



PROGRAM SCHEDULE WITH ABSTRACTS

APRIL 28, 2017

**University of Mary Washington
Fredericksburg, Virginia**

Financial Support for Research and Creativity Day
generously provided by the Class of 1959 Endowment



UNIVERSITY OF MARY WASHINGTON
IS AN INSTITUTIONAL MEMBER OF THE
COUNCIL ON UNDERGRADUATE RESEARCH
Learning Through Research



Schedule of Events

April 28, 2017

Researcher Registration and Poster Set-up

8:30 am - 9:30 am in the Hurley Convergence Center (Check-in at Digital Auditorium; Poster Pick-up begins at 4:00 pm)

Oral Sessions	10:00 - 3:00
HCC Classrooms 210, 327, 328 & 329	
Sustainable Fashion Show	10:00
Digital Auditorium HCC	
Poster Sessions	12:00– 1:00
HCC Building Locations <i>refreshments served for all</i>	
Original Music Performances	1:15 - 2:00
Digital Auditorium HCC	
Additional Exhibits and Sessions	
HCC Convergence Gallery (Postcards from Astoria)	10:00 – 4:00
Woodard Hall (College of Business)	11:00 – 11:50 & 2:00 – 3:00
Combs Hall (Modern Languages & Literatures)	1:00 – 2:30
Phyllis Ridderhof Martin Gallery (Art History)	2:00 – 3:30
Trinkle Hall (College of Education)	9:15 – 4:45
Trinkle Hall (Religion)	3:00 – 4:30
Melchers Hall Art Studio open house	10:00 – 3:00
DuPont Gallery Annual Student Art Exhibit	10:00 – 4:00



Exhibits in Hurley Convergence Center

10:00 – 10:30

Digital Auditorium

Fashion Show

Natascha Zelloe, “Fashion for the Future: The House of Sustainable Couture” (Kevin McCluskey)

10:00 – 4:00

Convergence Gallery (Third floor)

Mixed Media and Film Exhibit

Miranda Schnakenberg, “Postcards from Astoria” (Colin Rafferty)



Sessions in Woodard Hall

11:00 – 11:50

Room 202

Session Chair: Dr. Kashef Majid (College of Business)

Augmented Reality Advertisements for the Agora Coffee Shop – Fredericksburg

Presentation teams:

- Josiah Cherry, Jessica Martinez, Daniel O’Rourke, Alfredo Sanchez-Reyes and Jacob Schroth
- Rebekah Eyob, Emily Kube, Hannah Lynde, Rebecca Peterson and Gavin Wall
- David Chergosky, Daniel Doolin, Aaron Haynes, Tristen Stevens and Morgan Wellman

2:00 – 3:00

Room 202

Session Chair: Dr. Kashef Majid (College of Business)

Selected Topics in Business and Economics

Seth Dorman, Hillary Lebedun and Melanie Dorchester, “Sacked for a loss: When College Football Recruits use Reputation to Predict Future Success” (Kashef Majid)

Allison Jakubek, “The Effect of Crime Rates on Major League Baseball Attendance”

Lauren van Nostrand, Bryant White and Fallon Wright, “Popularity in Television Shows” (Belleh Fontem)

Samantha White, Bethany Wilson and Riley West, “The Effect of Sleep Habits on Student Success at UMW” (Belleh Fontem)



Sessions in Combs Hall

Modern Languages and Literatures

French

1:15 - 2:00

Room 214

Kadie Bennis: “L’importance du malheur dans les romans des XVIIe et XVIIIe siècles : *La Princesse de Clèves* de Madame de Lafayette, *Lettres d’une Péruvienne* de Françoise de Graffigny et *Candide* de Voltaire”

Allyssa Kagehiro: “Francois Quesnay et ses oeuvres innovatrices dans les sciences économiques”

Audrey Livingstone: “D’ou vient le Mal? une etude thematique des *Liaisons Dangereuses*”

German

2:00

Room 213

Nathan Anderson: “Seeds of Recession”

Spanish

1:30– 2:00

Room 215

Riska Perez-Castiello: “La intertextualidad en la novella *Todos se van* de Wendy Guerra”

Thallya Diaz: “El misticismo como vehiculo para el feminismo en la serie *La Habana Oculta* por Daina Chaviano”



Session in Phyllis Ridderhof Martin Gallery

2:00 – 3:30

Individual Studies in Art History

Michelle Finnegan, “London Museums during World War II” (Marjorie Och)

Madeline Quick, “Michelangelo, Genius, and the Casa Buonarroti” (Marjorie Och)

James Stewart, “A Royal Display: The Significance of Rubens’ Banqueting House Ceiling” (Marjorie Och)



DuPont Gallery and Melchers Studios

10:00 – 4:00

The Department of Art and Art History hosts their Annual Student Art Exhibit in DuPont Gallery.

10:00 – 3:00
Room 202

Display of works of art created in the ARTS 475: Senior Thesis Seminar

Emily Dabbs *Sculpture*

Clara Doin-Vieira *Printmaking*

Margeaux Ducoing *Printmaking/Drawing*

Sarah Eells *Photography*

Regine Eleazer *Ceramic Sculpture*

Michael Evert *Ceramics/Pottery*

Olivia Gallagher *Performance*

Jackie Huber *Digital Photography*

Jessica Martinez *Digital Drawing*

John McQuaid *Drawing*

Zach Norrbom *Ceramics*

Elisa Pritchard *Ceramic Sculpture*

Lily Radolinski *Painting*

Isabel Soble *Drawing*

May Townley *Ceramic Sculpture*



Sessions in Trinkle Hall

Religion Senior Theses

3:00 – 4:30
Room 242

Olivia Belisle: “Paul, Antony, and Mary: The Healing Purpose of Ascetic Death and Resurrection in Late Antiquity Hagiography”

Carolyn Bird: “Neurotheological Explanation of Evangelical Prayer Experiences”

Lindsey Crabill: “The Importance of Teaching World Religions in Public Schools: Survey of Secondary Social Studies Curriculum in the States of California, Kentucky, and North Dakota”

Jacob Ducey: “Kierkegaard’s Theory of ‘Truth is Subjectivity’ as a Model for Dialog and Tolerance”

Jimmy Rhodes: “The Great I Am Not: A Sociolinguistic Analysis of Maimonides’ Theory of Negative Theology as a Means of Interpreting, Defining, and Understanding God”

Hassan Siddig: “Islam: The Right Way”

9:15 – 4:30

College of Education Graduate Student Presentations

Room 107B

9:15 – 10:15

Session 1: Instructional Technology

Research Supervisor: George Meadows

Courtney Guengerich: “Class Dojo in a Fourth Grade Classroom”

Brooke Tyrrell: “Google Earth in the Second Grade Classroom”

Claire Zhang, “Do Addition Apps Help First Graders With Addition Fluency?”

Logan Berns: “Comparing the Effects of Electronic Books vs. Traditional Books on First Grade Students’ Comprehension and Engagement”

10:30 – 11:30

Session 2: Mathematics

Research Supervisor: Cathy Walker

Stephanie Kemether: “The Use of Virtual and Concrete Manipulatives in the first grade classroom”

Lindsay Shortt: “Mental Images, First Grade Mathematics, and Persistence in Problem Solving”

Kelly MacRitchie: “So What’s the Story with Math? The Effects of Narrative Writing on Mathematics in a Fourth Grade Classroom”

Paige Thumel: “The Effect of Logic Puzzles on Mathematical Problem Solving”

11:45 – 1:00

Session 3: Literacy

Research Supervisor: Antonio Causarano

Kaitlin Gates: “Teamwork Makes Reading Work: How Signpost Strategy Enhances Collaborative Learning”

Kevin Tertocha: “A Case for Multimodality: Graphic Novel Usage in the Elementary Classroom”

Courtney Lyons: “Picture Books and Critical Thinking Skills”

Anna DeMarr: “Write All About It! Writing Workshops and Emergent Literacy”

Ashley Jenkins: “Loving to Read: Reading Motivation in Elementary School Classrooms”

1:15 – 2:00

Session 4: Science

Research Supervisor: Beverly Epps

Sara Crisafulli: “Using Kinesthetic Movements to Increase Comprehension of Science Vocabulary”

Kayla vanWerkhoven: “The Impact of Engineering-Based Instruction on Student Knowledge”

Kelly Gearhart: “Constructivism in the Science Classroom”

2:15 – 3:15

Session 5: Social Studies

Research Supervisor: John Broome

Alli Leibowitz: “The Impact of Arts Integration on Student Interest in Social Studies”

Abigail Fleming: “The Use of the Socratic Method to Understand Historical Empathy in a Fifth Grade Classroom”

Bailey Ivancic: “Integrating for Understanding: Interactive Read Alouds and Social Studies in the Kindergarten Classroom”

Dana Baumgartner: “Interactive Notebooks for Content Retention in Social Studies”

Room 204

12:00 – 1:00

Session 1: English Language Learners

Research Supervisor: Courtney Clayton

Ashley Ireland: “Two Languages, Two Literacies: How Does Allowing an English Language Learner to Utilize his/ her First Language Affect his or her Reading Comprehension in English?”

Savannah Kelley: “The Effect of Cognate Awareness on English Language Learners’ Comprehension Abilities”

Jenna DiGiacomo: “Vocabulary Instruction and ELLs: Does Culturally Relevant Teaching Increase Retention?”

Mickinley Nault: “Buddy Reading: A Study on ELL Fluency and Self-Esteem”

1:15 – 2:15

Session 2: Secondary Social Studies

Research Supervisor: Janine Davis

Corey Dyke: “Current Events and their Effect on Student Engagement”

Kathleen MacIndoe: “Using the Self-Regulated Strategy Development Model to Improve Paragraph Composition”

Research Supervisor: John Broome

Mercia Spicer: “What is the Effect of Note-Taking on Student Textual Recall and Written Historical Analysis?: A Mixed Methods Action Research Study”

Daniel Webb: “The Effect Note Taking Strategies have on Student Learning: A Mixed Method Action Research Study”

2:30 – 3:30

Session 3: Music

Research Supervisor: Alice Hammell

Erin Waters: “Understanding Rhythm: Exploring the Effects of Color Coding on Students' Knowledge of Rhythmic Notation”

Abigail Seymour: “Do Students Enjoy Music? A Comparison of Enjoyment and Achievement Across the Curriculum”

Earth Science

Research Supervisor: Janine Davis

Carley Lohr Dotson: “The Impact of Note Taking Strategies in the Secondary Earth Science Classroom”

Secondary Mathematics

Research Supervisor: Marie Sheckels

Stefannie Asselanis: “Effective Note Strategies in the Secondary Mathematics Classroom”

3:45 – 4:30

Session 4: Special Education

Research Supervisor: Penny Causarano

Keriann Ketterman: “A Comparison of Traditional Note Taking and Strategic Note-taking in mathematics With Students with Learning Disabilities: A Single Subject Design Study”

Alexis Hayden: “The Impact of Student Choice on Work Completion and Accuracy for a Student Deemed At-Risk”

Jessica Williams: “The Impact of Cooperative Learning Groups on the Participation of Students in Special Education”

Room B-36

1:00 – 2:00

Session 1: Secondary English

Research Supervisor: Janine Davis

Kaitlyn Berube: “Teacher Styles and Their Correlation to Student Attitudes: A Mixed-Methods Research Study”

Erin Moller: “Culture in the Secondary Classroom”

Karlin Hoffman: “The Influence of Cooperative Learning Groups on English Learners’ Self-Determination: A Qualitative Action Research Study”

Research Supervisor: Greg Feducia

Alexandra Darnell: “Where Did the Writing Go? Pairing Creative Writing and Goal Setting and How It Impacts Academic Motivation and Self-Efficacy”

2:15 – 3:15

Session 2: Secondary English

Research Supervisor: Jo Tyler

Lindsey Aylor: ““What do you mean my first draft isn't perfect?” A Study of the Impact of Reflection Journaling and Peer Review on Student Writing”

Sean Fredericks: “The Effects of Involved SSR on 9th Graders' Attitudes Toward Reading”

Research Supervisor: Janine Davis

Meredith Reed: “Creative Thinking: Using Metacognitive Skills to Develop Skilled Readers”

Research Supervisor: Greg Feducia

Jacob Black: “The Effect of Guided Self-Assessment for Writing in Classrooms on Student Skill and Confidence”





Morning Oral Sessions in Hurley Convergence Center

10:00 – 11:00

Room 327

Session Chair: Dr. Randall Reif (Chemistry)

Matthew Tovar, “Finding the (nano)Cure: How Magnetic Nanoparticles can Revolutionize the Treatment of Nonresectable Glioblastoma” (Leanna Giancarlo)

Sean Morris, “The Temporal Dynamics of Caspase Activity in Cellular Suicide” (Randall Reif)

Rachelle Dambrose, “Three-Dimensional Approximations of Poisson’s Equation” (Leo Lee)

Courtland Lyle, “New Mysticete Whale Fossil Could Represent First of its Kind from middle Miocene site in Caroline County, Virginia” (Alexander Hastings, Virginia Museum of Natural History)

Room 329

Session Chair: Dr. Robert Rycroft (Economics)

Elizabeth Beauchamp, “Textile Bans: Does One Size Fit Most? A Policy Recommendation for the East African Community” (Elizabeth Larus)

Victoria Sheil, “Mixed Land Use Impact on Residential Home Values” (Margaret Ray)

Katie Armstrong, “Geographic Isolation in the North Carolina Prison System” (Melina Patterson)

Hannah Zontine, “The ‘Hidden Trump Model’: Modeling Social Desirability Bias Through ABMs” (Stephen Davies)

11:00 – 12:00

Room 327

Session Chair: Dr. Suzanne Sumner (Mathematics)

Alexander Clegg and John Guidon, “Religion in the Media: A Study of Student Perception of Media Bias in Georgia” (Elizabeth Johnson-Young)

Caitriona Cobb, “A Unique Addition to Secondary Public Education about the Middle East and Islam: Generation Global” (Emile Lester)

Ryan Barlow, “Fractal Image Compression and GIS Application” (Suzanne Sumner)

Kyra Watkins, “Marginalization of Minority Groups in the United States and Sex Trafficking” (Robert Barr)

Room 329

Session Chair: Dr. Grant Woodwell (Earth and Environmental Sciences)

Lubna Akhtar, “Women’s Bodies, Nation, and Love in Bollywood” (Shumona Dasgupta)

Lydia Grossman, “Climate Change and Civil Unrest in the Middle East: Current Crises, the Role of Governance, and Future Implications” (Ranjit Singh)

Stephanie Cook, “An Analysis of the Portrayal of Purdah in Sultana’s Dream and The Secluded Ones and the Feminism it Inspired” (Shumona Dasgupta)

Amelia Carr and Emily Oliff, “The Reluctant Fundamentalist and Unaccustomed Earth: Discovering Hybrid Identity through Literature” (Shumona Dasgupta)



Poster Sessions – Hurley Convergence Center

12:00 – 1:00

- Tatiana Aleman and Tianni Sicam, “The Redox Titration of Potassium Ferricyanide by Ascorbic Acid” (Leanna Giancarlo)
- Brittany Armbright and Brian Burns, “Mean-Risk Policies for an Equipment Rental System” (Belleh Fontem)
- Sarah Balenger and Josephine Gray, “Connecting Equilibria with Thermodynamics: Determination of K_a , Gibbs Free Energy, Enthalpy and Entropy for Bromothymol Blue”, (Leanna Giancarlo)

- Sarah Balenger, Kristina Brown, Matthew Tovar, “Investigating the use of Superparamagnetic Iron Oxide Nanoparticles to Induce Non-Metastatic Tumor Growth Arrest Via Thermal Ablation” (Leanna Giancarlo)
- Ryan Barlow, “Chaos: Hidden Attractors in Chua's Circuit” (George King, III)
- Kwame Bempong, John Lutkenhaus, M. Connor McLearn, “Fluorescence Quenching of Aspirin using Caffeine” (Leanna Giancarlo)
- Laura Bufano and Lauren Rauch, “Wood Kiln 2017” (Jon McMillan)
- Danielle Capra, “The Impact of Different Classroom Modalities on Students’ Learning Experience” (Steve Greenlaw)
- Jordan Carrier, “An Economic Analysis of What Role Monetary Contributions Play in How a Government Representative Will Vote” (Robert Rycroft)
- Crystal Cauley and Habiba Noor, “Lactose Intolerance and Probiotics” (Lynn Lewis)
- Connor Collett and Brittany Olenlager, “Heritage Tree Project” (Alan Griffith)
- Sofia Di Benigno, “Investigating the Antiviral Effect of Interleukin-1 Treatment on Newcastle Disease Virus Infection in Chicken Embryo Fibroblasts” (Lynn Lewis)
- Richard Joseph Dragone, Alexanna Hengy, Danielle Niepokoj, Madison Combs and Caroline Schwartz, “Rappahannock Goodwill Section 14© Program Evaluation” (Virginia Mackintosh)
- Emma Eichenberger, Lesya Melnychenko, Brooke Preas, Corey Staier and Madison Winters, “Highland Haunting- An Interactive Narrative-Based Horror Game” (Mary Kayler)
- Sabrina Elliott, “Fibroblast Viability and Scleroderma” (Rosemary Barra)
- Emily Ferguson, “Development of a novel operant behavior testing chamber using a touchscreen and an Arduino” (Parrish Waters)
- Sara Fioretti, “Embryonic Development of the Stress Axis in Two Model Teleost Species” (Dianne Baker)
- Andrew Franklin, Claude Thompson and Chloe Morton, “Quantification of Nitrate and Phosphate in the Rappahannock River by UV-Vis Spectroscopy” (Randall Reif)
- Abby Friedman, “Residual Mercury from Gold Mining Activity in Soils at Lake Anna State Park” (Chuck Whipkey)
- Diana Handler and Peter Mitchell, “The Trees of UMW: A Geospatial Observation of Trees” (Alan Griffith)
- Sarah Heisey, “Alkyl phosphonate films on copper oxide surfaces as a platform for supported catalysis” (Nicole Crowder)
- Emily Henry, Hannah Kass, Laura Leonard, Sarah Pennington and Kristy D'Alessandro, “Quantitative Analysis of BaP in Water: A comparative Instrumentation Study” (Randall Reif)
- Grace Henry, “Synthesis and Biological Evaluation of Inhibitors of KasA Identified Through Virtual Screening: A Novel Inhibitor of Mycobacterium Tuberculosis” (Davis Oldham)

