustrongylides Spp. in West Tennessee**

**Presenter:** Tyler Boone

**Faculty Advisor:** James R. Kerfoot, Jr. and Marc Lockett

The study of Eustrongylides spp. in West Tennessee is non-existent. The goal of my research is to estimate infection rates of Eustrongylides spp. in fish at selected sites along the South Forked Deer River including the West Tennessee Research and Education Center. Thermal discharges into the waterways and wastewater plants near collection sites are thought to be positively correlated with higher infection rates. In addition to environmental factors influencing the Eustrongylides spp. populations, the physical properties of the intermediate fish host also affect the infection rate. Mosquitofish (*Gambusia holbrooki*) were obtained from the selected study sites through the use of dipnets and examined for parasites following measurement of their length and weight.

## **The Effects of Mustard and Cinnamon on Escherichia Coli and Staphylococcus Epidermidis**

**Presenter:** Lauren Collins

**Faculty Advisor:** Andy Madison

Essential oils have been used as antimicrobials for years. They have become an interesting research topic recently as bacteria are developing resistance to current antibiotics and antimicrobials. Research in this area could allow for development of new treatments that bacteria are not yet resistant to. The 2 oils used in this experiment were cinnamon oil and mustard oil. They were each tested against the Gram positive bacterium *Staphylococcus epidermidis* and the Gram negative bacterium *Escherichia coli*. The research was performed by plating bacteria cultures and placing filter disks containing the oils onto the centers of the plates. Then zones of inhibition were measured and analyzed. It was determined that cinnamon oil was effective against both bacteria, but more effective against the Gram positive *S. epidermidis*. The mustard oil did not affect either bacterium.

## **Scaling the Feeding Mechanism and Kinematics of Captive Bred Alligator Mississippiensis**

**Presenter:** Micah Fern

**Faculty Advisor:** James R. Kerfoot, Jr.

This study examines how growth is a contributing factor in the scaling of feeding kinematics for *Alligator mississippiensis*. The American alligator is an ideal model for studying functional relationship in vertebrate musculoskeletal systems. Experimental objectives for this project included finding if kinematic variables and skeletal elements scale isometrically in the alligator. This project also investigated the scaling of the feeding mechanism and kinematics of prey capture in the alligator. Feeding kinematics were captured using a high-speed video camera (300 frames s<sup>-1</sup>) to closely examine functional changes occurring in the feeding mechanism of prey capture as a consequence of body size. Alligators ranging in size from 1 to 4 feet in total length were filmed feeding on a stationary prey item using a high speed video camera for the study to quantify feeding kinematics during prey capture. CMA Coach 6 Studio MV software was used to quantify the maximum excursions, maximum velocities, and timing variables. It was hypothesized that the kinematic variables and skeletal elements of the alligator scale isometrically allowing for increases in velocity of prey capture action. Maximum gape and lower jaw angular displacement velocities scaled isometrically. Feeding bouts for the hatchlings lasted longer than the feeding bouts of the larger juveniles. Maximum gape and lower jaw displacement velocities were higher in larger alligators. These findings reveal isometric growth of the body and muscular system positively affect feeding kinematics in the alligator by increasing maximum gape and lower jaw displacement velocities.

## **The Effects of Pramipexole on the Behavior of Mice**

**Presenter:** Audrey Garneau

**Faculty Advisor:** Marc Lockett

*Toxoplasma gondii* has behavioral implications on its hosts. A possible mechanism for the behavior change involves up-regulation of dopamine. Administration of

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# biology

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D<sub>2</sub>/D<sub>3</sub> agonist pramipexole may induce similar behavior changes. A mirrored chamber was used to analyze the behavior of mice before, during, and after seven weeks of pramipexole treatment. We hypothesized that pramipexole treated mice would enter the chamber sooner, spend more time in the chamber, and enter the chamber more frequently after seven weeks of treatment. Results showed that the average seconds until entry was 87 s prior to treatment and 16 s after treatment. The average time spent in the chamber was 91 s before treatment and 129 s after treatment. The average number of entries was 4 before treatment and 5 after treatment. Based on these results, pramipexole may serve as a model for study of the mechanism used by *T. gondii* to induce behavior changes.

