



PROGRAM SCHEDULE WITH ABSTRACTS

APRIL 25, 2014
University of Mary Washington
Fredericksburg, Virginia

Financial Support for Research and Creativity Day
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COUNCIL ON UNDERGRADUATE RESEARCH
Learning Through Research



Schedule of Events

April 25, 2014

Researcher Registration and Poster Set-up

8:30 am - 9:30 am in the Jepson Science Center

Oral Sessions

10:00 am - 3:00 pm

Jepson Classrooms 107, 219 & 313

Poster Sessions

12:00– 1:00 pm

Jepson Rotunda

refreshments served for all

Original Music Performances

1:00 -1:35 pm

Studio115 duPont Hall

Theatrical Performances

1:45 -3:45 pm

Studio115 duPont Hall

Additional Exhibits and Sessions

Melchers Hall

10:00 am – 4:00 pm

Monroe Hall

9:00 am – 4:00 pm

Trinkle Hall

9:00 am – 5:00 pm

Poster Pick-up starting at 4:00 pm





Sessions in Melchers Hall

Room 207

3:00 – 4:00

Session Chairs: Dr. Joseph Dreiss and Dr. JeanAnn Dabb (Art and Art History)

Individual Studies in Art History

Annie Grotophorst, “Transcending Wright: Originality in the Architecture of John Lautner”, (Joseph Dreiss)

Mason Moorman, “Street Art: Protest and Profit”, (Joseph Dreiss)

Isabel Smith, “The Ballet Dancers of Edgar Degas: A Feminist Theoretical Perspective”, (JeanAnn Dabb)



Sessions in Monroe Hall

Room 240

Geography Symposium Oral Session

9:00 – 9:50

Hannah Kincaid, “Reading the Landscape of National Parks”

Jenna Randall, “Indigenous Place and Personhood”

10:00 – 10:50

Adam Hager, “Old Growth Forest Management in the Pacific Northwest: How the Northern Spotted Owl Affected Policy Change”

Carl Larsen, “The Reintroduction of the Gray Wolf in Yellowstone National Park and the Northern Rocky Mountains”

11:00 – 11:50

Nathan Slater, “Christianity in China: Why Communist China is Actually Fertile Ground for Religion”

Julia Wood, “Gendered Understandings of the Lived Religious Experience: Exploring Emotional Responses Through Sacred Space”

2:00 – 2:50

Andrew Walz, “Don’t Worry, They’re Having Fun Too! A Representation of Samoans in Tourism Paradise Landscapes”

Brady Larkin, “Reading a Football Landscape in the UK”

3:00 – 3:50

Lulu Walker, “Zip Code Productions: The Marginalization of Poor and Minority Students in the American Public Education System”

Sarah Bergstresser, “The Value of Grassroots Activism with the Love Canal Incident”

1:00 – 2:00**Room 319****Geography Symposium Poster Sessions**

- David Chambers, Ray Humiston, “Determining Deforestation in the Sierra Yalijux, Guatemala”
- Stanton Coman, “Mapping Breast Cancer in the Commonwealth”
- Robert Darron, “Poverty Rates in the DC Metro Area”
- Philip Devine, “Calculating Shade in Urbanized Areas”
- Ellie Meyer, “Fracking and its Possible Seismic Effects on the Contiguous United States”
- Robert Skoczylas, “Fredericksburg Fire Department Response Area Analysis”

Room 320

Session Chair: Dr. Brian Rizzo (Geography)

GISC Capstone Presentations

9:00 Jason Hilton, “Concrete Evidence: Increase in Impervious Surfaces in Stafford County, and How They Can Affect the Chesapeake Bay”

9:20 Jenna Stockton, “Virginia Mines: A Methodology”

9:40 Andrew Walz, “Geodatabase Development of a Road Sign Project for Fort A.P. Hill”

10:00 Margaret Walker, “Mapping Exotic Species in Crow’s Nest, Virginia”

- 10:20 Lucy Baker, “Model Creation Improving Web-Based Public Participation GIS”
- 10:40 Chris Petroff, “The Dynamic Response Solution: A Combination of GIS and Social Media”
- 11:00 Leigh Hamilton, “Constructing an ArcGIS Online Interactive Heritage Map”
- 11:20 Robin Ramey, “Application of GIS Software to Historic Maps: Georeferencing Thomas Jefferson Plats and Surveys”
- 1:00 Christina Sabol, “Conflicts in Ukraine: Past and Present”
- 1:20 Suzanna Toske, “Determining Potential Wildfire in Alaska for Allstate Insurance”
- 1:40 Carl Larsen, “GIS in “Young Life”: An Introduction to its use in the Organization”
- 2:00 Nathan Dawes, “Warrenton Urbanization”
- 2:20 Sarah Bergstresser, “The Geographic Representation of Kimberley Process Diamond Data”
- 2:40 David Chambers, “Monitoring Oil and Gas Leases of Potential Fracking Sites in Caroline County, VA”
- 3:00 Gregory Baugher, “GIS Model of Alaskan Oil Wells”
- 3:40 Drew Chritton, “Building a Geodatabase from Legacy CAD Data”



Sessions in Trinkle Hall

9:00 – 11:00 & 1:00 – 3:00

Room 204

Session Chairs: Dr. Angela Pitts and Dr. David Ambuel (Classics, Philosophy and Religion)

Mindfulness Gallery

- Matthew Babineau, “The Process of Meditation Through Music”
- Cameron Bierkan, “But I’m Not a Poet”
- Daniel Browne, “Mindfulness and the Art of Diabetes Management”
- Stephanie Buckler, “Defining Friendship”
- Danielle Deville, “Mindfulness Through Music”
- Shama Doshi, “Inner Peace”

- Emily Farnsworth, “Ceci N’est Pas Une Erreur”
- Shannan Feight, “Bamboo Pen and Ink Drawing”
- Nyssa Giangregorio, “She is Detached from all Things; That is Why She is One With Them”
- Alice Girton, “Mindful Eating”
- Thomas Hughes, “Connectivity of the World”
- Samuel Jackson, “Hanging Starlight”
- Aashna Jain, “Mindfulness of Yoga”
- Kyle Khalifa, “Stencil Art and Mindfulness”
- Kaitlin Lamb, “Star Series”
- Madeline Lord, “Mindful 2048”
- Brennan Miller, “Gathas For Every Occasion”
- Erik Nosar, “Ball of Color”
- Alice O’Brien, “Meta Inspired Abstract Art”
- Megan O’Connell, “Breath”
- William Sacripanti, “Do It Yourself Desktop Zen Garden”
- Anna Ware, “Situational Poetry”
- Cara Wood, “Mindfulness, in Color”

3:30 – 5:00

Classics, Philosophy & Religion Suite

Religion Senior Thesis Oral Presentations

Aysha Tahreem Iqbal, “An Experiential Versus Intellectual Defense of Religious Pluralism”

Mathew Konerth, “One Virtuous, One Villainous, Both Striving: Parallels of Dissatisfaction in Goethe’s Faust and The Book of Job”

Ellen White, “The Pontificate of Pope Francis and a New Approach to Catholicism”



Morning Oral Sessions – Jepson Science Center

10:00 – 11:00

Room 107

Session Chair: Dr. Janet Asper (Chemistry)

Claire Pickard, "Cruel and Usual: Virginia Supermax Prisons and Their Adherence to International Human Rights Regulations" (Eric Bonds)

Katelyn Maxwell, “Gendered Speech and Sexuality in Ovid’s *Metamorphoses*” (Joseph Romero)

Emma Oestreicher, “*Mixtum carmen*: Rehabilitating the Iambic in Horace’s Post-Actian Symposia” (Joseph Romero)

Kasey Moore, “Navigating Life with Congenital Nystagmus” (Tracy Citeroni)

11:00 – 12:00

Room 107

Session Chair: Dr. Debra Steckler (Psychology)

Sertima LeGendre, Kristen Schuetz, Patrick Vukmirovich, Ryan Aschenbrenner, “The Influence of Musically Induced Frontal Asymmetry on Pain Perception and Threshold” (Hilary Stebbins)

Frances Ellmo, Janie Hayden, Kima Nieves, Jacob Hargis, Nicole Erickson, “Emerging Adulthood and Music: More than Just My Ding-a-Ling” (Debra Steckler)

Danielle DeVille, “Interoceptive Sensitivity and Eating Disorder Risk: The Roles of Self-Objectification and Intuitive Eating” (Jennifer Mailloux)

11:00 – 12:30

Room 313

Panel: Economics Department Thesis Presentations

Jessica Melvin, “The Viability of the Peer-to-Peer Lending Market: Does the Model Work?” (Stephen Greenlaw)

Chelsea LeHew, “The Economics of Estate Planning” (Robert Rycroft)

Lavar Edmonds, “Great Expectations: Student Loans and College Major Choice Among STEM Students” (Robert Rycroft)

Taylor Knight, “A Cross-National Study on Infant Mortality Rates” (Steve Greenlaw)

Clare Stechschulte, “Finding the Root of Virginia’s Educational Turnover: A Cross-Sectional Study Exploring Rumberger’s Theory of High School Dropouts” (Stephen Stageberg)



Poster Sessions – Jepson Science Center 12:00 – 1:00

- Brooke Andrews, “Comparative Synthesis of 4,4′di(bromoalkyl)-2,2′-bipyridine” (Nicole Crowder)
- Molly Banfield, Briana Wilson, “Collection and Identification of Trematodes from the Rappahannock River” (Abbie Tomba)
- Ethan Bottone, “Documenting Language Erosion and Preservation Efforts in the Canadian Arctic” (Dawn Bowen)
- Jeff Branson, Jeff Mirzada, “Detection of Nuclear Import in Isolated Liver Cell Cytosol and Crude Liver Homogenates” (Stephen Gallik)
- Abby Brooks, “Spandex: From the Lab to Your Closet and Beyond” (Janet Asper)
- Daniel Browne, Amanda Shea, “Wormfinding: Creating a Significant Learning Experience” (Theresa Grana)
- Theresa Buczek, Alesha Ballman, “The Impact of News Content on Attitudes Towards Persons with Mental Illness” (Laura Wilson)
- Mary Chessman, “Methods in Gene Regulation” (Deborah Zies)
- Samuel Clark, Ariel, Davati, “Comparative Methods in the Analysis of Lipoproteins” (Kathryn Loesser-Casey)
- Katherine Coleman, “Preliminary Spatial Analysis of Polycyclic Aromatic Hydrocarbons (PAHs) in the Virginia Portion of the Chesapeake Bay Basin” (Ben Kisila and Charlie Sharpless)
- Jeff Davidson, Safwaan Islam, Shannon Henry, “Conductivity of Polymer Electrolytes as a Model for Understanding Electricity Generation in LIBs”, (Leanna Giancarlo)
- Jeff Davidson, “STM Investigation of Coadsorption of Carboxylic Acids on Graphite” (Leanna Giancarlo)
- Katherine DeCecco, “Auxiliaries, Legionaries, and More: A Study of Trajan’s Column, the Representation of Trajan, his Soldiers, and Their Tasks” (Joseph Romero)
- Dominique Delfino, Virginia King, “Cell Phone Radiation Induced Gene Expression in Human Glioblastoma Cells” (Deborah O’Dell)
- Jessica Dochney, “Imaging and Characterizing Nematode Species” (Theresa Grana)
- Corinne Fredrickson, “Use of an Electrolysis Titration Cell and Ideal Gas Law for the Analysis of Household Vinegar” (Leanna Giancarlo)
- Alexander Gilley, “Creating Tools for the Advancement of Chemistry Education” (David Toth)
- Brittany Harris, “Polyurethane as used in the Ball-Jointed Doll Industry” (Janet Asper)
- Ngoc Quyen Huynh, “Manipulating Light Through Room Temperature Vapor Cell” (Hai Nguyen)

- Eric Johnson, “Synthesis of a Catalytic Metal oxide Surface through the Use of Click Chemistry” (Nicole Crowder)
- Eric Johnson, Ariel Davati, “Spectrophotometric Determination of the Bromocresol green Equilibrium Dissociation Constant as a Function of Ionic Strength” (Leanna Giancarlo)
- Anna Kania, “Silencing of Essential Genes in Models of Animal-Parasitic Nematodes” (Theresa Grana)
- Megan Kelly, “Atomic Spectroscopy” (Hai Nguyen)
- Kimberly Kerns, Domingo Alvarez, Caitlin Chmielewski, “Putting the Fun in Learning-Educational Games” (Mary Kayler)
- Susanna Kirschner, Jenna Stockton, Teresa Fenn, “Study of the Distribution and Interaction of Heavy Metals, Sulfur, and Organic Matter Throughout the Soil Profile in an Acid Mine Drainage-Impacted Ecosystem” (Melanie Szulczewski)
- Peyton Kremer, “Determining the Effectiveness of Using Kinovea Software in Recording and Analyzing Crayfish Behavior” (Abbie Tomba)
- July Laszakovits, Kelly McDaniel, “Green Polymers: Synthesis of Biodegradable Polymers from Carbon Dioxide” (Janet Asper)
- Madeline Lord, “Simulating Preference and Opinion Drift in a College Environment” (Stephen Davies)
- Thy Mai, Dan Browne, Amanda Shea, “Wormfinding: Characterization of Nematode Species through Behavioral Assays” (Theresa Grana)
- Sarah Marzec, “Free-living Soil Nematode Population Dynamics at an *Asimina tiloba* site in Virginia” (Theresa Grana)
- John Meadows, “Slow Light Research Using a Mach-Zehnder Interferometer” (Hai Nguyen)
- Daniel Miller, “A Comparison of Gene Expression in Response to BPA Exposure in Prostate and Mammary Tissues” (Deborah O’Dell)
- Carter Moore, “A Fossil’s Tail: The Paleoenvironmental Evolution of Carboniferous Aquatic Ecosystems in Atlantic Canada” (Neil Tibert)
- Kelsey Moxey, Lainey LeBlanc, “A Comparative Analysis of the Effects of Forested Buffers and Floodplain Soil Properties on Phosphorous Dynamics in Two Chesapeake Bay Sub-Watersheds, Virginia” (Ben Kisila)
- Chastaine Perry, Jesse Lynch, “Photochemical Upconversion using 9,10-Diphenylanthracene and Tris(2,2'-bipyridyl)ruthenium(II)” (Leanna Giancarlo)
- Catherine Peterson, “Common Ground: Discover, Integrate & Celebrate the Arts and Theology” (Joe DiBella)
- Lynn Pincus, “Prestige and Exclusive International Institutions” (Jason Davidson)
- Alexander Priest, David Nunez, “Synthesis and Application of Poly (lactic-co-glycolic acid) [PLGA]” (Janet Asper)
- Olivia Schiermeyer, Erica Falvey, “PDMS: Seeing Polymers in a New Light” (Janet Asper)
- Brittany Simmons, Charlotte Hagerman, Elizabeth Storey, Adrienne Bell, “Turning to Food Under Stress: Roles of Attentional Focus and Dietary Restraint” (Chris McBride)
- Zaire Sprowal, Nathan Bradley, “A Short Introduction to Solar Energy: A Comparative Analysis of the Seebeck and Becquerel Effects” (Chinthaka Liyanage and Charles Whipkey)
- Orlando Stewart, Jr., “Effect of Evaporative Weathering on the Spectroscopic Properties of Crude Oil” (Charles Sharpless)

- Rachel Thomas, Taylor Oehm, “Dermabond® Surgical Glue” (Janet Asper)
- Chiara Tornabene, “The Paleoenvironmental Significance of Nonmarine Ostracodes in the Dinosaur Bearing Cedar Mountain Formation, Utah, U.S.A.” (Neil Tibert)
- Katherine Vanderpool, Katie Graff, “Using UV-Vis Spectroscopy and Conductance to Investigate the Kinetic Solvent Isotope Effect for D₂O and H₂O” (Leanna Giancarlo)
- Lauren Waaland-Kreutzer, Hester Godfrey, Leanna Papp, “The Dark Side of Romance: Romantic Beliefs Predict Intimate Partner Violence” (Mindy Erchull and Miriam Liss)
- Usman Zafar, Holly Perucci, “Determination of Thermodynamic Properties of 6-NO₂-BIPS Through its Photochromism” (Leanna Giancarlo)