- Lucas Hidalgo, Mitchell Greenwood, “Cadmium Selenide Quantum Dots for the Exploration of Trap State and Exciton Emission” (Leanna Giancarlo)
- Renee Hilelson, “Characterization of vegetative phenotypes of EARLY RESPONSE TO DEHYDRATION 10 (ERD-10) mutants in *Arabidopsis thaliana*” (April Wynn)
- Riley Hoch and Ashley Parkhurst, “The Solubility of Calcium Sulfate” (Leanna Giancarlo)
- Coalter Hollberg and Lauren Mosesso, “The Impact of Soil Characteristics and Sea Level Rise on Phosphorus Dynamics in Coastal and Upstream Wetlands in the Lower Chesapeake Bay” (Ben Kisila)
- Victoria Howell and Rebecca Na, “Application of the Schrodinger Equation to An Examination of Zinc Oxide Nanoparticle Sunscreen” (Leanna Giancarlo)
- Kenyon Huber-Wilker and Molly Miller, “America Entangled” (Jason Davidson)
- Hannah Kass, “The Effect of Kisspeptin 1 on Gonadotropin Releasing Hormone in Embryonic Medaka (*Oryzias latipes*)” (Dianne Baker)
- Brandon Kern, “Disappearing Streams in Crow’s Nest” (Jackie Gallagher)
- Hannah Killian and Brandon Rozek, “Modeling Population Dynamics of Incoherent and Coherent Excitation” (Hai Nguyen)
- Eleanor Kilmon and Zafrullah Malik, “Kinetic Study of the Oxidation of Ascorbic Acid by Hexacyanoferrate III” (Leanna Giancarlo)
- Meghan King, “Application of Soil and Water Assessment Tool (Swat) to Model the Impact of Progressive Land-Use Changes on Sediment and Nutrient Fluxes in Rivanna River Basin, Virginia, USA” (Ben Kisila)
- Courtney Kuzemchak “Collections Management” (Cristina Turdean)
- Brooke MacAdam, Manuelle Cao and Brandon Fincham, “Geospatial Mapping of Trees on the UMW Campus” (Alan Griffith)
- Miguel Marx, “Testing for the cross-reactivity of a myosin heavy chain antibody in the flight muscles of *Apis mellifera*” (Deborah O'Dell)
- Kelly McDaniel and Hoang Anh Tran, “Synthesis of Oxidative Metabolites of DEHP” (Davis Oldham)
- Kimberly McFarland, “Optimization of RNA Purification for RNA Aptamer Selection” (Randall Reif)
- Liam Missios and Daniel Valdez, “Taxis in the Age of the Gig Economy: An Analysis of the Taxi Market in Fredericksburg, Virginia” (Margaret Ray)
- Cristina Montemorano, “DALlrious: It's Surreal Deal!” (Mary Kayler)
- Hannah Morgan and Mikaela Goldrich, “Be the Data: Project in Embodied Interaction for Data Analytics” (Jessica Zeitz-Self)
- Joshua Mwandu, “Understanding the Quantum Key Exchange” (Keith Mellinger)
- Brandon Nolan, “The Effects of Aldosterone on the lncRNA Gas5: A potential negative regulator of blood pressure” (Debbie Zies)

- Ashley Otto, “BPS Effect on Oncogene Expression on Mammary Epitheial Cells” (Deborah O’Dell)
- Katherine Qualls and Sarah Roche, “Determination of the Composition of a Presumed 3-GFP Plasmid” (Stephen Gallik)
- Eisha Raja, “Fredericksburg’s Favorite Past Botanist” (April Wynn)
- Erin Schaeffer, Matthew Tovar, Emily Coulter and Bernice Kear, “Determination of Lead Concentration in Commercially Available Lipsticks via ICP – AES Analysis” (Randall Reif)
- Zaire Sprowal, “Fractal Image Compression (FIC) and possible applications to Physical Systems” (Hai Nguyen)
- Eva Turcios and Hannah Lascano, “Medical Applications of Colonial Plants of Virginia” (April Wynn)
- Kenneth Vukmanic and Sara Armor, “Should we live in the moment? Plan to anticipate the event” (Kashef Majid)
- Johanna Woodwell and Anna Jennings, “Using Crossover Events to Determine Gene Linkage in *Saccharomyces cerevisiae*” (Debbie Zies)



Original Music Performances – Digital Auditorium

1:15 – 2:00

Sonic Depths

Levi Manuel

Ensemble

Vocaloid

Cole Masaitis

Cole Masaitis – Guitar
 Drake Dragone – Violin
 Danny Arslan – Piano
 Luke Payne – Cello
 Levi Manuel – Bass
 Austin O’Rourke - Drum Set
 Caroline Flynn – Vocals
 Ryan Goodrich – Trumpet
 John Irby - Harsh Vocals

Carry You Home

Carmen Lily Flores

Carmen Lily Flores

Stone Cold

Damon Dixon

Damon Dixon

Stairs

Danny Arslan

Danny Arslan - Piano
Austin O'Rourke - Marimba
Drake Dragone – Violin
Levi Manuel – Electric Bass
Luke Payne – Cello

Atria & Aortas

Drake Dragone

Drake Dragone - Violin/Synth
Cole Masaitis – Guitar
Michael Prime – Euphonium
Danny Arslan – Piano
Austin O'Rourke - Percussion
Caroline Flynn – Vocals
Luke Payne – Cello
Ryan Goodrich – Trumpet
Unnur Sigurgeirsdottir - Synth/Vocals

Egodystonic

Caroline Flynn

Drake Dragone - Violin
Caroline Flynn - Acoustic guitar
Luke Payne - Cello
Alex Rodriguez - Double bass
Ryan Goodrich - Trumpet
Danny Arslan - Piano
Austin O'Rourke - Percussion
Cole Masaitis - Guitar

Anachronistic Memoirs

Michael Prime

Ryan Goodrich - Trumpet
Michael Prime - Euphonium
Austin O'Rourke - Percussion
Caroline Flynn - Banjo
Cole Masaitis - Guitar
Levi Manuel - Electric Bass
Danny Arslan - Piano
Amanda Clark - Soprano 1
Lily Flores - Soprano 2
Drake Dragone - Violin

Luke Payne - Cello
Alex Rodriguez - Bass

The American Addiction Addiction

Luke Payne

Luke Payne - Cello

Reaching Out for Your Hand

Austin O'Rourke

Cole Masaitis - Synth
Drake Dragone - Violin
Austin O'Rourke - Percussion
Carmen Lily Flores - Violin
Levi Manuel - Violin
Alex Rodriguez - Bass
Michael Prime - Euphonium
Caroline Flynn - Vocals
Ryan Goodrich - Trumpet
Luke Payne - Cello
Danny Arslan – Piano

Program Notes:

Faculty mentor: Dr. Mark Snyder

MUTH 483 & MUPR 336: Music Composition students: All students

Sonic Depths - This original composition is a seamless, multi-movement musical depiction of the layers of the ocean, as well as the life within them.

Levi Manuel is a Senior music major. After graduating, he will be taking graduate courses for education so that he may become a teacher in Colorado.

Vocaloid

This piece is about coming to terms with life decisions, and what you gained and lost inherently by doing so. **Cole Masaitis** is a guitarist, composer, artist, and journalist whose music has been described as “haunting, bittersweet, and nostalgic”, and studies composition under Dr. Mark Snyder. He aspires to compose score, and be a sound designer for visual media, specifically video game music. Cole is a published Staff Writer at the UMW Blue and Gray Press, and has experience in booking concerts, performing live music, composing musical works, and audio production.

Carry You Home is my first ever song written using Logic Pro X. It is about being there for someone, letting them know that although life is not perfect, there is always a friend who will carry you home after all the ups and downs. It's about being unafraid and actually embracing the change and being open to new possibilities.

Carmen Lily Flores: vocalist, violist, and performer from Stafford, Virginia. She is studying compositions and songwriting at the University of Mary Washington and is currently working on building and expanding her musical portfolio under Mark Snyder.

Damon Dixon is a Business Administration Major with a huge passion for art. At the early age of 4, he vividly remembers listening to Michael Jackson's INvincible album. From then he had always had an ear for music. It was not until high school, that he decided to start singing and learning piano by ear. recently he started creating his own music out of emotion. his song "stone" was built around the idea of growth. Love

starts out sweet and progresses to something that digs deeper than your bones. It is not until you are alone that you feel how stone cold love and life can be.

Danny Arslan - Stairs go up or down, just as life goes up or down.

Atria & Aortas is a piece about my struggles with depression. The vocalists embody my past experiences and the music around them signifies the emotions of the time.

Drake Dragone is a composer, performer, and multi-instrumentalist from Richmond, Virginia. Currently studying Music Composition at the University of Mary Washington, Drake is honing in his musical skills studying under Mark Snyder while living in Fredericksburg. His compositions have been called “transporting” and “refreshing.”

Egodystonic

This piece represents intrusive thoughts and their impact on one’s mental health and identity.

Caroline Flynn is a composer and self-taught multi-instrumentalist studying music composition with Mark Snyder and psychology at the University of Mary Washington. She hopes to become a clinical psychologist and music therapist.

Hundreds of years ago, in medieval Scandinavia, men were often away from home with travel, politics, or viking (to travel or participate in an adventure), while many women stayed at home, tending to the fäbod (summer grazing pastures). From the need to call the livestock back to the farm from the mountain pastures, as well as the need to communicate with neighboring fäbod kilometres away, ancient Swedish farmers developed the technique of kulning. **Anachronistic Memories** aims to explore these singing styles and bring them into a more contemporary setting while evoking images of daily life for these people.

Michael Prime is a composer and performer based in Oakton, Virginia. He aspires to compose soundtracks and his compositions have been described as “programmatic”, “mystical”, and “vivacious”. His compositions have been presented at Fairmont State University and the University of Mary Washington. Born in Grasse, France, Michael was raised in Northern Virginia, where he first learnt music, and is currently finishing studying composition and computer science at the University of Mary Washington. His primary instrument is euphonium, though he also knows keyboard and harp, and he is currently first chair euphist in the Mary Washington Concert Band. Michael made his composition premier in 2015 at the West Fork New Music Festival in Fairmont, West Virginia with his piece Invocation.

Luke Payne - The American Addiction Addiction

About 570,000 people in the U.S. die due to issues relating to substance use and abuse. First hand accounts from these individuals reveal most are conflicted with overwhelming feelings of powerlessness, guilt, and shame among others. This work attempts to capture the emotions of a person in the grasp of an addiction in order to shift the perspective of a listener so that they can be reminded that most people in this situation do not deserve to be demonized.

Reaching Out For Your Hand

...as you slip away.

Austin O'Rourke is a composer, multi-instrumentalist, sound designer, electronic music producer and recipient of the ASCAP Morton Gould Young Composers Award in 2015. He was born in Culpeper, Virginia and is studying music composition with Mark Snyder at the University of Mary Washington.





Afternoon Oral Sessions in Hurley Convergence Center

12:00 – 2:00

Room 328

Session Chair: Dr. Angela Pitts (Classics, Philosophy & Religion)

Panel: Classics Senior Thesis Presentations

Ellen Field, “Romans and their dogs: how canines were viewed in ancient Rome”

Miranda Lovett, “Grabbing the Bull by its Horns: A Look at the Social and Archaeological Context of the ‘Toreador Fresco’”

Kati Justice, “Phoenix in the Embassy to Achilles”

Jamie Shafferman, “Helen in the Iliad”

Carson Meadows, “Rivers and Impasses in Caesar's Civil War”

Alice Maggio, “Twins, Augustus and Ovid: The Overlooked Chains That Connect Rulers, Writers and Mythical Founders of Cities”

Zaynah Zaatar, “Al-Farabi and the Islamization of Plato”

1:00 – 2:00

Room 327

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

Elizabeth Hiatt, “Racialized Historical Commemorations and their Defenders: Tactics Revealed through a Student-Led Project in the U.S. South” (Eric Bonds)

Dominique Lopez-Piper, “Working Towards a Socially Just World of Occupational Therapy” (Tracy Citeroni)

Marc Gehlsen, “Stancetaking as a Marker of Identity in Hispanic Millennials” (Maria Isabel Martinez-Mira)

Sarah Dickshinski, "Narrating the French National Story: The Role of Discourse in the Production of Frenchness" (Eric Gable)

Room 329

Session Chair: Dr. Christopher Garcia (College of Business)

Kelsey Vincent, "Connecting Law and Morality, is it Necessary?" (Jason Mazke)

Lindsay Vaught, Ryan Cho, Ryland Byrd, Joe Brown and Keanu Korkor, "Factors that Influence Unethical Behavior in Division 3 Sports" (Chris Garcia)

Abigail Corey, "Regime Change and Democratic Stability in Tunisia after the Arab Spring" (Maysoun Al-Sayed)

Emma Valinski, "Honesty and Trustworthiness of Presidential Candidates in the 2016 General Election" (Stephen Farnsworth)

2:00 – 4:00

Room 210

Session Chair: Dr. Angela Pitts (Classics, Philosophy & Religion)

Panel: The Classical World in Focus

Amanda Clark, "Vergil's Influence on Berlioz's *Les Troyens*"

Zahnah Zaatari, "Breaking the Fourth Wall in Aristophanes' 'Frogs'"

Kati Justice, "Analysis of Lines 992 to 1003 in the Frogs"

Miranda Lovett, "Staging Aristophanes' Frogs"

Starr Attkisson, "Dionysus as a Comedic Vessel in Aristophanes' 'The Frogs'"

Liam Deihl, "Ritual Metatheatre in Aristophanes' Frogs"

Camille Jones, "Ireland Through the Ages: An Examination of How Ireland's Cultural Landscape Set the Stage for Roman Influence"

2:00 – 3:00

Room 327

Session Chair: Dr. Leslie Martin (Sociology and Anthropology)

Hannah Belski, "Sex differences in the response of BDNF and CRH in the BNST to social stress: a study in the neurobiological mechanisms of anxiety" (Parrish Waters)

Meghan Turney, Jennaveve Yost and Hannah Smith, “Do body esteem, self-objectification, mindfulness, and interoceptive abilities predict cognitive distraction during sexual activity in women?” (Jennifer Mailloux)

Alexis Robinson, Alexander Ramos, Elizabeth Edelen and Michelle Milligan, “Navigational variability as a function of reinforcement palatability in a small-n design in rats” (W. Dave Stahlman)

Emily Sander, “Adolescent Suicide and Depression in the City of Fredericksburg and Northern Virginia” (Leslie Martin)

Room 328

Session Chair: Dr. Andrea Livi Smith (Historic Preservation)

Cristina Montemorano, “Papunya Dot Painting: An Examination and a Replication” (Eric Gable)

Bethel Mahoney and Elyse Ridder, “Unearthing Musical Treasures” (Kevin Bartram)

Victoria Sheil, Nicole Paladeau, Alison Cramer and Melissa Parent, “Fredericksburg’s Art District” (Andrea Livi Smith)

Amanda Clark, “Vergil’s Influence on Berlioz’s *Les Troyens*” (Mark Snyder and Theresa Steward)

Room 329

Session Chair: Dr. Jackie Gallagher (Geography)

Joseph Smith, “Environmental Injustice: CSX Tankers in Mayfield” (Leslie Martin)

Colleen Cosgriff, “Panhandling in Virginia: The First Amendment and the Criminalization of Homelessness” (Eric Bonds)

Nicole Ziesing, “Criminalization of Homelessness in Virginia Cities” (Eric Bonds)

Meredith Fierro, “Introduction to Domain of One’s Own” (Martha Burtis)





Abstracts

Listed Alphabetically By Student Researcher

Student Researcher(s): Lubna Akhtar

Major: English

Research Mentor(s): Shumona Dasgupta

Project Title: Women's Bodies, Nation, and Love in Bollywood

Bollywood films have a strong focus on romantic and familial love. These depictions are heavily influenced by the South Asian patriarchal notions of love, which are embedded in the control and domination of women. The influence of South Asian patriarchy becomes apparent in the films *Dilwale Dulhania Le Jayenge* and *Veer-Zaara*, as both films face the conflict of “forbidden love” in which the female leads, Simran and Zaara are expected to forsake their love in order to uphold the honor of their families. The issue at stake is that in both circumstances, whether succumbing to familial expectations or pursuing love, Simran and Zaara become symbols for their respective communities, rather than retaining their autonomy. Simran and Zaara’s participation in their own oppression becomes vital in retaining the honor of their community.

Student Researcher(s) Tatiana Aleman and Tianni Sicam

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: The Redox Titration of Potassium Ferricyanide by Ascorbic Acid

The purpose of this study was to determine how the reduction potential of potassium ferricyanide is affected by reaction with ascorbic acid. Using platinum as the working electrode, the electrochemical potential for the reduction of ferricyanide to ferrocyanide was measured against the Ag/AgCl reference electrode as the concentration of ascorbic acid was increased. Both voltage and absorbance of the potassium ferricyanide were measured every two minutes until the reaction reached completion as noted by a change in color from yellow to colorless. These data are used in the Beer-Lambert law to compare the molar absorptivity for potassium ferricyanide to the known value of $1.02 \times 10^3 \text{ L/mol cm}$. The Nernst equation is also used to calculate the standard reduction potential and the number of moles transferred. These results are also compared to values of 0.430V and 1mole of electrons, respectively.