## Fluid-Phase versus Solid Phase Factor Xa Kinetics

Presenter: Ryan Gibbons

Faculty Advisor: Marc Lockett

Blood clotting is a vital function in the human body and is dependant on the interaction between proteases, cofactors, and phospholipid membranes. This research has examined the activation of factor X by tissue factor/factor VIIa (TF-VIIa) in the coagulation cascade. The objective of this study was to determine how factor X binds with TF-VIIa most efficiently. There were 2 possible mechanisms that were focused on for this study: 1) Factor X binds to the TF-VIIa complex after having interacted with the phospholipid before being activated into factor Xa or 2) Factor X binds to the TF-VIIa complex prior to interacting with the phospholipid surface before being activated into factor Xa. It was hypothesized that activation occurs more efficiently after factor X interacts with the membrane prior to interaction with TF/VIIa.

## Testing of an ELISA to Quantify Antibody Production of Adjuvants in BALB/c Mice

Presenter: Lucas Littleton

Faculty Advisor: Jennifer Gruenke

An organism can be exposed to an antigen by injection in order to create an immune response to produce antibodies. When non-pathogenic vaccinations

are given, it is standard to use an adjuvant, which is a chemical that enhances the immune response by creating inflammation. This research tested 3 adjuvants to determine which induced the highest antibody production. A quantitative assay to test the production levels was also developed. The assay developed and used was an enzyme-linked immunosorbent assay (ELISA). Eleven BALB/c mice were used to test the 3 adjuvants, and one control group which received no adjuvant was used. There was found to be no significant difference between production levels of the three adjuvants.

## Evaluating CP33 Habitat Buffers for Grassland Birds

Presenter: Buckley Parker

Faculty Advisor: Andy Madison

Grassland bird populations have been declining and the implementation of CP33 habitat buffers has the potential to help maintain populations. CP33 buffers help to increase native grass species, which provide brooding and feeding habitats for grassland birds. CP33 field were compared to traditional agricultural fields using point counts of 8 grassland indicative bird species. Total species numbers were compiled and statistical analyses were conducted in order to determine any significance between the control and experimental field data sets over the entire 3-year period, as well as each year individually. Species richness was also analyzed to determine if there was any significant change between the 2 field types.

## Behavioral Interactions of the White-tailed deer (*Odocoileus Virginianis*) at feeding sites on the Milan Army Ammunition Plant

Presenters: Rebekah Schneider

Faculty Advisor: Andy Madison

Observing social, foraging, and habitual behavior of a species may yield important clues as to how to best manage wild populations and their habitats. White-tailed deer (*Odocoileus virginianis*) form social status in their interaction with one another, particularly at feeding sites. This study focused on behavioral patterns by observing social interactions between deer at feeding sites and

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gut piles in different habitat types located on the Milan Army Ammunition Plant. Through the use of motion sensitive infrared cameras, the number of deer, sex, and behavior were observed and correlated with the time of day and temperatures. A total of 14 different species were observed at feeding and gut pile sites, where the most frequent were deer, raccoon, turkey, crow, and squirrel at feeding sites and vulture spp., deer, coyote, raccoon, and fox at gut piles. Both deer behavior and species observed at corn and gut piles differed significantly.

## The Effects of Temperature on Feeding Kinematics on Invasive Lionfish *Pterosis Volitans* from Sebastian Inlet Florida

Presenter: Sarah Williams

Faculty Advisor: James R. Kerfoot Jr.