Original Music Performances – Studio115 duPont Hall 1:00 – 1:35

Mouth of Munch

Lindsay Bulls

fixed media

Midnight in G

Jackson Wright

Mary Paige Rodgers and Jackson Wright, acoustic guitar
Stephen Hennessey, live tuner

Or of Goblins

Isun Malekghassemi

fixed media

Deep Breath

Austin O'Rourke

Zachary Faison, spoken word
Austin O'Rourke, percussion
Lindsay Bulls and Mary Paige, piano
Paige Naylor, accordion
Stephen Hennessey, contrabass

“Beyond the Horizon” for Clarinet and Electronics

Devin Geraghty

Devin Geraghty, clarinet

Ruminations

Claire Ashur

fixed media

Firebomb

Mary Paige Rodgers

Sepehr Sobhani, trumpet
Mary Paige Rodgers, electric guitar
Jackson Wright, electric bass
Austin O'Rourke, drums

"Ausgang" for Guitar and Electronics

Stephen Hennessey

Stephen Hennessey, guitar



**Theatrical Performances – Studio115 duPont Hall
1:45 – 3:45**

**Department of Theatre & Dance
The Work in Progress**

Criminal Hearts by Jane Martin
Judi Jackson
Margaret Lewis

Time Stands Still by Donald Margulies
Catherine O'Meara

No Exit by Jean Paul Sartre
Beverly Kippenhan

Lungs by Duncan Macmillan
Stephen Nickens
Kat Zeringue

Doubt, A Parable by John Patrick Shanley
Julia Wells
Stephen Nickens

Humble Boy by Charlotte Jones
Mason Prince
Covenant Babatunde

The Shape of Things by Neil LaBute
Evan Crump
Emily Burke

The Curious Incident of the Dog in the Night-Time
by Mark Haddon
Nick McGovern
Julia Wells

Fat Pig by Neil LaBute
Taryn Snyder
Evan Crump

The Gingerbread Lady by Neil Simon
Jake Crowley

Boy Gets Girl by Rebecca Gilman
Austin Bouchard
Catalina Ruiz de Gamboa

A Chorus Line by Michael Bennett
Brittany Polson

Boy Gets Girl by Rebecca Gilman
Gwen Levey

Fool for Love by Sam Shepard
Catalina Ruiz de Gamboa

Encyclopedia Salesman from *Vital Signs* by Jane Martin
Margaret Lewis

A Bebanding in Spokane by
Martin McDonagh
Austin Bouchard

The Glory of Living by Rebecca Gilman
Drew Polson
Morgan Gresham



Afternoon Oral Sessions – Jepson Science Center

1:00 – 2:00

Room 107

Session Chair: Dr. Richard Finkelstein (Dean, College of Arts and Sciences)

Irene Satchwell, “Destruction of the Museum and Library of Alexandria” (Joseph Romero)

Ana Tkabladze, “Solving the Long-Debated Iconography of the Portland Vase” (Joseph Romero)

Max Huemer, “The Gsur of Tripolitania: An Analysis of a Roman Frontier Defense System in North Africa” (Joseph Romero)

Brent Arehart, “Consistency, Self-Portrayal, and the Success of Galen’s *De differentiis februm*” (Joseph Romero)

Room 219

Session Chair: Dr. Elizabeth Wade (English, Linguistics and Communication)

Panel: The View from the River: Readings and Discussion with The Rappahannock Review

Members of the English 314 class, “The Rappahannock Review, UMW’s new national literary journal, through performance and dialogue”

2:00 – 3:00

Room 107

Session Chair: Dr. David Toth (Computer Science)

Yoshinori Takeda, “Induction of p53 Activity in NIH 3T3 Cells Following Exposure to Non-ionizing Radiation” (Rosemary Barra)

Kyle Genovese, “Application of Multiple Regression: A Two Case Study” (Julius Esunge)

Morgan Brown, “Simulating Social Interactions on a College Campus with a Java Agent-Based Model” (Stephen Davies)

Russell Ruud, “Computational Economic Research of Wealth Inequality” (Stephen Davies)

Room 219

Session Chair: Dr. Kristen Marsh (Anthropology and Sociology)

Olivia Smith, “Food Security and International Trade” (Surupa Gupta)

Tasha Horton, Lauren Holt, Madeleine Rhondeau, John Settle, Christine Zale, Carol Vinatieri, Garrett Hulfish, “Infographics and Preservation Planning” (Andrea Smith)

Rachel Sisk, Danielle DeVille, Emily Farnsworth, Wesley Horton, “Does Interoceptive Sensitivity Interact with Catastrophic Thinking to Affect Arousal?” (Jennifer Mailloux)

Kathleen Bettencourt, Valerie Lewitus, Eva Ng, “Extinction Patterns of Electrodermal Activity in Response to Threat Stimuli” (Hilary Stebbins and Laura Wilson)



Abstracts

Listed Alphabetically By Student Researcher

Student Researcher: Brooke Andrews

Major: Chemistry, ACS

Research Mentor(s): Dr. Nicole Crowder

Project Title: Comparative Synthesis of 4,4'-di(bromoalkyl)-2,2'-bipyridine

A platform for the electrochemical reduction of carbon dioxide can be formed by attaching an inorganic catalyst to a metal oxide surface. The catalyst-coated plate functions as a reusable electrode, allowing for the valuable formation of new carbon-carbon bonds. Bipyridine functions

to coordinate a ruthenium catalyst, and when substituted with alkyl chains terminated in phosphonic acids, the molecule also has the potential to be covalently bound to a copper oxide surface. In an effort to synthesize the necessary organometallic catalyst, modification of 4,4'-dimethyl-2,2'-bipyridine was attempted via two routes: a haloalkylation and a radical bromination of the methyl substituents.

The addition of an alkyl chain to 4,4'-dimethyl-2,2'-bipyridine was facilitated by the use of an extremely strong organic base, lithium diisopropylamide (LDA). A methyl proton was removed, creating a highly reactive carbanion. Subsequent introduction of alkyl chains functionalized by primary halogens yielded a product that was able to be converted to the intended phosphonic acid. Alternatively, a reflux in the presence of a radical initiator (azobisisobutyronitrile, AIBN) and a source of bromine (N-bromosuccinimide, NBS) radically brominated the methyl substituents of the bipyridine starting material. Of the two synthetic approaches, the radical bromination is preferable, as subsequent reactions require a simplified purification technique. There is also a reduction of potential byproducts.

Student Researcher: Brent Arehrt

Major: Classics

Research Mentor(s): Dr. Joseph Romero

Project Title: Consistency, Self-Portrayal, and the Success of Galen's *De differentiis februm*

This paper examines the rhetorical strategies which Galen of Pergamum (a doctor in the Roman Empire during the 2nd/3rd Centuries AD) uses in a work entitled *De differentiis februm*, or "On the Differences of Fevers" (hereafter *Diff. Feb.*). In this under-studied treatise, Galen expounds the proper theoretical criteria for classifying the various kinds of fever that were commonly identified in his time. Throughout his work, however, Galen employs multiple techniques which portray himself as competent and, at the same time, which depict his rivals as ineffectual. The present examination is concerned not only with how Galen cultivates his self-image in *Diff. Feb.*, but also with (I) how consistent this self-image is with Galen's other written works; and (II) the relationship between Galen's self-image and his posthumous acceptance as the greatest authority on fever theory after Hippocrates. The paper thus splits into two parts in order to handle each of these questions at length. In Part I, it is argued that Galen's self-image in *Diff. Feb.* conforms with the rest of his corpus. In Part II, it is argued that Galen's rhetoric of self-portrayal exerted a major influence on the success of his fever theory.

Student Researcher: Matthew Babineau

Major: Psychology

Research Mentor(s): Dr. Angela Pitts

Project Title: The Process of Meditation Through Music

The creative process to create this project was linking the process of meditation through the medium of music. After sessions of meditation music was written based on the experiences and processes gone through in the meditation session. The performance reflects a brief journey through the process of meditation.

Student Researcher: Lucy Baker

Major: Environmental Science

Research Mentor(s): Dr. Brian Rizzo

Project Title: Model Creation Improving Web-based Public Participation GIS

Mandated by the Mapping Act of 1992, the United States Geologic Survey (USGS) and Association of American State Geologists (AASG) joined to create the National Geologic Map Database (NGMDB), whose goal was to "serve the public and geoscience professionals". This goal empowers the public with the knowledge and applications that GIS brings, creating a well-informed and involved community through easy to view web-based interactive maps. The transparency and accessibility of energy sources, in particular wind and gas, databases and maps is a fundamental concept in the mission of the United States Geologic Survey. By creating models in modelbuilder, larger amounts of data can be processed. The ever-expanding fields of

wind turbines and gas wells make this automated model necessary as more turbines or wells are often added. During my internship at the United States Geologic Survey, I created two models organizing, calculating and generating points for a wind farm database and a gas well database. These models will be used to effectively organize data to eventually share with the public, ideally creating a well-informed public.

Student Researcher: Molly Banfield, Briana Wilson

Major: Biology

Research Mentor(s): Dr. Abbie Tomba

Project Title: Collection and Identification of trematodes from the Rappahannock River

Digenetic trematodes, commonly called flukes, are obligate parasites with complex life cycles that are important to community and ecosystem function. Opecoelidae are a family of trematodes with a snail intermediate host and fish definitive host. Because morphological identification of trematode larval stages is nearly impossible we are using genetic markers to determine if the adult stage of the trematode from the family Opecoelidae found in fish is the same species as the juvenile found in snails. Fish and snails were collected from the Rappahannock River under the route 1 bridge between June 2011 and September 2013. Parasites were isolated from snails and the intestines of fish and preserved in 70% ethanol. Species name, size, location, and date of collection were recorded for each fish and snail. Larval parasites from snails were lysed to extract DNA and PCR was performed to amplify the ITS regions of rDNA using the primers 18s and 5.8s. Once DNA was amplified gel electrophoresis was performed to confirm the presence of DNA. 159 fish samples were collected, and of those ten different species of fish were identified. *Notropis procne* was the only species that was parasitized with trematodes. A total of 17 potential parasites were found in fish, including trematodes, tapeworms and nematodes. Successful amplification occurred in three parasite samples (N5, N6, and N12). Future work will include amplifying the ITS region in the adult trematodes, sequencing the amplified regions and comparing these sequences to determine their identity.

Student Researcher: Greg Baugher

Major: Environmental Geology

Research Mentor(s): Dr. Brian Rizzo

Project Title: GIS Model of Alaskan Oil Wells

Advances in Geographic Information Systems (GIS) have given the industrial sector many options to collect, create, and process data in ways that save time and improve efficiency. At the United States Geological Survey (USGS), a large component of these processes is the mapping of national oil reserves and other similar data. For this project, a GIS model was constructed with the goal of creating a display of Alaskan oil wells from a database of tables and carrying out specific analysis on these wells. This model was constructed within ESRI's ArcMap software and involves use of batch processing, preconditions to specifically control workflow, Python coding, detailed attribute selection, and other tools and elements. The model is designed to accept two tables: a master well table containing basic well information and a latitude/longitude table containing different sets of coordinates. The model then creates point features for each well based on criteria, labels the type of well (based on whether it has surface hole, bottom hole, or calculated bottom hole coordinates), and also calculates the lateral distance between each well's surface hole and bottom hole, if applicable. The final output is a shapefile of point features for each well containing data from the master well table and any applicable data added through the model processes.

Student Researcher: Sarah Bergstresser

Major: Geography

Research Mentor(s): Dr. Brian Rizzo

Project Title: The Geographic Representation of Kimberley Process Diamond Data

This project involves looking at and spatially representing Kimberley Process diamond data over time on a global scale. The goal is to visually represent the data in a pleasing and insightful way in order to identify

trends in Kimberley Process member states' diamond production, imports, and exports over time. Through maps, one can also determine how the member states compare in the global diamond market and find anomalies that may be present in the data. The data, which was obtained from the Kimberley Process website, was processed extensively and laid out as a geographic representation. The trends and changes in the diamond data can be more easily identified with a visual, geographic representation. By showing Kimberley Process diamond data in map form, the Kimberley Process organization can use the data to determine further policy steps to improve the program.

Student Researchers: Kathleen Bettencourt, Valerie Lewitus, Eva Ng

Major: Psychology

Research Mentor(s): Dr. Hilary Stebbins and Dr. Laura Wilson

Project Title: Extinction Patterns of Electrodermal Activity in Response to Threat Stimuli

This study investigated whether individuals with high rejection sensitivity are sensitive to only social threat or threat in general. High and low rejection sensitive individuals were conditioned to social and non-social threat and non-threat stimuli and extinction patterns of electrodermal activity to these stimuli were examined.

Student Researcher: Cameron Bierkan

Major: Undecided

Research Mentor(s): Dr. Angela Pitts

Project Title: But I'm Not a Poet

For my final project in Contemplative Practice, I decided to write a poem. I've never really written a poem so I thought this would be a good opportunity to try something new. I'm hoping that through my mindful practices over the past semester I can portray my most prevalent thoughts and feelings through this medium.

Student Researcher: Ethan Bottone

Major: Geography

Research Mentor(s): Dr. Dawn Bowen

Project Title: Documenting Language Erosion and Preservation Efforts in the Canadian Arctic

This work examines the past, current, and future status of the Inuit language, Inuktitut, in the regions of Arctic Canada, specifically Nunavut, as well as the many aspects of language revitalization being utilized to save the Inuit language. The history and importance of languages to indigenous cultures is discussed, as well as past and current government initiatives and community projects designed to revitalize Inuktitut. By examining language data collected from multiple sources, including territorial and national surveys, we have concluded that major language erosion has occurred in Nunavut since the beginning of the region's colonization. Further investigation has shown that language loss has only worsened since the middle of the twentieth century. By a comprehensive review of primary literature, government documents, and community projects, this paper explores the recent explosion of support for the preservation of Inuktitut. Through local and territorial efforts, such as legislation, media, and publication of books and other materials, Inuktitut is once again assuming the role of primary language in many homes, businesses, and institutions throughout Nunavut.

Student Researchers: Jeff Branson, Jeff Mirzada

Major: Biology

Research Mentor(s): Dr. Stephen Gallik

Project Title: Detection of Nuclear Import in Isolated Liver Cell Cytosol and Crude Liver Homogenates

All proteins are synthesized in the cell's cytoplasm. Proteins that function in the nucleus must be imported into the nucleus from the cytoplasm after they are synthesized. This nuclear import process depends on a number of factors that enable the protein to bind to the surface of the nucleus and be actively imported through the membrane that surrounds the nucleus. Contemporary standard investigative methods used to demonstrate and study the nuclear import of proteins are too time consuming to be used in the typical undergraduate teaching lab. The specific objective of the project reported here is to use a variety of simple

fluorescent probes to demonstrate nuclear import in crude liver homogenates and in isolated liver cytosol using relatively simple methods that can be used in an undergraduate biology teaching laboratory.

Student Researcher: Abby Brooks

Major: Chemistry

Research Mentor(s): Dr. Janet Asper

Project Title: Spandex: From the Lab to Your Closet and Beyond

How many of us own a pair of skinny jeans or athletic shorts? What about leggings, socks, or a bathing suit? What do all of these garments have in common? A little cutting-edge polymer spun into a fiber known as Spandex. Spandex fibers are made up of a polymer called polyurethane that is unique because of its both rigid and flexible sections. The rigid sections allow for manipulation into a long fiber that can then be woven into other materials such as cotton, polyester, or even leather. But the flexible sections allow for elasticity in the fiber that creates the stretchiness that is characteristic of spandex. This polymer is highly popular because of its history, production, and incredible impact on many large industries.

Student Researcher: Morgan Brown

Major: Mathematics and Computer Science

Research Mentor(s): Dr. Randall Helmstutler and Dr. Jennifer Polack

Project Title: Simulating Social Interactions on a College Campus with a Java Agent-Based Model

This presentation will investigate the use of an agent-based model to simulate the social relationships on a college campus. The simulation is written in Java using various tools, including the MASON agent-based modeling toolkit. It creates a large network of simulated individuals with various properties, and tracks the evolving connections between them as they meet one another, form friendships, and join groups. The theory behind the model is based on empirical findings from the social psychology literature. The graph produced by the simulation can then be analyzed to determine the ways in which the unfolding series of social interactions in a college campus environment may lead to certain social phenomena; for instance, students ultimately experiencing different degrees of social alienation based on demographic factors.