Student Researcher(s): Brittany Armbright and Brian Burns

Major: Mathematics

Research Mentor(s): Belleh Fontem

Project Title: Mean-Risk Policies for an Equipment Rental System

We consider an equipment rental firm with independently arriving identical clients that provide revenue to the firm by renting the firm's equipment units for random durations. Equipment units fail randomly with probabilities that increase with rental age, and impose contractual repair costs on the firm. Under the assumption of fixed unit replacement costs, and a restriction to myopic policies, we determine a replacement policy that maximizes expected profit while taking into account a certain measure of uncertainty (Conditional Value-at-Risk) induced by the replacement policy. We also propose a computationally simpler heuristic policy, and experiment numerically on the weight of the Conditional Value-at-Risk component to illustrate the tension between maximizing expected profit and tolerating higher Conditional Value-at-Risk.

Student Researcher(s): Katie Armstrong

Major: Geography

Research Mentor(s): Melina Patterson

Project Title: Geographic Isolation in the North Carolina Prison System

Physical distance between prisoners and their home communities can have a significant impact on social connectivity during imprisonment and after release. This reduction in social connectivity, in turn, can contribute to greater rates of re-incarceration. Through determination of the average distance between prisoners and their counties of residence, this study identifies communities that could potentially see a greater loss in social ties and a greater rate of re-incarceration.

Student Researcher(s): Starr Attkisson

Major: Ancient Greek

Research Mentor(s): Angela Pitts

Project Title: Dionysus as a Comedic Vessel in Aristophanes' "The Frogs"

Aristophanes, the Father of Comedy, was an author capable of using comedy in order to clearly and cleverly convey messages about Greek life to his audience. He was well known for his powers of ridicule and comedic wit, both of which were respected by his colleagues and peers throughout Greece. His prowess as a comedian and an author shines through in his play "The Frogs," which is a comedy about Dionysus' trip to the underworld in order to bring the playwright Euripides back from the dead. In this paper, "the Frogs" will be closely examined for puns, double entendres, and other comedic techniques used or experienced by Dionysus. Through Dionysus, Aristophanes' attitude towards comedy, poets, and theatre in general are revealed.

Student Researcher(s): Sarah Balenger and Josephine Gray

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Connecting Equilibria with Thermodynamics: Determination of K_a , Gibbs Free Energy, Enthalpy and Entropy for Bromothymol Blue

This poster details the experimental determination of pK_a and ΔG for the acid-base indicator bromothymol blue. This was achieved by examining the absorption spectra of several buffered solutions of bromothymol blue at 24.8°C, 15.6°C, and 36.5°C. Two methods were used to determine the equilibrium constant K . The first method consisted of plotting pH as a function of the log absorbance ratio, then obtaining pK by finding the pH for which the log of the ratio is equal to zero (i.e., the ratio is equal to 1 and the reaction is at equilibrium). The second method consisted of plotting the absorbance for all buffered solutions at the acidic and basic peaks as functions of pH, then obtaining pK by finding the pH at which absorbance is equal for both peaks. Both methods claim that pK is equal to pH at equilibrium. The reported values of pK are 7.04, 7.02, and 7.01 for reactions observed at 24.8°C, 15.6°C, and 36.5°C, respectively. The reported values for ΔG at these temperatures, in the same order, are 4.014×10^4 J/mol, 3.878×10^4 J/mol, and 4.153×10^4 J/mol. Based on these results, we conclude that the formation of basic bromothymol blue is nonspontaneous. This is further supported by a positive standard enthalpy change of 902.0 J/mol and a negative standard entropy change of -131.4 J/mol.

Student Researcher(s): Sarah Balenger, Kristina Brown and Matthew Tovar

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Investigating The Use Of Superparamagnetic Iron Oxide Nanoparticles To Induce Non-Metastatic Tumor Growth Arrest Via Thermal Ablation

This investigational study focuses on the synthesis of superparamagnetic iron oxide nanoparticles for future use in thermal ablation of non-metastatic tumor growth. The procedure involves the use of an iron rod immersed in a 0.1 M LiCl and nanopure water solution with varying volumes of 200 proof anhydrous ethanol. The solution is deoxygenated with argon gas, and the iron is oxidized electrochemically using a reference electrode of Ag/AgCl, a platinum auxiliary electrode, and the iron as the working electrode. Depending on the amount of water present, the solution changed colors and produced nanoparticles of various sizes. These particles were characterized via TEM and UV-Vis spectroscopy.

Student Researcher(s): Ryan Barlow

Major: Physics

Research Mentor(s): Suzanne Sumner

Project Title: Fractal Image Compression and GIS Application

Fractal image compression (FIC) is a method popularized at the turn of the century, when data storage and transmission began to provide limitations. Fractals have a defining characteristic known as self-similarity. This property simply implies that a portion of the figure looks identical to the whole. FIC hinges on this concept, where blocks of pixels are mapped to similar blocks during compression, and a transformation equation will provide the key to decompression. This research explores the applications of Fractal Image Compression (FIC) through the FIASCO compression algorithm. FIC represents a divergence from established compression methods, and the FIASCO algorithm is compared to .jpg image compression. While both are lossy methods, FIASCO claims to outperform .jpg compression. Additionally the image comparison method of subtracting pixel values using ArcGIS is discussed and evaluated. The output image is a map detailing how well compression works topographically, as opposed to the "PSNR" image metric which is limited to a number output.

Student Researcher(s): Ryan Barlow

Major: Physics

Research Mentor(s): George King, III

Project Title: Chaos: Hidden Attractors in Chua's Circuit

This particular examination of chaotic systems involves construction of Chua's circuit. By varying resistance through potentiometers, the conditions for chaos can be created along a particular interval, with manifestation of strange attractors as we approach chaos. There is further distinction between self-excited attractors and hidden attractors, which is studied in detail.

Student Researcher(s): Elizabeth Beauchamp

Major: International Relations

Research Mentor(s): Elizabeth Larus

Project Title: Textile Bans: Does One Size Fit Most? A Policy Recommendation for the East African Community

In spring 2016 the East African Community (EAC) proposed a textile ban on secondhand clothing and textiles in member countries Kenya, Tanzania, Burundi, Uganda, South Sudan, and Rwanda in an effort to protect domestic textile production. Academic literature is divided in its assessment of the efficacy of the ban in protecting and encouraging domestic textile production. The paper draws on research from international development theory and anthropology to give us a deeper understanding of the used clothing trade. It examines the costs and benefits of the ban by taking into account the intricacies of national development strategies and the complexities of used clothing distribution networks, and by assessing the impact of the used clothing industry on the poorest residents of sub-Saharan Africa. It offers policy recommendations to address the market for used clothing within the EAC. The paper proposes alternatives to the ban, such as an increase in

trade protections and the development of a secondary sorting industry to combat domestic pressure. It concludes by offering recommendations to EAC policy makers.

Student Researcher(s): Hannah Belski

Major: Biology

Research Mentor(s): Parrish Waters

Project Title: Sex differences in the response of BDNF and CRH in the BNST to social stress: a study in the neurobiological mechanisms of anxiety.

Anxiety is a complex behavioral disorder that can devastate a person's life. While the physiological causes of anxiety are multifaceted, the neuropeptide BDNF, typically associated with positive affect, has recently been found to contribute to the etiology of this disorder. Specifically, increases in this molecule in a limbic brain region known as the bed nucleus of the stria terminalis (BNST) can illicit anxiety-like behavior. One of the major contributors to this anxiety is social stress. Exposure to this social stress in the form of social subordination elicits a stress response, characterized by an increase in corticotropin releasing hormone (CRH). Furthermore, anxiety disorders are far more prevalent in females than males. This experiment examines the sex-specific impact of BDNF and CRH in the BNST.

Student Researcher(s): Kwame Bempong, John Lutkenhaus and M. Connor McLear

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Fluorescence Quenching of Aspirin using Caffeine

Stern-Volmer kinetics enables the study of intermolecular quenching, where a fluorophore is deactivated by the presence of a second molecule. This quenching may often be defined as either static (formation of a ground state complex between fluorophore and quencher), dynamic (formation of an excited state complex between fluorophore and quencher), or the combination of the two. Here, the fluorescence quenching of aspirin by caffeine is used to generate a Stern-Volmer plot from fluorescence spectra. Solutions of constant 1.0 mM aspirin and 0 mM, 1 mM, 2 mM, 4 mM, and 6 mM caffeine explore the effect of caffeine concentration on the fluorescence intensity of aspirin. Temperature dependent kinetics of the fluorescence quenching is conducted at approximately 20°C, 30°C, and 40°C. From the recorded fluorescence intensity as a function of caffeine concentration and temperature, the Stern-Volmer constant, K_{sv} , is extracted and the occurrence of static, dynamic, or both mechanisms of quenching is elucidated. The effect of intramolecular quenching by variations in the viscosity of the solvent, rather than by a separate quencher molecule, may also be determined via the kinetics experiments. As a result of this study, the differences between inter- and intramolecular and between static and dynamic quenching may be further understood in the context of Stern-Volmer kinetics.

Student Researcher(s): Kadie Bennis

Major: French and Geology

Research Mentor(s):

Project Title: L'importance du malheur dans les romans des XVII^e et XVIII^e siècles : La Princesse de Clèves de Madame de Lafayette, Lettres d'une Péruvienne de Françoise de Graffigny et Candide de Voltaire

Le malheur incite à un moment significatif d'influence sur l'esprit du personnage et par extension sur l'esprit du lecteur. Selon les œuvres littéraires des XVII^e et XVIII^e siècles, ils révèlent l'injustice des normes de la société donc les personnages persévèrent de trouver la vérité dans le but d'être satisfaits avec leur modes de vie dans une société bornée. *La Princesse de Clèves*, *Lettres d'une Péruvienne* et *Candide* présentent au lecteur une série des malheurs qui arrivent aux personnages clés en vue de montrer leurs progrès physiques, leurs progrès émotifs et de provoquer les idées d'un perspectif non traditionnel. C'est le but de cette étude de démontrer que le malheur inspire les gens des trouver la vérité, la raison, la justice et de plus, la satisfaction dans leurs propres vies qui peuvent les mener à s'améliorer malgré les coutumes traditionnelles.

Student Researcher(s): Laura Bufano and Lauren Rauch

Major: Studio Art

Research Mentor(s): Jon McMillan

Project Title: Wood Kiln 2017

We will be showing you the stages of building the wood kiln and the time it takes in order to construct the kiln.

Student Researcher(s): Danielle Capra

Major: Economics

Research Mentor(s): Steve Greenlaw

Project Title: The Impact of Different Classroom Modalities on Students' Learning Experience

This research focuses on both traditional classroom settings and online courses and how these might affect a student's learning experience within the course. The courses being observed are both principles of economics courses: macroeconomics and microeconomics. The data from this research is specific to the University of Mary Washington. This research also looks at the effects of interactive software on a student's learning. The findings of this study concludes that online courses do not have an adverse impact on a student's learning experience.

Student Researcher(s): Amelia Carr and Emily Oliff

Major: English

Research Mentor(s): Shumona Dasgupta

Project Title: The Reluctant Fundamentalist & Unaccustomed Earth: Discovering Hybrid Identity

Through Literature

American society has placed pressures on South Asian Minorities to be "the Model Minority". In our analysis of the novels "The Reluctant Fundamentalist" and "Unaccustomed Earth", we will be examining how hybrid identity is formed and how it is effected by gender and religion. We hope to increase awareness of limitations in society to promote an equitable progression for South Asian Americans.

Student Researcher(s): Jordan Carrier

Major: Economics

Research Mentor(s): Robert Rycroft

Project Title: An Economic Analysis of What Role Monetary Contributions Play in How a Government

Representative Will Vote

As a result of polarizing election outcomes, controversial legislative actions, and the general stigma that elected officials are corrupt, many Americans are questioning whether their representatives in government have the best interest of their constituents at heart, or are considering more self-centered motives. One point of contention is that political action committees and lobbyists contribute hundreds of thousands of dollars to legislators' campaigns in return for consideration of their viewpoints. This study seeks to determine exactly how much weight members of the House of Representatives give to monetary contributions when considering how to vote on a bill by using voting records and control variables associated with the Patient Protection and Affordable Care Act and the Korea Free Trade Agreement.

Student Researcher(s): Crystal Cauley and Habiba Noor

Major: Biology

Research Mentor(s): Lynn Lewis

Project Title: Lactose Intolerance and Probiotics

Lactose intolerance (LI) affects many people worldwide. It causes significant discomfort including nausea, gas, diarrhoea and abdominal pain. Lactose is the main sugar found in milk. It is a disaccharide sugar that is normally broken down by the enzyme lactase in the small intestine in order to be absorbed by the body. In this experiment, we will determine if commercial probiotics containing *L. acidophilus*, *L. reuteri*, *B. longum*, *B. lactis*, *B. bifidum*, *L. rhamnosus*, *L. casei*, *L. plantarum* are an effective method for the breakdown of lactose in milk and if they are, which brand or strains of probiotics work best in the digestion of lactose in vitro. Using the recommended dosage of each probiotic dispersed in low-fat milk, we will test the amount of lactose broken down and the amount of lactose left with a lactose assay kit and a colorimetric assay. We predict that lactose

will be broken down by the use of probiotics. The amount of lactose broken down will vary depending upon the type of probiotic used and the strains of bacteria in the probiotics.

Student Researcher(s): Amanda Clark

Major: Classics: Latin and Music

Research Mentor(s): Mark Snyder and Theresa Steward

Project Title: Vergil's Influence on Berlioz's *Les Troyens*

Louis-Hector Berlioz and Publius Vergilius Maro (Vergil) have many similarities, both in life and in compositions. Vergil's influence on Berlioz's works is strongly comparable between Berlioz's *Les Troyens* and Vergil's *Aeneid*, in which *Les Troyens* is directly influenced by structure, language, and rhythm. The *Aeneid* is an epic poem, written in Latin between 29 and 19 BCE, and *Les Troyens* is a French grand opera that was between 1856 and 1858. Like the *Aeneid*, *Les Troyens* is made up of two separate but interlocking parts. In this paper, I will be doing a musical analysis of *Les Troyens* and a literary analysis of the *Aeneid*. I will be looking at the rhythm of specific parts in the opera and comparing it to the poetic meter of the *Aeneid* to discover any influences that the literature may have had on *Les Troyens*. In addition to the rhythm and meter, I will be looking at the texts to determine whether Berlioz uses direct quotes or if he paraphrased the Latin text. I will also be looking at how Berlioz uses certain instruments to illustrate the Latin text in addition to the French text.

Student Researcher(s): Alexander Clegg and John Guidon

Major: Communication and Digital Studies, History

Research Mentor(s): Elizabeth Johnson-Young

Project Title: Religion in the Media: A Study of Student Perception of Media Bias in Georgia

Religious bias in state media is a common property of developing countries. However, Georgia is fighting to make that step from developing to developed and the influence of the Georgian Orthodox Church has been an identified barricade for European Union leadership to accept Georgia into the supranational organization. This research investigates the relationship between religiosity and the perception of media bias among college students at Tbilisi State University. It is hypothesized that the more religious a student is the less media bias they will identify. Similarly, the less religious a student is the more media bias they will identify. Data will be analyzed using linear regression analyses in order to understand the influence of religion on perceived media bias.

Student Researcher(s): Caitriona Cobb

Major: International Affairs

Research Mentor(s): Emile Lester

Project Title: A Unique Addition to Secondary Public Education About the Middle East and Islam: Generation Global

The current research on American public education about the Middle East shows that there are serious gaps and biases in the present teachings. This is extremely harmful in light of the current political climate, Islamophobia, and the importance of foreign policy decisions made about the troubled Middle East. Informed voters are vital to influencing how the US will engage with the rest of the world. This presentation will endeavor to explore what improvements can be made in the teaching of this field. The researcher is performing a case study on a unique program called Generation Global. This program is run out of the Tony Blair Faith Foundation and connects students across the world via videoconferences, which helps encourage intercultural dialogue and exposes students to peoples and cultures they may not have access to otherwise. The program strives to promote tolerance and has contact with seven Middle Eastern countries. From observations of the videoconference and interviews with the teacher in the classroom, the researcher will outline the findings showing what features of Generation Global help develop informed, tolerant citizens and what can be supplemented to improve or support such a program.

Student Researcher(s): Connor Collett and Brittany Olenslager

Major: Environmental Science

Research Mentor(s): Alan Griffith

Project Title: Heritage Tree Project

The goal of the Heritage tree project is to update old paper maps to a digital format as well as inventory the historic and protected trees on the UMW campus. To do this, we catalogued the trees which had been marked as Heritage trees by the grounds coordinator. We measured height, canopy width, species, diameter and location of the trees. This data was then uploaded into a GIS ArcMap that will be used in future grounds-keeping and landscaping projects.

Student Researcher(s): Stephanie Cook**Major: English****Research Mentor(s): Shumona Dasgupta****Project Title: An Analysis of the Portrayal of Purdah in Sultana's Dream and The Secluded Ones and the Feminism It Inspired**

This presentation examines Rokeya Sakhawat Hossain's text, Sultana's Dream and Selections from The Secluded Ones, and the approach the text takes on the phenomenon of purdah and the feminism it inspired. Sultana's Dream exists as one of the first feminist utopian text and to contrast that with The Secluded Ones allows one to examine what the consequences of purdah were and why these actions would inspire the idea of a feminist utopia. Hossain's work takes us back in time and we see the patriarchal world through a new lens.

Student Researcher(s): Abigail Corey**Major: International Affairs****Research Mentor(s): Maysoun Al-Sayed****Project Title: Regime Change and Democratic Stability in Tunisia after the Arab Spring**

The purpose of this research was to analyze in Arabic the myriad factors that are responsible for the relative political stability and democratic success that are present in Tunisia today. After the Arab Spring, many other countries' promising revolutionary movements failed, resulting in authoritarian regimes or civil war. Tunisia is an exception. Despite persistent economic and political problems, Tunisia's democracy has thus far proved sustainable. Through comprehensive research, this paper found that the relative success of Tunisia's democracy is due largely to the moderate and adaptive nature of its primary Islamist political party, Ennahda, which made many significant political and ideological concessions. Ennahda agreed to make the new constitution more liberal, in accordance with public demand. It also conceded defeat to a more secular party in the 2014 elections, publicly stressing the importance of political compromise. In addition, the limited role of the military was a relevant factor in Tunisia's democratic success. Finally, demographics also played a role, as Tunisia possesses an educated population. Though Tunisia admittedly faces many pressing political issues that it must resolve, the aforementioned factors contributed significantly to Tunisia's success thus far.

