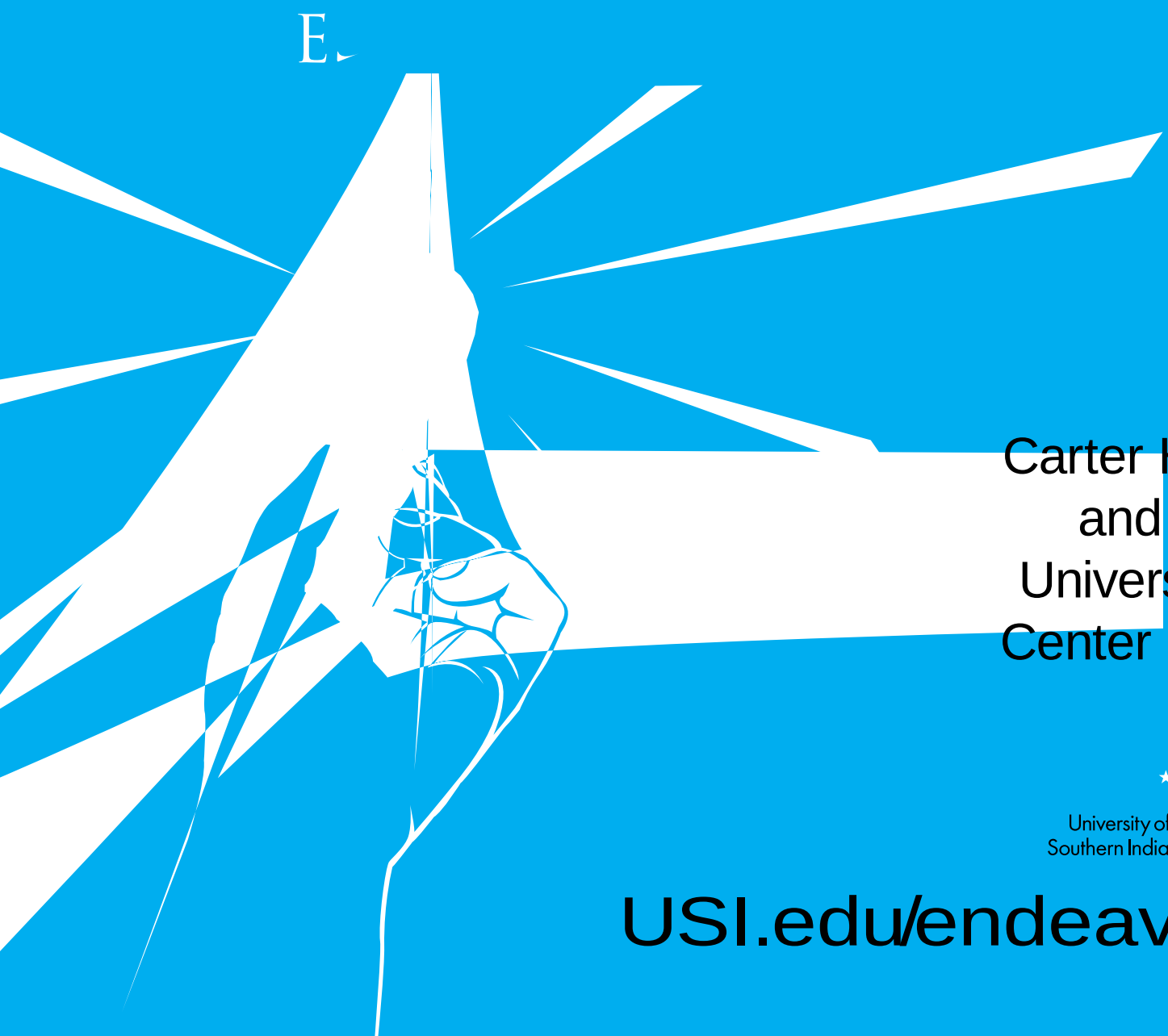
12th Annual Symposium

2013



Carter Hall
and
University
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University of
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April 2013

Dear Endeavor! Participant:

Welcome to the 12th Annual Endeavor! Undergraduate Research and Creative Works Symposium at the University of Southern Indiana! As a participant in the Symposium, you are deepening your undergraduate learning experience and exhibiting initiative that is valued by graduate degree programs and employers.

During the Symposium, take the opportunity to get to know students and faculty from other departments and universities. Building networks outside your discipline is an important part of preparing for the next step after you complete your undergraduate education.

Congratulations on being a participant in USI's Endeavor! Symposium and best wishes to you.