Student Researcher: Daniel Browne

Major: Biology

Research Mentor(s): Dr. Angela Pitts

Project Title: Mindfulness and the Art of Diabetes Management

Living with diabetes requires the person with diabetes (PWD) to make many conscious and critical healthcare decisions every day of their lives. To maintain proper glycemic control and, as a consequence, good health, it is necessary to be constantly aware of one's blood sugars and to assess food, medication, exercise, stress, and various other factors in how they will impact one's control. This poster examines the pervasiveness of diabetes control in the mind of the PWD and explores the research regarding the role that mindfulness can play in maintaining health as a PWD.

Student Researchers: Daniel Browne, Amanda Shea

Major: Biology

Research Mentor(s): Dr. Theresa Grana

Project Title: Wormfinding: Creating a Significant Learning Experience

In response to the call for reform in undergraduate science education, we have developed an introductory biology laboratory course for freshman in which students are engaged with the research process and "real life" science as they isolate and characterize a novel nematode strain from local soil over the course of the semester. We aim to integrate the principles of significant learning into introductory biology to create a meaningful, enjoyable, and lasting learning experience, while still incorporating department biology curriculum. Here we present insight from our Fall 2013 pilot semester and plans for future development.

Student Researcher: Stephanie Buckler

Major: Undeclared

Research Mentor(s): Dr. Angela Pitts

Project Title: Defining Friendship

My presentation on mindfulness is a collection of portraits I have drawn of my dearest friends, highlighting what draws me into the friendship

Student Researcher: Theresa Buczek, Alesha Ballman

Major: Psychology

Research Mentor(s): Dr. Laura Wilson

Project Title: The Impact of News Content on Attitudes Towards Persons with Mental Illness

Prior research suggests that news coverage following mass shootings perpetuates negative attitudes and stigma towards persons with serious mental illness (McGinty, Webster, & Barry, 2013). Only one known experiment has been conducted on this topic (McGinty et al., 2013). The current study expanded on the prior design by also including potential covariates, such as participants' mental health history. 184 college student participants were asked to read one of four randomly selected fictitious news stories (46 participants per group): Article 1 (control article) discussed the opening of a dining facility on a college campus; Article 2 discussed a mass shooting and included only facts without mentioning the mental health of the perpetrator; Article 3 discussed a mass shooting and mentioned that the perpetrator had history of serious mental illness; Article 4 discussed a mass shooting and offered educational information about the low prevalence of violence in patients. The participants then answered questions about their attitudes towards persons with mental illness, trust beliefs, mental health history, and demographic information. The results suggest that participant gender, trust beliefs, history of a mental health diagnosis, and history of therapy with a mental health professional were significantly related to attitudes towards persons with mental illness. Therefore, they were included in the primary analysis as covariates. The results also suggested that the control group reported significantly lower levels of negative attitudes towards persons with serious mental illness than the three groups asked to read an article discussing a mass shooting. There were no significant differences in negative attitudes among the participants randomly assigned to read the three articles about a fictitious mass shooting. The findings of the study suggest that media coverage of mass shootings may perpetuate negative attitudes and stigma towards persons with serious mental illness, regardless of the content of the article.

Student Researcher: David Chambers

Major: Geography

Research Mentor(s): Dr. Brian Rizzo

Project Title: Monitoring Oil and Gas Leases of Potential Fracking Sites in Caroline County, VA

The purpose of this project is to assist the non-profit Friends of the Rappahannock (FOR) in monitoring current oil and gas leases signed by property owners in Caroline County using a GIS. This dataset will be used to find illegal fracking sites that do not meet state regulations, educate farmers about the dangers of Fracking, and to predict potential ecosystem degradation as Fracking takes a stronghold in the County. Data collection involved contacting Caroline County courts for lease records to compile a GIS-friendly dataset that joins parcels to leases. Land cover and impervious surface data was collected using remote sensing techniques and USDA land cover datasets. This is used to determine effects of potential restoration efforts conducted by FOR. Elevation data for the County helps to aid in locating Fracking sites that will have high risks associated with soil erosion and ground water pollution as a result of Fracking. This study will be easily replicated for other counties in the area using a model to predict high-risk fracking sites and for FOR to monitor a cost-benefit analysis of conducting restoration efforts in the counties affected

Student Researcher: Mary Chessman

Major: Biology

Research Mentor(s): Dr. Deborah Zies

Project Title: Methods in Gene Regulation

Smith Magenis Syndrome is a human genomic disorder that is caused by a deletion or mutation of the Retinoic Acid Induced 1 gene (RAI1). RAI1 is known to be a transcription factor that regulates the

expression of many other genes. The overall goal of this research project is to determine the DNA sequence required for RAI1 to regulate gene expression. Over the past year, I have participated in a training program designed to help me master molecular biology techniques used in studying gene regulation. These techniques have included maintaining bacterial cultures that contain human DNA constructs and isolating the DNA from them, caring for tissue culture cell lines, inserting DNA constructs into culture cells, measuring DNA concentrations, carrying out a luciferase assay to measure gene expression, and the appropriate way to analyze luciferase data. This undergraduate research experience has exposed me to the type of work I will be expected to carry out in graduate school next year.

Student Researcher: Drew Chritton

Major: GIS Certification

Research Mentor(s): Dr. Brian Rizzo

Project Title: Building a Geodatabase from Legacy CAD Data

The purpose of this internship was to create a useful geodatabase from legacy CAD data for future GIS analysis. In addition to the supervisors' request, further land cover analysis was performed on the area using remote satellite imagery coupled with ancillary data. The original CAD data was brought into ArcGIS, converted to a shape file which was then defined and projected. A program written in python was used to extract all layers from the attribute table in the original files to produce useful layers. A number of geospatial tools were then used to create an aesthetically pleasing product including but not limited to; spatial adjustments, creation/ deletion of features, polyline to raster, etc. The end result is a fully functional, easy to use geodatabase. The additional analysis and work performed on this data includes a python program that can be adapted for similar uses, and an analysis of the areas land cover using multispectral imagery. This task was primarily a preparatory step for future GIS use.

Student Researchers: Samuel Clark, Ariel Davati

Major: Biology

Research Mentor(s): Dr. Kathryn Loesser-Kasey

Project Title: Comparative methods in the analysis of lipoproteins

Atherosclerosis is the leading cause of death in the United States with several factors contributing to the development of the disease. Cholesterol (carried by lipoproteins) lodged in the arterial walls cause an immune response by macrophages (which up take the lipoproteins turning into foam cells). This ultimately leads to plaque accumulation and inflammation of the arterial walls. Thus the amount of lipoproteins in the blood stream is directly linked to atherogenesis in patients. The mechanisms underlying the relationship between heart disease and lipoproteins is unclear. Unfortunately, the isolation and analysis of lipoproteins at the undergraduate level is often not feasible due to the expensive equipment necessary for the the process. Our research aimed to discover a cheaper, more accessible method for the analysis of lipoproteins. Venous blood samples were centrifuged and the serum was retrieved. The serum was then divided into 5 ultracentrifuge tubes containing differing concentrations of NaBr gradient ranging from 0.098 M to 1.724 M, intending to separate the lipoproteins by their mass. The samples were then spun for 24 hours at 28,000xg. To further purify the samples, they were then filtered through YM-100 Centricon filtration tube . Once the serum samples were purified they were prestained with sudan black and diluted 1:1 in a saturated sucrose gradient and run on a gradient gel for 24 hours, photographed and analysed. The ultrastructure of the lipoproteins were examined by negative staining techniques, using 1% uranyl formate, to further deduce the size of the lipoproteins. This technique proves to be a cost effective method for the analysis of lipoproteins by undergraduates.

Student Researcher: Katherine Coleman

Major: Environmental Geology and Biology

Research Mentor(s): Dr. Chuck Whipkey and Dr. Andrew Dolby

Project Title: Preliminary Spatial and Analysis of Polycyclic Aromatic Hydrocarbons (PAHs) in the Virginia Portion of the Chesapeake Bay Basin

Polycyclic Aromatic Hydrocarbons (PAHs) are organic pollutants that result mainly from the incomplete combustion and pyrolysis of fossil fuels. PAH pollution is contaminating waters and soils worldwide. This ubiquitous range is due to their production through common anthropogenic practices including fossil fuel driven transportation and power plants, the manufacturing of cement, creosote, rubber, asphalt, and paper, and waste incineration.

A preliminary study has been completed within the Virginia portion of the Chesapeake Bay Watershed analyzing the spatial distribution of PAHs. This study area, having been subject to an increasing presence of development and anthropogenic alteration in the recent past, has experienced tremendous pollution and resultant ecological and environmental degradation. PAHs were measured in both surficial soil samples and in fish tissues. These two medium incorporate PAHs from atmospheric outfall and point sources. A spatial gradient of PAH concentrations was created through a weighted overlay function of ArcGIS software. The gradient was a result of the overlaying Euclidean linear distances from identified PAH input sites. The closer in space a given location is to identified sources of PAHs, the greater the likely this given location is more highly contaminated with PAHs. This gradient and the locations of given sources were analyzed in relation to a series of existing PAH contamination levels provided by the Virginia Department of Environmental Quality. Through hot spot analyses and inverse distance weighted interpolation, the resultant gradients were superimpose to observe linkages within the proposed gradient and the actual measured gradient. It was found that hot spots of high PAH levels are also areas with multiple PAH identified sources. These areas are also areas of higher human populations. This is of high concern as PAHs are highly carcinogenic. Exposure to disturbed surficial sediment, with PAH molecules adhered to particulate matter within the air, and ingestion of a contaminated fish can lead to tumors and uncontrolled cell growth within the respiratory and gastrointestinal tracts. Future studies will be completed through the UMW's Summer Science Institute to gain a larger sampling size of PAH levels across the study area. This will include exploring the methodology by which the measured PHH gradient and the potential PAH gradient and sources are linked; incorporating statistics spatial analyses.

Student Researcher: Jeff Davidson

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: STM investigation of coadsorption of carboxylic acids on graphite

Scanning Tunneling Microscopy (STM) has been used to examine the surface of bare graphite and two carboxylic acids physisorbed on graphite. Octadecanoic acid (OA) and tetracosanoic acid (TA) were prepared at various concentrations in phenyloctane and deposited on a graphite surface. The STM studies reveal that the acid molecules formed self-assembled monolayers on the graphite. Several lamellae are visible where the dark regions of the image correspond to hydrogen bonding between the COOH groups of the acid molecules and the lighter regions show the hydrocarbon backbone of the acid. OA and TA are able to be differentiated in the graphite image based on their molecular lengths (2.3 and 3.7nm, respectively). The amount of TA versus OA coadsorbed to the graphite surface differs depending on the concentration of the acids in solution. TA has been seen to cover the majority of the surface at concentrations of 14mol percent and up. This preferential adsorption may result from the differences in the heats of adsorption where, for every methylene group, the heat of adsorption increases by 2kJ/mol, giving TA a heat of adsorption 12kJ/mol greater than OA.

Student Researcher: Jeff Davidson, Safwaan Islam, Shannon Henry

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Conductivity of Polymer Electrolytes as a Model for Understanding Electricity Generation in LIBs

Lithium-ion batteries (LIBs) have become one of the most used rechargeable batteries in consumer markets. An important part of LIBs is the electrolyte phase in the battery which allows for the transfer of lithium ions from anode to cathode, driving the electron movement to generate electricity. It has been found that the discharge-recharge processes within LIBs are highly dependent on the electrolyte composition. Currently, organic solvents that contain lithium salts are used in LIBs as the electrolyte. However, these solvents are difficult to be analyzed in a laboratory setting due to their high flammability. Polymer electrolytes using polyethylene oxide (PEO) have been introduced in this experiment as a successful and a safer electrolyte for LIB. PEO was evaluated with several ionic salts to observe the effect that the ionic radii have on the conductive abilities of the electrolyte. Two different experiments were conducted where the radii of the cation and anion were changed. The cation study was performed with 0.1M LiCl, NaCl, and KCl in 20,000 g/mol PEO, and the solutions were found to have conductivities of 1.45 μ S/cm, 1.25 μ S/cm, and 0.571 μ S/cm, respectively. The anion study had solutions of 0.100M LiI, LiBr, and LiCl and were found to have conductivities of 2.51 μ S/cm, 1.66 μ S/cm, and 1.45 μ S/cm, respectively. From the conductivities obtained, an increase in cation radius decreases conductivity and an increase in anion radius size increases conductivity. The ionic trends obtained in this study can be applied to current research dealing with designing batteries that contain electrically effective and safe electrolyte media. The effect of polymer size in the electrolyte medium will also be discussed.

Student Researcher: Nathan Dawes

Major:

Research Mentor(s): Dr. Brian Rizzo

Project Title: Warrenton Urbanization

Through the georectification of historic aerial photographs of the town of Warrenton, VA from multiple decades, the study and comparison of specific land covers can be analyzed. This data can be used to understand the percent growth or decline of the town's land uses such as commercial/industrial, forest, agriculture, and residential areas. Using Warrenton as a microcosm, both the quantifying and qualifying of the town's expansion can be used to understand local and national changes in development and urbanization.

Student Researcher: Katherine DeCecco

Major: Classics

Research Mentor(s): Dr. Joseph Romero

Project Title: Auxiliaries, Legionaries, and More: A Study of Trajan's Column, the Representation of Trajan, his Soldiers, and Their Tasks

Trajan's Column showcases the soldiers of the Roman Army and Trajan himself in a very unique fashion. By differentiating between the Legionaries and the Auxiliary troops, Trajan makes a bold propaganda statement. By showing the Auxiliary troops as participating in a majority of the fighting, Trajan is demonstrating that he is distancing Legionaries, the Romans, from the bloodshed of the war. The Auxiliaries, or the non-Romans, were considered barbarians to the Legionaries, so for them to be fighting and dying was not an issue. The Legionaries are present, but they are completing most of the tasks which are war preparation or logistical in nature. However, even the war preparation tasks can be seen more as a civilizing force. The Legionaries are building roads, bridges, and forts etc. This representation does not align with historical reality because the Auxiliaries were doing a majority of the heavy fighting when usually they were supporting bodies or scouting forces. By showing the non-Roman troops fighting, Trajan was ensuring to his audience back home, the Roman citizens, that he was not letting their fellows or their family die in a cause some may have not believed in.

Student Researchers: Dominique Delfino, Virginia King

Major: Biology

Research Mentor(s): Dr. Deborah O'Dell

Project Title: Cell Phone Radiation Induced Gene Expression in Human Glioblastoma Cells

The average American spends 25 minutes a day talking on a cell phone. Cell phones emit electromagnetic radiation that ranges from 106 to 1012 Hertz, which has been shown to produce free radicals that can induce changes in gene transcription. This study examined gene expression changes in human glioblastoma cells over time after cell phone radiation exposure. Human glioblastoma cells were cultured and when confluent were exposed to 25 minutes of cell phone radiation. The cells were lysed and the RNA was extracted immediately, 24, and 48 hours after exposure. The RNA was converted to cDNA and placed on a commercial RT PCR 96 well plate containing the primers for 84 oncogene and tumor suppressor genes (SABiosciences Corporation: Frederick, MD). RT PCR was performed using a Stratagene 3005p Thermocycler, and the data was analyzed using the SABioscience PCR Array Data Analysis tool. The results show that over time, most oncogenes, tumor suppressor genes, transcription factors, and apoptosis genes are down-regulated at 48 hours after an initial up-regulation at 24 hours. Genes with both oncogenic and tumor suppressor properties show no change overall while epithelial-to-mesenchymal transition genes show an overall steady down-regulation. Angiogenesis and cell cycle genes show an overall up-regulation over time. The data show that after 48 hours of cell phone radiation exposure, gene expression changes occur which promote tumor growth. Future studies may incorporate larger sample sizes as well as increased time after exposure for RNA extraction such as 72 and 96 hours after exposure.