Student Researcher(s): Colleen Cosgriff**Major: English****Research Mentor(s): Eric Bonds****Project Title: Panhandling in Virginia: The First Amendment and the Criminalization of Homelessness**

Cities throughout the state of Virginia are repealing or changing their ordinances, which criminalized panhandling, after the ordinances have been challenged. This project explores the impact of the work of Jeff Fogel, the Virginia attorney working to protect the First Amendment Rights of people experiencing homelessness, as well as the importance of panhandling to those experiencing homelessness in Virginia.

Student Researcher(s): Rachelle Dambrose**Major: Mathematics****Research Mentor(s): Jangwoon Lee****Project Title: Three-Dimensional Approximations of Poisson's Equation**

The focus of this research was to develop numerical algorithms to approximate solutions to Poisson's equation in two and three dimensions. Numerical analysis of partial differential equations is vital to understanding and modeling these complex problems. A numerical approximation can be obtained by expanding Poisson's equation with a centered difference formula. A computer program was developed to approximate these

solutions in different regions with various input parameters, such as boundary conditions and nonhomogeneous source function. Approximate solutions were compared with exact solutions to prove its accuracy. The program was tested with increasing number of subintervals to ensure that the approximations get closer to the actual solution. Then, an experiment was performed to find the temperatures through a heated piece of aluminum foil to show how this approximation can predict real world phenomenon.

Student Researcher(s): Liam Deihl

Major: Classics

Research Mentor(s): Angela Pitts

Project Title: Ritual Metatheatre in Aristophanes' Frogs

Frogs is a comedy about drama itself. By retrieving Aeschylus (and making such a lot of noise about Euripides in the first place), the god Dionysus comments on the state of Athenian culture in the fifth century. My paper will demonstrate metatheatrical moments in Aristophanes' text, during which he renegotiates the relationship between the stage and the audience. Parody and literary awareness ultimately call attention to the ritual nature of the drama as an offering to Dionysus. At times, the comic poet inserts himself (or the persona of a poet) into a supplicant character before the god, as when the slave Xanthias repeatedly wonders "what [jokes] should [he] tell?" and Dionysus rejects each of his suggestions. I will examine moments of god/slave inversion, because, as Dover notes in the introduction to his edition of the text, Dionysus "has become abjectly dependent on Xanthias, reduced to coaxing and wheedling in terms extraordinary between master and slave." Choral passages are of interest: the two choruses display an awareness of their station and purpose: the frogs reference their own song, the mystics reference their own dance, and both sing of Dionysus right in front of him, having invoked the Muses and other deities. Finally, I analyze the agon between Aeschylus and Euripides, in which Euripides prays to his alleged personal gods rather than to Dionysus or even the Muses, and Aeschylus wins Dionysus' favor after a ridiculous and frantic ceremony. The agon ultimately brings Dionysus even closer to the dramatists who conduct his worship: he is humanized by the way the dead poets treat him, and he offers a reprieve from death to the most worthy of his "priests" in exchange for his cultural services—Aristophanes uses Dionysus to "revive" an art form that is meant to save Athens from itself.

Student Researcher(s): Sofia Di Benigno

Major: Biology

Research Mentor(s): Lynn Lewis

Project Title: Investigating the Antiviral Effect of Interleukin-1 Treatment on Newcastle Disease Virus Infection in Chicken Embryo Fibroblasts

Inflammation is an immune process activated in response to infection or other unfavorable cellular conditions. It is often initiated by chemical signals called inflammatory cytokines, including interleukin-1 β (IL-1 β). In this study, the effect of IL-1 β was examined on a primary culture of chicken embryo fibroblasts infected with Newcastle Disease Virus (NDV), a paramyxovirus that infects avian species and can be transferred to humans. Samples of both healthy and infected cells were treated with media as a negative control, IL-1 β as an experimental group, and ribavirin as a potential positive control. These samples were plated and evaluated for cell survival using an MTT assay. Ribavirin had no effect on healthy cells ($p=.625$), and those infected cells treated with ribavirin experienced a small increase in survival over untreated NDV-infected cells, but survival was not as high as that of healthy cells. IL-1 β caused a decrease in survival of the healthy cell culture ($p=.042$), which demonstrates a cytotoxic effect on healthy cells. However, this effect was not demonstrated in infected cells; those infected cells treated with IL-1 β had a survival rate equivalent to that of untreated NDV-infected cells ($p=.509$). Therefore, it can be concluded that IL-1 β has no effect on NDV-infected cells in vitro, and it has a cytotoxic effect on healthy cells.

Student Researcher(s): Thallya Diaz

Major: Spanish and International Affairs

Research Mentor(s):

Project Title: Mysticism as a vehicle for feminism in the novels of *La Habana Oculta* by Cuban writer Daína Chaviano

In my paper I explore how the mystical events experienced by the protagonists in the four novels of the series *La Habana Oculta* by Daína Chaviano, become vehicles for the expression of a feminist consciousness. The mystical elements in the novels, such as the presence of “shadows,” spiritual guides, and the prevalent references to idols and figures historically associated to mysticism represent the life experiences of Cuban women. I show how mystical occurrences described in the texts act as a form of escape but are also metaphors for women’s reality. I explore the relationships between the protagonists and her friends. This analysis is important as the protagonists are surrounded by a circle of friends who view them as “locas” and out of control due to their mystical experiences; this perspective adds a significant element to the description of feminism because societal resistance to mysticism motivates the spiritual journey and search for identity of the women protagonists. Lastly, I conclude that the experiences of the women in all four novels –ranging from 1850 to 1998—coincide with the historical evolution of Cuban women.

Student Researcher(s): Sarah Dickshinski

Major: Anthropology and French

Research Mentor(s): Eric Gable

Project Title: Narrating the French National Story: The Role of Discourse in the Production of Frenchness

At the center of the question of alterity today lies a debate on the role ethnicity, race, religion, and culture each play in the context of multicultural societies. In France the social contract claims to extend equal rights to all of its citizens by simple virtue of their presence in the collective, yet members of minority populations living in France often do not have access to these rights. Arab Muslim immigrants in particular are treated differently than citizens who represent the white, catholic, bourgeois population whose ancestry is seen as being “rooted” in France. While Arab Muslim immigrants are legally citizens of the French Republic, they are unable to gain sufficient “Frenchness” in order to acquire full cultural citizenship in French society. Although native French citizens present this cultural identity as unchanging, it is ultimately through the debate they hold on what constitutes Frenchness that Frenchness is produced. Through the course of my thesis I address the native French population’s perceptions of Arab Muslim members of society through Front National (FN) leader Marine Le Pen’s Assises Présidentielles speech, Caroline Fourest’s socio-political essay *Génie de la laïcité*, and the Cité nationale de l’histoire de l’immigration’s (CNHI) permanent exhibit *Repères* in order to examine how Frenchness is produced in relation to Arab Muslim immigrants living in France.

Student Researcher(s): Seth Dorman, Hillary Lebedun and Melanie Dorchester

Major: Accounting

Research Mentor(s): Kashef Majid

Project Title: Sacked for a loss – When college football recruits use reputation to predict future success.

This paper examines the likelihood that a college football player will be drafted by a professional football team. We examine whether schools which win many college football games enhance (or decrease) the likelihood that a player gets drafted. Our findings reveal that highly sought after recruits benefit from attending highly rated college football teams but recruits which are not as highly sought after may benefit from attending less prestigious college football programs.

Student Researcher(s): Richard Joseph Dragone, Alexanna Hengy, Danielle Niepokoj, Madison Combs and Caroline Schwartz

Major: Psychology

Research Mentor(s): Virginia Mackintosh

Project Title: Rappahannock Goodwill Section 14© Program Evaluation

The study evaluated the Rappahannock Goodwill Industries Section (RGI) 14(c) programs. In order to determine whether or not RGI is meeting their mission statement we attempted to analyze the quality of life of both the participants and their family members, but found data based on just participants. We also examined how work impacts the quality of life of the participants. The goals listed in the RGI mission statement are to provide opportunities to those who otherwise cannot obtain employment, especially due to disabilities, and to

promote a sense of independence through their participation. This evaluation will help to inform whether RGI programs are meeting their goals and positively impacting the participants and their family.

Student Researcher(s): Emma Eichenberger, Lesya Melnychenko, Brooke Preas, Corey Staier and Madison Winters

Major: English

Research Mentor(s): Mary Kayler

Project Title: Highland Haunting- An Interactive Narrative-Based Horror Game

Our presentation showcases the work of six undergraduate students at the University of Mary Washington (UMW) who enrolled in Playable Fiction, a three-credit experiential course held in Scotland and Wales through Bangor University.

Ghosts, goblins, and things that go bump in the night have been terrorizing your town. A quest leading around the United Kingdom will give you the clues to solve this mystery. Step into the role of a paranormal investigator who uncovers the mysteries that are held within Highland Haunting. Hone your skills, choose to battle, or meet characters that will help or hinder your progress. Who is the ghost that traveled to your town and what does it want?

Highland Haunting is an interactive transmedia mystery that takes the player through historically significant castles where you meet mystical creatures and experience the possibilities. Step into a choose your own path ... will you win or will you die?

Student Researcher(s): Sabrina Elliott

Major: Biology

Research Mentor(s): Rosemary Barra

Project Title: Fibroblast Viability and Scleroderma

Scleroderma is a chronic autoimmune rheumatic disease of connective tissue. there are multiple forms of the disorder, ranging from limited to systemic. In the more progressive systemic sclerosis the entire body can be affected, not just the epidermis. Research in this area has grown because nearly 300,000 Americans have Scleroderma and approximately 1/3 of those have systemic scleroderma. While the symptoms vary for each patient, the root of the problem lies in the hardening of the skin caused by fibrosis. As there is no known cause for the onset of fibrosis, research is focused on discovering if there are environmental or genetic causes. Previous experiments conducted by Yamamoto in 2011, demonstrated the increase of fibroblast proliferation leading to fibrosis under hypoxic conditions. Furthermore, experiments by Yang et al. in 2014 and Sakai and Tager in 2013, saw that bleomycin was able to overcome the connective tissue growth factor insufficiency in mice to induce fibroblast accumulation, which led to the development of fibrosis. The Yamamoto study inferred that hypoxia triggered microvascular alterations that activated the dermal fibroblasts and furthered the progression of fibrosis. An earlier study by Lasky et al. in 1998, saw that the combination of hypoxia and bleomycin induced changes in the proliferation of fibroblasts in cell cultures. For this experiment, cultured human dermal fibroblasts were treated with various concentrations of bleomycin and hypoxia in an attempt to induce cellular changes consistent with the development of Scleroderma. The initial results indicate that bleomycin and hypoxia decreased cell viability without inducing the expected morphological changes.

Student Researcher(s): Emily Ferguson

Major: Biology

Research Mentor(s): Parrish Waters

Project Title: Development of a novel operant behavior testing chamber using a touchscreen and an Arduino

Operant performance is an important measure in animal models, as it can help us understand the animal's mental and neurophysiological states for clinical and academic purposes. Classical operant performance chambers (e.g. Skinner's Box) are however, limited by the simplicity of their design. While digital tools have been successful in adding versatility to operant systems, commercially-available chambers are prohibitively expensive and are limited by access to proprietary software. To address these deficits, we are developing an operant behavior chamber composed of a touchscreen, an Arduino (a small circuit board), an array of

compatible hardware options, and open-source software. These components summarily contribute to an operant behavior testing chamber that is inexpensive yet incredibly versatile.

Student Researcher(s): Ellen Field

Major: Biology and Classics

Research Mentor(s): Angela Pitts

Project Title: Romans and their dogs: how canines were viewed in ancient Rome

I will be looking at different aspects of Roman culture to determine how they saw canines and how that affected their actions towards them. I will use primary and secondary sources that focus on mosaics, poems, tombstone inscriptions and statues to understand how the romans thought about animals, primarily dogs. I will answer questions about how the depiction of dogs in Roman art literature shows their true feelings towards animals.

Student Researcher(s): Meredith Fierro

Major: Digital Media Studies

Research Mentor(s): Martha Burtis

Project Title: Introduction to Domain of One's Own

This project is a video introducing the Domain of One's Own Project. Domain of One's Own is a project that allows students to create their own domain during their time at the University. It allows them to build out a digital presence in any way they'd like. The video was produced and edited by Meredith Fierro using material from students and faculty, this video will be shown to incoming students at orientation this summer 2017.

Student Researcher(s): Michelle Finnegan

Major: Historic Preservation

Research Mentor(s): Marjorie Och

Project Title: London Museums During World War II

The threat and effects of World War II presented concerns and challenges to British museums that caused them to take unprecedented precautions to manage collections, protect priceless works of art, and establish procedures relevant to the field of museum studies, in particular in the area of collection management in times of tragedy. These historically documented events have application to the modern management of museums and their collections. This presentation will cover how the blitzkrieg affects museums and their collections, what precautions were taken, how the art was protected, and what happened to the museums. The museums in this research include the British Museum, the Victoria and Albert Museum, the National Gallery, and the Tate Britain.

Student Researcher(s): Sara Fioretti

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: Embryonic Development of the Stress Axis in Two Model Teleost Species

Zebrafish (*Danio rerio*) are a commonly studied model organism utilized for stress research due to functional similarities between the human hypothalamus–pituitary–adrenal (HPA) axis and teleost hypothalamus–pituitary–interrenal (HPI) axis. Japanese medaka (*Oryzias latipes*) are promising model organisms for HPA/HPI axis research; however, there has been considerably less research done on the embryonic development of key stress axis components compared to zebrafish. To further their utility as model organisms for stress research, we are characterizing the development of the HPI axis in both species by measuring expression levels of genes encoding key HPI hormones, receptors, and enzymes during embryonic development. Toward this goal, we isolated total RNA from zebrafish embryos collected at 12 time points, from 10 hours post-fertilization (hpf) to just prior to hatching at 48 hpf, and from medaka embryos collected at 9 time points, from 2 days post fertilization (2 dpf) to just prior to hatching at 8 dpf. After synthesizing cDNA from total RNA, we used quantitative PCR (qPCR) to determine the relative expression of the target HPI axis genes normalized to the housekeeping gene β -actin. We found that in the medaka, glucocorticoid receptor (GR) mRNA levels significantly increase from 2 days post fertilization (dpf) through 6dpf, then remain fairly steady until 8 dpf. Conversely, in the zebrafish, we found that GR mRNA levels remain relatively

unchanged from 10 hours post fertilization (hpf) up to 48 hpf. Analysis is underway to characterize temporal changes in expression of other HPI axis genes.

Student Researcher(s): Andrew Franklin, Claude Thompson and Chloe Morton

Major: Chemistry

Research Mentor(s): Randall Reif

Project Title: Quantification of Nitrate and Phosphate in the Rhappahanock River by UV-Vis Spectroscopy

Nitrate and phosphate are key factors in determining water quality in environmental systems. These two chemicals are major contributors to plant growth and as such affect the extent of oxygen available to animal life. If this level of available oxygen falls too low, the water system can "die" in the sense that it is no longer inhabitable to animal species and can go so far as to eutrophicate over time. Nitrate can be measured by UV-Vis spectroscopy in the mid-UV region, but is susceptible to organic compound interference. To mitigate this, the sample of river water will be filtered through a microfilter and an approximation of organic interference will be determined from the absorption in a region nitrate is known not to absorb. Phosphate, however, does not absorb light and as such can't be directly measured by UV-Vis spectroscopy. As such a conjugation to the phosphate must occur to allow for quantification. Through reaction with molybdate and antimony-tartrate, phosphate creates a short lived complex that produces color in proportion to its concentration. Therefore, a calibration curve will be created from sodium nitrate standards to test for interference subtracted nitrate levels. Additionally, standards of an antimony-phosphate-molybdate complex will be used to create a calibration curve that will then allow for phosphate determination after a sample of river water is processed in the same manner as the standards. Results are expected to fall in the range of 1-10ppm for nitrate and .025-0.1ppm for phosphate. It is expected for elevated rates of contamination to be observed due to the extensive farming near the river, however as the river hasn't shown signs of extensive eutrophication we aren't expecting to find results over the maximum ranges.

Student Researcher(s): Abby Friedman

Major: Geology

Research Mentor(s): Chuck Whipkey

Project Title: Residual Mercury from Gold Mining Activity in Soils at Lake Anna State Park

The former Goodwin Gold Mine, located in Lake Anna State Park in Louisa County, VA, was in operation from 1880-1881. Although mine structures are no longer intact, building foundations are identifiable at the site. Elemental mercury was used in the processing of ore at this mine to separate gold from the ore. In this process, gold was amalgamated with mercury by mixing pulverized ore with liquid mercury. The mercury-gold amalgam was separated from the ore and then retorted, thus driving off the mercury, and leaving a gold residuum. In the 19th century, elemental mercury was commonly released to the environment during this type of gold ore processing. Preliminary soil analyses at the mine site indicate mercury concentrations up to 100 times higher than regional background levels. Mercury concentrations are most elevated near the structure identified as the amalgamation room, the likely source of mercury releases. Elevated levels of mercury have so far been found up to 200 meters away from the amalgamation room. Additional analysis of soils, mine tailings, and stream sediments are proposed to further delineate the extent of dispersed mercury in the area.