Sincerely,

Linda L. M. Bennett, Ph.D.
President

April 4, 2013

Dear Endeavor! Symposium 2013 Presenters and Sponsors:

Welcome to the 2013 Endeavor! Symposium. Your work has increased the number of researchers and artists making presentations at this Symposium to more than 100. Your work has advanced discoveries in your fields of research and creativity, and I am certain you are energizing the University of Southern Indiana's academic culture.

The Endeavor! Research and Creativity Award program assumes that when you follow a passion, you emerge with an enhanced education and strong ties to your learning. The synergy between research and learning is the foundation for the best education possible. Likewise, when faculty sponsors follow their curiosity, they become more insightful and grounded professors.

I sincerely hope that all of you found one of your research or creativity passions and that the Endeavor! Symposium gave you the incentive to be curious and inventive.

Sincerely,

Jane Johansen, Ph.D.
Director
Endeavor! Research and Creativity Awards

Endeavor! Symposium Agenda

Thursday, April 4, 2013

7:30 – 8 a.m.	Check-in for all presenters and sponsors. Receive programs and ID badges at front hall table
8 a.m. – Noon	Oral Presentations UC 204, 2205, 2206, 2207
8 a.m. – Noon	Poster and Artwork Sessions University Center, Carter Hall A – C Presenters of posters and art pieces will be available for two assigned hours.
12:10 – 1:10 p.m.	Endeavor! Research and Creativity Awards Program Luncheon Badges are lunch tickets!
1:10 – 1:30 p.m.	Breakdown of all poster materials and objects

Endeavor! Research and Creativity Awards Committee

Jane Johansen	Director of Endeavor! Awards for Research and Creativity Professor of Business Communication, College of Business
Antonina Bambina	Director of the Honors Program Assistant Professor of Sociology, College of Liberal Arts
Vaughn DeCoster	Director of MSW Program Associate Professor of Social Work, College of Liberal Arts
Khaled Elkhal	Assistant Professor of Finance, College of Business
Sangwook Heo	Professor of Mathematics Pott College of Science, Engineering, and Education
Emily Lynn	Grant Administrator Sponsored Projects and Research Administration
Rob Millard Mendez	Art Department Assistant Chair Associate Professor of Art, College of Liberal Arts
Gabriela Mustata Wilson	Assistant Professor of Health Informatics College of Nursing and Health Professions

Acknowledgements

The Endeavor! Committee thanks the following for their support of the Endeavor! Research and Creativity Award Program and Endeavor! Symposium

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Dr. William Elliott
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Mr. Rob Millard Mendez
Ms. Jamie Seitz
Dr. Jeff Seyler
Dr. Natasha Smith
Dr. Susan Spencer
Dr. Rex Strange
Dr. Edmir Wade
Dr. Ken Walsh

8 a.m. POSTER SESSIONS

Carter Hall

Alex Arwood	The Taxonomic Status of Subspecies of the Fantail Darter
Scot Patrick Finney & Casey Mackenzie Coffey	Understanding Population Variation Through Discrete Traits and Cluster Analysis: A Class Project
Levi C. Holscher	Assessment of the University of Southern Indiana's Microbiology Laboratory Regarding Aseptic Technique And Biosafety Guidelines of Salmonella Species and Serovars
Maxwell King	Petrography and Geochemistry of an Ultramafic Dike in Southern Illinois
Lauren Martin	Oxidative Addition of Alkanes to Iridium Pincer Complexes
Joseph Richard Schaefer	Characterization of Methyl Accepting Chemotaxis in V. fischeri Using the Quantitative Capillary Assay
Evan Michael Taylor	Flexural Stiffness of the Hindwings of Lycaenidae Butterfly
Reuben Warshawski	Synthesis of Green, Red and Far Red Emitting 3 r ethynylthiophene Substituted BODIPY Dyes
Aaron Williams	The Invariant Measure for Anderson Localized Negative Index Metamaterials Continuously Disordered
Brett Williams	The Isolation and Amplification of the Actin Gene Sequence for the Slime Mold Stemonitis flavogenita
Nathaniel Williams	ÐÀ 0

9 a.m. POSTER SESSIONS

Carter Hall

Maxwell Dahlquist	Provenance of Cobbles in the Rocky Gulch Sandstone Member of the Hornbrook Formation (Upper Cretaceous) in Siskiyou County, California
Scot Patrick Finney & Casey Mackenzie Coffey	Understanding Population Variation Through Discrete Traits and Cluster Analysis: A Class Project
Chelsea Heibel	Synthesis of tC C Glycosides of 2 r Amino Sugars from Glycal Aziridines
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10 a.m. POSTER SESSIONS
(continued)