Student Researcher: Danielle DeVille

Major: Psychology

Research Mentor(s): Dr. Jennifer Mailloux

Project Title: Interoceptive Sensitivity and Eating Disorder Risk: The Roles of Self-Objectification and Intuitive Eating

The aim of the current study was to examine factors that influence the relationship between interoceptive sensitivity and eating disorder risk. A hypothesized path model linking interoceptive sensitivity, body surveillance, body shame, intuitive eating, and eating disorder risk was proposed. Forty-two undergraduate females completed a heartbeat detection task and self-reported measures of self-objectification and eating disorder risk. This model was assessed using a series of mediation analyses. While the mediation analyses did not support the inclusion of body surveillance and body shame in this model, the path from interoceptive sensitivity to eating disorder risk, mediated by intuitive eating, was significant. Implications for the inclusion of interoception research in the development of eating disorder treatments are discussed.

Student Researcher: Danielle DeVille

Major: Psychology

Research Mentor(s): Dr. David Ambuel

Project Title: Mindfulness through Music

A video portrayal of mindfulness and meditation through music.

Student Researcher: Jessica Dochney

Major: Biology

Research Mentor(s): Dr. Theresa Grana

Project Title: Imaging and Characterizing Nematode Species

Nematode species represent an extremely important genetic model organism for the field of biology. *Caenorhabditis* lacks an extensive evolutionary framework of closely related species, and this research aims to help characterize nematode species through 3d Nomarski imaging in order to create a dichotomous key. To capture these images, individual worms were mounted on to slides, spliced together using multi-D photos of different body parts, and measured by pixel number.

Species were compared at the morphological level with known species by comparing them alongside individuals from other cultured strains, and by consulting species descriptions already published. This research only represents a few species, and there are still a broad range left to be characterized.

Student Researcher: Shama Doshi

Major: English

Research Mentor(s): Dr. David Ambuel

Project Title: Inner Peace

I will be creating and displaying a terrarium. There will be live plants and rocks.

Student Researchers: Frances Ellmo, Janie Hayden, Kima Nieves, Jacob Hargis, Nicole Erickson

Major: Psychology

Research Mentor(s): Dr. Debra Steckler

Project Title: Emerging Adulthood and Music: More Than Just My "Ding-a-ling"

Arnett (2004) introduced the concept of emerging adulthood as a transitional stage of development between adolescence and adulthood. During this period, Arnett theorized that emerging adults have unique experiences and emotions that distinguished them from adolescents and adults. He proposed five dimensions that defined the stage of emerging adulthood; feeling in-between, self-focus, identity exploration, instability and age of possibilities.

Arnett suggested that social changes produced the stage of emerging adulthood. These social changes include pursuing higher education, marrying later in life, and postponing children. Changes in parenting styles also contributed to this stage. The current study examined the influence of popular music and investigated whether emerging adulthood dimensions were reflected in changes in popular music lyrics over time.

We hypothesized that as years increased references to emerging adulthood in popular music lyrics should increase as well. This relationship would be seen in each of Arnett's dimensions and in an overall correlation between emerging adulthood and years. A content analysis of song lyrics was conducted on the top 15 songs for years in five year increments from 1955 to 2010.

Results from this study were mixed. There was a significant positive correlation between year and the dimensions of identity exploration and self-focus. We also found a significant positive correlation between year and the overall score of emerging adulthood. However, the dimensions of feeling-in-between, age of possibilities, and instability were not significantly correlated with year. However, further analysis revealed higher instability between 1985 and 2010 than between 1955 and 1980. In our discussion, we examine possible explanations for these mixed results, including historical context and other mediating variables.

Arnett, J. J. (2004). *Emerging adulthood: The winding road from the late teens through the twenties*. New York: Oxford University Press.

Student Researcher: Lavar Edmonds

Major: Economics

Research Mentor(s): Dr. Robert Rycroft

Project Title: Great Expectations: Student Loans and College Major Choice Among STEM Students

A growing body of research in Economics seeks to determine variables that help predict college major choice. Still, there remains a small amount of literature that considers financial factors, especially for STEM (Science, Technology, Engineering, and Mathematics) majors. This research investigates the relationship between a student's decisions with regard to student loans and his or her choice of a STEM major. The project uses a binomial logit model on cross-sectional data from undergraduate Mary Washington students during the 2012-2013 academic school year. Results indicate little statistical and economic significance for the effect of student loans on the probability of choosing a STEM major, though the findings are consistent with contemporaneous enrollment statistics.

Student Researcher: Emily Farnsworth

Major: Psychology

Research Mentor(s): Dr. Angela Pitts

Project Title: Ceci N'est Pas Une Erreur

My project is an expression of the principles of non-judgmental mindfulness. Often, we shy away from creative endeavours because we fear making mistakes and thus enduring judgment. My series of paintings portrays a group of objects which at first glance appear "wrong" or misused, but when contemplated further, are actually perfectly functional. This encourages the viewer to engage mindfully with the painting, and to reflect on the fact that just because something is different or non-traditional, it doesn't mean that it is a mistake.

Student Researcher: Shannan Feight

Major: Spanish

Research Mentor(s): Dr. David Ambuel

Project Title: Bamboo Pen & Ink Drawing

Pen and ink drawing tracking the growth of a simple but loveable bamboo plant - inspired by themes of impermanence, creativity, appreciation, and mindfulness.

Student Researcher: Corinne Fredrickson

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Use of an Electrolysis Titration Cell and Ideal Gas Law for the Analysis of Household Vinegar

Acetic acid is main component in household vinegar and finding the concentration of acetic acid has been a key experiment in many high school and undergraduate chemistry classes. In this experiment the oxidation-reduction (redox) reaction of acetic acid is pushed by a 12 V battery with an agar-sodium nitrate gel salt bridge. The products of the redox reaction yield oxygen gas at the anode and hydrogen gas at the cathode. The difference in the volume of generated oxygen will be used to calculate the number of moles of oxygen through the ideal gas law. Preliminary results have shown oxygen evolution occurs at the anode: in particular, over a short amount of time, 0.50 mL or 2.0×10^{-5} moles of oxygen were produced and in a 3 hour lab period full oxygen evolution is expected.

Student Researcher: Kyle Genovese

Major: Mathematics

Research Mentor(s): Dr. Julius Esunge

Project Title: Application of Multiple Regression: A Two Case Study

We propose using multiple regression to construct two mathematical models. One using the state crime rates across the United States for the years 1960 and 2012, and a second model for the total energy consumption (TEC) of the U.S, based on a number of readily available variables. The resulting models provide estimations of a series of crime rates by state and of a series of TEC values with high degrees of accuracy, as compared with past experiments and as evidenced by very small estimation errors.

Student Researcher: Nyssa Giangregorio

Major: English

Research Mentor(s): Dr. David Ambuel

Project Title: "She is detached from all things; that is why she is one with them"

My painting is based on two of the poems from the Tao Te Ching, translated by Stephen Mitchell. The poems, 6 and 7, inspired me to relate the Tao to a tree. It depicts a personified tree as a meditating woman with astral hair and roots from her feet seated on a cushion "It is never born, thus it can never die" reminded

me of how a tree creates a seed which, in a way, continues the tree's same life. Trees have no blood and are not "born" as humans or animals are, thus they "die" differently as well. However with their seeds, the tree lives on in another tree, forever creating new trees from the old. From poem 6, the lines "it gives birth to infinite worlds" and "you can use it in any way you want" reminded me of the Tree of Life, so I chose to present my tree as the Tree of Life. The galaxy representing the infinite worlds, the branches "why she is one with[all things], " and the roots show the use of the Tao. She is personified into a female as the poems refer to the Tao as she and the "Great Mother."

Student Researcher: Alexander Gilley

Major: Biology and Computer Science

Research Mentor(s): Dr. David Toth

Project Title: Creating Tools for the Advancement of Chemistry Education

The visualization of chemical compounds is often difficult for students. A professor identified the need for a system which allows students to better visualize the complex structures of these compounds while taking quizzes. A quiz program incorporating the PyMOL molecular viewer was created. Students can view three-dimensional molecular structures while taking quizzes created by their instructors.

Student Researcher: Alice Girton

Major: English and Psychology

Research Mentor(s): Dr. David Ambuel

Project Title: Mindful Eating

Through pictures, I hope to capture all aspects of mindful eating, from buying food, to preparing it, to enjoying it.

Student Researcher: Annie Grothorst

Major: Art History

Research Mentor(s): Dr. Joseph Dreiss

Project Title: Transcending Wright: Originality in the Architecture of John Lautner

This project focuses on the influence of Frank Lloyd Wright on the organic architecture of John Lautner from the late 1930s to the 1980s. Lautner studied under Wright for several years, during which time he absorbed the ideals, philosophies, and overall style that was so characteristic of Wright's work. These underlying themes permeated Lautner's personal brand long after his buildings stopped looking similar to those of his mentor. While Wright's enormous stylistic influence is evident when examining Lautner's works, Lautner ultimately transcended his teacher to establish an entirely different but still organic approach to architecture. Wright's beliefs and Lautner's adherence to them helped shape him into the iconic American architect he is known as today.

Student Researcher: Leigh Hamilton

Major: Historic Preservation

Research Mentor(s): Dr. Brian Rizzo

Project Title: Constructing an ArcGIS Online Interactive Heritage Map

At my internship with the Journey Through Hallowed Ground Partnership, I was tasked with the problem of how to make an interactive map showing all of the points of interest that are located within the heritage area. I figured that the easiest way to do this would be with ArcGIS Online. The various points of interest that are in the heritage area have a short description and they have a link so that the user can read more about the site. In addition to working on the online map, I also performed a variety of different geospatial processes.

Student Researcher: Brittany Harris

Major: Chemistry

Research Mentor(s): Dr. Janet Asper

Project Title: Polyurethane as used in the Ball Jointed Doll Industry

Polyurethane is used in many processes in modern industry, from medical equipment to children's toys. However, few outside of the industry know what goes into making this compound. Polyurethane, like other polymers, is composed of monomers attached to one another. Specifically, polyurethane is built from a diol and a diisocyanate. Different combinations of these monomers produce distinct properties in the final product. These properties are utilized by each company in its merchandise. The ball jointed doll industry uses polyurethane in order to create dolls that are sturdy and appear like porcelain. They want their product to last and to be handled by collectors, each one customizable to suit the individual customer. While the specifics of each company's polyurethane resin mixtures are trade secrets, the process for making each doll is the same. Polyurethane resin allows them to produce a wide range of dolls with different body shapes and properties in order to appeal to many different collectors.

Student Researcher: Jason Hilton

Major: Geography

Research Mentor(s): Dr. Brian Rizzo

Project Title: Concrete Evidence: Increase in Impervious Surfaces in Stafford County, and how they can affect the Chesapeake Bay

Many factors present in our modern world have had undeniable negative effects on the environment. Human creations such as power plants and factories get an enormous amount of negative attention, however an environmental threat lies in the very place everyone parks their cars. Impervious surfaces such as concrete and asphalt pose a threat to bodies of water due to the fact that they prevent water from infiltrating the ground, causing tainted water to flow back into the origin of the local water cycle. Areas that are just 10% impervious have been known to cause heightened rates of erosion, increased pollutant loads, increases in stream temperatures, and negative effects in the growth of ecosystems. In this case, the threatened body of water is the Chesapeake Bay. The Chesapeake Bay is the largest estuary in the United States, encompassing six states in its watershed, and throughout the years its health has deteriorated from increasing population and the exuberance of urban development. As the health of the bay continues to dwindle, researchers have found that grasping the amount of impervious surfaces in the surrounding areas is essential to studying the quality of local water quality. In growing communities, it has become more and more crucial to document the percentage of land use that is impervious because those areas could pose a threat to the bay. Using various datasets from Stafford County, this study should show if and how the current growth of Stafford is negatively affecting the surrounding water quality. The results will show the percentage of impervious land use and projected development of impervious surfaces. The percentages should show whether or not Stafford County could potentially be a threat to the Chesapeake Bay and whether or not proper action should be taken in order to keep this large body of water healthy.

Student Researchers: Tasha Horton, Lauren Holt, Madeleine Rhondeau, John Settle, Christine Zale, Carol Vinatieri, Garrett Hulfish

Major: Historic Preservation

Research Mentor(s): Dr. Andrea Smith

Project Title: Infographics and Preservation Planning

Infographics are proving to be one of the most effective ways of conveying information to a broader audience. They are particularly useful in preservation planning because they break down and explain processes and ideas that may otherwise be difficult for the public, and even preservationists, to understand. This presentation will detail the collaborative process required of the infographics course as well as the step by step process required in order to execute a final product. Following the creation of the first group of infographics, each student embarked on a journey to design and create their own infographics on a wide variety of topics within the preservation planning field. Students chose their individual topics and with the help and critiques of their fellow classmates and Professor Smith, began the process of creating a basic design for their infographics on paper. Using a variety of programs such as Photoshop, InDesign, and Pages,

students then brought their designs to life with the hope that they would be able to convey the importance of preservation planning to a broader audience through this rising infographic medium.

Student Researcher: Max Huemer

Major: Classical Archaeology

Research Mentor(s): Dr. Joseph Romero

Project Title: The Gsur of Tripolitania: An Analysis of a Roman Frontier Defense System in North Africa

I have researched the gsur of Tripolitania, and their place in the larger frontier of the region. The gsur are fortified farmhouses located along seasonal rivers called wadis, and despite the desert climate of the region, produced vast amounts of foodstuffs, especially olive oil. The gsur appear in their earliest form in the first century BCE and continued into the Arab invasions, when they fell out of use and farming in the region disappeared almost completely. Most of the gsur are located in the hinterland of Tripolitania, a region in modern Libya. They number in the hundreds and were largely undocumented until the UNESCO Libyan Valleys Survey conducted by David Mattingly, Graeme Barker, et al., which provides a comprehensive survey of most of the gsur. The main question raised by scholars since they were first studied is whether or not the structures serve a military or defensive purpose. Mattingly asserts that the gsur were not maintained or used by the Roman military and that they served no defensive purpose. However this leaves the question, why did the native Libyans choose this sort of defensive architecture for their farms? The answer has to do with the larger frontier region, which was permeable and allowed for controlled movement in and out of Roman territories. Using the archaeological and epigraphic evidence found in the ULVS and elsewhere, and drawing parallels to the northern border of Britannia and Hadrian's Wall, I will demonstrate that the gsur of Tripolitania were in fact a part of a larger frontier control scheme, which can be found elsewhere in the Roman world. The scheme used the gsur in conjunction with other defensive installations such as the clausurae and forts elsewhere in the region to control and observe movement.

Student Researcher: Thomas Hughes

Major: English

Research Mentor(s): Dr. Angela Pitts

Project Title: Connectivity of the World

A map of the world separated into three panels, demonstrating that while up close we appear to be separate, we are actually part of the same picture.

Student Researcher: Ngoc Quyen Huynh

Major: Physics

Research Mentor(s): Dr. Hai Nguyen

Project Title: Manipulating Light Through Room Temperature Vapor Cell

The ability to manipulate light pulses will work towards the advancement of quantum information and communication technology including optical quantum cryptographic systems, quantum computation, and memory storage using photons. In current optical networks, optical light pulses are changed to electronic signal, losing amounts of data in the process. Therefore, by being able to set up an experimental set-up that has the ability to control the optical light pulses and manipulate them with little or no data loss is an important task towards quantum data transportation. Some of the current researches to manipulate and store light include electromagnetically induced transparency (EIT), the off-resonant Raman interactions, and the atomic frequency combs (AFC), but only EIT has been able to achieve 43% of light pulse storage and recall. Newer research involving room-temperature vapor cells have shown to be more successful with light pulse storage and recall up to 87%. If we are able to establish a similar set-up in our lab using Rubidium-87, we will be able to manipulate light pulses for faster switching time with little or no loss in data.

Student Researcher: Samuel Jackson

Major: Mathematics

Research Mentor(s): Dr. David Ambuel

Project Title: Hanging Starlight

Stellated Dodecahedron made with origami paper. Made from 108 pieces of 6x6 in. origami paper in a rainbow pattern. Each star consists of 30 square pieces of paper, ranging from 6x6 inches down to 1x1 inch. Hung on fishing line.

Student Researcher: Aashna Jain

Major: Economics and International Affairs

Research Mentor(s): Dr. Angela Pitts

Project Title: Mindfulness of Yoga

Photographs focusing on the simple, mindful activity of yoga.

