



PROGRAM SCHEDULE WITH ABSTRACTS

APRIL 27, 2018

**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 27, 2018

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

8:00 - 3:00

HCC Classrooms 307, 327, 328 & 329

Poster Sessions

12:00– 1:15

HCC Building Locations

refreshments served for all

Original Music Performances

1:30 - 2:30

Digital Auditorium HCC

Additional Exhibits and Sessions

HCC Convergence Gallery (Margaret Sutton: Face to Face) 9:00 – 4:00

Phyllis Ridderhof Martin Gallery (Art History) 8:30 – 10:00

Trinkle Hall (College of Education) 9:15 – 4:45

Trinkle Hall (Computer Science) 2:00 – 5:00

University Center (Anthropology) 2:00 – 3:00

Monroe Hall (Anthropology) 11:00 – 12:00

Melchers Hall Art Studio open house 10:00 – 3:00

duPont Gallery Annual Student Art Exhibit 10:00 – 4:00

duPont Hall (Theatre) 4:00 and 7:00





Exhibits in Hurley Convergence Center

9:00 – 4:00

Convergence Gallery (Third floor)

Margaret Sutton: Face to Face

Prepared by students in Art History 317: Laboratory in Museum Studies

Yoko Aita, Campbell Hartley, Cheyenne Johnson, Myranda Morrison, Mary Novitsky, Mele K. Richardson, Olivia Sanderson, Jessica Schmitt, Kyle Welty, and Erin White (Dr. Marjorie Och)



Morning Oral Sessions in Hurley Convergence Center

8:15 – 9:00

Room 307

Chemistry Honors Research Presentation

Poornima Rachel Sunder, “Synthetic Routes to Bromo-Terminated Phosphonate Films and Alkynyl Pyridine Compounds for Click Coupling” (Dr. Nicole Crowder)

9:00 – 10:30

Room 327

Session Chair: Dr. Joe Romero (Classics, Philosophy and Religion)

Classical Perspectives: Greek Language, Literature, Culture and History Panel

Greek Language

Thomas Broadwater, “Missing Sounds: Digamma” (Dr. Joe Romero and Dr. Paul Fallon)

Greek Culture and History

Dalton Baughn “*Let’s Hear It For the Boys: Athenian Pederastic Practices and Their Effects on the *Eromenos*’ View of Masculinity in the Fifth and Fourth Centuries BCE*” (Dr. Joe Romero)

Marshall LeMert “The Tomb of Alexander: Its Disappearance, Final Location, and Its Meaning to the Field of Archaeology” (Dr. Joe Romero)

Greek Literature, Ancient & Modern

Liam Diehr, “Interdependent Identities in Sappho 1” (Dr. Joe Romero)

Andrew Unger “*The Song of Achilles: Queering the Life of Achilles*” (Dr. Joe Romero)

Beja Julia Romero “The Gender-Fluidity of Athena” (Dr. Angela Pitts)

10:00 – 11:00

Room 329

Session Chair: Dr. Tracy Citeroni (Sociology and Anthropology)

Amanda Sharps, “Is Current Health Care Policy Effectively Assisting Women Veterans?” (Dr. Tracy Citeroni)

Corinne Kuge, “Evaluating Gender: Gender Bias in UMW’s Student Feedback on Faculty Teaching” (Dr. Debra Schleef)

Paige LoBue and Allison Sellers, “The Physical and Emotional Scars of Breast Cancer” (Dr. Tracy Citeroni)

Deziree Jackson and Emily Rudich, “The Hookup Culture and Gender” (Dr. Tracy Citeroni)

11:00 – 12:00

Room 327

Session Chair: Dr. Janet Asper (Chemistry)

Peter Grap, “The Effects of Predation Pressure on Pectoral Spine Allometry in Margined Madtoms (*Noturus insignis*)” (Dr. Bradley Lamphere)

Matthew Tovar, “Finding the (Nano) Cure: How uniquely synthesized nanomaterials can revolutionize the field of neuro-oncological theragnostic medicine” (Dr. Leanna Giancarlo)

Sean Morris, “Timing Cellular Suicide: Elucidation of the Temporal Dynamics of Apoptosis” (Dr. Randall Reif)

Kimberly McFarland, “Optimization of RNA Purification for RNA Aptamer Selection” (Dr. Randall Reif)

Room 329

Session Chair: Dr. Richard Finkelstein (English, Linguistics and Communication)

Sarah Bond, Laura Downs, Kyle Moran and Sarah Scruggs, “Riverside Redevelopment in the Historic District” (Dr. Christine Henry)

Emily Rothstein, “Democracy in Nepal: a Case Study on Democratic Transition and Federalism” (Dr. Surupa Gupta and Dr. Tracy Citeroni)

Cristina Montemorano and MacKenzie Norris, “An Auto-Ethnography of a Pilot Study for An Intel Analysis Software Program” (Dr. Eric Gable)

Nina Burges, “Emboldened by Absence” (Dr. Nabil Al-Tikriti)



Poster Sessions – Hurley Convergence Center

12:00 – 1:15

- Grace Adithela, “The Physiological and Psychological Effects of Chronic Exposure of Sucralose and Caffeine in Mice” (Dr. Parrish Waters)
- Daphne Ahalt, “A Soldier’s Life in One Context: An Analysis of Small Finds from Sherwood Forest Plantation (44ST615)” (Dr. Lauren McMillan)
- Tanisa Ahmed, Rachel Diehl, Colin Travis, and Alex Ramirez, “Concentrations of Harmful Metals in Various Apples and Apple Juice Types by ICP-AES” (Dr. Randall Reif)
- Chris Amurrio, “Optimizing the Enzymatic Resolution of 2-Ethyl-1-Hexanol” (Dr. Davis Oldham)
- Eleni F. Antzoulatos and Claude W.C. Thompson, “Hydrogen Bond Energetics of Methyl Acetate by FTIR” (Dr. Leanna Giancarlo)
- Abigail Barnett, “Effects of Crizotinib and Ganoderma lucidum on Apoptosis and Caspase-3 Activation in Lung Cancer” (Dr. Rosemary Barra)
- Shannon Becker and Mary Nethery, “Relationships Between Anxiety, Dominance, and Corticotropin Releasing Factor” (Dr. Parrish Waters)
- Hannah Belski, “Sex- specific mechanisms of social hierarchy in mice” (Dr. Parrish Waters)
- David Borsheim, Logan Hargis, “Investigation of Iron Transport in Spinach Chloroplasts” (Dr. April Wynn)