*Pterosis volitans*, lionfish, are an invasive species to the Atlantic coast. Increased lionfish populations along the Atlantic coast have been linked to a decrease in native species populations. As lionfish continue to establish, it is important to investigate how environmental factors of the novel territory, namely temperature, may affect the future expansion of this species. The objective of this research is to determine the effect of temperature on the attack velocity, approach velocity, duration of feeding bout, and peak gape velocity of the invasive lionfish. It was hypothesized that there would be a difference in attack velocity, approach velocity, duration of feeding bout, and peak gape velocity at different temperatures. Using a Casio Exilim-ExFl high speed camera, 3 lionfish were filmed individually feeding on live mosquito fish, *Gambusia affinis* at 3 different temperatures, 18°C, 22°C, and 26°C. Frame by frame analysis by Tracker Video Analysis and Modeling Tool was used to measure the dependant variables of prey-capture events. A repeated measures analysis of variance (ANOVA) indicated that there was no effect of repeatedly measuring individuals for an of the dependant variables. A multivariate analysis of variance (MANOVA) indicated that there was no significant difference in dependent variables between temperatures. This means that lionfish fed equally across all 3 temperatures with the implication that they are a voracious invasive species. ■

# digital media studies

## Exploring Responsive Design and Database Integration For A Freelance Website

**Presenter:** Jared Carpenter  
**Faculty Advisor:** Cam Tracy

This project will consist of creating a website for Hinterland Creative, a freelance studio specializing in photography, video, and graphic design. HTML5 will be used to implement the latest in web standards, and CSS3 will be used to achieve a dynamically responsive design for multiple displays. The framework of the site will consist of PHP and MySQL to build a database structure that will be available for modification through the administrative back-end of the website.

## A 'Student Gallery' For Sharing Student Work

**Presenter:** Stephen Hiscox  
**Faculty Advisor:** Cam Tracy

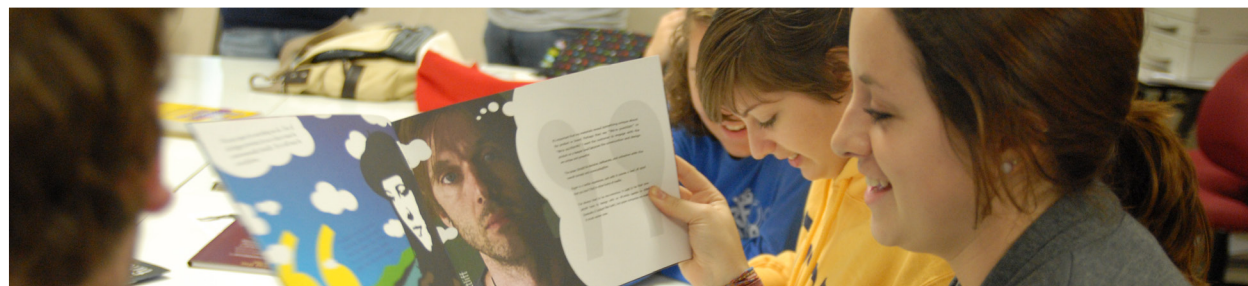
The Student Gallery is a dynamic online gallery built using PHP, MySQL, HTML 5, and CSS3. The goal is to create a website that encourages Union Communication Arts students to share their work, whether it is in-class assignments or extracurricular work. Once users are assigned an account, they can upload images or PDFs, set

a user picture, and comment on other users' work. The site will accept JPEG, PNG, GIF, and PDF file types, and will feature embedded video from services like Youtube or Vimeo. Images will be resized, thumbnailed, and added to the database automatically.

## Exploring New Web Design Technologies—HTML5, CSS3, and Responsive Design

**Presenter:** Ben Joyce  
**Faculty Advisor:** Cam Tracy

This project will be to build a personal portfolio site to feature not only my creative talents, but my technical skills as well. It will include a variety of project types, including print & identity, but will primarily focus on my work as a web designer over the last couple of years. In building the site, I will explore and implement new features of HTML5 and CSS3, including HTML5 animations. In addition, I will focus on making the site responsive, with a flexible grid and content. This will make the site work at it's best across multiple window sizes, and on mobile devices. All of these features should highlight both my skills as a graphic designer and a web designer, and result in a portfolio site that serves as a portfolio piece itself. ■



# engineering

## The Use of Steam as an Energy Source in a Piston-Driven Engine

**Presenters:** James Avery, Ryan Substad, Wilson Holland, Jonathan Gwaltney  
**Faculty Advisor:** Georg Pinggen

This research project is the design and application of a steam powered engine. This project focuses on the construction of an original model for the application, along with the analysis of the energy transferred and the overall efficiency. The project is divided into two parts, the boiler apparatus and the piston model. We hope to achieve a steam driven piston, powered solely by the steam produced in the boiler, and the conservation of momentum in the flywheel. As these results are achieved, the output data is collected and a Thermodynamic analysis will be conducted in order to maximize the overall efficiency. This research, conducted in a small scale model, will show how the heat source is used to power the engine and will give results for full scale engines.