Student Researcher: Eric Johnson

Major: Chemistry ACS

Research Mentor(s): Dr. Nicole Crowder

Project Title: Synthesis of a Catalytic Metal Oxide Surface through the Use of Click Chemistry

By attaching an azide-terminated compound to a metal oxide surface through a phosphonic acid head-group, a surface bound molecule with the ability to participate in click chemistry is generated. Through a copper-catalyzed azide-alkyne cycloaddition (CuAAC) click reaction, a transition metal catalyst can be attached to the metal oxide, provided one of the ligands has a terminal alkyne. Two compounds, diethyl 2-bromoethylphosphonate and 11-hydroxyundecylphosphonic acid, were used to modify a metal oxide surface and, subsequently, perform CuAAC with the azide-terminus to form a triazole.

The ethoxy groups of diethyl 2-bromoethylphosphonate were removed via a deprotection reaction, converting the phosphonate moiety to a phosphonic acid (99% yield). Tethering By Aggregation and Growth (TBAG) deposition was used to covalently bind this compound to a copper oxide surface through the phosphonic acid head-group before being used in an in-situ CuAAC reaction, which both attaches an azide and forms a triazole. 11-hydroxyundecylphosphonic acid was attached to a copper surface through the same deposition method. The hydroxyl group was then converted into either a bromo or mesyl intermediate, and successively reacted in an in-situ CuAAC reaction. Surface reflectance infrared (IR) spectroscopy was used to verify surface modifications.

Student Researchers: Eric Johnson, Ariel Davati

Major: Chemistry ACS

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Spectrophotometric Determination of the Bromocresol Green Equilibrium**Dissociation Constant as a Function of Ionic Strength**

The determination of the bromocresol green (BCG) equilibrium dissociation constant through the use of UV/Vis spectrophotometry will be presented. Five 2.03×10^{-5} M solutions of BCG were prepared with varying concentrations of NaCl (0.002-0.2 M), in addition to both pure acidic and pure basic solutions of the dye. This resulted in a series of solutions that showed a color change from yellow for the pure acidic form, through gradated green for the salt solutions, and ultimately to blue for the pure basic form. This is due to the increasing ionic strength, I , of the salt solutions, which shifts the equilibrium of BCG from the monoanionic (yellow) form to the dianionic (blue) form. UV/Vis spectroscopy was used to monitor the shift from the monoanionic form to the dianionic form, both of which absorb light in distinct regions of the visible spectrum, $\lambda_{\text{max}} = 444$ nm and 616 nm, respectively. Absorbance of each solution was measured at 616 nm and increased as the concentration of the dianionic form in solution increased. The ratio of the absorbance for each salt solution to that of the pure basic form of the dye was used to determine the mole fraction of the dianionic species, which was subsequently used to calculate the equilibrium concentration quotient, K_c . The intercept of a plot of $\text{p}K_c$ versus either $\sqrt{I}/(1+2.30\sqrt{I})$ or \sqrt{I} is equivalent to the equilibrium dissociation constant, $\text{p}K$, of bromocresol green and should be around 4.9.

Student Researcher: Anna Kania

Major: Biology

Research Mentor(s): Dr. Theresa Grana

Project Title: Silencing of essential genes in models of animal-parasitic nematodes

RNAi is an intrinsic silencing process used by cells to regulate the expression of their genes and serves as a defense mechanism against viral infections. Manipulation of cells by inducing RNAi is an extremely valuable tool that changed the study of gene function. RNAi can be used to reduce or eliminate the expression of a selected gene, yielding imperative information about its function in an organism. My goal is to evaluate the efficiency of RNAi in inhibiting the expression of essential genes in five nematode species closely related to many parasitic nematodes. The results of my project could be applied to the study of gene function in many human- and animal-parasitic nematodes and thus contribute to eradicating many diseases by identifying essential genes that may be potential drug targets. I also plan to further expand my work by evaluating the inter-species variation in the susceptibility to RNAi of 140 free-living nematode strains in our unique collection. The obtained results will add to the literature and help trace the evolution of the RNAi mechanism.

Student Researcher: Megan Kelly

Major: Physics

Research Mentor(s): Dr. Hai Nguyen

Project Title: Atomic Spectroscopy

Atomic spectroscopy is the determination of elemental composition by its electromagnetic or mass spectrum. The study of the electromagnetic spectrum of elements is called Optical Atomic Spectroscopy. The purpose of this experiment is to show the atomic emission spectroscopy of the sun and the moon in the winter and summer months. The spectrum of sunlight reflected off the moon was recorded, and then compared to a direct sunlight spectrum sample during the summer and winter months. In order to demonstrate the physical principles of this experiment, commercially available discharge tubes and spectrometers were used to give an example of the different elemental atomic emissions that could be found in the sunlight spectrum. These discharge tubes help show the atomic emission spectroscopy of elements such as hydrogen, helium, nitrogen, and mercury. During this procedure the wavelengths of different colors of light emitted by the atoms were observed and measured. The sample in the discharge charge tubes were subjected to a high energy, thermal environment in order to produce excited state atoms, capable of emitting light. The energy source we used was an electrical arc. These samples are used to help compare known atomic emission spectrums to the data collected from the summer and winter months.

Student Researchers: Kimberly Kerns, Domingo Alvarez, Caitlin Chmielewski

Major:

Research Mentor(s): Dr. Mary Kayler

Project Title: Putting the Fun in Learning-Educational Games

This presentation will be an example of student creativity at UMW by presenting educational games that students created in their freshman honors seminar, Participatory Play. There will be some playtest games available, and students will discuss the inspiration for their games as well as the process they went through in the creation of these games to meet both educational goals and criteria for engaging and fun games.

Student Researcher: Kyle Khalifa

Major: Computer Information Systems

Research Mentor(s): Dr. David Ambuel

Project Title: Stencil Art and Mindfulness

The mindful state of intense focus can be achieved by partaking in the artistic process. In this case, it will be achieved by applying stencils to disc golf discs to create customized designs that will remain on the disc and create a sense of individuality with the set of discs to be stenciled. The discs will become my own, instead of just plastic to be thrown.

Student Researchers: Susanna Kirschner, Jenna Stockton, Teresa Fenn

Major: Earth and Environmental Sciences

Research Mentor(s): Dr. Melanie Szulczewski

Project Title: Study of the Distribution and Interaction of Heavy Metals, Sulfur, and Organic Matter Throughout the Soil Profile in an Acid Mine Drainage-Impacted Ecosystem

Contrary Creek, is a well-known stream in Louisa County, Virginia, that has been adversely affected by acid mine drainage (AMD) since several pyrite mines and their tailings were abandoned along the streambed in the early 1900s. The effects of AMD are noticeable in both the appearance of the stream and in several qualities of the stream and surrounding soils, especially pH levels and heavy metal concentrations. Reclamation attempts in the 1970s included the application of sewage sludge and lime, stabilizing stream banks with riprap, and constructing stream diversions. The stream showed little improvement in terms of pH, acidity, and sulfate content, although there was a small reduction in heavy metal concentrations. Our research examines the current impact of this legacy AMD contamination on the stream and nearby soils which remain heavily contaminated. This study investigated the concentrations and distributions of heavy metals both among various soil fractions and throughout the soil profile to determine correlations with sulfur concentrations, organic matter content, and other soil characteristics. Remediation attempts at Contrary Creek have mostly failed in the past, but without further attempts, the abandoned mines and tailings will continue to leach heavy metals into the stream and surrounding soil, negatively impacting local ecosystems both in the surrounding area and further downstream.

Student Researcher: Taylor Knight

Major: Economics

Research Mentor(s): Dr. Steve Greenlaw

Project Title: A Cross-National Study on Infant Mortality Rates

This study will analyze the impacts of environmental factors on infant mortality rates to see if there are any factors that affect all countries.

Student Researcher: Peyton Kremer

Major: Biology

Research Mentor(s): Dr. Abbie Tomba

Project Title: Determining the effectiveness of using Kinovea software in recording and analyzing crayfish behavior

Many previous studies have researched the behavior of crayfish in the presence of an alarm cue; but, much about the particulars of this alarm cue remain unknown. However, the crayfish response to the alarm cue has been well documented in that the crayfish decrease their activity in response to an alarm cue. The specific objective of the project is to determine the effectiveness of using Kinovea software to measure crayfish behavior. Our trials involved isolating a crayfish in a small tank into which we would first inject food odor. After two minutes of behavioral observation, either a control of water or the alarm cue from the crayfish hemolymph was injected and another two minutes period of behavioral observation would occur. To utilize the Kinovea software, a mark was placed onto the crayfish carapace using a fluorescent paint pen. This mark is necessary because the software is able to track the mark throughout the trial. Through tracking the crayfish, the software records data on the speed, direction, and duration of crayfish movement. To determine the effectiveness of the software, the data it produces will be compared to that of the more standard method of measuring crayfish behavior which involves an individual manually recording the time the crayfish spent moving using a stopwatch. The data provided by the Kinovea software potentially offers a more precise method of data collection that offers consistency in measuring crayfish behavior. The goal is to utilize Kinovea software for behavioral analysis to determine the size and identity of the alarm cue using methods such as fractional centrifugation, High Performance Liquid Chromatography, and mass spectrometry.

Student Researcher: Kyle Genovese

Major: Mathematics

Research Mentor(s): Dr. Julius Esunge

Project Title: Application of Multiple Regression: A Two Case Study

We propose using multiple regression to construct two mathematical models. One using the state crime rates across the United States for the years 1960 and 2012, and a second model for the total energy consumption (TEC) of the U.S, based on a number of readily available variables. The resulting models provide estimations of a series of crime rates by state and of a series of TEC values with high degrees of accuracy, as compared with past experiments and as evidenced by very small estimation errors.

Student Researcher: Kaitlin Lamb

Major: English

Research Mentor(s): Dr. Angela Pitts

Project Title: Star Series

A series of paintings using several different mediums, incorporating the use of origami as a main focal point.

Student Researcher: Carl Larsen

Major: Geography

Research Mentor(s): Dr. Brian Rizzo

Project Title: GIS in “Young Life”: An Introduction to its use in the Organization

Young Life is an organization that works in high schools, middle schools, and with special needs individuals to mentor them. It is one of the highest rated organizations on Charity Navigator, and has expanded its reach internationally as well. While a very large and influential organization, Young Life has virtually no GIS work being done for them and no way of looking at their impact spatially. During this internship, I have undertaken the task of starting the first GIS work for Young Life, creating the first map layers for administrative areas, and conducting analysis on the organization’s impact. The goal of the internship, in my sponsor’s own words, is to “show the essential ways Young Life could use data and mapping to grow our organization and better understand our current footprint.” The internship will also help to “produce deliverables that will help us make internal business decisions about a larger roll-out of a GIS program (either managed in-house or outsourced).”

Throughout the internship, my sponsor will be analyzing my work and seeing what capabilities GIS has for helping the organization. We anticipate that by the end of my internship, the organization will have a clear understanding of where and how to go forward with a potential GIS program. The specific projects I have been working on are creating layers for areas and regions the organization divides their outreach and administrative offices into, conducting analysis on “Kid’s Impacted”, and providing various work on mapping projects that specific areas and regions throughout the nation are requesting (this is very diverse work). Throughout the internship my sponsor has monitored my progress, seen the speed of individual project delivery, seen what analysis can be conducted on statistics relevant to Young Life. I fully recommend that Young Life hire one GIS professional to develop an interactive web mapping system for staff, conduct spatial analysis on impact by each area, and meet the project requests of Regional Directors throughout the international organizations reach.

Student Researchers: July Laszakovits, Kelly McDaniel

Major: Chemistry

Research Mentor(s): Dr. Janet Asper

Project Title: Green Polymers: Synthesis of Biodegradable Polymers from Carbon Dioxide

In our research, we investigated a technique to produce biodegradable polymers by making use of carbon dioxide (CO₂) emissions. This approach was formulated by Geoffrey W. Coates through the development of new catalysts that enable the synthesis of CO₂ into versatile polymers. These polymers are formed by an alternating copolymerization process involving an epoxide opening. When these products eventually enter the environment they are able to degrade through depolymerization reactions with naturally-found enzymes. Novomer, a company specialized in the production of a variety of plastics, has applied Coates’ work to their manufacturing processes. Depending on the chemical of interest, Novomer is expected to decrease the CO₂ footprint by 40-110%.

Student Researchers: Sertima LeGendre, Kristen Schuetz, Ryan Aschenbrenner, Patrick Vukmirovich

Major: Psychology

Research Mentor(s): Dr. Hilary Stebbins

Project Title: The Influence of Musically Induced Frontal Asymmetry on Pain Perception and Threshold

Previous research indicates that music has analgesic effects, but no research has yet indicated the physiological processes through which music modulates pain. We hypothesized that music reduces pain perception through the induction of left frontal asymmetry, which is associated with positive affect and the “approach” response. Participants were played music in major mode (which has been shown to induce increased activity in the left frontal region) and in minor mode (which has been shown to induce activity in the right frontal region). The participants then completed a cold pressor task. Self-reported and physiological responses (EEG, GSR, heart rate) to music and pain were measured during this time to determine whether the frontal asymmetry induced through the music alters their cardiovascular, electrodermal, and self-reported response to pain. When order of mode was analyzed, there was a pattern of induced asymmetry found when minor mode was played first.

Student Researcher: Chelsea LeHew

Major: Economics

Research Mentor(s): Dr. Robert Rycroft

Project Title: The Economics of Estate Planning

This paper is inspired by the economic incentives presented by proper estate planning. Estate plans are used for anything from ensuring that a beloved pet is well-provided for, to creating a trust that provides for the education of grandchildren. Simply stated, estate planning provides assurance that an estate will be allocated how the decedent desires. Modern methods of planning expand on traditional use of wills as the centerpiece to an estate plan. Integrating strategic estate planning methods into an estate plan not only provides peace of mind regarding belongings, but also allows for assurance that the maximum value of an estate will be retained and that transference of property is simple for beneficiaries. These benefits provide greater incentive for people to complete a well-developed estate plan. This paper consists of a detailed overview of the estate planning process, preceded by a discussion of various estate planning methods that enable probate avoidance, preserve the value of an estate, and minimize federal estate taxation. After a discussion of these techniques I discuss how to integrate a series of tools through specific examples that utilizes modern applications of estate and elder law. Estate planning is a complex subject that combines aspects of financial advising, accounting, and legal practices. These plans show how strategic planning allows the optimal method of allocating assets, estate tax minimization, and retention of an estate’s value. Every estate plan is tailored to a specific individual, so only through knowledge estate planning techniques can one create a plan that maximizes their utility.

Student Researcher: Madeline Lord

Major: Computer Science

Research Mentor(s): Dr. Stephen Davies

Project Title: Simulating Preference and Opinion Drift in a College Environment

Over the course of their college career, a student's preferences and opinions may go through significant changes as a result of their social environment. Many factors can affect these changes, but possibly the most significant is the relationships that are formed and maintained. Throughout college, students form individual friendships and groups with their peers. The students in these relationships may then influence their peers' preferences and opinions, as well as be influenced themselves. Other factors, such as the level of introversion of a student, play a role in how this effect occurs, by influencing the number of friends a student makes and the likelihood that they will join groups.

One of the most effective ways of studying topics such as this one is by running computer simulations. Simulations allow for programmers to have complete control of a programmed environment. For example, it would be hard to study real students and gather this information because it wouldn't be possible to create specific scenarios necessary to study; it would be necessary to wait and see if the situations arise so not to meddle with people's lives. By creating an agent based model, virtual students called “agents” can be created with assigned characteristics. These agents will then form multiple relationships, influence each other's

characteristics, and possibly end relationships. This method will then help determine which factors cause different amounts of change of the characteristics.

A major influence in how groups among friends occur in this simulation come from the paper Student Peer-Group Influences by Newcomb. Based on Newcomb's descriptions, the groups and friendships in this simulation are formed through homophily (or similarity of characteristics between the actors), propinquity (how likely an actor is to meet another actor), and pre-existing friendships.

Student Researcher: Madeline Lord

Major: Computer Science

Research Mentor(s): Dr. David Ambuel and Dr. Angela Pitts

Project Title: Mindful 2048

The game 2048 has become a fast hit among puzzle and number lovers over the past several weeks. From a programmer's perspective, an exciting part of the game is that the code behind it is all open source. This means that everyone has access to the code, and can actually add to the existing code. This can also allow for various customizations of the game to be made. For this project, I have been working on my own customization of the game: a meditation themed 2048. I chose the game 2048 because the goals of the game mirror the goals of contemplative practice-- as the game progresses, you free the board of the smaller, distracting numbers to eventually attempt to clear the board almost entirely. Using images and ideas from the Contemplative Practices 100 class, I hope to give the user a mindful and pleasant experience.