- Jamie Broadhead, Kevin DiCicco, Lily Olson, Patrick Regal, “Student Driven Theatrical Production and Direction in Studio 115” (Mr. Gregg Stull)
- Kait Brogan, “Spatial Ecology of Fish Communities in Accokeek Creek, Virginia” (Dr. Brad Lamphere and Dr. Jackie Gallagher)
- Allison Burgess, Elise Pyfrom, and Adriana Usher, “Pesticide Analysis in Honey” (Dr. Randall Reif)
- Robert Byles and Mary Hoffman, “Wind Energy Potential Analysis” (Dr. Chuck Whipkey)
- Fernando Cabezas, Matt Coyne, Anna Jennings, Josie Woodwell and Whitney Post, “Constructing a Comprehensive Ethogram of Mouse Social Behavior” (Drs. Jennifer Polack, David Stahlman and Parrish Waters)
- Rebecca Callaway and Mary Dye, “Laser Harp: Restoring a Classic Instrument with Modern Technology” (Dr. Hai Nguyen and Dr. Michael Bratt)
- Emily Contompasis and Leonid Smorodintsev-Schiller, “The effects of day length on expression of the ETIN gene in Perianthia mutant Arabidopsis thaliana plants” (Dr. April Wynn)
- Emily Coulter, Lindsey Jones, Hannah Killian, and Rachel Gunraj, “Quantification of Gallic Acid Content in Buckwheat Leaves by HPLC” (Dr. Randall Reif)
- Sarah Davis, “CAD-7 Gene Expression in Response to Herbivory” (Dr. April Wynn)
- Tiffany Diaz-Calderon, Hoang-Anh Tran, “Modeling Kinetic Study: Spectator Ions Influence Aluminum Corrosion” (Dr. Leanna Giancarlo)
- Arthur Drake Dragone, “Sound and Game Design” (Dr. Michael Bratt)
- Rachel Evans, “Phenotypic Characterization of AINTEGUMENTA (ANT) and EARLY RESPONSIVE TO DEHYDRATION 10 (ERD10) and Spatial and Temporal Analysis of ERD10 Gene Expression in Arabidopsis thaliana” (Dr. April Wynn)
- Andrew Franklin and Nick Atwell, “Kool Aid(ing) Adsorption” (Dr. Leanna Giancarlo)
- Andrew Franklin, Daniel Arango, and Grace Rihl, “Metal Content in Sediments of Northern Virginia Drinking Water Reservoirs” (Dr. Leanna Giancarlo and Dr. Ben Kisila)
- Scott Freiwald, “Determination of Kisspeptin 1 binding affinity to Medaka Kisspeptin 1 and 2 receptors in COS-7 Cells” (Dr. Dianne Baker and Dr. Debbie Zies)
- Maggie Gallagher and Sarah Manugo, “Fredericksburg Taxi Analysis” (Dr. Margaret Ray)
- Blake Gostelow, Devin Rantz, “Examining the Diversity and Abundance of Invasive Plant Species within Urban Woodlots” (Dr. Alan Griffith)
- Margaret Gregory and Melody Sepehrar, “Setup for Saturated Absorption Spectroscopy of 87Rb” (Dr. Hai Nguyen)
- Jenifer Grove, “The Social Transfer of Information Between Rats” (Dr. Parrish Waters)
- Shannon Haley, “Non-commutative Massey-Omura Encryption with Symmetric Groups” (Dr. Randall Helmstutler)
- Taylor Hennage and Alexandra Fellows, “The Effects of Stress, ABA, and Auxin Treatments on the Growth of Sinapis Alba” (Dr. April Wynn)

- Kenyon Huber-Wilker, “The Demise of Democracy?” (Dr. Jack Kramer)
- Asia Huff and Tekirah Britton, “Antimicrobial Properties of Aloe barbadensis in response to growth in various wavelengths of light” (Dr. April Wynn)
- Eric Hurwitz, “Investigating the Reusability of Affinity Coated Surfaces” (Dr. Randall Reif)
- Emily Hutchins and Arshuman Sheikh, “Characterizing Novel Lactose Operon Mutant in Escherichia coli through Beta Galactosidase Assay” (Dr. April Wynn)
- Hannah Jabusch, “Women in Accounting” (Dr. Smita Oxford)
- Mariah Jensen-Wachspress, “Toxicity of Iron-Oxide nanoparticles in an in vivo setting” (Dr. Parrish Waters)
- Lindsey Jones, “Synthesis of piperidinol-based inhibitors of KasA: A novel treatment for Mycobacterium tuberculosis infection” (Dr. Davis Oldham)
- Sarah Jordan, Abby Friedman, and Allison Burgess, “Survey of Legacy and Other Contaminants in Soils and Waters of Central Virginia Golf Courses and Public Places” (Dr. Melanie Szulczewski)
- Skyler Larsen, “Biodiversity between Native and Non-Native Species Maintained at UMW” (Dr. Alan Griffith)
- Kirsten E. Littlefield, “The Effect of Treatment with Ultra-Dilute Phytolacca decandra on the Cellular Viability of Mouse Mammary Tumor Virus Infected Cells” (Dr. Lynn Lewis)
- Laura Mangano and Makenzie Katzer, “Effect of Benzo[a]pyrene on Expression of Alzheimer’s Disease Marker Genes in Zebrafish (Danio rerio)” (Dr. Dianne Baker)
- Julie Meade and Emily Henry, “Now You See Me Now You Don’t: A Kinetics Experiment on Disappearing Ink” (Dr. Leanna Giancarlo)
- Liam Missios, “The Impact of "Ban the Box" Legislation on the Crime Rate” (Dr. Robert Rycroft)
- Joshua Morris and Melissa Pampel, “Determination of the Concentration of Riboflavin in Milk Sample by Fluorescence” (Dr. Randall Reif)
- Shannen Nowakowski, “Women's Fashion Under the Occupation” (Dr. Leonard Koos)
- Alexandra Piercy, “The effect of cognitive stimulation on senescent cognitive decline” (Dr. Parrish Waters)
- Mackenzie Quick and Curtis Pilcher, “Geology of Hunter's and Ficklen Islands” (Dr. Chuck Whipkey and Mr. Woodie Walker)
- Andrew Rasure and Shannon Brindle, “Exploration of Parameters for Upconverting Nanoparticles” (Dr. Hai Nguyen)
- Grace Rihl and Andrew Franklin, “Sedimentation rate and trace metal input history in Lake Manassas and the Occoquan reservoir, Virginia, USA” (Dr. Ben Kisila and Dr. Leanna Giancarlo)
- Isobel Rissing, “SEUSS and ERD10 genes importance in ovule production in stressful environments in Arabidopsis thaliana” (Dr. April Wynn)
- Brandon Rozek, Stefano Coronado and Ethan Ramirez, “Beowulf Cluster for Research & Education” (Dr. Maia Magrakvelidze)

- Anna Ruuskanen, “Life Cycles of Digenetic Trematodes Infecting *Elimia virginica*” (Dr. Abbie Tomba)
- Jacquelynn Seaward, “The Effect of Online Film Critique on the Demand for the Cinema Industry” (Dr. Robert Rycroft)
- Jeremiah Smith, “On a Class of Chance-Constrained Nonlinear Programming Problems” (Dr. Belleh Fontem)
- Madison Smith, “Public Perception of the Flu Shot” (Dr. Lynn Lewis)
- Sophia Somsen and Katherine Greener, “How Sharing Harms the "Sharing" Economy” (Dr. Kashef Majid)
- John Strangfeld, “Spatial Distribution and Geographic Analysis of Nomini Plantation (44WM12), Westmoreland County, VA” (Dr. Lauren McMillan)
- Lauren Taylor, “Multimedia Essays & Publishing” (Mr. Colin Rafferty)
- Mariam Tekle and Morgan Hutt, “Determining the Role of the YIL158W and YDL199C Genes in *Saccharomyces cerevisiae* in DNA Repair” (Dr. Debbie Zies)
- Matthew Tovar, Sarah Balenger, Ashley Parkhurst, and Emily Matuczinski, “Synthesis, Optimization, and Bioconjugation of Electrochemically Synthesized Magnetic Nanoparticles to Induce Irreversible Damage to Glioblastoma Invasive Rim Cells” (Dr. Leanna Giancarlo)
- Hoang-Anh Tran, “Synthesis of Oxidative Metabolites of the Environmental Contaminant DEHP” (Dr. Davis Oldham)
- Rebeckah Wood and Shelley Lyons, “Allelopathic Potential of *Fagopyrum esculentum* (Buckwheat) at Different Ages” (Dr April Wynn)
- Jennaveve Yost, Victoria Power, Emily Saldanha, and Erynn Sendrick, “Development of a Consolidated Helicopter Parenting Scale (CHPS) and its Relationship to Intelligence Mindsets” (Dr. Holly Schiffrin)
- Alyssa Zanzucchi, “Land use change and fish assemblages in Spotsylvania Co., VA from the 1980s to the present” (Dr. Bradley Lamphere)
- Theodosius Zotos, “The Adverse Effects of Income Inequality on Tertiary Education Attainment: An Evaluation of OECD Membership” (Dr. Robert Rycroft)





Original Music Performances – Digital Auditorium

1:30 – 2:30

Last of Us	Short Film Score Fixed Media	Sidney McPhail
Acedia	Fixed Media	Caroline Flynn
Lost Head EP	Lily Flores, Vocals Fixed Media	Lily Flores
War Crime and Death March	Tambourine, Sam Bradshaw	Sam Bradshaw
Etude no. 1 for piano and electronics	Drake Dragone, piano and electronics	Drake Dragone
Insomnomania	Kelsey Payne, violin Zach Payne, violin Kaylee Payne, viola Luke Payne, cello	Luke Payne

Program Notes

Acedia

The deadliest of sins and the saddest of sicknesses.