## A Bright Idea: Analyzing Energy Savings from Turning off Desk Lamps in Union Offices

**Presenters:** Rachel Carbonell, Caroline McConnell, Joel Ingram, Jonathan Gwaltney  
**Faculty Advisor:** Georg Pinggen

At the end of the day, the hardworking Union employee packs their briefcase, turns out the overhead light, and closes the door behind them as they direct their thoughts towards home. All this occurs without the employee noticing that they have left their desk lamp turned on, and that it will continue to shine through the night until they return the next morning. The purpose of this project is to determine if the energy consumed by desk lamps or other office lighting during the night poses a significant cost to the university. By considering variables such as administrative versus professorial offices, day of the week, and gender of the office-holder, the potential yearly energy savings for the university will be determined and presented. The group also explored and will present possible solutions to the problem of energy waste from leaving desk lamps lit through the night.

## Fuel Efficiency Relative to Air Intake

**Presenters:** Tom Drury, Phillip Johnson, Kian Jost, Ryan Substad  
**Faculty Advisor:** Georg Pinggen

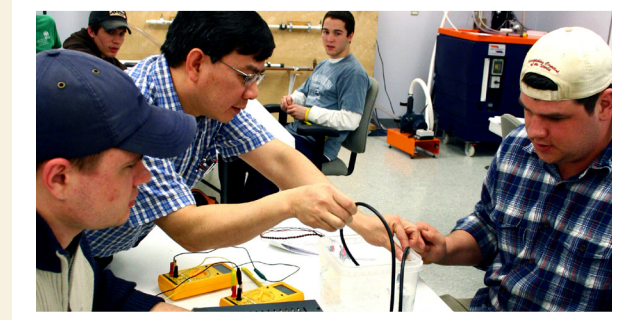
It is speculated that hot air intake on a vehicle is more efficient than cold air intake. This project will examine the fuel efficiency of hot air intake versus cold air intake by conducting experiments. Test runs will be performed on a closed course by using different temperature air intakes. The amount of fuel used will then be calculated and the fuel efficiency will be determined. The aerodynamics of the vehicle will also be briefly examined and its relationship to the fuel efficiency of the vehicle. The results will be tabulated and the best combination for fuel efficiency will be determined.

## The Aerodynamic and Heat Transfer Properties of a Solar Panel

**Presenters:** Eric Olson, Rob Calvert, Aaron Porterfield, John Hall, Nate Peterson  
**Faculty Advisor:** Georg Pinggen

As traditional sources of power such as fossil fuel become more difficult to obtain, alternatives such as solar power are more important than ever. While new technologies for solar cells continue to improve efficiency, more direct sunlight will allow for greater power production. To facilitate this, solar panels are often mounted on movable mounts that maximize the amount

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# engineering

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of solar radiation collected. However, the combination of a large collection area of the panel, and a space efficient support structure make the assembly vulnerable to high winds. This project examines the forces and cooling effects of wind flowing across a solar collector at various angles. This is a critical step in designing an economical system robust enough to withstand high winds.

## Rocket Science

**Presenters:** Matt Wilson, Brady Sheppard, Scott Kahler, Wilson Holland

**Faculty Advisor:** Georg Pinggen

The students are currently enrolled in Engineering Experimental Methods. The purpose of this class is to teach engineering students methods for properly conducting experiments and analyzing data collected.

The group will be conducting an experiment involving the distance travelled by various “bottle rockets” with differences in aerodynamics, masses, and applied pressures. The goal of the project is to determine the optimal design to maximize the distance travelled by the rockets, while using analytical methods the students have learned throughout the semester.