Student Researcher: Thy Mai

Major: Biology

Research Mentor(s): Dr. Theresa Grana

Project Title: Wormfinding: Characterization of Nematode Species through Behavioral Assays

Course-based undergraduate research can be transformative and effective learning experiences. In the Wormfinding sections of introductory biology, students carry out a semester-long research project characterizing a nematode worm. Much of this characterization is descriptive work, based on observations and comparison to known species. To include hypothesis-based work in the Wormfinding laboratory, we are developing a three-week unit where students can explore the response of their nematode to chemical compounds often found in nematode environments. Nematodes have more than 1280 chemoreceptors (more than dogs!) and thus can distinguish widely different environmental factors. Based on knowledge of their particular nematode, students will develop hypotheses and predictions about their nematode, design and carry out experiments to test their predictions, and then analyze their findings using basic statistical analysis. Students will form their own conclusions and present their results as part of their end of the semester poster. We chose a range of chemical compounds including compounds released by rotting fruits, plant volatiles, byproducts of fermentation, beetle sex pheromones, and laboratory agents. We also selected and began to adapt a robust behavioral test to refine for use by introductory-level students. Currently, we are testing five strains of nematodes representing diverse genera in response to the compounds to obtain standard information and to better develop the protocol.

Student Researcher: Sarah Marzec

Major: Biology

Research Mentor(s): Dr. Theresa Grana

Project Title: Free-living Soil Nematode Population Dynamics at an *Asimina triloba* site in Virginia

Nematodes are microscopic roundworms that are highly successful in many environments. The model organism *Caenorhabditis elegans* is specifically a free-living nematode which can be found in soil but has been mostly isolated from anthropogenic habitats. Thus little is known about the environmental factors that affect *C. elegans* and other free-living nematodes and where they are proliferate in nature. Information on ecological factors affecting nematode species will be useful in identifying selective pressures that can influence genomic changes. The goals of this study are to find and identify nematode species and shed light on relationships between the ecological factors and proliferating populations of nematodes. An *Asimina triloba* (paw paw tree) site provides a natural Virginian habitat with a food source for nematodes. This site was sampled every two

weeks and any relevant ecological factors were recorded for the duration of a year. Nematodes were isolated from each soil sample and were separated based on morphology. The life stages of the nematodes from each sample were recorded and then the nematodes were sequenced for species identification. At present, multiple strains of nematodes have been found and isolated among and within the samples. General trends show that populations are found in the dauer stage, a non-feeding migratory stage, during cooler parts of the year and that adults and larvae, signifying an established colony, are present during warmer points in the year.

Student Researcher: Katelyn Maxwell

Major: Classics

Research Mentor(s): Dr. Joseph Romero

Project Title: Gendered Speech and Sexuality in Ovid's Metamorphoses

The Metamorphoses were written by Ovid and are narrative poems comprised of fifteen different books. These stories begin with the creation of the Earth and end with the deification of Julius Caesar. It contains over one hundred and twenty tales about the transformations of many humans that typically result from their interactions and relationships with the gods. A correlation can be made between the ideologies of Roman sexuality of both men and women during the Augustan time period, and the consistent treatment of men and women throughout the Metamorphoses, as seen specifically in the six tales of Daphne, Arachne, Niobe, Byblis, Galatea, and Caenis. This project examined how the career path that Ovid chose and the time period in which he grew up were shaping factors granting him insight into what being a male or female meant. He conveyed these ideas in his poetry through the use of distinct language choices and the separation of different genders. Ovid created obvious instances of characteristic gendered speech that subtly defined gender roles in his writing. The correlation to the reality of both the ancient and modern world is shown by how Ovid chose gendered speech patterns as a way to serve the purpose of casting females and males into their respective archetypes which reinforced the norms established by the social and political pressures that were dominant during his life.

Student Researcher: John Meadows

Major: Physics

Research Mentor(s): Dr. Hai Nguyen

Project Title: Slow Light Research Using A Mach-Zehnder Interferometer

The purpose of this project has been to develop and assemble the groundwork for a Mach-Zehnder type interferometer. A Mach-Zehnder type interferometer uses a single light beam that is split into two beams using a beam splitting prism. Each new beam travels separate paths, but are then recombined using another prism. With this type setup, a reference path and an experimental path are created. Using this, we are able to experimentally determine the refractive properties of a variety of materials by observing the interference patterns created when the beams are recombined due to the beams being out of phase with each other.

The eventual goal of this project is to be able to control the intensity, polarization, and speed of a light beam.

Student Researcher: Jessica Melvin

Major: Economics

Research Mentor(s): Dr. Steven Greenlaw

Project Title: The Viability of the Peer-to-Peer Lending Market: Does the Model Work?

Peer-to-peer (P2P) lending is a new financial intermediary and substitute to the credit card market. It is an online platform that brings individuals together to lend and borrow money at their own risk. The question: Does the P2P model work? This paper will compare the credit vetting process of the credit card market to the P2P sector.

Student Researchers: Members of the English 314 Class

Major:

Research Mentor(s): Dr. Elizabeth Wade

Project Title: The View from the River: Readings and Discussion with The Rappahannock Review

The Rappahannock Review is UMW's new national literary journal, produced each semester by students in ENGL 314, a capstone course in the Creative Writing Concentration. This panel will serve as an introduction to the Rappahannock Review through both performance and dialogue. The current editors will provide background into what the journal is and how it operates before other Rappahannock Review staff members conduct a reading. The reading will feature upcoming works of poetry, fiction, and nonfiction from both the regular issue (to go live in May) as well as the inaugural theme issue, focusing on appetite (to go live in August). The staff will then hold a Q&A to discuss any questions about the journal, the authors, the world of the literary journal, and more.

This panel serves a two-fold purpose, introducing the Rappahannock Review to the broader University community and also offering valuable professionalization opportunities to students in the experiential learning course that produces the journal.

Student Researcher: Brennan Miller

Major: Computer Science

Research Mentor(s): Dr. David Ambuel

Project Title: Gathas For Every Occasion

Programming is one of the ways that I practice mindfulness as it requires intense focus and concentration. Therefore, I developed a website that will prompt the user for a specific type of practice and respond with a gatha to recite during. This semester we have learned a great deal about different types of meditation and how to remain focused and mindful during practice sessions. The website is supposed to be used as another tool to aide in contemplative practice.

Student Researcher: Daniel Miller

Major: Biology

Research Mentor(s): Dr. Deborah O'Dell

Project Title: A Comparison of Gene Expression in Response to BPA Exposure in Prostate and Mammary Tissues

Bisphenol A (BPA) is a synthetic carbon-based compound that has been shown to exhibit hormone-like properties in its ability to act as a ligand to estrogen and androgen receptors. This study aims to investigate similarities in the transcription-altering pathways of BPA in mammary and prostate cells with regards to oncogenes and tumor suppressor genes in untreated control and BPA-treated experimental groups. Previously extracted RNA from human mammary and prostate cells was assessed for integrity and reverse-transcribed to cDNA via PCR. Genomic profiles were obtained through microarray analysis (Oncogenes and Tumor Suppressor Genes PCR Array, SA Bioscience) and analyzed for fold-change in expression from control using software supplied with the assay. Using a threshold fold-change of ± 2.00 , BPA exposure resulted in primarily opposite responses in gene expression (i.e. genes up-regulated by BPA in the mammary group tended to be down-regulated in the prostate group). As BPA is a xenoestrogen, and estrogen has the opposite effect on prostate cells as it does on mammary cells, this is to be expected. However, there was one oncogene (JAK2) that was up-regulated and one tumor suppressor gene (BRCA1) that was down-regulated in response to BPA exposure in both mammary and prostate cells. Although JAK2 has not been directly linked to mammary or prostate cancers, mutation in the BRCA1 gene is known to be implicated in breast, ovarian, fallopian tube, and prostate cancers, as it plays an important role in DNA repair in these cell types. These results suggest a mechanism for the conversion of mammary and prostate epithelial cells to the cancerous state.

Student Researcher: Carter Moore

Major: Environmental Science

Research Mentor(s): Dr. Neil Tibert

Project Title: A Fossil's Tail: The Paleoenvironmental Evolution of Carboniferous Aquatic Ecosystems in Atlantic Canada

Nova Scotia contains some of the most exceptional exposures of Carboniferous sedimentary rocks that were studied by the early pioneers of geology (e.g., Sir Charles Lyell and Sir William Dawson). The sedimentary rocks record the transition from marine to terrestrial ecosystems during an important interval of biologic diversification. The two most significant formations include the Mississippian Horton Bluff Formation (Windsor Basin), known for the earliest tetrapods, and the Pennsylvanian coal measures of the Boss Point, Joggins and Port Hood Formations (Cumberland Basin), known for exceptional plants, insects and early reptiles. While the evolutionary significance of these deposits is well established, the environment of deposition still remains controversial in the context of marine versus non-marine deposition.

Ostracodes are bivalve crustaceans that live in aquatic environments that range from freshwater to marine. They have a long fossil record with known distributions in carboniferous sedimentary deposits in Nova Scotia. Analysis of shale samples collected from the Horton Bluff, Boss Point, and Port Hood Formations reveal an ostracode association that includes: 1) *Velatamorpha altilis* with non-marine/brackish affinities; 2) *Gutschicka* sp. with similar non-marine/brackish affinities; and 3) *Bairdia* new species with well-known marine affinities elsewhere in Atlantic Canada.

A new trilobite discovery from Horton Bluff Formation during our field investigation indicates that the earliest Mississippian fossil forest and ecosystem was at times a marine shelf. The Boss Point and Port Hood Formations recorded marginally marine influences in a predominately brackish environment, indicated by the ostracode affiliations. The Carboniferous strata in Nova Scotia record an elegant pattern of marine transgression and regression contributing to the evolution of the earliest brackish and aquatic non-marine paleoecosystems.

Student Researcher: Kasey Moore

Major: Sociology

Research Mentor(s): Dr. Tracy Citeroni

Project Title: Navigating Life with Congenital Nystagmus

The goal of this study is to provide information on the quality of life experienced by people with congenital nystagmus. Nystagmus is an eye condition marked by involuntary movement of the eyes which can seriously reduce vision. It is often characterized by an unusual head position or nodding as the brain attempts to position the eyes where the amplitude of the nystagmus is lessened, otherwise known as the null position. People with congenital nystagmus, like myself, have a unique mental framework in which they live their lives because they are born with the condition and do not know a life without nystagmus. I intend to explore this framework more thoroughly through qualitative in-depth interviews with ten young adults with nystagmus. This study will benefit anyone affected by nystagmus because, for the first time, information on coping mechanisms and quality of life will be exposed.

Student Researcher: Mason Moorman

Major: Art History

Research Mentor(s): Dr. Joseph Dreiss

Project Title: Street Art: Protest and Profit

Street Art has become one of the most significant art movements of the 21st century. One of the primary qualities of Street Art is the fact that it is illegal. Done for free and in public spaces that the artist neither owns or has permission to use, the artist makes no money through the production of a work of Street Art. The street artist might not have overtly anti-capitalistic concerns, but as long as it is done for free and is a crime against property, it serves as a critique of capitalist society. Recently Street Art has become highly valued with some prominent street artists having work that is valued for the hundreds of thousands of dollars and the medium has been repurposed as a new form of advertising for corporate interests. How an illegal, monetarily valueless, art form became incorporated as a useful feature of the market economy can be understood is through the Marxist work of Fredric Jameson. Since some degree of Street Art has become sanctioned and approved by capitalist interests it has lost some of its ability to serve as a form of dissent to capitalism. Yet it remains an illegal art form in the eyes of the state, and as long as Street Art remains illegal, it will always be subversive, no matter what capitalist interests do to try and undermine Street Art.

Student Researcher: Kelsey Moxey

Major: Environmental Science

Research Mentor(s): Dr. Ben Kisila

Project Title: A Comparative Analysis Of The Effects Of Forested Buffers And Floodplain Soil Properties On Phosphorous Dynamics In Two Chesapeake Bay Sub-Watersheds, Virginia

Aquatic ecosystems are known to undergo fluctuations in nutrient and other contaminant levels as a function of both natural processes and anthropogenic stresses. The historical changes in environmental conditions related to nutrient and sediment fluxes in the Chesapeake Bay, eastern USA, are well documented. However, changes in both extrinsic and intrinsic floodplain processes necessitate constant monitoring as modern climate and anthropogenic alterations exert new pressures to the basin. We report an ongoing analysis of stream water and riparian zone soil phosphorous (P) dynamics in two 3rd order sub-watersheds in central and northern Virginia. The Ni River in central Virginia is a relatively pristine (70% forested) sub-watershed of the Rappahannock River basin, which is the largest contributor of sediment per square kilometer to the Chesapeake Bay; Sugarland Run located in the suburbs of Washington D.C., is a more human impacted (14% forested, > 45% impervious surfaces) sub-watershed of the Potomac River, the second largest contributor of sediment to the Chesapeake Bay.

Total stream P concentrations were measured during both high and low flows and Mehlich-3 methods were used to evaluate both surficial and sub-surface P fluxes from riparian soils into the two stream systems. Preliminary results show total P levels in Sugarland Run range from 30-200 ppb, with an average of 53.84 ppb. In contrast, the more pristine Ni River P concentrations are typically <10 ppb. Our ongoing Mehlich-3 based analysis of floodplain P will highlight the forms of P in alluvial soils of the region and the role of adsorption/desorption on the overall P dynamics in these watersheds. Analyses of stream bank erosion will also help in quantifying the proportion of total P additions derived from erosion of previously deposited legacy sediments.

Student Researcher: Erik Nosar

Major: Computer Science

Research Mentor(s): Dr. David Ambuel

Project Title: Ball of Color

Microcontrollers and 3D printing have made it easier to create new projects with custom functionality and shapes. One of the more popular microcontrollers, the Arduino, allows both experienced and new programmers to bridge computer programs with the physical world. In this project I want to integrate mindfulness. Mindfulness is the ability to process information that is happening at the current moment with no regard to the past or future. One way that I will be combining both mindfulness and a microcontroller is by expressing colors based on one's own body temperature. By holding a sphere, it will change color based on the person's temperature of their hands.

Student Researcher: Alice O'Brien

Major: English

Research Mentor(s): Dr. Angela Pitts

Project Title: Meta Inspired Abstract Art

For my creative project, I used acrylic paint on canvas to produce these small images called mandalas. I painted the mandalas after engaging in meditation, especially Meta, which is a meditation practice that inspires one to extend loving kindness towards themselves and others. I did not complete the mandalas in one sitting; rather, I returned to them over and over again to add small details as my meditation practice progressed. Although mandalas are always drawn as circles with symmetrical décor inside, I did not aim to paint a specific design, scene, or vision within the circle; rather, I allowed my inner creativity and meditations inspire my brush strokes. Ellen Langer's book *On Becoming an Artist: reinventing Yourself through Mindful Creativity* was especially inspirational to read while working on my creative project.

Student Researcher: Megan O'Connell

Major: Religion and International Affairs

Research Mentor(s): Dr. Angela Pitts

Project Title: Breath

I will be writing a poem focusing on interconnectedness and impermanence. The poem explains why someone feeling unworthy, empty, or alone should not feel those ways because everything beautiful is connected to them so they should feel beautiful.

Student Researcher: Emma Oestreicher

Major: Classical Civilization

Research Mentor(s): Dr. Joseph Romero

Project Title: "Mixtum carmen": Rehabilitating the Iambic in Horace's Post-Actian Symposia

Throughout his literary career, Horace is very careful in addressing political subjects within his poetry, especially the divisive subject of the Roman Civil War, a conflict that was still painfully fresh in the national memory. One of the earliest instances in which the Roman Civil War is directly addressed occurs in Epode 9, a sympotic poem addressed to Maecenas sometime during or immediately after the Battle of Actium. This poem appears in a body of work which is loosely modeled after the iambic genre, a poetic tradition characterized by blame. There are only two other poems in the Horatian corpus which address civil war in a sympotic setting, namely Ode 1.37 and Ode 2.7, where the primary goal is not blame, but consolation. However, both of these odes seem to contain certain stylistic and structural restatements of Epode 9, suggesting that Horace may have had this epode in mind when he was writing these later odes. The purpose of this paper is to assess the evolution of Horace's response to the Roman Civil War across these three pieces of political symposia by analyzing the shared underlying function of the poetic symposium within the poems and the relationship between the lyric and iambic traditions.