Matthew Vincent	Modeling Transition States of Fluoride Substitution in F r BODIPY with Organometallic Alkynyl Reagents
Matthew Vincent	Synthesis of Novel Amphiphilic BODIPY Derivatives with Hydroxyl Groups for Live Cell Imaging
Reuben Warshawski	Synthesis of Green, Red and Far Red Emitting 3 r ethynylthiophene Substituted BODIPY Dyes
Aaron Williams	The

11 a.m. POSTER SESSIONS

Carter Hall

Alex Arwood	The Taxonomic Status of Subspecies of the Fantail Darter
Nathan Bartholomew	Use of Stratigraphy, Sediment and Soils to Assess the Potential for Converting an Abandoned Agricultural Field into a Man Made Wetland, Evansville, Indiana
Chelsy Calhoun & Josh Long	Measuring Elementary Teachers Perceptions as an Initial and Partial Assessment of the Impact of the Indiana Science Initiative
Maxwell Dahlquist	Provenance of Cobbles in the Rocky Gulch Sandstone Member of the Hornbrook Formation (Upper Cretaceous) in Siskiyou County, California
Alexandra Jordan & Kaetlyn Schmelzer	Comparative Look at the Reproductive Systems of Pongo pygmaeus, Pisaster ochraceus, Apis Mellifera
John Talley	Late Quarternary History and Geomorphology of an K7aphy, Reproc34uy Indiana

The Taxonomic Status of Subspecies of the Fantail Darter

Alex Arwood

Faculty Mentor: Dr. Rex Strange

The fantail darter (Etheostoma flabellare) is a polytypic species represented by two subspecies in the Midwest and Southeastern United States, both of which occur in Indiana. The barred fantail darter (E.f. flaballare) generally occurs to the east while the striped fantail darter (E.f. lineolatum) is distributed to the west; Indiana is located along the contact zone between the two subspecies. Although E.f. flabellare and E.f. lineolatum were originally described by morphological characteristics, it is arguable whether or not they are genetically distinct. The subspecies appear to show a continuum of intraspecific variation within Indiana, and some authors hold that E.f. lineolatum should not be recognized as a separate taxon. However, both subspecies were recognized in the recently published Fishes of Indiana. To date, all hypotheses regarding the relationships among these fantail darter populations have been based on morphology; but it is possible that a genetic data set might better elucidate the taxonomic validity of E.f. flabellare and E.f. lineolatum. The main objective our research is to determine whether there is a genetic distinction between the subspecies.

Specimens were collected from major river systems within Indiana and adjacent states. We then extracted DNA from the specimens and used sequence variation of the mitochondrial cytochrome b gene to infer the phylogenetic relationships among the represented populations. Preliminary analysis of the sequence data revealed evidence for two clades within E. flabellare, generally corresponding to 1) populations to the west and prairie regions of Indiana, and 2) populations in the unglaciated regions of Southern Indiana and Kentucky. Although it is tempting to equate these two clades to E.f. lineolatum and E.f. flabellare, more samples will be needed to assess the taxonomic status of these subspecies.

Taylor Atkins & Katie

Use of Stratigraphy, Sediment and Soils to Assess the Potential for Converting an Abandoned Agricultural Field into a Man Made Wetland, Evansville, Indiana

Nathan Bartholomew

Faculty Mentor: Dr. James Durbin

A need to utilize property recently granted to the University of Southern Indiana yielded a plan to develop a human made wetland. In addition to the wetland providing a location for biological and geological training, it also has potential to capture environmentally hazardous chemicals from campus housing and parking lots.

The study area sits within an underfit stream valley underlain by late Quaternary alluvium and glaciolacustrine sediments associated with the Ohio River. The stratigraphy observed in sediment cores consists of a sand to sandy silt at a depth of 3.26 to 3.35 m overlain by 0.82 to 2.25 m of sandy silt interpreted as fluvial sediments. Overlying these fluvial sediments is a 0.82 to 2 m thick silt to clayey silt interpreted as loess derived floodplain or colluvial sediment. Wakeland series soils developed in the upper silt are poorly drained, with Ap/Bt/C profiles extending through the silt into the uppermost part of the silty alluvium. Mottling, gleying, and iron nodules are common in all cores, evidence of a fluctuating water table. Cores and GPR data confirm the location of the water table at an average of 1.5 m depth. The water table slopes gently downward from east to west before intersecting the stream channel at 1.9 m.