The poster will consist of measured data, any calculations involving this data, and various analytical approaches toward determining the best design, as well as graphs and pictures for aesthetics. ■



# nursing

## A Celebration of Life

**Presenter:** Kristen Broadus

**Faculty Advisor:** Bradley Harrell

I was inspired to create three acrylic paintings on canvas after reading John Donne's poem, *Death Be Not Proud*, and watching the film *Wit*. This poem and film stirred much thought and many emotions about death, and even more about life and the freedom we have as Christians in our lives with Christ. Because of this freedom, I was inspired to etch my paintings with a verse from the song "In Christ Alone" by Stuart Townend and Keith Getty. The paintings begin with the darkness of the world and the death of Christ, then they move to light "bursting forth" as Christ conquered death and rose again. With His victory over death, we can now live a full life with no fear of sickness or death, as our salvation is secure. What a wonderful reality.

## A Study of Faith Through Mixed Media

**Presenter:** Dana Monroe

**Faculty Advisor:** Bradley Harrell

This project accompanied our Adult Health II chapter on oncology. We were asked to analyze Donne's poem *Death Be Not Proud* and the 2001 HBO film *WIT* and translate it into a unique medium. The film is about Vivian Bearing, a professor of English poetry, specializing in Donne's life and death sonnets. Vivian learns that she has advanced ovarian cancer and only a short time to live, which gives her a sudden and dramatic insight into the importance of kindness and compassion. Both works approach death in a light manner and poke fun at it through the use of language and words. I chose to do a mixed media painting with yellow and black symbolizing life and death, yellow representing life and black representing death. The circle with opposing colors points out that life and death are one; there is no end and no beginning and with life there is death and with death comes eternal life for those who believe. The red cross symbolizes the Christian faith and is outlined with the words of Donne's poem to symbolize Vivian's faith in them. A blindfold was incorporated into the red cross

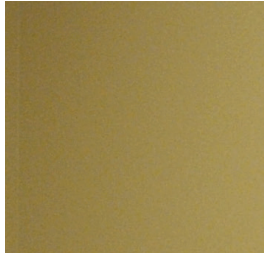
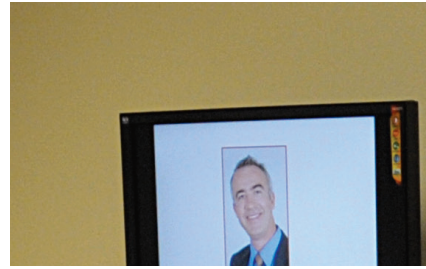
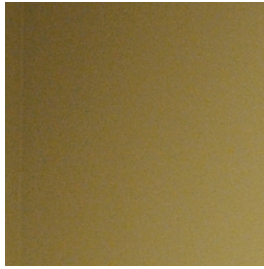
to symbolize the manner in which the scientist treated Vivian, not as human being, but a research subject. She came to realize through the uncompassionate acts of her doctors that she had been much like them her entire life. Vivian found inner peace in the end and a peace symbol supports this idea.

## Wit Project Sculpture

**Presenter:** Catherine Pantik

**Faculty Advisor:** Bradley Harrell

This project was undertaken as part of our Adult Health II Oncology study. We were asked to watch Mike Nichol's 2001 film adaptation of the off Broadway play "Wit". The play depicts the final days of a professor of metaphysical poetry. Mrs. Bearing is diagnosed with Stage 4 ovarian cancer, and decides to participate in a research project aimed at her particular disease. The protagonist, having focused on John Donne's poetry in her graduate work, often quotes Donne's Divine Sonnet X, commonly referred to as "Death Be Not Proud" After viewing the movie and studying Donne's famous words, we were asked to create something that depicted our interpretation of these two works. This exercise brought the diagnosis of terminal out of the text book, and made it real and humane. I chose to do a sculpture, as it represents the multi-dimensional aspects of both the experiences of a dying person and the words of John Donne. The sculpture is of large hands engulfing a female figure. The hands represent the healing and comfort provided by healthcare team, and the hands represent the personification of death in Donne's poetry. The female figure represents all humanity as they grapple with their mortality. Finally, the hands represent the hands of our Father, bringing us from death's grasp, to eternal life. ■





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