Student Researchers: Chastaine Perry, Jesse Lynch

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Photochemical Upconversion using 9,10-Diphenylanthracene and Tris(2,2'-bipyridyl)ruthenium(II)

Increasing the efficiency of solar panels is critical to improving their competitiveness as an alternate renewable energy source in the marketplace. One focus for improving the efficiency is a process known as photochemical upconversion, where low-energy, long wavelength photons (otherwise not absorbed by the solar panel) are converted into high-energy, short-wavelength photon emissions. These high-energy photons can then be utilized by the semi-conductors present in the solar panels, which will increase the range of wavelengths of solar radiation that can be converted into electrical energy. The process of photochemical upconversion relies on a combination of two chromophores: a sensitizer and an acceptor. The sensitizer undergoes excitation and intersystem crossing to its triplet energy state by a low-energy, long-wavelength photon. Then, through triplet-triplet energy transfer and triplet-triplet annihilation the acceptor molecule is excited by the sensitizer to its triplet state and combines with another acceptor to produce a singlet state excited acceptor with high energy and a ground state acceptor. This energy is then emitted as a short-wavelength, high-energy photon. Emission spectra are gathered for tris(2,2'-bipyridyl)ruthenium(II), the sensitizer, and 9,10-diphenylanthracene, the acceptor, using a standard fluorimeter. A series of filters will be used to alter the power of incident light to observe its effect on emission intensity. The emission data gathered allow for the calculation of the reaction order of the proposed mechanism based on the emission intensity as a function of percent transmission of the excitation beam.

Student Researcher: Catherine Peterson

Major: Studio Art

Research Mentor(s): Dr. Joe DiBella

Project Title: Common Ground: Discover, Integrate & Celebrate the Arts and Theology

I will present from a poster! I will discuss certain aspects of planning that I was a part of for a large conference titled Common Ground. I will talk about the planning that took place for a logo, webpage, and publicity.

Student Researcher: Chris Petroff

Major: GIS Certification

Research Mentor(s): Dr. Brian Rizzo

Project Title: The Dynamic Response Solution: A Combination of GIS and Social Media

Mobile technology has exploded within the past decade and with it, the ability for a person to instantly share words, pictures or video with anyone in the world. This social media can be looked at as a wealth of information for the world we live in. During instances of mass panic and chaos such as the Boston Marathon bombing or the recent Navy Yard shooting in Washington DC, information is invaluable. Information gained from people who Tweet about being evacuated due to reports of an active shooter in the facility will be more useful to first responders than a tweet from a news agency across town. The person being evacuated has the ability to instantly give an eyewitness account of the situation whereas the news agency across town is relying on the secondhand information being sent to them from some source. With eye witness accounts and information from social media in hand, a web based GIS application can give first responders the ability to rapidly visualize, understand the unfolding situation and react accordingly. This project attempts to demonstrate this concept of using social media as a source of intelligence and GIS as the medium to visualize and disseminate information concerning an event or incident. The two components of this system are ESRI's ArcGIS Viewer for Flex web application and TweetDeck.

Student Researcher: Claire Pickard

Major: Philosophy

Research Mentor(s): Dr. Eric Bonds

Project Title: Cruel and Usual: Virginia Supermax Prisons and Their Adherence to International Human Rights Regulations

"Supermax" prisons are ultra-high security, long-term penitentiaries with a standard of full-time solitary confinement for inmates. After gaining popularity in the U.S. during the late 1980s and early 1990s, supermax facilities have been the target of numerous human rights investigations pertaining to alleged physical abuse of prisoners and to their practice of continual solitary confinement. My research is focused on two supermax facilities in Virginia: Wallens Ridge State Prison and Red Onion State Prison. Although I am focusing on allegations of abuse at two specific locations, many critiques regarding the inhumanity of solitary confinement can be applied to all U.S. supermax facilities. To evaluate compliance with international norms, this project examines U.S. participation in several international human rights treaties and protocols, including the United Nations Standard Minimum Rules for the Treatment of Prisoners, and compares those standards to the treatment of inmates at Virginia supermax facilities.

Student Researcher: Lynn Pincus

Major: Political Science

Research Mentor(s): Dr. Jason Davidson

Project Title: Prestige and Exclusive International Institutions

This poster explains how we found sources for Dr. Davidson's paper "A Seat at the Table: Realist Institutionalism, Prestige, and Exclusive International Institutions," which argues that medium power states join international institutions primarily to increase their prestige. We found newspaper articles, journal articles, books, and government documents related to the Balkans Contact Group's membership dynamics.

Student Researchers: Alexander Priest, David Nunez

Major: Chemistry

Research Mentor(s): Dr. Janet Asper

Project Title: Synthesis and Application of Poly (lactic-co-glycolic acid) [PLGA]

In the field of organic chemistry, there are a number of molecules whose discoveries revolutionized medicine; Poly(lactic-co-glycolic acid) is one of these. PLGA is formed from a complex of the monomers lactic acid and glycolic acid in variable ratios via a cyclic dimerization and ring-opening polymerization mechanism. This variability of composition gives PLGA a unique property by which it biodegrades at a predetermined rate, as

a function of the concentration of monomers used in synthesis. The non-toxic nature of these monomers cause PLGA to be very safe for use in vivo, and the polymer biodegrades, so it can be reabsorbed into the tissues of the organism with ease. PLGA is effective in a wide range of applications, including but not limited to drug delivery and surgical sealants. This poster will illustrate the capabilities of PLGA, the synthetic route for its production, and walk through the synthesis of PLGA.

Student Researcher: Robin Ramey

Major: Archaeology

Research Mentor(s): Dr. Brian Rizzo

Project Title: Application of GIS Software to Historic Maps: Georeferencing Thomas Jefferson Plats and Surveys

It is well known that during his lifetime Thomas Jefferson was an accomplished politician, author, architect, and plantation owner. However, among his various titles, Jefferson was also a talented surveyor. In the late 18th and early 19th century, Jefferson employed his surveying skills to organize and reorganize the landscape of his primary plantation, Monticello. Many of the plats of Monticello created by Jefferson have survived and become prime sources of information regarding the plantation's original landscape. GIS software can be used to manipulate, evaluate, and display these historic maps in new ways. In the current study, ArcGIS and MicroStation were utilized to compile and consolidate the information from various Jefferson surveys, georeference historic plats to the modern landscape, and drape plats over 3D models of Monticello's terrain. The maps and models produced by this study could potentially reveal the location of historic landscape features that no longer exist, play a role in planning future archaeological projects, and most importantly aide the Thomas Jefferson Foundation in interpreting Monticello's historic landscape to the public. This project stands as a small example of GIS's potential value and prospective application to the field of historic preservation.

Student Researcher: Russell Ruud

Major: Computer Science

Research Mentor(s): Dr. Stephen Davies

Project Title: Computational Economic Research of Wealth Inequality

Our study investigated the causes of wealth inequality using an agent based simulation, focusing on trading behavior and bequeathal policy. Wealth inequality has been rising in the US since the 1960's and was recently the target of the "99% Movement", which believes wealth inequality is detrimental to national prosperity. Individual agents (decision making software constructs) were programmed to interact in a barter economy with the motivation of satisfying their randomly assigned need levels in ten commodities, one of which they produced. When the agents "died" they passed on their wealth to their children in two possible ways; giving all to their first born child or dividing the wealth equally among their children. The agents were assigned to and live in communities, with which we varied their ability to trade with everyone in the simulation. We found that increasing the degree to which agents trade within their local community causes a "tipping point" in the number of satisfied goods they tend to have at around 80% local trading. Giving only to the first born child yields a higher level of wealth inequality over time than dividing the wealth equally among the children, but it does stabilize to a level of inequality rather than continuing to become more unequal over the course of the model. We also found that the level of inequality is remarkably resilient to disruptive events to the system, such as a spike in deaths. This model will be refined by studying the effect of communities in conjunction with life cycles as well as the inclusion of agents with unlimited wants and needs in the future.

Student Researcher: Christina Sabol

Major: Historic Preservation

Research Mentor(s): Dr. Brian Rizzo

Project Title: Conflicts in Ukraine: Past and Present

The purpose of this analysis is to study the historic territorial change in the borders of Ukraine from the mid-9th century to the current day. This analysis also examines the current conflict on Ukraine. To analyze this conflict, the study looks at the ethnic cultures and minorities of the people in Ukraine. Import and export

trade values between Ukraine and the world are also examined. At the conclusion of the analysis one should be able to draw a conclusion between the changing borders and the diverse cultures of the country that have continued to be an integral role in the current conflict.

Student Researcher: William Sacripanti

Major: Political Science

Research Mentor(s): Dr. Angela Pitts

Project Title: Do It Yourself Desktop Zen Garden

The do it yourself desktop Zen garden is designed to allow a student to cultivate, contemplate and maintain a small Zen garden within the already limited living space each student is allotted. The Zen garden will take up no more space than a standard clock/radio, but it will allow the student to practice mindfulness with a minimal footprint.

Student Researcher: Irene Satchwell

Major: Classical Archaeology

Research Mentor(s): Dr. Joseph Romero

Project Title: Destruction of the Museum and Library of Alexandria

The mystery of how the Library of Alexandria was destroyed is one of the great mysteries of the ancient world. The four main theories of the Library and Museum's destruction are, the fire set by Caesar to Alexandria's harbor in 48 BCE, the Aurelian attack, Emperor Theodosius I decree to destroy all pagan temples in 391 BCE, and the siege of Alexandria by Caliph Omar. The most logical theory is that the Library and Museum had its last stand in 391 CE, when Emperor Theodosius I, as part of his attempt to wipe out paganism, officially sanctioned the destruction of all the temples in Alexandria. This sanction included the demolition of the Serapeum, the last piece of the Library and Museum of Alexandria. This theory will be proven using archaeological evidence of the Serapeum, ancient sources, such as Strabo and Plutarch, and modern interpretations, such as Luciano Canfora and P.M. Fraser, of the Library of Alexandria and Museum's history.

Student Researchers: Olivia Schiermeyer, Erica Falvey

Major: Biology

Research Mentor(s): Dr. Janet Asper

Project Title: PDMS: Seeing Polymers in a New Light

Polymers are found everywhere around us, whether it be clothing, paint, or the plastic of credit cards. Some even aid us in our day to day lives. Polydimethylsiloxane (PDMS) is one of these polymers. Used in the production of the majority of soft contact lenses today, this polymer allows the lens to exhibit desirable characteristics which include wettability, softness for comfort, permeability for oxygen exchange, and biofilm resistance. These properties arise from the structure of PDMS, more specifically the crosslinking of various oligomers. PDMS is a silicone-based polymer and is formed via a step growth, ring opening reaction. The synthesis begins with the hydrolysis of dimethylchlorosilane and with linear and cyclic oligomers eventually being made. It is these cyclic oligomers that are polymerized to obtain the final polymer. In the context of contact lenses, additional polymers are added to PDMS to form copolymers that enhance the beneficial properties of the polymer.

Student Researcher: Brittany Simmons

Major: Psychology

Research Mentor(s): Dr. Chris McBride

Project Title: Turning to Food Under Stress: Roles of Attentional Focus and Dietary Restraint

Research suggests that the presence of stress and palatable food together can spur endogenous opioid release (Adam & Epel, 2006). This opioid release may act as a reinforcement for stress-eating behavior and may drive individuals to turn toward food when faced with a stressful task. However, some research suggests that this pattern of stress-induced eating may hold for only for those who are carefully monitoring their food intake

(Kandiah, Yake, & Willett, 2008). Therefore, we predicted that when participants are under stress, restrained eaters would not only show an attentional bias toward food items instead of non-food items, but also increase their intake of highly palatable food. Participants in our study were split into restrained and unrestrained eaters based on the results of the restraint scale from the Dutch Eating Behavior Questionnaire (Van Strien, Frijters, Bergers, & Defares, 1986). Each participant engaged in either a timed mental math task (stressful task) or a control condition. All participants were then shown a series of slides with food and non-food items while their eye movements were tracked using a Tobii eye-tracker. Attentional focus was measured by the total fixation time on the food items compared to the total fixation time spent on the non-food items. In addition, participants were offered cookies to eat as part of a “taste test” and the number of cookies consumed was recorded. As predicted, restrained eaters showed a different pattern of attentional focus and cookies ingested under stress than unrestrained eaters.

Student Researchers: Rachel Sisk, Danielle DeVille, Emily Farnsworth, Wesley Horton

Major: Psychology

Research Mentor(s): Dr. Jennifer Mailloux

Project Title: Does Interoceptive Sensitivity Interact with Catastrophic Thinking to Affect Arousal?

Our study examined whether interoceptive sensitivity and catastrophic interpretation of body sensations interacted to affect arousal to unpleasant images. All participants were screened for interoceptive sensitivity using a heartbeat counting task. Participants with high interoceptive sensitivity and those with low interoceptive sensitivity were divided into two groups. Then, participants were presented with several pairs of words; half of which were used to prime catastrophic interpretation of body sensations, the other half of which were neutral. Following the priming task, participants were presented with a series of images, half of which were unpleasant and half of which were neutral. During the heartbeat counting task, priming of catastrophic sensations, and presentation of images, we measured self-reported arousal, heart rate and electrodermal responses. Although we anticipated that individuals with high interoceptive sensitivity will be more aroused by emotional stimuli when they are primed to catastrophize, we found that self-reported arousal, heart rate and electrodermal responses were significantly higher for unpleasant compared to neutral images, regardless of heartbeat counting ability and priming of catastrophic interpretation of body sensations.

Student Researcher: Isabel Smith

Major: Art History

Research Mentor(s): Dr. JeanAnn Dabb

Project Title: The Ballet Dancers of Edgar Degas: A Feminist Theoretical Perspective

For my individual study, I am examining how Degas' treatment of women in his sculptural works of ballet dancers, specifically Little dancer Aged Fourteen (1881), differs from that of his paintings and drawings of ballet dancers. I hope to establish that in his paintings and drawings Degas disregards his subjects' individuality, concerned only with their actions and his sculptural studies can be included in this group; however, I believe that with his only finished sculpture, Little Dancer Aged Fourteen, Degas shows an unusual awareness of her individuality by emphasizing her personality and her features.

Research regarding Degas' depictions of women, specifically his images of ballet dancers, has yet to consider how these depictions in paintings and drawings may differ from that of his sculptures. My research will consider how Degas' sculptural works, such as Little Dancer fit into the parameters set by previous art historians. I will also consider the role of the ballerina in the nineteenth-century and how this may have affected Degas' perception of his subjects. I will then address Degas' relationship with his models, specifically with the model for Little Dancer, Marie van Goethem, and how this may have affected the outcome of the work.

Student Researcher: Olivia Smith

Major: International Affairs

Research Mentor(s): Dr. Surupa Gupta

Project Title: Food Security and International Trade

What is Food Security? What can we do about it? Food security is often labelled a development issue. Recently though, volatile food prices and mounting demographic problems brought food security to the center of international discussions. The international community now devotes much effort toward food concerns, as evidenced by local and international food relief programs and scores of policy research organizations. This project examines the role of the World Trade Organization in the growing dialogue on food security. Focus is on the process by which the WTO considered food security concerns and addressed them with policy changes. The presentation will culminate in reflection on the recent Bali Ministerial decisions.