War Crime Death March

War Crime Death March is a short composition for one percussionist, who recites spoken word, whistles, and plays a tambourine. It is a reaction to the most recent use of chemical weapons in Douma, Syria, which occurred on April 7, 2018. It is heavily influenced by traditional tambourine playing in the Middle-East. It begins with the percussionist whistling the medieval funeral chant "Dies Irae," after which various texts are spoken in a rhythm while the tambourine is playing. Pulled from contemporary and historic speeches, reactions, and documents, as well as literary references to the

nature of warfare and power, these texts are meant to provide a solemn acknowledgement of humanity's failure to prevent the proliferation and use of chemical weapons.

Etude no. 1 for piano and electronics

Passing obliquely through.

Lost Head EP

LOST HEAD EP features trap/hiphop element songs, with some electric-pop and finally a ballad to have a diverse EP. It focuses on vocal effects and beat making to have a unique sounding style, and there will be a final presentation before the concert on the making of LOST HEAD and the concepts it explores. The EP drops April 2018 on Carmen Liliana's Soundcloud (@CarmenLiliana).

Insomnomania

Insomnomania is a piece written for acoustic string quartet. Programmatic in nature, this piece was written to capture the artist's experience with many sleepless nights and attempts to convey feelings of unrest and agitation. The piece features virtuosic passages where the ensemble navigates fast moving lines being passed from instrument to instrument with each player vying for control. These passages of conflict are interjected by brief moments of tranquility, much like the feeling of drifting off to sleep, before being torn away by another storm of passionate fury.

Biographies

Caroline Flynn is a composer, songwriter, multi-instrumentalist, and performer studying music and psychology at the University of Mary Washington. She has studied music composition with Mark Snyder and Michael Bratt. Her music has been described as "sophisticated and complex, with its ability to return to a basic gesture in a variety of contexts." Her music has been performed at Virginia X, West Fork New Music Festival, Next Reflex Dance Collective Winter Music and Dance Festival, and the Electroacoustic Barn Dance, for which she serves as Production Assistant.

Carmen Liliana Flores is a singer, songwriter, composing and sound engineer at the University of Mary Washington. She studied songwriting and composing under Mark Snyder and will release Lost Head, her first EP, in April 2018. She interned at Fast Track Studios as assistant sound recording engineer and won 3rd place in 90 Grados Karaoke competition season 9 in May 2017. She is also an international affairs major and plans to combine both majors post-graduation.

Samuel Bradshaw is a young composer and percussionist who currently resides in the Fredericksburg area. His compositions have been described as ambitious by composer Peter Gilbert. Samuel's compositions are heavily influenced by political activism and current events, and is musically influenced by the serialist and minimalist movements. As a performer he has played with the Richmond Symphony musicians under the baton of Victor Yampolski, and was a member of the CCM and VCU percussion ensembles. Samuel currently studies composition with Dr. Michael Bratt, and has studied percussion under Allen Otte and Dr. Justin Alexander.

Drake Dragone is a composer, performer, and multi-instrumentalist from Richmond, Virginia. His works have been described as "fascinating textural creations, which invoke introspective feelings and senses of ethereal wonder." His works have been accepted and presented at multiple festivals,

including the Electro-Acoustic Barn Dance, West Fork New Music Festival, and Third Practice New Music Festival. Drake is currently studying at the University of Mary Washington with Michael Bratt where he will graduate with a BA in Music and a minor in computer science in the Spring of 2019.

Luke Payne is a cellist and composer of new music based in Fredericksburg, VA. A senior at the University of Mary Washington, he has studied composition with Dr. Mark Snyder and Dr. Michael Bratt. Luke is deeply interested in the use of live electronics to expand the artistic capabilities of traditional instruments and uses them to create lush, evolving soundscapes. This perspective and fascination with timbral and spectral development transfers directly to his purely acoustic works, where he explores the possibilities of virtuosity and vulnerability on traditional instruments. Luke's works have recently been featured at Electronic Music Midwest in Kansas City, the Electroacoustic Barn Dance in Jacksonville Florida, and the West Fork New Music Festival in Fairmont West Virginia.



Afternoon Oral Sessions in Hurley Convergence Center

1:00 – 2:00

Room 327

Session Chair: Dr. Caitie Finlayson (Geography)

Shannon Bremer, “Health and Hygiene at Sherwood Forest Plantation (44ST615): Civil War and Postbellum” (Dr. Lauren McMillan)

Cheyenne Johnson, “ ‘Drop It Like It’s Hot’: Understanding the Context of Arms and Armaments of the Union Winter Encampments at Sherwood Forest Plantation, Stafford County, VA (44ST615)” (Dr. Lauren McMillan)

Lizzie O’Meara, “Wine Bottle Seals at Nomini Plantation (44WM12)” (Dr. Lauren McMillan)

Meredith Gregory, “The Paradox of Cracker Barrel: A Case Study on Place and Placelessness” (Drs. Caitie Finlayson, Steve Hanna and Ian Finlayson)

Room 328

Session Chair: Dr. Robert Rycroft (Economics)

Margaret Gallagher, “To What Extent Does the Unemployment Rate Affect the Robbery Rate in the United States?” (Dr. Robert Rycroft)

Pamela Zaelke, “Predicting the 2018 NBA Championship Winner” (Dr. Robert Rycroft)

Alyssa Zanzucchi and David Jett, “Environmental Implications of Gas Drilling in the Taylorsville Basin” (Dr. Chuck Whipkey)

Mark Herring, “Fresh or Rotten: Analyzing the Impact a Film’s Rotten Tomatoes Score Impacts its Box Office Revenue” (Dr. Robert Rycroft)

Room 329

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

Juliette Guilloux, “Library of Congress Project: Unearthing America’s Musical Treasures” (Dr. Kevin Bartram)

Madalyn Rymer, “Multi-Narrative Creative Nonfiction” (Mr. Colin Rafferty)

Claire Goode, “Husbands of the Women’s Movement: James Mott, Theodore Weld, and Henry Stanton” (Dr. Jeff McClurken)

2:00 – 3:30

Room 307

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

Community Engaged Research Panel

Lexy Maratellos, “Attitudes Towards Renting/Renters in Fredericksburg” (Dr. Leslie Martin and Dr. Tracy Citeroni)

Tirzah Rao and Jasmine Pope, “Starving for Food Justice” (Dr. Tracy Citeroni)

Abigail Richardson and Tianni Sicam, “Engagement with the Central Rappahannock Regional Libraries” (Dr. Leslie Martin)

Chance Shaw and Deziree Jackson, “Understanding Legal Rights” (Dr. Leslie Martin)

Nicole Ziesing, “Evaluation of FUSE Program in Fredericksburg Area” (Dr. Leslie Martin)