The main stream channel and "tributary" drainage ditches flood the field semiannually. Water currently ponds in shallow depressions during heavy rains except where the farmer dug a 0.4 m deep drainage

Human Powered Vehicle

Brett Bielfeld

Faculty Mentor: Dr. Natasha Smith & Dr. Brandon Field

The objective of this project is to design and assemble a human powered vehicle (HPV) to compete in the Human Powered Vehicle Challenge (HPVC) hosted by the American Society of Mechanical Engineers (ASME) each year. This project will allow students to apply engineering design principles obtained in the classroom to a real world problem: the development of sustainable transportation. The competition, which will be held April 26 – 28 at Ferris State University in Big Rapids Michigan, consists of four different events (design, speed, innovation, and endurance) that will put the designed vehicle to the test against several other schools across the nation.

This competition will also allow students to get hands on experience with the design sequence, time r management, cost r management, metal working, and fiberglassing. For this year's competition, USI's HPV team will be constructing a

Variable Water Level Response to Stress in a Sandstone Aquifer of the Illinois Basin

T. Bryce Chambers

Faculty Mentor: Dr. Paul Doss

Hydrological systems respond to a variety of stressors. Several years of hourly groundwater levels from a deep-shallow piezometer nest in the Pennsylvanian Inglefield Sandstone of Southern Indiana display water level responses to barometric pressure and earth tides but do not have the resolution necessary to detect potential changes from seismicity. Existing data show water level fluctuations of up to 5.5 cm/day (2.2 in/day) with a pronounced inverse relationship to barometric pressure. Water level fluctuations of 2.7 cm (1.1 in) with periodicities of 12 and 12.4 hours correspond to solar and lunar tidal stressors. To observe potential strain responses due to seismic stress, a pressure transducer with data logger was deployed in the Groundwater Monitoring Laboratory at the University of Southern Indiana (USI) to measure groundwater levels every minute. The USI campus is

Provenance of Cobbles in the Rocky Gulch Sandstone Member of the Hornbrook Formation (Upper Cretaceous) in Siskiyou County, California

Maxwell Dahlquist

Faculty Mentor: Dr. William S. Elliott

The Hornbrook Formation (Upper Cretaceous) consists

Conduct According to Moll Flanders

Jerrica Dowling

Faculty Mentor: Dr. Michael Kearns

Daniel Defoe's Moll Flanders is both a likeable character and a criminal. Her behavior, however unlawful, is easily justified by the circumstances of her social condition.

This paper discusses the relationship between growing female criminal conduct and the rise of the novel. Defoe's Moll Flanders explores the realms of gender and class

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Preferential Preservation of Sedimentary Fabrics and Textures in Mudrock Concretions from the Hornbrook Formation (Upper Cretaceous) in Siskiyou County, California

Travis I. Hatfield

Faculty Mentor: Dr. William S. Elliott

The Hornbrook Formation (Upper Cretaceous) is made up of approximately 1,200m of mudrock, sandstone, and conglomerate exposed along the northeastern flank of the Klamath Mountains in Southwestern Oregon and Northern California. Concretions provide important depositional and sedimentological information that may not have been preserved and/or was obliterated by compaction in surrounding mudrocks.

Synthesis of α-C-Glycosides of 2-Amino Sugars from Glycal Aziridines

Chelsea Heibel

Faculty

Effect of Meal Composition of Postprandial Blood Glucose Levels in College Students with varying BMIs and Exercise Patterns

Carynn Koch & Jennifer Koch

Faculty Mentor: Dr. Mari Hopper

We investigated the effects of meal composition and levels of physical fitness and body composition on postprandial blood glucose. For 20 college students, BMI was determined and classified (High BMI ≥ 25; Low BMI <25). Participants self assessed their physical fitness using a Likert type scale (High Fit >5; Low Fit ≤ 5). Subjects completed an oral glucose tolerance test (OGTT) and in following weeks consumed one of three breakfast meals (all 520 kcals) following an overnight fast in random order: 1) energy drink and toaster pastry; 2) ham and cheese; 3) bagel, peanut butter, and banana. An Accucheck® glucometer was used to determine fasted, 30, 60, and 120 minute postprandial blood glucose levels. All fasted glucose values were normal. Two hour OGTT glucose remained above 130 mg/dL in both the High BMI and Low Fit groups. Low Fit glucose levels were significantly higher than High Fit at all time periods for both toaster pastry and bagel meal treatments. Similarly, High BMI glucose levels were higher than Low BMI by 10.5% at 30 min, 15.8% at 60 min, and 20.8% at 120 min.