Student Researcher(s): Marc Gehlsen

Major: Spanish and Linguistics

Research Mentor(s): María Isabel Martínez-Mira

Project Title: Stancetaking as a Marker of Identity in Hispanic Millennials

The analysis of stance taking in discourse has several implications about the expression of the identity of the speaker by means of sentence formation consistent with patterns among members of a speech community. This study focuses on the ways in which speakers that are considered a part of the millennial generation (birth dates between 1982 and 2004) express their identity as US born Latino heritage speakers by means of a "stance repertoire" present among a majority of speakers who identify themselves as part of the target community. Through an analysis of individual interviews, common means of expressing a stance are outlined and explained

as components of this stance repertoire, with each individual method of taking a stance explained as being present under certain conditions of a speech utterance.

Student Researcher(s): Lydia Grossman

Major: International Affairs

Research Mentor(s): Ranjit Singh

Project Title: Climate Change and Civil Unrest in the Middle East: Current Crises, the Role of Governance, and Future Implications

In the past few decades, it has become clear that anthropogenic climate change is affecting the environment and societies across the globe. In the Middle East and North Africa, climate change has already had very noticeable effects. The temperature averages across the region have increased, sea levels have risen to intrude on coastal areas in the Mediterranean, and most importantly, rainfall has decreased drastically. Climate change has not only caused environmental degradation in the Middle East, but it has also led to a number of social, economic, and political consequences.

Also in the past few years, the MENA region has experienced a generally high level of civil unrest. This culminated in the events of the “Arab Spring” in 2010-2011, in which millions of Arabs across the region joined protests against government corruption and repression of civil liberties. Some of these movements have led to democratic transitions, while others have led to violent conflict and civil war.

These two phenomena may seem completely separate. However, some scholars suggest that climate change, and the way that governments addressed climate change, played a role in the civil unrest that swept the Arab World in the past few years. In my research, I seek to investigate how government response to climate change affects civil unrest in the Middle East. To do this, I conduct case studies in a controlled comparison—I look at the cases of Syria, Jordan, Tunisia, and Sudan. These countries all experienced similar effects of climate change, and yet they had very different levels of civil unrest. I argue that one of the primary factors in affecting this difference is the way that each government addressed climate change.

Student Researcher(s): Diana Handler and Peter Mitchell

Major: Biology

Research Mentor(s): Alan Griffith

Project Title: The Trees of UMW: A Geospatial Observation of Trees

Numerous students worked in collaboration with Professor Griffith to catalog trees across the campus of the University of Mary Washington. We were placed in groups and divided up the campus in order to document as many relevant trees as possible. We measured tree canopy width, diameter at breast height, height and location. The first three were accomplished manually, while location was implemented with GPS technology. These data points were then placed into ArcGIS by ESRI for creation of a database and future cartographic presentations.

Student Researcher(s): Sarah Heisey

Major: Biochemistry

Research Mentor(s): Nicole Crowder

Project Title: Alkyl phosphonate films on copper oxide surfaces as a platform for supported catalysis

The reduction of CO₂ through the use of ruthenium-based catalysts can yield more synthetically useful multi-carbon products. The attachment of such a catalyst to copper surfaces would create catalytic electrodes that can be re-used without loss during the recovery of reduction products. In this work, 11-hydroxyundecyl phosphonic acid was attached to copper plates through the tethering by aggregation and growth method (TBAG), resulting in a self-assembled monolayer of phosphonates through covalent attachment to the native oxides present on the copper surface. Esterification between the terminal hydroxyl and 2,2'-bipyridine-4,4'-dicarboxylic acid yielded surfaces that can coordinate to a ruthenium metal center through the bipyridine ligand. The resulting modified copper surfaces were characterized through surface reflectance IR-spectroscopy, indicating the attachment of the ligands of interest.

Student Researcher(s): Emily Henry, Hannah Kass, Laura Leonard, Sarah Pennington and Kristy D'Alessandro

Major: Chemistry

Research Mentor(s): Randall Reif

Project Title: Quantitative Analysis of BaP in Water: A Comparative Instrumentation Study

Benzo [a] pyrene (BaP) is a highly carcinogenic compound that can be found in industrial waste, cigarette smoke, charred foods, and in third world countries water at high levels. Undergraduate research students in the UMW biology department researching the effect of BaP on zebrafish development need an easy and effective method quantifying BaP from water samples. Low levels (5-100 nM) of BaP in water will be detected using fluorescence spectroscopy and gas chromatography and mass spectrometry (GC-MS) to determine which method is more effective. Standard solutions of BaP ranging from 0.5-100 nM will be created and ran through each instrument, producing a standard curved. An absorbance spectrum, collected from UV-Vis Spectroscopy, will determine the maximum wavelength necessary for the parameters of the fluorescence BaP trials. BaP will be extracted and inserted back into acetone to mimic the steps of a biology student. The separation of PAHs will be achieved using GC-MS. The derived LOD and LOQ of BaP in water from the standard curve of each method will determine the efficiency and sensitivity of each instrument. The more sensitive method will allow for biologists to detect the lowest levels of BaP in water supply.

Student Researcher(s): Grace Henry

Major: Biology

Research Mentor(s): Davis Oldham

Project Title: Synthesis and Biological Evaluation of Inhibitors of KasA Identified Through Virtual Screening: A Novel Inhibitor Of Mycobacterium Tuberculosis

Tuberculosis is a disease caused by Mycobacterium tuberculosis, which is becoming increasingly drug resistant. A virtual screen was conducted to identify inhibitors of KasA, a key enzyme in the synthesis of the bacteria's cell wall. One compound identified from this screen killed M. aurum, a avirulent derivative of M. tuberculosis. We proposed making this compound in two steps: (1) alkylation of 4-piperidone and (2) addition of an aryl nucleophile to the product of the first step. Preparation of the required Grignard reagent using 1,4-dibromobenzene and either Mg or iPrMgCl were unsuccessful. Fortunately, the lithium-halogen exchange with 1,4-dibromobenzene was effective when excess n-BuLi and 0.7 equivalents of N-alkyl piperidones were used; trapping this reagent with 1-benzyl-4-piperidone as a model compound produced the desired product in 31% yield. The lithiation was repeated with other aryl halides and N-piperidones to produce the final products, which will be purified and tested on M. aurum.

Student Researcher(s): Elizabeth Hiatt

Major: Sociology

Research Mentor(s): Eric Bonds

Project Title: Racialized Historical Commemorations and their Defenders: Tactics Revealed through a Student-Led Project in the U.S. South

Historical commemorations that celebrate white supremacists are not just relics of the past. They are passionately defended in the present. We provide a literature review that discusses the contested nature of collective memory and how it is racialized. We then provide an overview of a student effort to remove one such commemoration in Virginia and describe the local controversy it generated. We move on to identify and discuss the rhetorical tactics that individuals and groups opposed to this effort successfully used to defeat it. As demographic trends continue to change the U.S. South, challenges to public commemorations of the Confederacy and white supremacy will continue. Future challengers may benefit from anticipating these tactics and planning accordingly.

Student Researcher(s): Lucas Hidalgo and Mitchell Greenwood

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Cadmium Selenide Quantum Dots for the Exploration of Trap State and Exciton Emission

Quantum dots (QDs) are nanostructures made from organic/inorganic materials that are commonly used in physical chemistry to observe quantum phenomena, such as their size-dependent optical properties. Current methods for QDs synthesis require toxic and harmful chemicals used under elevated temperature and pressures that are not ideal for an undergraduate chemistry lab. For this study, we have adopted the proposed method by Landry et al. for the synthesis of CdSe QDs that utilizes oleylamine to modify the surface structure of the CdSe QDs, thus improving their exciton emission. This increase in exciton emission of the CdSe QDs will allow for better spectral analysis and size determination, accomplished using fluorescence spectroscopy and the solution to the Schrodinger Equation for a particle on a ring. It is hypothesized that the improved exciton emission from the modified CdSe QDs will allow us to explore the theory behind trap-state and exciton emission and their role in the size dependent optical properties of QDs.

Landry, M. L.; Morrell, T. E.; Karagounis, T. K.; Hsia, C.-H.; Wang, C.-Y. *Journal of Chemical Education* 2014, 91 (2), 274–279.

Student Researcher(s): Renee Hilelson

Major: Biology

Research Mentor(s): April Wynn

Project Title: Characterization of vegetative phenotypes of EARLY RESPONSE TO DEHYDRATION 10 (ERD-10) mutants in *Arabidopsis thaliana*

We examined two mutant alleles of the EARLY RESPONSE TO DEHYDRATION 10 (ERD 10) gene, SALK_087789 and SALK_097255C, to observe the vegetative and floral phenotypic differences between the two mutant alleles and wild type plants. Phenotypic characterization included percent germination, rate of bolting and gross morphology. We observed and characterized a clear disruption in the phyllotaxy of both the erd 10 alleles. The phyllotaxy of plants, like *Arabidopsis thaliana*, is where axillary branches grow from the apical stem in a spiral pattern. However, in both the ERD-10 mutants we observed an irregularity in this spiral pattern; with the axillary branches and silique doubled up alongside one another instead of adjacent. The most extreme mutation we documented was of two siliques growing out of the same location on the stem. These vegetative phenotypes indicate that ERD 10 may play a role in the growth and structure of the vegetative organs in *Arabidopsis thaliana*. Additionally, previous studies have indicated that ERD10 and SEUSS (SEU), a transcriptional adaptor protein, may both play a role in vegetative and floral development (Wynn et.al, 2011). Crossing of seu-3 with both erd 10 alleles allowed for preliminary phenotypic characterization of the F2 homozygous double mutant plants. This data will provide directions for additional detailed characterization of this double mutant.

Student Researcher(s): Riley Hoch and Ashley Parkhurst

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: The Solubility of Calcium Sulfate

This experiment was conducted to evaluate the solubility of calcium sulfate in calcium chloride, hydrochloric acid, sodium hydroxide, and an aqueous solution by means of titration. Further, the solubility was determined by means of an atomic emission spectrometer. By means of titration, it was found that in 0.0250 M CaCl₂, 0.0500 M CaCl₂, 0.100 M CaCl₂, 0.0500 M HCl, 0.0500 M NaOH, and 0 M DI H₂O, calcium sulfate had 0.0234, 0.051, ~ 0, 0.106, 0.0226, and 0.000148 M, respectively. By spectroscopy, solubilities of 0.04281, 0.05150, ~ 0, 0.02590, 0.01722, and 0.01587 M were found, respectively. The decrease in solubility for the calcium chloride solutions is due to the common ion effect; whereas the increase in solubility for hydrochloric acid and sodium hydroxide is due to Debye-Huckel Theory.

Student Researcher(s): Coalter Hollberg and Lauren Mosesso

Major: Environmental Science

Research Mentor(s): Ben Kisila

Project Title: The Impact of Soil Characteristics and Sea Level Rise on Phosphorus Dynamics in Coastal and Upstream Wetlands in the Lower Chesapeake Bay

Aquatic systems are adversely affected by excess inputs of phosphorus (P) mobilized from extrinsic and intrinsic sources. Despite management improvements in most basins limiting extrinsic nutrient fluxes, associated eutrophication problems remain in most global fluvial and coastal ecosystems. Wetlands have been known as important sinks of terrestrially derived nutrients but progressive sea level rise and associated prolonged inundation of wetlands have the potential to change the biogeochemical characteristics of wetland soils and thus to influence the P retention/release dynamics in wetlands. This study uses 111 soil cores along 28 transects perpendicular to the streams to examine P dynamics and associated soil biogeochemical characteristics in five upstream and coastal wetlands in the lower Chesapeake Bay basin. Soil properties including total soil P, cation exchange capacity (CEC), degree of P saturation (DPS) and soil organic matter (SOM) were analyzed to understand the retention and release of P from wetlands into adjacent aquatic systems. Preliminary results from two drainage systems analyzed shows that SOM are relatively lower in the upstream wetlands ($2.56\% \pm 0.2$, $16.14\% \pm 0.93$) compared to coastal/downstream wetlands ($30.8\% \pm 1.1$, $20.85\% \pm 0.55$, $9.16\% \pm 0.51$). Likewise, Melich-3 soil P is greater in the downstream/coastal wetlands ($12.6\text{ ppm} \pm 0.7$, $31.7\text{ ppm} \pm 1.05$, $29.6\text{ ppm} \pm 0.95$) than upstream ($6.36\text{ ppm} \pm 0.46$, $10.56\text{ ppm} \pm 0.53$). CEC and DPS were also significantly higher in coastal/downstream wetlands than upstream wetlands. These preliminary results suggest the important roles of varying stream water salinities, wetlands soil characteristics, length of inundation and urbanization-related addition of cations in influencing P sorption/desorption dynamics in wetland soils. Completion of this study will provide insight into the role of wetlands in P fluctuations in the Chesapeake Bay waterways.

Student Researcher(s): Victoria Howell and Rebecca Na

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Application of the Schrodinger Equation to An Examination of Zinc Oxide Nanoparticle Sunscreen

Schrodinger's equation for the particle in the box shows a direct relationship between box size and absorbance wavelengths; this theory can be used to explore the use of zinc oxide nanoparticles in sunscreen. Bulk zinc oxide is a core sunscreen ingredient. In this study, the difference between the absorbance wavelengths of bulk and nanoparticle ZnO is investigated using UV-Vis spectroscopy, and the spectra are modeled using the Schrodinger equation. The agglomeration and emulsion of ZnO solutions are also observed under UV light where scattering will occur. We expect to see a correlation between smaller particle size and absorption of shorter wavelength light. The data generated from this study could be used to produce new and improved sunscreen formulations.

Student Researcher(s): Kenyon Huber-Wilker and Molly Miller

Major: International Affairs

Research Mentor(s): Jason Davidson

Project Title: America Entangled

The two of us are assisting Dr. Davidson on his new book: America Entangled. We are doing research on the alliances that America has been in since its inception. Molly is covering all alliances before WWII and i am covering all alliances from WWII to the present.

Student Researcher(s): Allison Jakubek

Major: Economics

Research Mentor(s):

Project Title: The Effect of Crime Rates on Major League Baseball Attendance

Major League Baseball attendance has been examined since the league's establishment in 1869. Winning percentage, opponent quality, and stadium quality have all been deemed significant determinants of increasing attendance, but deterring factors have yet to be closely examined. Since a majority of professional sports stadiums are constructed in economically poor, crime ridden areas, it seems natural to assume that crime could have an impact on people's desire to attend Major League Baseball games. Panel data collected on twenty-eight Major League Baseball teams over the course of ten years was used to determine whether or not crime rates have a significant effect on each team's respective attendance.

Student Researcher(s): Kati Justice

Major: Classical Civilization

Research Mentor(s): Angela Pitts

Project Title: Analysis of Lines 992 to 1003 in the Frogs

This research Paper focuses lines 992-1003. The allusion to Homer's Iliad in these lines is a form of communication to Aristophanes' audience. The choral message to Aeschylus and Euripides in these lines is a way for Aristophanes to convey the kind of poet Aeschylus is while teaching the audience about how to focus on their present circumstance.

Student Researcher(s): Kati Justice

Major: Classical Civilization

Research Mentor(s): Angela Pitts

Project Title: Phoenix in the Embassy to Achilles

Phoenix is an original character in the Iliad, but his speech in "Book IX" may have been superimposed after the original transcription of the epic. Some scholars believe that Phoenix has been added to the Iliad at a later time, and others believe that only his speech in 'book IX' was added in later. This research paper will focus on the purpose of Phoenix as a character, and why his presence in the Iliad is questioned by some scholars.

Student Researcher(s): Hannah Kass

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: The Effect of Kisspeptin 1 on Gonadotropin Releasing Hormone in Embryonic Medaka (*Oryzias latipes*)

In adult vertebrates, the neuropeptide kisspeptin1 stimulates the release of gonadotropin releasing hormone (GnRH) thereby regulating sexual maturation and reproduction. In the model teleost medaka, Kiss1 is expressed throughout embryonic development, where its function is largely unknown. We hypothesized that Kiss1 plays a role in the development of GnRH neural network in embryonic medaka. To examine the effect of Kiss1 on proliferation and differentiation, we exposed either GnRH-1promoter:GFP transgenic or wild-type medaka embryos to Kiss1 or a Kiss receptor blocker and examined the effects on GnRH neuron number. We quantified GFP-labeled neurons in the 4 dpf transgenic embryos. Neuron number varied from 19 ± 6.8 (mean \pm SD) in controls, to 22 ± 6.9 in Kiss1 embryos and 16 ± 4.6 in blocker embryos ($n=6$). These differences were not significant, however, (ANOVA; $p = 0.3$) indicating that Kiss1 signaling doesn't regulate GnRH-1 neuron proliferation or differentiation during embryogenesis. To examine the effects of Kiss1 on *gnrh-1* and *gnrh-3* expression, we collected treated wild-type embryos throughout embryogenesis and quantified expression with qPCR. Relative *gnrh* expression was normalized to β -actin and expressed as fold change relative to 2dpf control embryos using the $2^{-\Delta\Delta CT}$ method. There was a time dependent increase in *gnrh-1* expression (ANOVA; $p < 0.05$) but no effect of treatment ($p = 0.15$). There was no effect of time or treatment on the expression of *gnrh-3* ($p = 0.51$). Kisspeptin 1 appears to have no effect on the proliferation or differentiation of GnRH neurons, nor the expression of *gnrh* within the cells. The role of Kiss 1 in embryogenesis remains unknown.

Student Researcher(s): Brandon Kern

Major: Geography

Research Mentor(s): Jackie Gallagher

Project Title: Disappearing Streams in Crow's Nest

This project involved field research conducted at Crow's Nest Natural Area Preserve. The Crow's Nest Natural Area Preserve is Virginia's 54th state natural area preserve, located in Stafford County with a total area of just under 3,000 acres. A forested area with steep ravines, it has not been logged for 70-100 years so it has a natural fluvial system. The project specifically studied one stream valley where the disappearing stream phenomenon occurs in multiple places. Generally speaking, streams flow underground only in karst landscapes with carbonate bedrock; this area is one of alluvial gravels and sands. I have three hypotheses to explain this disappearing

stream. I made observations of the steam valley and conducted a detailed survey of one section of it. I collected sediments from an exposed cut bank and analyzed the texture and carbon content of those samples. Using literature describing the behavior of streams that are not in equilibrium and considering the history of this area, I think that two of my hypotheses might explain why the stream flows underground. While further work is needed, I am trying to construct a predictive tool using contours in a GIS that could be used to identify where other disappearing streams within Crow's Nest might be located.