Student Researchers: Zaire Sprowal, Nathan Bradley

Major: Environmental Science / Physics

Research Mentor(s): Dr. Chinthaka Liyanage and Dr. Chuck Whipkey

Project Title: A Short Introduction to Solar Energy: A Comparative Analysis of the Seebeck and Becquerel Effects

Photovoltaic cells make use of the Becquerel or photovoltaic effect to produce electric current. Optimized for a certain interval of the electromagnetic spectrum, these cells absorb light of certain wavelengths which causes electrons to be elevated to higher orbitals in the atoms of the cell. These electrons enter a conduction band which allows creation of an electric current. Peltier devices produce electric current as well, but instead make use of the Seebeck Effect, a subset of the thermoelectric effect. This describes the ability to produce an electric current through a temperature differential. Using the sun as our source of light and heat, both methods for producing electricity were compared and the advantages and disadvantages of each were investigated. In addition, a hybrid apparatus was created that combined a solar cell and a Peltier device to investigate the potential for increasing the total electricity generated per unit surface area of solar collector. Our hypothesis is that the hybrid device will allow an appreciable increase in electric power generation per unit area as compared to either the solar cell or Peltier device alone.

Student Researcher: Clare Stechschulte

Major: Economics

Research Mentor(s): Dr. Stephen Stageberg

Project Title: Finding the Root of Virginia's Educational Turnover: A Cross-Sectional Study

Exploring Rumberger's Theory of High School Dropouts

Russell Rumberger and Scott Thomas created a model to define the dual acting causes of the high school dropout rate, proposing that the criteria affecting a student's decision to drop out of high school is dependent upon student-level individual characteristics and structural-level school characteristics. This study aims to determine whether the state of Virginia's high school dropout rates are a result of these student-level traits, the structural-level traits, or both. Using data demonstrating 109 demographics across the state, it was found that the most important determinate of high school dropout rates in the state of Virginia is the individual characteristics and socioeconomic status of the individual students.

Student Researcher: Orlando, Stewart, Jr.

Major: Chemistry ACS

Research Mentor(s): Dr. Charles Sharpless

Project Title: Effect of Evaporative Weathering on the Spectroscopic Properties of Crude Oil

Oil spills result in thousands of gallons of crude oil being released into the environment. Due to the potential health and environmental risks, research into the weathering of oil has become imperative. Crude oil released during these spills can be weathered by physical processes such as evaporation and dissolution. Crude oil also undergoes oxygenation reactions caused by biodegradation and photooxidation that result in the formation of oxygenated hydrocarbons. These resulting hydrocarbons have received little attention in terms of their fate and the processes that lead to their formation. As part of a larger study to investigate the formation of these oxygenated hydrocarbons, a preliminary study was performed to explore the effects of dark weathering processes, specifically evaporative weathering.

UV-Vis spectroscopy was used to monitor the effects of evaporation on the spectroscopic properties of crude oil. Over a 9 day experiment, absorbance spectra were collected as evaporative weathering of the oil progressed. Spectroscopic analysis shows a decline in absorbance over the 9 day time series. From this, it is concluded that light absorbing compounds were lost as a result of evaporation. The application of spectroscopy to monitor the weathering of the samples not only uncovered the spectroscopic changes of the oil, but also suggests changes in its composition. Future work on this topic will include analysis of 3-dimensional fluorescence spectra collected of the samples to determine if fluorescence spectroscopy is an effective way to monitor the degradation and weathering of oil.

Student Researcher: Jenna Stockton

Major: Environmental Geology

Research Mentor(s): Dr. Brian Rizzo

Project Title: Virginia Mines: A Methodology

In the process of extracting materials such as iron, coal, tin, or gold, mines have an adverse influence on the environment surrounding them. There are more than 10,000 mines within the state of Virginia, with each mine displaying some degree of negative impact on the environment. Through GIS, these negative impacts can be assessed and analyzed. This study contains two goals: to construct a proximity and hydraulic analysis of the mines in order to inform the public of possible hazardous areas and to analyze the further use of GIS in future mining pollution analyses. The study concluded that mines in Virginia have the potential to greatly impact the environment through pollution. This study will serve as a foundation for any further mining studies within the region.

Student Researcher: Yoshinori Takeda

Major: Biology and Physics

Research Mentor(s): Dr. Rosemary Barra

Project Title: Induction of p53 Activity in NIH 3T3 Cells following Exposure to Non-ionizing Radiation

Radiation biology has been of interest in recent years with most of the research focused on ionizing radiation varying from UV to gamma radiation and their effects on DNA and development of cancer. However there is another, larger part of the electromagnetic spectrum, the non-ionizing radiation section; which consists of microwaves, visible light, and radio waves. We interact with this lower energy spectrum radiation on a daily basis, and it is traditionally considered to be safe or too weak to produce any effects. Recent articles have shown indications of free radical oxygen forming reactions possible with exposure to 60Hz frequencies. Free radical oxygen is a common agent of DNA damage. Another article showed increased p53 expression in cells exposed to infrared radiation. p53 monitors DNA damage and is increased when the cell detects DNA damage. It regulates cellular mitotic activity and apoptosis or programmed cell death. In this study, NIH 3T3 cells were exposed to a helium-neon laser (4mW, 632.8nm) for 3-5 hours for 2-5 days. p53 expression and radical oxygen presence were measured as indicators of DNA damage or response to DNA damage. Two-way ANOVA was performed to test for significance on hours of exposure, radiation exposure versus control, and effects of distance on the treatment cells in the chamber. p53 expression was found to be significantly higher (23% increase in expression of p53) in radiation-treated cells compared to the control (N=28, p=0.028). Radical oxygen levels was not significantly different (N= 6, p>0.05), but this may be due to a small sample size and warrants further study. Overall, the results indicate that non-ionizing radiation has an effect on fibroblast cells and this warrants further study including the evaluation of varying radiation sources and the effects on different cell types. Future studies will also focus on the mechanism involved in p53 activation following exposure to non-ionizing radiation.

Student Researchers: Rachel Thomas, Taylor Oehm

Major: Biology

Research Mentor(s): Dr. Janet Asper

Project Title: Dermabond® Surgical Glue

Dermabond is a liquid adhesive that can be used to close cuts, wounds, and incisions as an alternative to stitches. The most common use of this glue is for small surgical wounds since is

helps to reduce scarring and healing time of the skin. This adhesive is waterproof and provides an additional layer of protection against infection. Dermabond is a polymer that forms when it comes into contact with the moisture on the patient's skin; the moisture acts as a catalyst in the polymerization reaction.

Student Researcher: Ana Tkabladze

Major: Classical Archaeology

Research Mentor(s): Dr. Joseph Romero

Project Title: Solving the Long-Debated Iconography of the Portland Vase

Portland vase is one of the most exquisite and renowned artifacts preserved from antiquity. It is a result of a unique technique known as Roman Cameo Glass. It is generally agreed that cameo glass production was developed during the reign of Augustus, thus Portland vase is attributed to first century AD. Portland Vase was rediscovered in 16th century, since then, it has accumulated admirers and followers due to its mysterious nature. Their interests were further amplified due to vase's tragic destruction, followed by preservation and restoration attempts. While there has been debate over its history, production technique, and original function, more importantly, however, are the fifty interpretations in regards to its iconography that have yet to be resolved. Thus, in an attempt to filter through all the previous scholarships and interpretations, I have eliminated the illogical ones, and was successful in narrowing it down to one theory per side. I have come to the conclusion that the frieze depicts two different narratives: Side A depicting wedding of Peleus and Thetis and Side B depicting wedding of Achilles and Helen after death. In addition, I offer my own, original interpretation, which suggests that Side B depicts three agrarian deities, Triptolemus, Demeter and Persephone. As evident, the proof of allusions to marriage scenes on the Portland Vase is quite abundant. These references might be due to its possible original function as an expensive wedding present. Another, more unique explanation is to suggest that the vase's iconography was influenced by the Pax Romana period, and specifically the new marriage laws Augustus implemented during his reign. Thus, perhaps this magnificent piece of art was fashioned in order to commemorate newly implemented marriage laws and to encourage unity inspired by true and exemplary love, such as ones depicted on the frieze.

Student Researcher: Chiara Tornabene

Major: Geology

Research Mentor(s): Dr. Neil Tibert

Project Title: The Paleoenvironmental Significance of Nonmarine Ostracodes in the Dinosaur Bearing Cedar Mountain Formation, Utah, U.S.A.

The Early Cretaceous (~100-145 Ma) Cedar Mountain Formation in Utah contains one of the world's richest concentrations of dinosaur taxa and is therefore of considerable scientific importance to understand the evolution of terrestrial environments following the breakup of Pangaea. Paleoenvironmental and age determinations for these deposits remain works in progress.

This study offers further insight using aquatic bivalved crustaceans (Ostracoda) to improve the depositional models developed for the Yellow Cat and Ruby Ranch Members of the Cedar Mountain Formation.

A suite of samples (n=31) from different sites located outside of Arches National Park (ARCH) yielded two primary ostracode assemblages that are taxonomically similar to other Early Cretaceous deposits in North America. A lacustrine unit of the Yellow Cat Member to the north-east of ARCH contains an ostracode assemblage that comprises an association of *Cypridea*, *Mongolianella*, and *Candona*. An overlying lacustrine unit of the Ruby Ranch Member on the west side of ARCH contains an ostracode assemblage that includes an association of *Theriosynoecum*, *Cypridea*, and *Pattersonocypris* that are distinctively more ornate than those recovered from the Yellow Cat Member. The Cedar Mountain ostracode associations are comparable to Barremian-Albian deposits reported from Central Alberta and Montana (Blairmore Gp & Kootenai Fm). Paleoenvironmental inferences can be formulated on the basis of the ostracode ornamentation and the known paleoecological tolerances of extant lineages. The Yellow Cat Member association indicates that the Member was an expansive lacustrine system best suited for shallow burrowing organisms. The Ruby Ranch Member association indicates that the waters were likely alkaline in a hydrologically open lacustrine system. The distribution of the ostracode assemblages along the eastern front of the rising Cordillera in North

America may reflect, in part, environmentally cued polymorphism during initial flooding of the Cretaceous Western Interior Sea.

Student Researcher: Suzanna Toske

Major: Journalism

Research Mentor(s): Dr. Brian Rizzo

Project Title: Determining Potential Wildfire in Alaska for Allstate Insurance

The purpose of this project was to create a product using ArcGIS that allowed Allstate Insurance to place certain address points in Alaska and to determine if some houses were more prone to wildfires than others due to their environment. In order to decide which addresses were located in more wildfire prone surroundings compared with others, a model of a weighted overlay was generated in model builder. The goal was to make the methodology and its output comprehensive, user-friendly, and accessible for Allstate Insurance to use. The search for data took the longest amount of time, since Alaska data is generally scarce. However, data was found for the wildfire impact influencers at official websites, such as US Department of Energy and landfire.gov; these influencers included: vegetation, slope, fire regime, wind, precipitation, and fuel. The re-classification of each influencer was set into four main categories, which were: low chance of wildfire (1), medium chance of wildfire (2), high chance of wildfire (3), and very high chance of wildfire (4). All used rasters were 30 meters in resolution and had North American 1983 Albers set as their projection. Results concluded with having only three classes - low (1), medium (2), and high (3) - visibly showing. This was caused by the environment not retaining enough "very high" influencers to provide a class of category 4. To maintain the goal of accessibility, the output of the model was uploaded into ArcGIS Online so that individuals could access the data anywhere with Wi-Fi. In future editions of this model, the use of live weather feeds of data will be applied into the model to display more accurate results in the output.

Student Researchers: Katherine Vanderpool, Katie Graff

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Using UV-Vis Spectroscopy and Conductance to Investigate the Kinetic Solvent Isotope Effect for D₂O and H₂O

The purpose of this investigation is to observe the Kinetic Solvent Isotope Effect using the hydrolysis reaction between acetic anhydride and water or deuterated water. The rate constants for the two reactions were obtained through conductance and UV-Vis spectroscopy ($\lambda = 228\text{nm}$) measurements. The difference between the nucleus mass of hydrogen (1.00728g) and deuterium (2.01594g) is large enough to observe changes in the rate of the reaction by changing the isotopes. The UV-Vis spectrum attained in this experiment resembles the literature spectrum; El Seoud et al. report the rate constant for hydrolysis by water to be $2.6 \times 10^{-3} \text{ s}^{-1}$ and by its deuterated counterpart to be $9.0 \times 10^{-4} \text{ s}^{-1}$.

1. El Seoud, O.; Bazito, R.; Sumodjo, P. Kinetic Solvent Isotope Effect: A Simple, Multipurpose Physical Chemistry Experiment. *J. Chem. Educ.* 1997, 74, 562-565.

Student Researchers: Lauren Waaland-Kreutzer, Hester Godfrey, Leanna Papp

Major: Psychology

Research Mentor(s): Dr. Mindy Erchull and Dr. Miriam Liss

Project Title: The Dark Side of Romance: Romantic Beliefs Predict Intimate Partner Violence

Intimate partner violence is a serious problem in today's society, and its causes are constantly being identified in an attempt to diminish its prevalence. Previous research has indicated that people who endorse traditional gender norms are more likely than those who do not to endorse relationship ideals that may be unhealthy for romantic relationships. Specifically, the romanticization of jealousy has been related to traditional gender roles and romantic beliefs. In general, jealousy is usually not thought to be a positive thing. However, research has shown that some people value jealousy in romantic relationships and view it as a sign of caring. Other research has identified jealousy as a trigger for intimate partner violence. In this study we will explore the connection between relationship beliefs, the valuing of jealousy as a sign of love and how those may predict personal experiences of intimate partner violence in women.

Student Researcher: Andrew Walz

Major: Geography

Research Mentor(s): Dr. Brian Rizzo

Project Title: Geodatabase Development of a Road Sign Project for Fort A.P. Hill

For my capstone this semester I interned with Fort A.P. Hill's planning and public works office. Under the guidance of my boss Ms. Heather Casey we determined the best use of my time for their office would be to develop a geodatabase for a road sign project they would be hiring for in the summer. This was a task with multiple aspects, all of which will help me in the chance that I am employed using GIS in the future. The first step of this process was reacquainting myself with geodatabase design and techniques. The next step was to sit down with all of the interested stakeholders and determine how the geodatabase could be best designed for future users. After the design principles had been established, I went into the field to examine some of the signs on post to try and identify any sign characteristics we may have missed in the planning stage. Once this was completed, I created a mock geodatabase with all of these characteristics and their appropriate data types and domains. This geodatabase template will serve as the model for the actual sign geodatabase that will be populated this summer by Fort A.P. Hill Employees.

Student Researcher: Anna Ware

Major: Business Administration

Research Mentor(s): Dr. Angela Pitts

Project Title: Situational Poetry

This will be a series of poems, all written when I'm in a different setting or situation. The times that I will write the poems will depend on when the situation occurs. Depending on where I am in my state of mindfulness will determine the kind of inspiration that I will find in different situations. For example, I will write a poem when I'm very stressed and overloaded with work or when I'm relaxed and about to go to bed. Other times that I will write will be: when I'm in a good place when with my friends or not a good place with my friends, when I'm happy in a relationship or unhappy in a relationship. I will note under what circumstances I write each poem. Then once I finish the series of poems, I will determine what kind and what quality of poetry arose from each situation.

Student Researcher: Cara Wood

Major: History

Research Mentor(s): Dr. David Ambuel

Project Title: Mindfulness, in Color

I have painted a watercolor depiction of the colors, feelings and thoughts I see and feel while meditating.

Student Researcher: Usman Zafar, Holly Perucci

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Determination of Thermodynamic Properties of 6-NO₂-BIPS through its Photochromism

Through this kinetics experiment, thermodynamic parameters (E_a , A , and relaxation time τ) for the molecular rearrangement of 6-NO₂-BIPS converting from the merocyanine (MC) isomer to its more thermodynamically stable normal (N) isomer will be elucidated by monitoring the photochromic process through absorbance measurements provided by UV-Vis spectrophotometry. The thermal back-isomerization of MC to N isomer is governed by first order kinetics whereby the relaxation time (τ) can be determined from the slope of the first order plot ($\ln(A_t - A_i)$ vs time) which is equivalent to the negative of the rate constant k . Once τ is known, it can be used in conjunction with a linear Arrhenius plot to determine the activation energy (E_a) of the thermal back-isomerization process. With the value of E_a computed, ΔH^\ddagger and ΔS^\ddagger can be established for the transition state between the N and MC isomers. Lastly, the effect of the polarity of the solvent will be investigated, as a change in τ can result from the solvent's ability to stabilize one isomer relative to the other. Stabilization of the zwitterionic MC isomer is achieved by using a polar solvent like ethanol, which stabilizes MC relative to the more nonpolar N isomer and transition state complex, effectively increasing τ .



Acknowledgement

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