The greatest differences in blood glucose level occurred at two hours following the energy drink and toaster pastry (Low BMI 90±3.3 vs High BMI 120±15.3 mg/dL). These results indicate that postprandial blood glucose response depends on both meal composition and the individual's BMI and level of physical fitness.

PM3 and PM6 Calculations on Organometallic Dehydrogenation Catalysts

Allison M. Konieczki, Sarah B. Schwartz, & Lauren A. Martin

Faculty Mentor: Dr. Jeff Seyler

The catalytic mechanism for Iridium pincer dehydrogenation catalysts have been studied with semi r empirical methods. The intent of the current study is to compare the results of past PM3 calculations (Spartan'10, Wavefunction, Inc.) with results using the newer PM6 level of theory. For this report, we have examined the dissociation of cyclooctene from the iridium complex containing the isopropyl substituted PCP pincer ligand. This is a critical step in the catalytic cycle where catalyst regeneration occurs following the dissociation.

The energy diagram of this portion of the cycle was investigated to yield the energy of the Iridium r cyclooctene complex, along with the energies preceding the regenerated catalyst and dissociated cyclooctene. Geometry optimizations with PM6 have proven to be problematic with these organometallic systems. In cases where PM6 optimization failed to generate appropriate geometries, single point calculations were performed using the PM3 optimized geometries.

Oxidative Addition of Alkanes to Iridium Pincer Complexes

Lauren Martin

Faculty Mentor: Dr. Jeff Seyler

Iridium pincer complexes have proved to function as dehydrogenation catalysts. An early step within the catalytic cycle involves the activation of a C-H bond through oxidative addition. We have studied this process with semi-empirical methods. The intent of the current study is to compare the PM3 calculations with the newer PM6 level of theory (Spartan '10, Wavefunction, Inc.). For this report, we have examined the reaction of cyclooctane as the C-H source with an iridium complex containing an isopropyl substituted PCP pincer ligand. In previous reports, the oxidative addition step has been claimed to control the activation energy of the overall process. We have attempted to obtain transition states for this process in our model complex. Comparison of geometries and energies obtained with the two semi-empirical methods will be presented.

Ars Poetica: Storytelling

Morgan Opolski

Faculty Mentor: Dr. Michael Kearns

This poetry collection titled "Ars Poetica: Storytelling" was written for the 2013 Sigma Tau Delta International Convention. This collection focuses on the act of storytelling as a way energy

Comparative Study of Locomotory Systems Across Three Phyla

Jarod Allen Richards & Alex Arwood

Faculty Mentor: Dr. Mari Hopper

Locomotion is accomplished in many different ways across all the phyla. It provides a means of food acquisition, predation, and safety. This presentation focuses on organisms from three distinct phyla, Echinodermata, Mollusca, and Chordata. While the use of locomotion varies between organisms, individual form meets function in regard to niche. Asterias rubens is the model species of the phyla Echinodermata and has evolved specific locomotory behaviors as a benthic, marine dwelling organism. Its five arms are branches of the body itself. Tube feet are the primary locomotive organ of A. rubens and are unique to the phyla. Enteroctopus dofleini represents a typical octopod with two major forms of locomotion. Walking requires less energy expenditure, is used within reefs, and is performed by highly muscularized arms and suckers. Jetting is utilized in short bursts or migration and is accomplished via the expansion and contraction of mantle cavity volume. The locomotory capability of Falco peregrinus is interesting due to its ability to travel at and withstand high speeds. After diving from a perch, F. peregrinus uses an extremely derived body plan and large keel musculature to reach speeds of over 200 miles per TD 0 Tc <0003>Tj/T1_1 1 Tf 0.335 0 TD 0 Tc (of) Tj (this) Tj system.

Late

Flexural Stiffness of the Hindwings of Lycaenidae Butterfly

Evan Michael Taylor

Faculty Mentors: Dr. Eric McCloud & Dr. Julian Davis

Insect wing mechanics have been studied with the motivation of characterizing the relationship between flight and mechanical properties including flexural stiffness. Lyceanid butterflies offer a different mechanism for which flexural stiffness may contribute to behavior. Lycaenidae have characteristics of their hind wings that are described as a false head including posteriorly oriented wing projections called tails. While maneuvering on a substrate, many Lycaenidae fold and oscillate their hind wings along the cephalic caudal axis. At this time, the tails oscillate in a peculiar bouncing motion. This is called false head behavior. One of the predictions from the False-Head hypothesis posits that false head behavior deflects predator attacks away from the vulnerable body and head toward a weaker decoy region of the insect that can breakaway upon attack similar to the autotomizing tails of lizards. We predict that this weaker region in the hind wing may be a result of decreased modulus.