2:00 – 3:00

Room 327

Session Chair: Dr. Randall Reif (Chemistry)

Christina Bloom, “Morphological Awareness and Developmental Dyslexia” (Dr. Judith Parker)

Clare Arrington, “A Comparative Analysis of Machine Learning Algorithms for Natural Language” (Dr. Ron Zacharski)

Liam Missios, “The Impact of Foreign Direct Investment on the Composition of the Labor Force” (Dr. Don Lee)

Room 329

Session Chair: Dr. Rosalyn Cooperman (Political Science and International Affairs)

Grace Rice, “Test Tube Babies Talk Back” (Dr. Tracy Citeroni)

Hannah Wiers, “Sex Education in Public Virginia Universities” (Dr. Rosalyn Cooperman and Dr. Tracy Citeroni)

Natalie LeMay, “The Implementation of Religious Literacy Courses in American Public Schools” (Dr. Emile Lester and Dr. Mary Beth Mathews)

Jennifer Hill, Sophia Geron and Courtney Flowers, “Domain Fellows: Diving Deeper into Domain of One’s Own” (Martha Burtis)



Session in Phyllis Ridderhof Martin Gallery

8:30 – 10:00

Individual Studies in Art History

Brittany Horne, “A Study of the Gender-Bias Surrounding Camille Claudel and Her Mental Illness” (Dr. Joseph Dreiss)

Caitlin Kelly, “Intersectionality and the Academic Discourse of Frida Kahlo” (Dr. Joseph Dreiss)

Beja Julia Romero, “ “The King Jade”: A Study of a Qing Dynasty Masterpiece” (Dr. Suzie Kim)

Nina Wutrich, “Representations of Lucrezia Borgia and the Image of the Holy Woman in the Late Quattrocento and Early Cinquecento” (Dr. 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 and Melchers Hall Studios

Artwork by students enrolled in ARTS 475: Senior Thesis Seminar

Student	Title	Medium
Spencer Anderson	<i>Entanglement</i> <i>Throes</i>	India Ink and Acrylic India Ink and Acrylic
Sophie Brinkley	<i>Reciprocated Material</i>	Fabric, Cyanotype
Laura Bufano	<i>Untitled</i>	Ceramic
Jackie Crouch	<i>Untitled</i>	Ceramic
Claire DeHart	<i>Big Personality</i>	Acrylic on Wood
Antonio Elliott	<i>Annotated Exposure</i>	Photographs with Paint
Joey Enright	<i>Mid-Afternoon Ambrosia</i>	Oil on Canvas, Animation
Megan Falzarano	<i>Brush</i>	Porcelain with Underglaze
Campbell Hartley	<i>Equanimity</i>	Textile
Rachel Hicks	<i>Self Portrait in the Studio</i> <i>Again and Again and Again</i>	Acrylic on Canvas Acrylic on Canvas
Martha Keegan	<i>Untitled Chair 6</i>	Fabric on Panel

	<i>Untitled Chair 7</i>	Fabric on Panel
Sarah Law	<i>Healthy Soil Means Healthy People</i>	Single Channel Video Projection
Samantha Livesey	<i>Sonder</i>	Plaster, Wood and Paint
Chad Mundie	<i>EYES (1)</i>	Video Installation
Emily Stant	<i>A Little More Broken</i> <i>You're Alright</i>	Ceramic Handmade Book and Photographs
Rhett Teaster	<i>Teaster's Teapot 5</i> <i>Teaster's Teapot 6</i>	Stoneware Stoneware
KT Noelle	<i>Solitary Solidarity</i>	Oil on Canvas
Jackie Williams	<i>Untitled</i>	Folded Paper



DuPont Hall

4:00 and 7:00

Studio 115 (Basement)

New Perfectland, an original play with puppets

Erick Boscana, Brenden Bowman, Jamie Broadhead, Mitch Coomer, Rob Di Leo, Victoria Fortune, Lydia Hyundley, Marsha Kangas, Lily Olson, William Pineda, Jacob Savage, Zoe Simms, Clay Spence and Shasha Zabela (Gregg Stull)





Sessions in Trinkle Hall

2:00 – 5:00

B6

UMW Programming Extravaganza

Mikaela Goldrich, “Explaining the Gender Gap in Computer Science Undergraduate Academics” (Dr. Jessica Zeitz Self)

Demonstrations of Student Computer Programs

Timothy Caish, “uRoute: Exercise Route Mapping Utility for iPhone”

Ethan Carlos Ramirez, “Rat Maze Control System using ATmega328P”

Chad Baxter, “Project Spacebar: an Anti-Plagiarism Tool”

Greg Phillips, “StarLord: A Space-Based Third Person Shooter”

Tiffany Lower and Ryan Harris, “Gif Grad Cap using an Arduino”

9:00 – 4:30

College of Education Graduate Student Presentations

GRADUATE STUDENT RESEARCH PRESENTATIONS

April 27, 2018 - Trinkle Hall





University Center

2:00 – 3:00

Chandler Ballroom Foyer

**(Re) presenting the Past: Examining Cultural Memory in Film, Fiction,
Theater, Monuments, and Museums
Student Presentations from Anthropology 341, Practices of Memory
(Dr. Jason James)**

Posters on display through May 4, 2018

Amani Abbas, “Porajmos: The Forgotten Gypsy Holocaust.”

Hannah Backe, “How Accurate is ‘Accurate’ in *The Zookeeper’s Wife*?”

Beth Bayless, “*The Daily Telegraph* Accidentally Made Jack the Ripper Famous.”

Rebecca Brehmer, “The Exchange Hotels view of the Civil War.”

Brittany Brown, “The Gray Ghost: How Should John Singleton Mosby be Viewed within the Context of Confederate History?”

Grayson Cordova, “*Stolperstein*: Remembering By Accident.”

Anna Elmore, “Shakespeare’s Romanticization of the True History of Antony and Cleopatra.”

Lilly Fawcett, “Meet Molly and Nanea: American Girls on the Home Front.”

Deanna Geraghty, “Georgetown University’s Slave History and Reparations.”

Michelle Holt, “Why is there Romance in the Movie *Titanic*?”

Hannah Huggins, “What does *The Boy in The Striped Pajamas* say about Regular Germans?”

Anna Hughes, “The Way Collective Memory Shapes the Sinking of the Titanic.”

R.J. McKenna, “Memorialization in Guam: A Case Study.”

Cristina Montemorano, “*Maus*: Using A Graphic Narrative to Display Graphic Events.”

Bethany Muchler, “The Story of Trajan’s Column.”

Melissa Pampel, “Remembering Through Theatre: *The Laramie Project*.”

Anna Perdue, “One Man, Two Memories: John Brown, Menace or Martyr.”

Lexy Stanford, “The U.S. Public and the Vietnam Veterans’ Memorial.”

Renee Stemcovski, "Protests and Preservation: The Demolition of Penn Station."

Katherine Toomey, "Helter Skelter: Charles Manson and the True Crime Narrative."

Amber Tranter, "Mushroom Cloud Over Nagasaki: The Japanese Perspective."

Noor Varjabedian, "What the Martin Luther King Jr. Memorial Means to Americans."

Rachel Zernick, "Roadside History: Historic Markers and the Civil War."



Monroe Hall

Anthropology Senior Thesis Presentations

11:00 - 12:00

Room 213

11:00 a.m. Sara Farnor, "Changes in Perspective and Presentation: Quilts' Journey through the Art World"

11:30 a.m. Ester Salguero, "Perceptions of Homelessness and Hierarchies of Worth in Capitalist Society"

Other days and times in room 213

Wednesday, April 25

11:00 a.m. Alecia Milner, "Crafting Political and Economic Identity in Guatemala: Maya Methods of Resistance."