Student Researcher(s): Hannah Killian and Brandon Rozek

Major: Physics

Research Mentor(s): Hai Nguyen

Project Title: Modeling Population Dynamics of Incoherent and Coherent Excitation

In the three level atomic system, incoherent excitation leads to approximately one third of the population transferred from the ground state to the uppermost excited state. The objective of this study was to maximize the population transfer to the highest energy level while minimizing the amount of population in the intermediate state. Using the properties of coherent light in a two-photon system, theoretical calculations were performed with the time dependent Schrödinger equation. By exploiting the orthonormality of the wave function and applying the near resonance, dipole, and rotating wave approximations, a model was developed to show population dynamics for a 3-level Rb87 system. Population transfer is driven by delayed laser pulses, and the model demonstrated that to maximize transfer the pulses should be in a counterintuitive order where the second laser field is applied prior to the first. Nearly complete population transfer was achieved from the ground state to the excited state using this method of coherent excitation.

Student Researcher(s): Eleanor Kilmon and Zafrullah Malik

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Kinetic Study of the Oxidation of Ascorbic Acid by Hexacyanoferrate III

This study aimed to experimentally determine the rate law and activation energy of the oxidation of ascorbic acid by hexacyanoferrate III ($K_3Fe(CN)_6$) through methods of integrated rate law, initial rate, and Arrhenius plots. Solutions of varying concentrations were reacted at different temperatures and the progress was recorded by UV-Vis spectroscopy at 418nm. The rate law was determined to be $k[K_3Fe(CN)_6][Ascorbic\ Acid]$ where k equals $8.61\ M^{-1}\ s^{-1}$ at room temperature and the activation energy was calculated to be $12.82\ kJ/mol$. These findings are significant because they reaffirm the significance of temperature and concentration of reactants on activation energy and the overall rate of reaction.

Student Researcher(s): Meghan King

Major: Environmental Science and Geology

Research Mentor(s): Ben Kisila

Project Title: Application of Soil and Water Assessment Tool (Swat) to Model the Impact of Progressive Land-Use Changes on Sediment and Nutrient Fluxes in Rivanna River Basin, Virginia, USA

The Chesapeake Bay, on the eastern coast of both Maryland and Virginia has been the subject of intense research for its persisting degrading environmental conditions. Among the most prominent causes of this ecological decline is sediment and nutrient pollution. While there have been numerous attempts to clean up the Bay, understanding the dynamics of the sub-watersheds that drain into the bay is crucial in determining the course of actions needed to remediate this important ecosystem. This study aims to understand and estimate the sediment and nutrient fluxes into the Rivanna River Basin, a sub-watershed of the James River using The Soil and Water Assessment Tool (SWAT). This nearly 2000 km² sub-watershed begins in the Blue Ridge Mountains of Virginia, and flows through the city of Charlottesville before joining with the James River. The goal is to create a viable model for predicting the transport of sediment and associated nutrients (nitrogen and phosphorous) through the Rivanna River. The SWAT database was created using elevation, soil characteristics, and land use maps, in addition to meteorological, point source and reservoir data. This model was calibrated and validated using available 1980 to 2015 data, and yielded a 0.4 Nash Sutcliffe Efficiency. Preliminary results suggest that sediment and organic phosphorous fluxes within the watershed have been increasing on a monthly

average of 0.0078 t/ha and 0.0592 g/ha respectively. Conversely, organic nitrogen decreased on a monthly average of 0.0382 g/ha. The progressive conversion of natural forest and wetlands to urban and agricultural areas in this watershed is likely the cause of the trends in sediment, phosphorous and nitrogen. Improved model calibration, and projected land use will be used in a time series model output to enhance understanding of temporal variation of both sediment and nutrient fluxes into Rivanna River and ultimately the Chesapeake Bay.

Student Researcher(s): Courtney Kuzemchak

Major: Art History and Historic Preservation

Research Mentor(s): Cristina Turdean

Project Title: Collections Management

My project this semester has been in conjunction with a group study project tasked with cataloging the collection of museum objects owned by the Masonic Lodge in downtown Fredericksburg. As a senior ready to graduate in May, I have created a solid base of museum courses and experiences leading into a hopeful career in collections management. This project is a culmination of all the skills I learned in the last 4 years, both in-class and in the real world.

Student Researcher(s): Dominique Lopez-Piper

Major: Sociology

Research Mentor(s): Tracy Citeroni

Project Title: Working Towards a Socially Just World of Occupational Therapy

For my research project, I studied the ties between social justice and occupational therapy (OT), specifically focusing on research surrounding client-centered, cross-cultural practices that address inequities amongst patients and focus on fixing them. To clarify, the field of occupational therapy helps those recuperating from or coping with physical or mental illness or other afflictions and rehabilitating them through performing the activities of their daily lives in a functional manner. There were two main components to my internship: one was working at a pediatric occupational therapy office over the summer as an intern, a shadow to OTs, and a camp counselor, while the other was investigating how to be a culturally competent OT who acknowledges the differences amongst patients and caters treatment to each individual accordingly. That said, I would work at the office during the day and conduct research in the evenings on the topics connecting social justice and OT.

In order to document this work and demonstrate what I had learned in a palpable manner, I kept a log of my daily activities at the OT office—called Skills on the Hill—that included a lot of the vocabulary and therapeutic applications that I was witnessing before my eyes. On top of that, I logged each time I did research as well on several topics and listed what the main ideas I took from them were. Then, I went back through each text multiple times to achieve a mastery of each, so that I could convey what I had learned and how it connected the two fields of social justice and OT in a concrete meaningful way. To do this, I wrote a paper outlining my entire experience over the summer in person as well as synthesizing the research I had learned in addition to the hands-on knowledge I had acquired.

Student Researcher(s): Miranda Lovett

Major: Classics

Research Mentor(s): Angela Pitts

Project Title: Grabbing the Bull by its Horns: A Look at the Social and Archaeological Context of the ‘Toreador Fresco’

Since its discovery in the early 20th century by archaeologist Sir Arthur Evans, the Bull-Leaping Fresco of Late Bronze Age Knossos has triggered much debate among scholars. While Bronze Age historians and archaeologists have confirmed the performances of bull games in the palatial society, the meaning of these activities and the fresco remain unclear. This paper will build off Senta German’s 1999 dissertation “Performance and Art in the Aegean Bronze Age,” as my thesis has the same goal of finding explanations for how the bull-leaping fresco functioned in the Minoan social context. However, while German’s work focuses heavily on finding the source of social drama in the Minoan society, this paper will also explore the archeological evidence of the site. I believe that the fresco was placed in a specific area in the palace at Knossos so that the

social connotations that surround the activity of bull-leaping could be viewed and internalized by a target audience.

Student Researcher(s): Miranda Lovett

Major: Classics

Research Mentor(s): Angela Pitts

Project Title: Staging Aristophanes' Frogs

This paper discusses the possible staging for several scenes in Aristophanes' Frogs. These visual cues from staging were vital to the Greek audience's understanding of the plot, especially in a theatre lacking extravagant backdrops or an abundance of props. With only the ruins of theatres and a handful of surviving plays, envisioning the staging of Greek comedies is mostly left to speculation. However, this paper will focus on Bat. 35-48, 180-208, and 285-305, which are scenes that have a wider range of staging possibilities. This paper then suggests the possible ways the staging may have been done by analyzing the dialogue and using what knowledge we have about the constructions of Greek theatre (such as the skene and ekkyklema). The purpose of looking at these possibilities is to give modern readers of Frogs an idea of how these scenes would have been physically performed on the stage, which is an important factor in both the communication of the plot and the comedy that Aristophanes wanted to portray to the audience.

Student Researcher(s): Courtland Lyle

Major: Geology and Biology

Research Mentor(s): Dr. Alexander Hastings (Virginia Museum of Natural History)

Project Title: New Mysticete Whale Fossil Could Represent First of its Kind From Middle Miocene Site in Caroline County, Virginia

Numerous remains of fossil whales have been recovered from the middle Miocene Calvert Formation, yet many have yet to be entered into the published record. In 2009, the Virginia Museum of Natural History excavated a fossil whale skull from the Carmel Church Quarry in Ruther Glen, Virginia. Here we report a species of Miocene mysticete whale that could represent the first of this taxon collected from this site. The site at Carmel Church is well documented, and has yielded many marine fossils from the Calvert Formation. This specimen is represented by a partial skull, preserving most of the brain case as well as both ear bones. The skull material also includes a partial dentary, partial premaxilla, which appear to be associated with the occipital, frontal, and both squamosals. Despite such limited material, the highly diagnostic petrosals and tympanic bullae were recovered in direct association with the rest of the cranial material. We have made extensive use of these ear bones to determine the identity of the specimen. The skull and ear bones appear most similar to the basal crown mysticetes *Parietobalaena* and *Halicetus*, both known from the Miocene of eastern North America. However, what sets this specimen apart from many other known mysticetes is the small size of the posterior process of the petrosal relative to the anterior process. The petrosals here closely resemble those of *Parietobalaena*, though this whale's skull differs from *Parietobalaena* in the greater anterior extent of the supraoccipital, which nearly comes into contact with the rostral bones. Most of the skull of *Halicetus* is unknown, which makes further comparison difficult. Further cladistics study will hopefully resolve the new specimen's relationships within Mysticeti and further develop the increasingly complex Miocene cetacean fauna of the western Atlantic.

Student Researcher(s): Brooke MacAdam, Manuelle Cao and Brandon Fincham

Major: Biology

Research Mentor(s): Alan Griffith

Project Title: Geospatial Mapping of Trees on the UMW Campus

We catalogued trees on campus using their geographic locations. The following measurements of each tree were taken: Diameter at Breast Height (DBH), height, canopy width, and species. The data obtained will be used by Dr. Griffith and Joni Wilson for better grounds keeping practices.

Student Researcher(s): Alice Maggio

Major: Classical Civilizations and English Literature

Research Mentor(s): Angela Pitts

Project Title: Twins, Augustus and Ovid: The Overlooked Chains That Connect Rulers, Writers and Mythical Founders of Cities

This thesis surveys Romulus and Remus as a legendary story that became the foundation for Augustus' propaganda in his campaign as the first emperor at the close of the Republic. Their significance to Rome, as well as the set of images and motifs Romulus and Remus issued as the founders of Rome will be discussed through the lens of how Augustus exploited them for his merit. This propaganda takes many forms: coins, monuments, and of course Roman literature. This thesis will illuminate how much more vital the twins were to Augustan propaganda than what modern scholars have noticed or voiced. Livy is discussed, and once these modes of propaganda are established, another lens will be added on to this line of research. Looking into how the poet Ovid reacted to this exploitation of the twins through his *Fasti*, the connection between the three seemingly unrelated major figures will be revealed. In the *Fasti*, Ovid appears to be genuine in his praise and loyalty towards Augustus and his regime, and despite this implausible speculation, the literature reveals a potentially submitting Ovid. His exile and the aftermath of the *Fasti* are also major aspects of this thesis. The time period falls within the late republic and the early empire. How Augustus manipulated the known images attached to Romulus for his propaganda as a world leader is shown. How Ovid reacts to Augustus' association with Romulus is exposed through his writing. The ways Romulus and Remus' legend are made into a conceptualization or emblem of the state and the emperor behind it are also made clear.

Student Researcher(s): Bethel Mahoney and Elyse Ridder

Major: Psychology, Music

Research Mentor(s): Kevin Bartram

Project Title: Unearthing Musical Treasures

We were given the opportunity, with the help of professional researchers, to resurrect hidden pieces within the Library of Congress. In contrast to popular music, classical music has been declining in performances. The Library of Congress is the largest music library in the world. There is no number on how many American Symphonic Pieces are in the Library of Congress. Our goals involve bringing awareness to the public of these works. Our team will assess for historical importance, edit to make separate parts for each instrument, and research. The UMW Philharmonic Orchestra, will perform two pieces, either *The Birds* by Leonard Bernstein, or *Passacaglia* by Aaron Copland.

Student Researcher(s): Miguel Marx

Major: Biology and Geology

Research Mentor(s): Deborah O'Dell

Project Title: Testing for the Cross-reactivity of a Myosin Heavy Chain Antibody in the Flight Muscles of *Apis mellifera*

A large diversity of proteins comprise the muscles of insects. the function and behavior of insect flight muscles are determined by the expression of different muscle proteins. identifying the specific muscle proteins present within the flight muscles of insects can reveal the evolutionary conservation of particular isoforms that are integral to flight function. the presence of protein isoforms can be determined by binding specific antibodies to muscle proteins. Establishing the cross-reactivity of antibodies between different species is important in determining the function and location of proteins across various taxa. antibodies that are capable of binding to proteins in different species reveal conserved epitopes in the protein molecules. myosin isoforms that are common throughout various taxa may imply functional significance. the presence of myosin heavy chain isoforms in the flight muscles of *apis mellifera* were tested using the anti-myosin monoclonal antibody, a4 1025, using a western blot and immunohistochemistry.

Student Researcher(s): Kelly McDaniel and Hoang Anh Tran

Major: Chemistry, Mathematics

Research Mentor(s): Davis Oldham

Project Title: Synthesis of Oxidative Metabolites of DEHP

Di(2-ethylhexyl) phthalate (DEHP) is a persistent organic pollutant that is used as a plasticizer in polyvinyl chloride (PVC). Humans are exposed to DEHP through inhalation, ingestion, and intravenously; it has shown

toxicity as an endocrine disrupter and carcinogen. In the body, DEHP is broken down into mono(2-ethylhexyl) phthalate (MEHP), when it is then converted into a variety of oxidative metabolites. The purpose of this research is to synthesize enantiomerically pure oxidative metabolites of DEHP to benefit future metabolism, biomonitoring, and toxicity studies. 2cx-MMHP was produced by the alkylation of diethyl allylmalonate with 1-iodobutane, hydrolysis, decarboxylation, lithium aluminum hydride (LAH) reduction, esterification with phthalic anhydride, and oxidation in 13% overall yield. Mono(2-ethyl-5-hexenyl) phthalate was prepared in an analogous manner, beginning with the alkylation of diethyl ethylmalonate with 4-iodo-1-butene (prepared from 4-bromo-1-butene), in 34% yield. Various oxidations of mono(2-ethyl-5-hexenyl) phthalate will yield 5cx-MEPP, 5oxo-MEHP, and 5OH-MEHP. A resolution step will be incorporated into both syntheses to produce both enantiomers of each metabolite.

Student Researcher(s): Kimberly McFarland

Major: Biology

Research Mentor(s): Randall Reif

Project Title: Optimization of RNA Purification for RNA Aptamer Selection

Aptamers are small DNA or RNA molecules that fold into specific conformations and exhibit a high binding affinity to a target, such as a protein. They are created through a process called Systematic Evolution of Ligands by Exponential Enrichment (SELEX), which isolates the sequences with the greatest affinity and specificity. In order for SELEX to be efficient and cost-effective, large amounts of RNA must be synthesized. The methods used preceding SELEX, including RNA transcription, reverse transcription (RT) and gel purification, were investigated. Gel purification of RNA was tested using different concentrations of polyacrylamide (8%, 10%, and 12%) in the gels. RNA yield after purification was lower than expected, and the steps of RNA transcription were determined not to be the cause. It was determined that during RT, the lowest possible concentration of RNA to be effectively used was determined to be a 1:10000 dilution. A longer DNA sequence will be used as a control in gel purification to determine if higher yield can be obtained for longer RNA strands. Future experiments will need to be performed in order to increase RNA yields involving additional gel polyacrylamide concentrations, and/or by using different RNA transcriptases.

Student Researcher(s): Carson Meadows

Major: Classical Civilizations

Research Mentor(s): Angela Pitts

Project Title: Rivers and Impasses in Caesar's Civil War

This paper is an analysis of the effect of rivers as obstacles in the war between Julius Caesar and Pompey in 49BC. Rivers, mountains, risk of starvation and man-made walls were impeditive elements of ancient warfare that required strategic prowess and often non-combative action to overcome. A combination of established techniques and tactical ingenuity allowed Caesar and his generals to gain the upper hand in sieges and skirmishes and ultimately win the war.

Student Researcher(s): Liam Missios and Daniel Valdez

Major: Economics

Research Mentor(s): Margaret Ray

Project Title: Taxis in the Age of the Gig Economy: An Analysis of the Taxi Market in Fredericksburg, Virginia

This research project examines the state of the taxi industry in the Fredericksburg area in the face of increased competition from Uber. To estimate the effect of mandated taxi fares in Fredericksburg, we compiled a data set using taxi manifests and compared the mean fare per mile for trips within Fredericksburg with the mean fare per mile for trips in neighboring counties where taxi fares are not regulated. We used the Uber app to compile a data set, which we used to estimate the mean fare per mile for Uber trips. We also used these data sets to estimate at which times of day Uber drivers and taxi drivers are most active. We found that the average fare per mile for taxi trips within Fredericksburg was less than the average fare per mile for both taxi trips outside of Fredericksburg and Uber trips. We also found that in Fredericksburg, both taxi drivers and Uber

drivers are most likely to be active during the late morning and mid-afternoon but that Uber drivers are more likely than taxi drivers to be active during the evening.

Student Researcher(s): Cristina Montemorano

Major: Undeclared

Research Mentor(s): Eric Gable

Project Title: Papunya Dot Painting: An Examination and A Replication

This project, inspired by the documentaries *Dreamings: The Art of Aboriginal Australia* and *Mr. Patterns and the tenants of the Anthropology of Art* course, involves the creation of a piece emulating the "dreamings" of Mary Washington by using elements such as the physical, cultural, spiritual, and symbolic landscape of campus modeled after the ideas behind Aboriginal Papunya dot painting. In this presentation, the process of topic discovery, art object creation, and backstory of the meanings within the piece, the meanings created by Aboriginal pieces from which this piece is derived, and the generation of art objects by Papunyan artists like Michael Nelson Jagamara, are explored extensively within the framework of anthropological study.