We measured flexural stiffness profiles of butterfly wings along the length of the wing. We used these measurements along with finite element models to predict average modulus of the wing. Uniform moduli of wing membrane and wing vein structures can predict the flexural stiffness to within approximately 18% of mechanically tested wings. However, preliminary results indicate regional variation of wing moduli allows us to better capture the flexural stiffness profile observed in experimental data. In addition, dynamic analysis of the wing models indicates that there may be a mechanical relationship between hind wing movement and tail bouncing.

Don't Forget Me When I'm Gone: Examining Relationships between the Living and the Dead through Decorated Headstones

Jillian Utter & Ashley Christianson

Faculty Mentor: Dr. Susan Spencer

Decorated headstones from two Evansville, Indiana, cemeteries were examined in order to understand the relationships between the living and the dead. This study specifically aimed to examine how the identity of the decedent affects whether their loved ones will continue to decorate their headstone after their death. Decorations left on headstones commonly included flowers, ceramic figurines, flags, letters, and decorative seasonal items. It is expected that the type and number of decorations left on headstones will be dependent on the sex and life stage of the decedent. We expected that most loved ones would not continue to decorate headstones after five years since death. Online memorial web pages were used to understand the life and death of people with elaborately decorated headstones. This data elucidates the very active relationship that the living continues to share with the dead.

Synthesis of Novel Amphiphilic BODIPY Derivatives with Hydroxyl Groups for Live Cell Imaging

Matthew Vincent

Faculty Mentor: Dr. Priya Hewavitharanage

New BODIPY derivatives with one 4-hydroxy-1-butynyl group at the 2 position and two 4-hydroxy-1-butynyl groups at the 2, 6, or 4, 4' positions were conveniently synthesized using tert-butyldimethylsilyl (TBDMS) protected alcohols. Deprotection of TBDMS of 4, 4' substituted BODIPY was achieved using tetrabutylammonium fluoride (TBAF) while deprotection of 2 and 2, 6 substituted BODIPY was achieved with acetyl chloride to obtain corresponding alcohols in excellent yields. All BODIPY derivatives with TBDMS protected alcohols fluorescein higher quantum yields when compared to those with free hydroxyl groups. Cell uptake experiments showed that these compounds that

The Invariant Measure for Anderson Localized Negative Index Metamaterials Continuously Disordered

Aaron M. Williams

Faculty Mentor: Dr. Glen Kissel

We consider one dimensional photonic bandgap structures with negative index of refraction materials modeled in every layer or in every other layer. When the index of refraction is randomized, and the number of layers becomes large, the light waves undergo Anderson localization resulting in confinement of the transmitted energy. Such a photonic bandgap structure can be modeled by a long product of random transfer matrices from which the (upper) Lyapunov exponent can be calculated to characterize the localization effect and thereby further understanding of the phenomenon. Furstenberg's integral formula can be used to calculate the Lyapunov exponent via integration with respect to the probability measure of the random matrices and with respect to the so called invariant probability measure of the direction of the vector propagated by the long chain of random matrices. This latter invariant probability measure, so fundamental to Furstenberg's theorem, is generally impossible to determine analytically. Here we use a bin counting technique with Monte Carlo chosen random parameters from a continuous distribution to numerically estimate the invariant measure and then calculate Lyapunov exponen rando 1 Tc (vil 1 Tf 1.5355 0 TD 3f -38.9071 -1.224 943 (2(impossible) Tj /TT1 1 Tf 4

Development of a Carcerand for C60

Nathaniel J. Williams

Faculty Mentor: Dr. Edmir Wade

The field of organic chemistry, though very diverse in nature, has in the last decade, become particularly interested in the area of host molecules. The reason behind this interest is the unique properties associated with these molecules' ability to detect, encapsulate, and transport a host specific molecule to a targeted site. This ability opens the door to a wide variety of applications for these molecules. The primary focus of this study was to produce such a carcerand that was capable of hosting C60 guest molecules based on the allotted intermolecular interaction properties of the molecule's structure. Upon assembly of the molecule, the aromatic nature of the host and guest will allow for the interaction to be monitored via ultraviolet/visible spectroscopy or fluorescence. This detectable nature

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