11:30 a.m. David Fulton, "Drink, Drank, Drunk: Liminality and the Ritual of Consumption."

Monday, April 30

12:00 p.m. Amanda Liverette, "A Relationship with Death: The Diverging Subculture of the Catacombs"

12:30 p.m. Simona Spiegel, "Freedom in the Structure: Grassroots Education in Rural Appalachia"

1:00 p.m. Robin C. Diaz, "Is Brown the Gold Standard? A Look Into Racialized Group Membership."

1:30 p.m. Justin Sisk, “Democratic Magic: The Influence of Democracy on American Paganism.”

2:00 p.m. Jessica Cottrill, “Narcissistic Confession in the Video Blog ‘I Mom So Hard.’”

2:30 p.m. Jesse Slate, “College as Ritual.”



Abstracts

Listed Alphabetically By Student Researcher

Student researcher(s): Grace Adithela

Major: Biology

Research Mentor(s): Dr. Parrish Waters

Project Title: The Physiological and Psychological Effects of Chronic Exposure of Sucralose and Caffeine in Mice

Artificial sweeteners have gained popularity over the past decade as noncaloric substitutes for sugar. A common artificial sweetener used is sucralose, which unfortunately possesses multiple side effects including increased appetite and weight gain. Sucralose is often consumed along with caffeine, a drug that also has profound demonstrated effects on behavior. Caffeine can increase motivational drive, enhance activity levels, and increase boldness. We designed this study to examine the combined effects of sucralose and caffeine in mice. We housed 16 CD-1 mice in four cages for 21 days during with ad libitum access to food. We administered drugs via drinking water, either pure water (control), with 0.1 g/L of sucralose, 0.6 g/L of caffeine, or both doses of drug. Prior to these experimental conditions, we measured anxiety and boldness behaviors using an elevated T-maze, an open field test, and the marble burying test. Animals fasted for twelve hours prior to testing to increase motivational drive. We will measure fecal cortisol levels prior to experimental conditions and again after 21 days of treatment. We are currently collecting our post-experimental results, and expect mice that are fed sucralose and caffeine to show boldness in all three tests, as well as an increase in cortisol levels.

Student researcher(s): Daphne Ahalt

Major: Historic Preservation

Research Mentor(s): Dr. Lauren K. McMillan

Project Title: A Soldier’s Life in One Context: An Analysis of Small Finds from Sherwood Forest Plantation (44ST615)

Sherwood Forest Plantation is a circa-1840s plantation in Stafford County, Virginia that served as an officer's encampment for the Union Army during the Winter of 1862 and 1863. Through the excavation and ongoing laboratory analysis, a variety of small finds related to the daily lives of those encamped on the property have been recovered. One layer from one unit was chosen as the focus of this project with the goal of researching and exploring a few select metal objects in depth. Such artifacts include: a Sticking Tommy candle holder, a set of pants buttons, a copper clamshell box, a tin can, and shoe eyelets. What can these five metal objects tell us about a Union Officer and what his life was like? The goal of this archaeological and historical research is to demonstrate how metal artifacts— collected from a single archaeological context – can aid in the interpretation of an archaeological site.

Student researcher(s): Tanisa Ahmed, Rachel Diehl, Colin Travis, Alex Ramirez

Major: Chemistry

Research Mentor(s): Dr. Randall Reif

Project Title: Concentrations of Harmful Metals in Various Apples and Apple Juice Types by ICP-AES

Apples and apple juice are very common foods found in most households; however, they have been found to contain trace amounts of the harmful metals: arsenic, cadmium, and lead. In this experiment, we will analyze the concentrations of Cd, Pb, and As in fresh "organic" apples, not "organic" apples, apple juice from concentrate, and "natural" labeled apple juice. This will be conducted using ICP-AES. Apple samples will be prepared using an aqua regia digestion in a fume hood. Juice samples will be prepared by diluting with nanopure water. The concentrations of these harmful metals are expected to be higher in the apples than in the juice and higher in the "organic" products than the "non-organic," but all concentrations should be considerably below the toxicity levels for human consumption.

Student researcher(s): Yoko Aita, Campbell Hartley, Cheyenne Johnson, Myranda Morrison, Mary Novitsky, Mele K. Richardson, Olivia Sanderson, Jessica Schmitt, Kyle Welty, and Erin White

Major: Art History and other majors

Research Mentor(s): Marjorie Och

Project Title: Margaret Sutton: Face to Face

Margaret Sutton graduated in 1926 from the Virginia State Teachers' College in Fredericksburg, now UMW. The drawings in this exhibition span much of her career, from 1936 through the 1970s. These were decades of remarkable developments in American art, and many of these developments occurred in New York City, Sutton's home for this entire period. By the 1930s, the city had become the center of an international, albeit predominantly European, art world, and Sutton explored contemporary art in galleries and museums. These were also decades of dramatic social and political changes. In 1929 the United States fell into the Great Depression; a decade of gradual economic recovery was followed by the country's entry into World War II. In the postwar boom, the arts in New York City flourished with the opening of new galleries, theaters, and music venues. and the city became a center for fashion, advertising, and publishing. Living in Greenwich Village in the 1950s, '60s, and '70s, Sutton witnessed her neighborhood in transition: this was a center for the Beat Generation, folk musicians and hippies, the Civil Rights and Women's Rights movements, protests against the Viet Nam War, and the Stonewall Riots. This exhibition examines Sutton's exploration of this world in her extraordinary drawings.

Student researcher(s): Chris Amurrio

Major: Biochemistry

Research Mentor(s): Dr. Davis Oldham

Project Title: Optimizing the Enzymatic Resolution of 2-Ethyl-1-Hexanol

Phthalates are used as plasticizers which make plastics stronger and flexible so they are found everywhere alongside plastic. Phthalates may be toxic to humans and other organisms; in humans phthalates disrupt the endocrine system. One common phthalate is di(2-ethylhexyl) phthalate, or DEHP, which has three diastereomers. When ingested, it metabolizes into MEHP where one of the esters is hydrolyzed. The relative toxicity of the metabolite is unknown as it is readily excreted out of the body. As the body is sensitive to many chiral molecules, DEHP and MEHP should be synthesized as pure diastereomers and individually be tested for their respective toxicities. 2-ethyl-1-hexanol will be used to synthesize the phthalates, so the alcohols must be

in high enantiomeric excess (e.e.) to begin. The efficiency of (R)-2-ethyl-1-hexanol separation was optimized by varying time; the results were based off the e.e, which was measured using a chiral GC. A racemic mixture of 2-ethyl-1-hexanol was reacted with succinic anhydride in the presence of catalytic lipase which stereoselectively favors the reaction with (S)-2-ethyl-1-hexanol to form a hemisuccinate. Throughout many reactions with different modifications, the unreacted (R)-alcohol has been monitored and reached 81.9% e.e. The hemisuccinate product which is largely S has also been hydrolyzed back into the alcohol but has only seen a high of 69.0% e.e. and needs to be separately optimized in order to synthesize diastereomically pure DEHP and MEHP.

Student researcher(s): Eleni F. Antzoulatos, Claude W.C. Thompson

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Hydrogen Bond Energetics of Methyl Acetate by FTIR

The temperature effect on the formation and disruption of hydrogen bonds between methyl acetate and deuterated water was observed by Fourier Transform Infrared Spectroscopy (FTIR). A 0.3M solution of methyl acetate in deuterium oxide was prepared. This enabled the partially negative oxygen on the carbonyl group to hydrogen bond with the partially positive deuterium and allowed for 1 or 2 hydrogen bond interactions to occur at once. FTIR spectra were acquired from 1700-1800 cm^{-1} in order to focus specifically on the hydrogen bond interactions involving the carbonyl group. Each spectrum was collected at a different temperature ranging from 283-333K (increments of 10K) to determine how the peak intensity changes due to the methyl acetate-deuterium oxide interactions. The peak absorbance at each temperature was found and allowed for enthalpy, entropy, and the Gibbs free energy of the interactions to be obtained. Utilization of the Gibbs free energy indicated which methyl acetate-deuterium oxide hydrogen bond interaction was more thermodynamically favored.