The presentation of this project would include a visual aid via slide show and the physical display of the UMW dot painting created as a result of my artistic performance.

Student Researcher(s): Cristina Montemorano

Major: Undeclared

Research Mentor(s): Mary Kayler

Project Title: DALIrious: It's Surreal Deal!

This prototype project was created throughout the Part Play, Part Game FSEM and presented for the final class expo as an interactive and engaging result of the process of game design. The DALIrious display includes a trifold, rules packet, game pieces & game board that may be used for gameplay, game design log, and props for surreal ambiance. While available for presentation, a laptop playing a YouTube playlist entitled "DALIrious: It's Surreal Deal - Starter Soundtrack" will be an additional part of the display. DALIrious' main purpose is to simultaneously provide a tangible and emotional experience, instruct players about surrealism as an artistic movement, and grant individuals a chance to create a unique story while having fun in a group of fellow dream journey "travelers." By allowing players to create within a slightly-constraining system, people are able to use the anti-structure of surrealism to learn collectively and interactively. Through the game, the goal of forming a clear mental, emotional, and physiological reaction to art is proposed as a unique environment for the creation and appreciation of art.

Student Researcher(s): Hannah Morgan and Mikaela Goldrich

Major: Computer Science and English

Research Mentor(s): Jessica Zeitz-Self

Project Title: Be the Data: Project in Embodied Interaction for Data Analytics

This project explores how "embodied interaction" in an educational setting may enhance student learning. Embodied interaction refers to physical interaction with data through a system. For our system, the users are students, and the data is any learning material. The students using our system are immersed in visual multi-dimensional data and can learn about complex data sets in a fun and inviting atmosphere.

Consider a dataset that contains information about animals. Dimensions of the data would be characteristics of animals, including size, furriness, domestication, speed, etc. While this complex data cannot be visualized with a traditional graph, our system can help visualize this complex, multi-dimensional data set. Each student using our system is assigned an animal datum to "embody". As students move and interact, their positions in the research room are tracked by cameras and used to determine what dimensions are most strongly influencing the data. For example, if students are prompted "What animals make good pets?", students who think their animal is a good pet will move closer together, and students who are not good pets will separate themselves from this group. This may result in the system indicating the data is more sorted by size and domestication and less by furriness (since both cats and goldfish could make good pets). We would say that size and domestication are more important to this data configuration. Different configurations can reveal patterns of relationship not

visible in other approaches to multi-dimensional data visualization. Consequently, embodied interaction provides a more complete analysis of data.

It is expected that this experiential approach to data analytics may enrich student learning in two ways: first, it will teach students about multi-dimensional data, which is a complicated subject; secondly, it can help the students learn about the data set itself.

Student Researcher(s): Sean Morris

Major: Biochemistry

Research Mentor(s): Randall Reif

Project Title: The Temporal Dynamics of Caspase Activity in Cellular Suicide

Apoptosis, a process in which a cell systematically triggers its own death, is widely utilized in the body. Malfunction of apoptosis may lead to serious health problems including cancer. There are several different pathways to induce apoptosis but at its core is a family of enzymes called caspases. While the stages of the intrinsic pathway of apoptosis are known, the timing of the process is poorly understood. The goal of this research is to examine the temporal dynamics of the mitochondrial pathway of apoptosis with respect to caspase enzyme activation. Using an affinity microfluidic device, a known apoptosis inducer (hydrogen peroxide) and various fluorescence caspase probes based on rhodamine 110, the fluorescence of individual Jurkat T lymphocytes was monitored via fluorescence microscopy over a six hour period. The fluorescence of the cells indicated the level of caspase activity in the cell. This allowed for the determination of various parameters including the onset time, duration, and rate of caspase activity for all caspases as well as caspase-3 specifically. Overall caspase activity was shown to start from 4.3 to 5.3 hours after induction and last 40 to 60 minutes, while caspase-3 activity started 5.3 hours after induction and lasted 20 to 40 minutes. Additional preliminary work investigating caspase-9 activity using an alternative fluorescent probe will also be discussed. Knowledge of the timing of caspase activation could be helpful when designing therapies that affect apoptosis.

Student Researcher(s): Joshua Mwandu

Major: Mathematics

Research Mentor(s): Keith Mellinger

Project Title: Understanding the Quantum Key Exchange

Cryptography is simply the science/study of encrypted information. Standard cryptography relies on the use of algorithms that aren't completely secure, but are so time consuming to decrypt that an attacker would likely win every lottery in the state of Virginia before finding the desired solution. Quantum cryptography is much like standard cryptography but instead exploits the properties of quantum mechanics to create algorithms that are unconditionally secure. Should it ever be feasible to mass produce quantum computers and use them to send secure information back and forth, it would be foolish not to implement an unconditionally secure system over an extremely secure system. It is for this reason that mathematicians study the field of quantum cryptography. the difference between a classical cryptographic protocol and a quantum cryptographic protocol is a difference of philosophy in how to secure information. Classical cryptographic protocols leverage the power of high computational cost to make something theoretically possible but practically impossible to solve. This ensures that if an attacker wanted to break into a secure system they would require an unfathomable amount of time in order to gain access to the information that they desire. A quantum cryptographic protocol uses the power of quantum mechanic to make a system unconditionally secure, meaning that even if the attacker somehow managed to gain infinite computing power they couldn't get into the system. Once the first quantum computer gets built, certain computing tasks now become much easier to solve making different types of classical computing protocols solvable in a manageable amount of time. It's for this reason that moving to quantum based cryptographic protocols is necessary, should such a thing ever occur.

Student Researcher(s): Brandon Nolan

Major: Biology

Research Mentor(s): Debbie Zies

Project Title: The Effects of Aldosterone on the lncRNA Gas5: A Potential Negative Regulator of Blood Pressure

The kidney is critical for the regulation of blood pressure by maintaining sodium and fluid homeostasis. The hormone aldosterone is critical for the regulation of these processes. Aldosterone acts on principal cells of the renal collecting duct to increase sodium reabsorption by increasing transcription of the epithelial sodium channel and SGK1; these effects are mediated by the mineralocorticoid receptor (MR). Recent work by others identified two novel factors that may play a role in sodium reabsorption in the kidney. FK506 binding protein 5 (FKBP5), a member of the immunophilin family, is a co-chaperone for MR, and causes increased translocation of MR into the nucleus. Growth arrest-specific 5 (Gas5) is a long noncoding RNA (lncRNA) that acts as a decoy to the hormone response element (HRE) of MR. Gas5 may compete for binding of MR to the HREs of aldosterone target genes. However, it is unknown if FKBP5 or Gas5 are aldosterone targets. Thus we treated mouse kidney collecting duct cells (mpkCCDc14), with aldosterone for 24 hours. Aldosterone treatment led to increases in FKBP5 and Gas5 RNA expression. These data demonstrate that FKBP5 and Gas5 are potential aldosterone targets in kidney cortical collecting duct cells. This may be the first report demonstrating aldosterone-mediated regulation of a lncRNA.

Student Researcher(s): Ashley Otto

Major: Biology

Research Mentor(s): Deborah O'Dell

Project Title: BPS Effect on Oncogene Expression on Mammary Epithelial Cells

A rise in concern for the use of Bisphenol-A (BPA) in common household products led to many companies switching to other plastic monomers. Bisphenol-S (BPS) is the most commonly substituted monomer due to its stability when exposed to heat despite its higher dermal absorption rate. Scientists have noticed similarities in structure between the two and even found that the two bind to estrogen receptors in a similar manner and in doing so, stimulate the same signaling pathway. Since these findings, BPS has been inspected closely to determine if it is a safe plastic alternative. While the similarities have been extensively discussed on binding and signaling pathways, we still do not know if BPS increases cancer instances at the same rate as BPA. To investigate this, normal mammary epithelial cells were treated with 1×10^{-7} M BPS and compared against control cells for the expression of oncogenes and suppression of tumor suppressing genes. Then the data was compared against data from a previous student who ran the same test with BPA on mammary cells to determine if there was a difference between the oncogene expression of the two plastic compounds. If BPA and BPS stimulate the cell in the same manner and with the same affinity, we expect to see no difference in expression between the two compounds.

Student Researcher(s): Riska Perez-Castiello

Major: Spanish

Research Mentor(s):

Project Title: Nieve: the other voice of the Novísimos generation

This paper analyzes the novel *Todos se van* (2006) by Wendy Guerra as a novel within the subgenre of the Künstlerroman, which explores the development of the young artist. Through the voice of a child and later an adolescent female narrator, the novel represents the disillusionment and suffering of a trapped generation that questions the utopian ideals it has lived. Additionally, I explore images of violence, specifically the mistreatment of children and violence against women. Violations of human rights appear as specific events that the protagonist and the whole of Cuban society must suffer. Lastly, I connect the characteristics of the novel—such as themes previously banned by the Cuban literary canon before the decade of the 1980s—with the movement known as “los Novísimos” in Cuba.

Student Researcher(s): Katherine Qualls and Sarah Roche

Major: Biology

Research Mentor(s): Stephen Gallik

Project Title: Determination of the Composition of a Presumed 3-GFP Plasmid

Nuclear localization is the process of importing proteins into the nucleus of a eukaryotic cell. Proteins that are naturally imported into the nucleus of a cell contain a short sequence of amino acids, called a nuclear localization signal (NLS), that target such proteins for nuclear import. Due to its relatively high molecular weight and its

natural fluorescence, a fusion protein consisting of at least 3 copies of green fluorescent protein (GFP) linked to an NLS is an ideal reporter protein for nuclear localization studies. The long-term goal of this research project is to create a recombinant plasmid expression vector that can express this fusion protein in a mammalian cell. Recently, our laboratory reported the creation of a recombinant plasmid expression vector that DNA sequencing suggests contains 3 copies of the GFP gene and 3 copies of an NLS. The specific objective of the research reported here is to use agarose gel electrophoresis to preliminarily confirm the composition of this plasmid.

Student Researcher(s): Madeline Quick

Major: Art History, Historic Preservation

Research Mentor(s): Marjorie Och

Project Title: Michelangelo, Genius, and the Casa Buonarroti

This individual study seeks to combine the disciplines of art history and museum studies to analyze the events, people, and institutions that honored Michelangelo after his death and how they contributed to his status as a genius today. My research focuses on the memorialization of the artist through the planning and decoration of his funeral, the contributions of the writers, Giorgio Vasari and Sir Joshua Reynolds, and the role of the Casa Buonarroti. While a large part of my research deals with the 16th and 17th century, I use the discourses of Sir Joshua Reynolds to study how the concept of Michelangelo's genius was perpetuated into the 18th century. I conclude that the efforts to memorialize Michelangelo after his death served to elevate his career and works above that of other artists and were major contributors to his classification as a genius.

Student Researcher(s): Eisha Raja

Major: Biology

Research Mentor(s): April Wynn

Project Title: Fredericksburg's Favorite Past Botanist

Although the collection and preservation of plants has been a practice done for hundreds of years, it was not common in the Fredericksburg area until the mid-20th century. The MWCF Herbarium and other herbaria like it are essential in retaining and exhibiting collections of specimens from the southeastern United States. The MWCF Herbarium features collections from Virginia and Jamaica from the past century as well as specimens from important collectors. One such famed collector was the late botanist, Hugh Iltis (1925-2016). He was an avid plant collector and his discoveries were vital in botanical findings and largely impacted the domestication of corn. His father, Hugo Iltis, was a professor at the formerly named Mary Washington College making him a UMW eagle at heart. The MWCF Herbarium is fortunate enough to have original specimens collected by Hugh Iltis in his early teens, being among some of his first specimens. He collected his specimens in locations in the Fredericksburg area and included a wide variety of families such as Asteraceae, Compositae, and Ericaceae. After his time in Fredericksburg, he continued collecting specimens until his death last year, and identifying new sources of genetic variability for plant breeders all over the globe.

Student Researcher(s): Alexis Robinson, Alexander Ramos, Elizabeth Edelen and Michelle Milligan

Major: Psychology

Research Mentor(s): W. David Stahlman

Project Title: Navigational variability as a function of reinforcement palatability in a small-n design in rats

Recent research has consistently found that variability in instrumental behavior is a function of the nature of the reinforcer. In two experiments, we investigated locomotor behavioral variability as a function of reinforcer quality. In an A-B-A design, rats were allowed to navigate a column maze with many possible routes to food reinforcement. In Phases 1 and 3, arrival at the goal location allowed for the consumption of a sugary cereal; in the intervening Phase 2, arrival at the goal allowed for consumption of maintenance chow. We hypothesized that behavioral variability would increase upon reward change from the highly palatable cereal to the less palatable chow, and decrease when subsequently shifted back to cereal. We found that decreasing reinforcer palatability produced greater variability in navigational performance. We situate these results in a broader context of creative action and make suggestions for future behavioral research.

Student Researcher(s): Emily Sander

Major: Psychology

Research Mentor(s): Leslie Martin

Project Title: Adolescent Suicide and Depression in the City of Fredericksburg and Northern Virginia

Adolescents and teenagers have many day-to-day problems and long-term stressors such as grades, friends, family, responsibilities, and romantic relationships which can negatively or positively impact their mental health. Well-being and depression are correlated with suicidality so it is important for adolescents to act in mentally health ways while also understanding the signs of depression in themselves and others (Cole & Fowles, 1989). Sociological factors also influence the life of a teenager, especially when it concerns their mental health and well-being. Access to care, limited knowledge of depression and suicidality, stigma, family functionality, and community support may interact to form an environment where adolescents in Fredericksburg and Northern Virginia become and remain depressed or suicidal, never receiving consistent care or care at all.

Student Researcher(s): Erin Schaeffer, Matthew Tovar, Emily Coulter and Bernice Kear

Major: Chemistry

Research Mentor(s): Randall Reif

Project Title: Determination of Lead Concentration in Commercially Available Lipsticks Via ICP-AES

Analysis

During the manufacturing process, many consumer products can be exposed to lead (Pb) from various unsuspecting sources. Lipsticks have an increased chance of being exposed to Pb due to the specific pigments and other particles involved in their production. At high concentrations, Pb can be dangerous. To test Pb in these products, lipsticks will be subject to Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) analysis in three main categories: orange vs. nude lipstick (flesh toned), metallic vs. non-metallic lipstick, and high-end vs. inexpensive lipsticks. A calibration curve will be created by generating a signal intensity vs. concentration graph of $Pb(NO_3)_2$ standard. It is expected that the orange lipstick will have a higher Pb concentration than the nude, and that the metallic lipstick will have a higher concentration of Pb than the non-metallic lipstick due to differences in color additives and pigments. Additionally, it is also expected that the drugstore lipstick will contain more lead than the high-end lipstick, due to decreased quality control.

Student Researcher(s): Miranda Schnakenberg

Major: English

Research Mentor(s): Colin Rafferty

Project Title: Postcards from Astoria

Postcards from Astoria is a cross-genre art piece that explores the complexities and nuances of grief, depression, and the deathless loss of a loved one. Inspired by and filmed on location in Astoria, Oregon, this narrative exists as a series of postcards, a series of paintings, and a film in which all the pieces come together into one comprehensive exploration of grappling with who we become once who lose what defines us. We all find ourselves in a tiny fishing town on the Oregon coast at some point in our lives, and this is the tale of one individual's journey into and out of Astoria.

Student Researcher(s): Jamie Shafferman

Major: Classical Civilization

Research Mentor(s): Angela Pitts

Project Title: Helen in The Iliad

Focus of Helen in the Iliad, nonverbal communication and how she is not just a plot device.

Student Researcher(s): Victoria Sheil

Major: Economics

Research Mentor(s): Margaret Ray

Project Title: Mixed Land Use Impact on Residential Home Values

Mixed land use is when both commercial and residential types are built on the same lot or in planned developments. In suburban areas, zoning codes maintained separate residential and commercial areas, only recently has mixed land use has become a popular trend. This paper examines the relationship of these land types on the surrounding residential homes using OLS regression of a housing demand function. The scope of this paper includes all residential parcels in Montgomery County. The results support that mixed land use has a negative relationship with residential home value assessments. This indicates that mixed land use may not be the best strategy for economic growth when examined through housing demand.

Student Researcher(s): Victoria Sheil, Nicole Paladeau, Alison Cramer and Melissa Parent

Major:

Research Mentor(s): Andrea Livi Smith

Project Title: Fredericksburg's Art District

This senior-level preservation planning course was focused on Fredericksburg's art district. While Fredericksburg has an existing district, it is not currently locally promoted. With this in mind, the goal of this course was to compile a comprehensive database of local resources, create an attractive and useful website, and propose new art initiatives for the City. The first step was extensive surveying, followed by meetings with local groups, and development of a database, website, and promotional materials. This talk will discuss the steps taken throughout the semester, emphasizing the challenges that were met and overcome. In particular, we will present our creative solutions to the problems that we found, namely: proposed walking tours of the City, a new arts mascot "Freddy the Fox", and Pallet Parks. We are hopeful that local organizations will adopt our website and (some of our) ideas.

Student Researcher(s): Joseph Smith

Major: Sociology

Research Mentor(s): Leslie Martin

Project Title: Environmental Injustice: CSX Tankers in Mayfield

Environmental injustice, or environmental racism, can be defined as the tendency for minority groups to be disproportionately exposed to environmental hazards (9). For over seven years now, CSX has been storing railcars filled with toxic chemicals right across from a predominantly black Mayfield neighborhood. These chemicals, which include toxins such as ammonium hydroxide, ethanol, propane, sulfuric acid, and chlorine, pose a very serious threat to the health and safety of the Mayfield residents (22). The question that I seek to answer in this paper is whether or not this situation is in fact a case of environmental injustice. In order to answer this question, I examine how the issue is being portrayed in the local media, analyze observational data comparing Mayfield to two other neighborhoods along the same tracks, and evaluate quantitative data on the patterns of income and race in Mayfield compared to all of Fredericksburg. After taking all of these factors into account, I conclude that the storage of tankers in Mayfield is most definitely a case of environmental injustice.