Student researcher(s): Clare Arrington

Major: Computer Science

Research Mentor(s): Dr. Ron Zacharski

Project Title: A Comparative Analysis of Machine Learning Algorithms for Natural Language Processing

Natural language processing is a blend of computer science, statistics and computational linguistics. NLP explores the relationship between human speech and writing for completing tasks such as translation and automatic summarization. Tasks can be solved using rule-based algorithms, but machine learning has provided an alternate approach to this. Machine learning algorithms are dynamic. They make adjustments to a model based on the provided data and goals such as matching desired outcomes or identifying features. Deep learning belongs to this family and has had a large resurgence in popularity. These architectures are most often built from neural networks, meant to resemble the functions of the human brain.

Deep learning algorithms have been shown to either match or surpass previously used models with improvements like higher predictive accuracy and more natural sounding produced language. This project focused on applying multiple models from traditional machine learning and deep learning to the task of sentiment analysis. Sentiment analysis is the process of identifying emotions and opinions to determine the overall a writing's overall tone, such as positive or negative. The dataset used features 130,000 wine reviews from Wine Enthusiast, along with the reviewers rating. These ratings were split into binary categories, mid-tier and top-tier, and is the goal of each model to predict. The models will be compared on accuracy and time required to train.

Student researcher(s): Abigail Barnett

Major: Biology

Research Mentor(s): Dr. Rosemary Barra

Project Title: Effects of Crizotinib and Ganoderma lucidum on Apoptosis and Caspase-3 Activation in Lung Cancer

Crizotinib and Ganoderma lucidum are two potential treatments for non-small cell lung cancer due to their effects on apoptosis and limited adverse side effects compared to conventional chemotherapeutic treatments.

Both treatments were hypothesized to cause cell mortality in the A549 and HCC827 cell lines, likely through increasing apoptosis by causing nuclear membrane fragmentation and blebbing of the cells. Cells were treated with concentrations of crizotinib between .001 and 1 mM and between 500 and 50,000 ng/mL of Ganoderma lucidum. MTT cell viability assays were performed to assess each chemical's effect on cell viability. Crizotinib was found to decrease cell viability by 68.5% in A549 cells and 63.87% in HCC827 following treatment for twenty four hours. Ganoderma lucidum decreased cell viability by 38% in A549 cells and had no noticeable effect on HCC827 at a concentration of 50,000 ng/mL, but decreased cell viability by 15.8% at 5,000 ng/mL. A caspase 3 ELISA assay was performed as an indicator of apoptosis on A549 cells treated with both substances. The results indicated no significant change in caspase 3 activity as a result of treatment with either of the substances. This may suggest that alternative apoptotic pathways were activated and account for the reduced cell viability. Further research will focus on other initiators of apoptosis to determine their role in the observed decrease.

Student researcher(s): Dalton Baughn

Major: Classics

Research Mentor(s): Dr. Joseph Romero

Project Title: Let's Hear it for the Boys: Athenian Pederastic Practices and Their Effects on the Eromenos' View of Masculinity in the Fourth and Fifth Centuries

Fourth and fifth century Athenian pederastic relationships have been a subject of much interest and study in both ancient as well as modern times. What is known about these relationships is that they were used mainly to impose an idea of what a good Athenian male citizen was. This was a close mentorship that was meant to engage the mind of the boy, while providing the adult male with close contact with what was considered pure male beauty. These relationships have been mainly interested in the adult male point of view and the reasoning why an adult would enter a seemingly erotic relationship with a child. This work is concerned with the younger partner's perspective of the relationship as well as how this mentorship affected their view of what masculinity was. By examining the views of ancient authors on the subject, modern scholar's interpretations, as well as vase paintings depicting these practices, one can examine the influence these relationships had on the younger partner's view of his place in society and in his own gender expression.

Student researcher(s): Shannon Becker and Mary Nethery

Major: Biology

Research Mentor(s): Dr. Parrish Waters

Project Title: Relationships Between Anxiety, Dominance, and Corticotropin Releasing Factor

Individuals with anxiety often report that their anxiety hinders social interactions. Furthermore, lower self-perceived social rank correlates with higher levels of anxiety in humans. We performed our experiment to provide a better understanding of the relationship between social dominance and anxiety, and to investigate the physiological role that CRF plays in mediating this relationship. We obtained 12 CD-1 laboratory mice and assessed their anxiety levels using the Elevated T-Maze and Novelty Food Test after they were housed in social groups of three mice per cage. We measured social dominance using the Tube Test, and by scoring videos of home cage social behavior, both of which are established indicators of social rank. Our initial analysis of behavioral data indicate differences in behavior between subordinate and dominant individuals, with dominant mice exhibiting more robust habituation to the T-Maze, and behavioral patterns that suggest decreased levels of anxiety. These results, however fail to meet the level of significance set by our statistical assumptions ($\alpha = 0.05$). Our data also indicate that individuals with low Tube Test dominance scores exhibit higher levels of attack in the home cage. Future directions of this study include repeating our behavioral tests to increase sample size, and analysis of brain tissue using qPCR (quantitative Polymerase Chain Reaction) to explore changes in stress related neuropeptides, such as CRF.

Student researcher(s): Hannah Belski

Major: Biology

Research Mentor(s): Dr. Parrish Waters

Project Title: Sex- specific mechanisms of social hierarchy in mice.

Social stress is a leading cause of anxiety, and females are disproportionately represented among patients. This sex disparity likely results from differences in the neurobiological mechanisms that underlie anxiety. To examine these mechanisms, we socially housed mice in same-sex cages for 8 weeks. We tested their behavior to determine dominance hierarchy and anxiety-like behavior throughout this period. We also removed the extended amygdala, a region of the brain implicated in anxiety, and used qPCR to assess the expression of brain-derived neurotrophic factor (BDNF) and corticotrophin releasing hormone (CRH), two peptides believed to mediate anxiety in this region of the brain. We are still collecting data for this experiment, and expect that females will have higher physiological expression of anxiety, CRH, and BDNF in the extended amygdala.

Student researcher(s): Christina Bloom

Major: English: Creative Writing

Research Mentor(s): Dr. Judith Parker

Project Title: Morphological Awareness and Developmental Dyslexia

Morphological awareness plays a significant role in the reading process. This skill helps readers recognize and understand the smallest meaningful units of words and benefits the reading comprehension, decoding, vocabulary, and spelling skills of typically-developing children. Children with developmental dyslexia, though, tend to struggle with morphological awareness and, until recently, the relationship between morphological awareness and developmental dyslexia has been relatively under-researched. This presentation examines the relationship between dyslexia and morphological awareness and seeks to explain the ways in which a morphological deficit impacts students with developmental dyslexia.