Student Researcher(s): Zaire Sprowal

Major: Physics

Research Mentor(s): Hai Nguyen

Project Title: Fractal Image Compression (FIC) and possible applications to Physical Systems

Fractal Image Compression (FIC) is a lossy compression method developed in the late 1980's by Michael Barnsley. This patented method allows for the compression of images with ratios of 1:4 to 1:100. Fractal compression should not be understood within the context of the more familiar mathematical Mandelbrot and Julia sets. They do, however, use the same principles of iteration and self-similarity. Here we show comparative methods for investigated the alterations of images put through FIC as well as suggestions for future work.

Student Researcher(s): James Stewart

Major: Art History and History

Research Mentor(s): Marjorie Och

Project Title: A Royal Display: The Significance of Rubens' Banqueting House Ceiling

The Banqueting House ceiling by Peter Paul Rubens (1577-1640) that was commissioned by Charles I (1600-1649) embodied the power that the Stuart monarchy thought they had and they intended to display that power. The Banqueting House is the only surviving building of Whitehall Palace in London. The ceiling, completed between the years 1632 and 1634, clearly demonstrated the idea of divine monarchy that was part of a wider European tradition. The main narrative of the ceiling is the triumphal and peaceful kingship of Charles I's father, James I of England (1566-1625). In the paintings James is depicted as a wise ruler who favored peace and united the two kingdoms of England and Scotland. The Banqueting House was also influenced by the classical and Renaissance art as well as Rubens's work with Marie de' Medici whose daughter was Henrietta Maria, Queen of England (1609-1669). Rubens's Banqueting House was created in the continental European Baroque style to show that the Stuart Monarchy was divinely chosen to rule over Great Britain.

Student Researcher(s): Matthew Tovar

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Finding the (nano)Cure: How Magnetic Nanoparticles Can Revolutionize the Treatment of Nonresectable Glioblastoma

Superparamagnetic Iron Oxide Nanoparticles (SPIONs; γ -Fe₂O₃) have been at the forefront of novel theranostic oncology research for the last two decades. Though intracellular SPION-induced magnetic hyperthermia is more cell-specific and has a greater biocompatibility than chemotherapy, significant challenges of SPION use exist including difficulty in controlling their size and distribution throughout the cell. Here we describe a simple redox reaction that regulates SPION size by controlling the concentration of H₂O in solution with ethanol. The reaction allows a maximal particle size (MPS) to be formed while maintaining a single domain magnetic state. This MPS should release a significant amount of energy when exposed to an external pulsating magnetic field, enough to denature targeted intracellular structures. Transmission electron microscopy studies determined that a 100% H₂O solution produced SPIONs with an average diameter of 47.7 +/- 12.4 nm. As the concentration of H₂O decreased, so did the SPION diameter, down to 4.40 +/- 1.40 nm in a 3% H₂O solution. Further, lengthening the time of synthesis also increased the particle size. Finally, IR spectroscopy was used to verify the presence of cationic vacancies in the SPIONs, confirming the presence of a γ -Fe₂O₃-nanoparticle structure.

Student Researcher(s): Eva Turcios and Hannah Lascano

Major: Biology

Research Mentor(s): April Wynn

Project Title: Medical Applications of Colonial Plants of Virginia

Seventeenth century colonial Virginia was a time period where medical science was very limited and qualified practitioners were scarce. For medications, many had to rely on what the environment had to offer. Plants played a major role in colonial medicine. Herb gardens were common in many households and most people in the 17th century had a basic knowledge of how certain plants could be used as medicine. Our research focuses on plants common in 17th century Virginia including Mayapple, Bloodroot, Sassafras, Jack-in-the-pulpit, Witch Hazel and bonset. These were often utilized as home remedies for a number of ailments in colonial Virginia. We will characterize the biological mechanisms that give these plants medicinal value and compare how these plants were used in the 17th century to today's age of modern medicine.

Student Researcher(s): Meghan Turney, Jennaveve Yost and Hannah Smith

Major: Psychology

Research Mentor(s): Jennifer Mailloux

Project Title: Do body esteem, self-objectification, mindfulness, and interoceptive abilities predict cognitive distraction during sexual activity in women?

Previously, cognitive distraction during sexual activity has been associated with poor body esteem (e.g., Pujols, Meston, & Seal, 2009), increased self-objectification (Pascoal, Narciso, & Pereira, 2012), and decreased mindfulness (Dunkley, Goldsmith, & Gorzalka, 2015). In our study, we examined the predictors mentioned above as well as interoceptive ability as a predictor of cognitive distraction during sexual activity in women.

Although poor interoceptive ability has been associated with poor body esteem (Duschek, Werner, Reyes del Paso, & Schandry, 2015), increased self-objectification (Ainley & Tsakiris, 2013), and decreased mindfulness (Kalsa et al., 2008), it has not been clearly associated with cognitive distraction during sexual activity. Therefore, participants in our study were asked to complete a heartbeat counting task and questionnaires assessing the other predictor variables mentioned above. We will report the results of a multiple regression analysis to determine which of the aforementioned predictors accounts for a significant amount of variability in cognitive distraction during sexual activity.

Student Researcher(s): Emma Valinski

Major: Political Science and Sociology

Research Mentor(s): Stephen Farnsworth

Project Title: Honesty and Trustworthiness of Presidential Candidates in the 2016 General Election

A survey of Virginia State voters found that the 2016 election would prove different than previous years. A closer look at the perceived honesty and trustworthiness of the 2016 presidential candidates exhibits that Virginians will vote for a candidate even if they show a lack of morality. The survey and an extensive literature review shows that regardless of age, sex, education, and political expertise, voters will use their “gut” when voting. Between candidates Hillary Clinton and Donald Trump, voters chose President Trump because they liked him more, even if they believed that he was immoral. The research performed in order to prove the hypotheses is comprised of questions from University of Mary Washington. The study compared variables through Chi Squares and Cross tabulations in order to receive a clearer understanding of the information inside the survey, and of the results of the interviews.

Student Researcher(s): Lauren van Nostrand, Bryant White and Fallon Wright

Major: Business Administration

Research Mentor(s): Belleh Fontem

Project Title: Popularity in Television Shows

We examine the factors that significantly affect television show popularity as measured by average ratings, or number of viewers per season. Existing research suggests that television show popularity may be reflective of social norms and attitudes. We test this idea by examining general connections between factors such as racial and gender diversity in television show casting, and average ratings. We also investigate factors that may be important for the profitability of a television show. Overall, our research can help inform business decisions in creating and managing television shows, or in developing new products designed to be advertised on television.

Student Researcher(s): Lindsay Vaught, Ryan Cho, Ryland Byrd, Joe Brown and Keanu Korkor

Major: Business Administration

Research Mentor(s): Chris Garcia

Project Title: Factors that Influence Unethical Behavior in Division 3 Sports

The goal of this research project is to understand factors that influence unethical decision making in division three sports. Specifically, we examine two categories of unethical behavior, dishonesty and aggression. In each category a set of seven hypothetical scenarios are posed with graded responses ranging from clearly ethical to clearly unethical. These scenarios were posed under anonymity to members of UMW's men's and women's tennis, men's and women's basketball, men's and women's lacrosse, softball, baseball, and volleyball. We consider the impact of sport type, gender, playing rivals, length of athletic career, and amount of referee experience as factors effecting unethical behavior and perform statistical analyses on the responses to understand the results.

Student Researcher(s): Kelsey Vincent

Major: Philosophy

Research Mentor(s): Jason Matzke

Project Title: Connecting Law and Morality, is it Necessary?

I will be presenting a thesis looking at how law and morality interact in our society (the United States). Whereas it seems clear that morality has some role in law, I will put forth that in fact the two interact with one another.

Morality is incorporated into law in some aspects, as is law into morality. Without the one or other decisions would be arbitrary and there would be no clear line of the "right and wrong," that individuals need to function in a society. I will use various authors and my own thoughts to make clear the interaction that must in fact take place to make laws successful in a society.

Student Researcher(s): Kenneth Vukmanic and Sara Armor

Major: Business Administration

Research Mentor(s): Kashef Majid

Project Title: Should we live in the moment? Plan to anticipate the event

We tested the effects of positive expectations on anticipation over time and then the effects of the greater build of positive anticipation over time on an individual's overall satisfactory level with said event.

Student Researcher(s): Kyra Watkins

Major: Political Science and Spanish

Research Mentor(s): Robert Barr

Project Title: Marginalization of Minority Groups in the United States and Sex Trafficking

Sex trafficking rakes in \$58 billion annually, making it the fastest growing criminal industry in the world. At least 20.9 million adults and children are trafficked for monetary value, like products rather than people, 6 in 10 of whom are trafficked for sexual exploitation. In recent years, this crisis has received more attention, but not nearly the amount it warrants. Sexual exploitation ruins lives, families and communities, and is deserving of governmental attention. Prostitution is the most dangerous job in America, with a murder rate of 204 for every 100,000 people. Even more disturbing, the average age of entry into prostitution is 14 years old. Women should not be forced into prostitution regardless of racial, ethnic, or socioeconomic background, and the government needs to make it a priority that no woman is forced into a life of selling her body as a means of survival. Overwhelmingly, women of color and other vulnerable populations are the victims of human trafficking; runaway youth, the homeless, poor women, and women who have previously been victims of other types of trauma. Despite recent "feminist" claims that prostitution is liberating, it is the most degrading "job" in modern society that perpetuates the hierarchy of men being on top of the socio-economic pyramid. Per accounts from former prostitutes, not one woman started that lifestyle because they wanted sex; it was a means of survival. Furthermore, it is more common than not that prostitutes are criminalized for the lifestyle they have been forced into, as opposed to those who forced them into that lifestyle being persecuted. Sexual exploitation is gender-based violence on steroids. Just as when a woman is being beat by her partner and feels psychological trapped, women who are in the sex trade are slaves to the physical and emotional control of their pimps.

People of color are constantly portrayed in media as sex objects. Women of color are the ones receiving the sexual attention, and men of color are portrayed as womanizers. Furthermore, men of color are seen as uneducated, violent, and dangerous. The normalization of these notions carry over into the everyday lives of people of color; whether it is in the form of police brutality, unequal access to education and other resources, or discrimination against immigrants, the black and latino communities are constantly held down by society and law enforcement, making many vulnerable to participating in the sex trade.

As with any crime, such as drug trafficking for example, sex trafficking may be something that is impossible to stop, however there are steps that can be taken to decrease the demand for it. Though it is modern day slavery, it is a much more complex issue to solve than the enslavement of African-Americans in the 1800s. With the use of technology to buy and sell girls on sites like backpage.com, families pimping out their daughters, and pimps making their prostitutes believe they are their boyfriends, it is a much more intricate process than slave masters selling people in auctions back in days of yore. However, people of color are still slaves to the prejudices of society, making them a vulnerable population to sex trafficking. Providing more opportunities for people of color, reducing the hyper sexualization of blacks and latinos, as well as properly tackling illegal immigration may prove to be the best ways to combat sex trafficking.

Student Researcher(s): Samantha White, Bethany Wilson and Riley West

Major: Business Administration

Research Mentor(s): Belleh Fontem

Project Title: The Effect of Sleep Habits on Student Success at UMW

For many college students, sleep is necessary to function properly throughout the day, and to help sustain their physical and mental well-being. However, with demanding schedules, it is unfortunately not a priority for most of them. Poor sleep habits can therefore lead to habitual sleep deprivation and sub-optimal student outcomes. In this primary research study, we investigate the link between student sleep habits and academic performance at the University of Mary Washington. Our findings are of potential interest not just to students, but to faculty members and also to campus counselors at the University of Mary Washington.

Student Researcher(s): Johanna Woodwell and Anna Jennings

Major: Biology

Research Mentor(s): Debbie Zies

Project Title: Using Crossover Events to Determine Gene Linkage in *Saccharomyces cerevisiae*

The genetics course at UMW currently contains a yeast genetics laboratory in which linkage between three genes (ADE1, TRP1, and CDC15) is determined by calculating recombination frequency. The goal of our project is to cross a new gene phenotype (GAL3 or REG1) into the yeast strains used in the lab in order to improve the quality of the data for student analysis. The first step is to make a diploid strain by streaking nutrient rich YED plates with the strains separate (haploid) and then combined (diploid). A single colony from the diploid strain was taken and mixed with YED media then placed in the shaker (30°C) for two days. The cells were then exposed to pre-sporulation and sporulation media in order to induce sporulation. This resulted in four haploid spores held together in an ascus. The spores were pelleted and mixed with zymolyase, 2-B-ME, and Nonidet P-40, to separate the four spores from the ascus. The spores were resuspended in water and plated onto YED plates. Once grown, 48 individual colonies were picked and stamped onto selection media. The genotype of each spore was determined based upon its phenotype. Once results are obtained, recombination frequency will be calculated to determine linkage. Our experiments are still underway and we will present progress.

Student Researcher(s): Zaynah Zaatar

Major: Classics

Research Mentor(s): Angela Pitts

Project Title: Breaking the Fourth Wall in Aristophanes' 'Frogs'

This paper is going to focus on the Chorus from the Aristophanes' Frogs and how they are seen to be using an acting method called breaking the fourth wall. Breaking the fourth wall is a technique in acting in which an actor directly involves the audience in the play. It's a technique that is used a lot in comedic purposes.

Within this paper, I'm going to analyse some passages that are specifically by the chorus and see how they break the fourth wall. There is another section that is not as outright about breaking the fourth wall, but with some background knowledge, it's easy to see Aristophanes' intentions. The chorus goes to say 'people who have fought so much at sea' which is brought back to the Peloponnesian War that ended the year prior to the play. Some people in the audience would have been members who had fought in the war, which makes this about them thus breaking the fourth wall. Does breaking the fourth wall bring the audience closer to the play and make help them better understand the play even more or does it do the complete opposite?

Student Researcher(s): Zaynah Zaatar

Major: Classics

Research Mentor(s): Angela Pitts

Project Title: Al-Farabi and the Islamization of Plato

This paper is going to talk about The Islamic philosopher Al-Farabi and how he Islamized the works of the greek philosopher Plato. Plato had a major influence on the Islamic Civilisation during the Islamic Golden Age (Eighth to thirteenth centuries C.E.). Al-Farabi was a philosopher during the Islamic Golden Age who studied and interpreted with Plato's works. This paper will talk about how Plato's Republic was Islamized by Al-Farabi in The Attainment of Happiness and how Al-Farabi took Plato's ideas and worked with them and improved

them to fit with his culture and beliefs. Did Plato's Greek thought have a positive effect/influence on the Islamic world and eventually on the modern world?

Student Researcher(s): Natascha Zelloe

Major: Business Administration

Research Mentor(s): Kevin McCluskey

Project Title: Fashion for the Future: The House of Sustainable Couture

Natascha's boutique offers one-of-a-kind clothing to create a unique look and style to make everyone look good by incorporating the "renew, reuse, recycle" sustainability cycle. We target confident men and women who want to show off the latest trends. Natascha is a trendsetting online clothing store, offering our refurbished first-rate products and exceptional customer service to shoppers from the comfort of their own homes. We're a business made up of innovators and forward-thinkers, with the drive and wherewithal to constantly update and improve the online shopping experience.

Student Researcher(s): Nicole Ziesing

Major: Sociology

Research Mentor(s): Eric Bonds

Project Title: Criminalization of Homelessness in Virginia Cities

United States cities have created city codes that create the criminalization of homelessness which inhibits the homeless to thrive. Our study focuses on small and large Virginia cities to better understand where the criminalization of homelessness exists. Further, we have submitted Freedom of Information Act (FOIA) to assess how criminalizing city codes have been carried out.

Student Researcher(s): Hannah Zontine

Major: Computer Science

Research Mentor(s): Stephen Davies

Project Title: The 'Hidden Trump Model': Modeling social desirability bias through ABMs

Social desirability bias is a tendency people have to lie about their opinions if they perceive they will be judged or rejected. We present an Opinion Dynamics model in which agents may not be truthful about their opinions when they interact with their social circle. We model two processes through which agents influence one another: an online anonymous process in which agents can interact with anyone and do not fear social rejection, and a face-to-face process where they interact only with friends and may feel compelled to conform. In a political setting, this would apply to a race in which one of the candidates bears a social stigma and therefore some agents are reluctant to voice support for him or her. The results that these nonlinear and asymmetrical processes will have on the overall electorate are not obvious, and are well-suited to an agent-based study.

We hypothesize that this model will produce a "poll bias" of the kind we saw in the 2016 Presidential election -- i.e., a significant difference between the number of agents who say they will vote for a candidate and the number who actually do so on election day. We present an analysis of this "Hidden Trump model" and describe the way in which poll bias depends on the strength of the various interaction processes.



Acknowledgement

Funding for this program has been generously provided by the Class of 1959 Endowment. The endowment was established in 2009 to express appreciation for the education, personal growth and enjoyment of Mary Washington's unique environment that was provided to members of the Class of 1959. The endowment supports activities such as the Research and Creativity Day Symposium, conferences or seminars that focus on research or improving instructional methods at the University of Mary Washington.



The Council on Undergraduate Research hosts a Registry of Undergraduate Researchers. The purpose of this registry is to facilitate matchmaking between undergraduates who have research experience and a desire to pursue an advanced degree, with graduate schools seeking high quality students who are well prepared for research. The Registry is open to students and graduate schools in the fields of Anthropology/Archaeology, Arts/Humanities, Biology/Biochemistry, Business, Chemistry/Biochemistry, Economics, Education, Engineering, English and Linguistics, Environmental Studies, Geosciences, Health Professions, History, Journalism and Communications, Mathematics/Computer Science, Physics/ Astronomy, Political Science, Psychology, Social Work and Sociology.

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