Student researcher(s): Sarah Bond, Laura Downs, Kyle Moran and Sarah Scruggs

Major: Historic Preservation

Research Mentor(s): Dr. Christine Henry

Project Title: Riverside Redevelopment in the Historic District

Throughout the semester, the Preservation Planning and Lab class has been investigating how the city of Fredericksburg makes use of Sophia Street. Currently, there is a mix of residential and commercial use as well as public parking space. Past and present there have been many attempts and plans made to develop various sections of Sophia Street with the intention to make more room for businesses, recreational spaces, and residential areas. Fredericksburg is in a unique and valuable location--essentially equidistant from Richmond and Washington, D.C., and situated on the banks of the Rappahannock River. This unsurprisingly makes it susceptible to proposals and ideas, all with the guarantee to increase revenue, population, attract new audiences, or improve the aesthetic of the city. Not to imply that development and progress aren't beneficial or essential but, like all active cities and communities, Fredericksburg takes pride in its rich history and everything on which its character is built. Holding what the city currently is and wishes to grow in while also bringing in new and progressive ideas is somewhat of a balancing act. In order to properly approach the problem, our class resolved to create a survey to gather information that would be pertinent to the focus of the project redevelopment on Sophia Street. Using the information from the survey as well as historical research, we compiled a report with suggestions, including but not limited to the improvement of transportation, recreational spaces, and with end goal to increase foot traffic to this underused area. Our proposal would ultimately benefit the community while still maintaining the image and identity of Downtown Fredericksburg.

Student researcher(s): David Borsheim and Logan Hargis

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: Investigation of Iron Transport in Spinach Chloroplasts

Chloroplasts contain the highest concentration of iron ions in green plants. Among other things, iron is required for biosynthesis of chlorophyll and for electron transfer during photosynthesis. Nevertheless, relatively little is known about the transport of iron into the stroma and thylakoids. This is especially true in the presence of other 2+ cations such as Mg(2+) and Cu(2+) which are also required for metabolism.

Using spinach (*Spinacia oleracea*) as a model to investigate the effects of iron deficiency in chloroplasts the purpose of this study is to determine whether iron deficiency would trigger the upregulation of the Spo22253 gene, a putative iron transporter in the chloroplasts.

Identified in *Arabidopsis thaliana*, the PERMEASE IN CHLOROPLASTS1 (PIC1) gene is an ancient permease implicated in the transport of 2+ cations, specifically Fe(2+) in chloroplasts. Knockout strains of *A. thaliana* for *pic1* were unable to engage in photosynthesis and could survive heterotrophically. As such, these mutants tended to be chlorotic and dwarfed as well as exhibiting other traits found in iron-deficient plants. Using Basic Local Alignment Search Tool (BLAST), regions of local similarity between nucleotide and protein sequences was used to compare *A. thaliana* PIC1 with the *S. oleracea* genome to identify Spo22253 as a probable orthologue.

With the lack of gene annotation, there is some question as to whether Spo22253, in spinach, functions to transport Fe(2+) or Cu(2+). In our study, young experimental *S. oleracea* (having germinated and begun to put out adult leaves) were subjected to iron deficiency for 7 days. These were compared to a control group with similar growth form, but which were supplied with sufficient iron. Tissue samples were collected, RNA was extracted, and levels of Spo22253 were examined to determine if SPO22253 had been upregulated under deficient conditions. Additionally, chlorophyll concentrations were compared in the two groups using spectrophotometry.

Student researcher(s): Shannon Bremer

Major: Historic Preservation

Research Mentor(s): Dr. Lauren McMillan

Project Title: Health and Hygiene at Sherwood Forest Plantation (44ST615): Civil War and Postbellum

Sherwood Forest Plantation (44ST615) in Stafford County, VA was occupied from the mid-19th century through the late 20th century. During the Civil War, specifically around the Battle of Fredericksburg, the Union Army used Sherwood Forest as a hospital, in addition to a general encampment. Through the University of Mary Washington field school during the summers of 2016 and 2017, we discovered a variety of evidence related to health and hygiene, including toothbrushes, hard rubber combs, patent medicine bottles, and a toothpowder jar. Personal hygiene was a very important part of a soldier's daily regimen. I will be discussing the hygiene related artifacts found on the site and what this evidence can tell us about hygiene both during and right after the Civil War and how this information can be used to better understand how the soldiers and people occupying Sherwood Forest took care of themselves.

Student researcher(s): Jamie Broadhead, Kevin DiCicco, Lily Olson and Patrick Regal

Major: Theatre

Research Mentor(s): Mr. Gregg Stull

Project Title: Student Driven Theatrical Production and Direction in Studio 115

With the assistance of Undergraduate Research Grants, students mounted four full-length shows and the annual First Year Showcase in Studio 115, a student run black box theatre in duPont Hall. In the fall semester, "Six People Trapped in a Bunker," a student written piece of devised theatre, relied on audience participation to create a unique story that changed every performance. The First Year Showcase, now in its second year, specifically created opportunities for new students through a festival of fully produced scenes directed by experienced students. A trio of plays supported by grants performed in the Spring 2018 semester: "The Children's Hour" by Lillian Hellman, a classic play transported to modern times to tackle themes of gossip and homophobia in technological America; "The Great God Pan" by Amy Herzog, which tackled issues of child sexual abuse and the fragility of identity; and "The Swing of the Sea" by Molly Hagan, which addressed the reevaluation of life and friendships two middle schoolers make following the suicide of their friend. With eighty-eight unique positions across the shows filled entirely by students, each production presented unique challenges and opportunities for students to grow as artists. The grants were awarded to student directors and producers who shaped the shows from casting to performance and improved their skills in team building, leadership, textual analysis, communication, and artistic expression while building a body of work to support themselves in their search for future careers. This season of shows pushed Studio 115 into new areas of technical and spatial creativity that maximized and proved its unending potential as a resource for artistic growth and opportunity. The efforts of all students involved culminated in audiences being met with thought provoking and hard hitting works produced, designed, and performed entirely by UMW students.

Student researcher(s): Thomas Broadwater

Major: Classical Civilizations

Research Mentor(s): Dr. Joe Romero and Dr. Paul Fallon

Project Title: Missing Sounds: Digamma

In examining the dialects of Ancient Greek, some oddities come to light: Homer's works have seemingly amateurish mistakes with lines that fail to keep the meter and the appearance of some suspicious deltas, vowels in Ionic seem to lengthen spontaneously where their Attic counterparts are short, and the writings of the western mainland show a character that is absent in the east. There must be, to quote Eric Weiskott, some "phantom syllable" that existed only just long enough to permanently alter the Greek Eastern Group, but not so long as to be found in the writings of the either Athenians, the Ionians, or Koine. Through comparing these extant writings against one another, and by cross-analyzing these writings with Greek's closest sister languages, Latin and Sanskrit, I argue for the existence of a singular phoneme in Proto-Hellenic (the ancestral root of all the Greek dialects), and look to reconstruct a list of vocabulary as would have possibly been spoken before the language split.

Student researcher(s): Kait Brogan

Major: Biology and Geography

Research Mentor(s): Dr. Brad Lamphere and Dr. Jackie Gallagher

Project Title: Spatial Ecology of Fish Communities in Accokeek Creek, Virginia

Stream complexity and structure are vital influences on the composition of fish communities living in them. We sampled fish distributions along the length of Accokeek Creek in Stafford County, Virginia, to test the influence of biotic, abiotic, and anthropogenic factors on species composition. At each of the five sites, we recorded the identity, number, and total length of each fish captured, along with water quality data, including temperature, total dissolved solids (TDS), pH, and specific conductivity. We accumulated land use data of the stream watershed at each sample point to compare possible anthropogenic effects. The most upstream sample site was located in a construction area for new residential development, while downstream sites sampled Accokeek Creek as it passes through Crow's Nest Natural Area Preserve and into the Potomac River. We summarized fish community composition using diversity indices, ordinations, and Principal Components Analyses, then used those data to assess their correlation with abiotic factors, land use variables, and water qualities to see aggregate species groupings. Longitudinal studies such as this can show the impact of site- and watershed level effects on biotic communities influenced by environmental impacts in streams.

Student researcher(s): Nina Burges

Major: International Relations

Research Mentor(s): Dr. Nabil Al-Tikriti

Project Title: Emboldened by Absence

Some internal conflicts receive more attention than others. Since 2002, the Central African Republic (CAR), a landlocked, former French colony has been mired in political and religious conflict that has gone widely unnoticed by the international community. This presentation explores the efforts of the international human rights organization, Federation Internationale de Droits de le Hommes or the International Federation for Human Rights, in bringing this situation to the forefront of international conscience, resulting in not one, but two cases coming before the International Criminal Court.

Student researcher(s): Allison Burgess, Elise Pyfrom, Adriana Usher

Major: Chemistry

Research Mentor(s): Dr. Randall Reif

Project Title: Pesticide Analysis in Honey

Pesticide use could be a possible cause of bee population decline due to colony collapse disorder. Pesticides are commonly used in agriculture, and bees can pick up the pesticides from surrounding plants near their hives. Pyrethroids are a common category of pesticide and the most common pyrethroid is cypermethrin. A local honey sample along with a commercial honey sample will be analyzed to see if they contain trace amounts of cypermethrin and determine if the levels are safe or not for bee life. The honey samples will be extracted with

ethyl acetate, magnesium sulfate, sodium chloride, and the internal standard, pyrene. They will be centrifuged, and the extracted solutions will be analyzed using GCMS with temperature gradient. Pesticide standards will be made with the internal standard containing various concentrations of cypermethrin to create a calibration curve. The signals of the local and commercial honey will be plotted on the calibration curve to determine the amounts of cypermethrin in each. It is expected that the results will be in amounts of micrograms since as little as 0.026 μ g can be toxic to bees. It is also expected that the commercial honey will contain lower levels of cypermethrin since that honey will be more processed.

Student researcher(s): Robert Byles & Mary Hoffman

Major: Environmental Science

Research Mentor(s): Dr. Chuck Whipkey

Project Title: Wind Energy Potential Analysis

In an age when fossil fuels are quickly becoming obsolete, there is a growing need for renewables such as wind power. The best time to begin investment in renewables is right now, so this project was created to statistically analyze the wind energy potential of a spot on the UMW campus in front of Jepson Hall. An anemometer was erected, 30 feet high, with a sensor to read wind speed at 15-second intervals. This data was collected and analyzed, looking at factors such as mean wind speed, wind speed frequency distribution, and wind energy distribution. These are compared to the efficiency and energy output of the proposed wind turbine to determine if the site is both cost effective and efficient enough to justify placing the wind turbine there. Based upon location and height, we hypothesize that the site will be suitable for a wind turbine.

Student researcher(s): Fernando Cabezas, Matt Coyne, Anna Jennings, Josie Woodwell and Whitney Post

Major: Biology

Research Mentor(s): Dr. Jennifer Polack, Dr. David Stahlman, and Dr. Parrish Waters

Project Title: Constructing a Comprehensive Ethogram of Mouse Social Behavior

Laboratory mice exhibit behaviors that promote the development of social hierarchies, and understanding these behaviors can provide an understanding how behavior relates to evolutionary fitness. Using the open source platform BORIS (Behavioral Observation Research Interactive Research Software), we monitor the behaviors of the four mice living in a social cage to create a comprehensive ethogram. Behaviors include active, social, and aggressive behaviors. Simultaneously, each mouse's position was tracked using RFID tags. Our goal is to sync our behavioral observations with data from the RFID software, which is being developed by students in the UMW computer science department. This will allow us to generate high fidelity ethograms of spontaneous, home cage social behavior in mice. This project is part of ongoing research in Dr. Waters' laboratory and will continue over the next two years.

Student researcher(s): Rebecca Callaway and Mary Dye

Major: Physics and Music

Research Mentor(s): Dr. Hai Nguyen and Dr. Michael Bratt

Project Title: Laser Harp: Restoring a Classic Instrument with Modern Technology

The modern harp has become so complex that restoration can become extremely costly and time consuming. Instead of discarding an injured harp, the idea was to repair it using programmable technology. Utilizing lasers and light dependent resistors, circuitry was created in order to mimic the strings of the original harp. With the body left intact, the lasers and resistors were inserted into the harp in a manner where the original playing technique could still be used to play the electrical components. Each resistor was programmed using an Arduino to correspond with a certain frequency. When the laser corresponding with the resistor is blocked, the tone is released through the attached speaker. A total of 23 recognizable pitches were programmed to the 23 laser-resistor combos: F4 to D#6 (almost two full octaves).

Student researcher(s): Emily Contompasis and Leonid Smorodintsev-Schiller

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: The effects of day length on expression of the ETTIN gene in Perianthia mutant Arabidopsis thaliana plants

Arabidopsis thaliana plants produce flowers with four petals. *Arabidopsis* plants with mutations in the PERIANTHIA (PAN) gene, a basic region/leucine zipper (bZIP) transcription factor responsible for maintaining development of floral meristems, have been shown to produce five-petal flowers when grown under short day conditions (8 hours of light per day). *Arabidopsis* plants with mutations in ETTIN (ETT) have also been shown to produce five-petal flowers. ETT is an auxin response gene believed to be responsible for controlling development of floral meristems especially in determination of perianth organ number and spacing. PAN and ETT are thought to have partially redundant function in regulating patterning and development of *Arabidopsis* flowers. To determine if short day growing conditions affects expression of the ETT gene in pan mutants plants were grown under short day or long day (16 hours of light) conditions and inflorescences were screened for the number of petals (4 or 5) produced. RNA was extracted, and qRT-PCR analysis was performed to analyze expression of the ETT gene in inflorescences grown under each light condition. We hypothesize that the ETT and PAN genes have partially redundant functions in floral organ patterning and that in short day conditions the 5 petal flowers are the result of decreased expression of ETT in pan mutants. Without the function of either PAN, a reduction in ETT expression is not sufficient for normal patterning and results in the alteration of floral meristem cell division and specialization.

Student researcher(s): Emily Coulter, Lindsey Jones, Hannah Killian, and Rachel Gunraj

Major: Chemistry

Research Mentor(s): Dr. Randall Reif

Project Title: Quantification of Gallic Acid Content in Buckwheat Leaves by HPLC

Allelochemicals are compounds produced by plants that inhibit the growth of surrounding flora. Buckwheat (*Fagopyrum esculentum*) contains the allelochemical gallic acid. The potential environmental impact of growing buckwheat near other plants is dependent upon the amount of gallic acid secretion. The gallic acid concentration in Buckwheat samples at different stages of growth will be quantified to evaluate when Buckwheat begins to secrete gallic acid and thus affect the environment. The Buckwheat will be subjected to a methanol extraction to isolate the gallic acid from the plant matter. The samples will be analyzed using high performance liquid chromatography (HPLC), generating a chromatogram with peaks that represent the different compounds in Buckwheat. Additionally, standard solutions of gallic acid will be analyzed using HPLC in order to create a calibration curve and determine the concentration of gallic acid in the Buckwheat samples. Results for the gallic acid concentration are expected to fall in the range of 0.1-0.4mg/g sample. It is expected that more mature Buckwheat will have a greater concentration of gallic acid.

Student researcher(s): Sarah Davis

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: CAD-7 Gene Expression in Response to Herbivory

Over the past 350 million years plants have contended with herbivorous insects, they have developed numerous deterrents to repel their attackers. During their life cycle, plants can come under attack and sustain damage from a variety of sources, necessitating the development of various methods to recognize attackers as well as a myriad of corresponding response mechanisms. Lignin is a phenolic heteropolymer which plays a role in reinforcing the structures of plant cell walls, making them rigid and more resistant to damage from insect herbivores. Genes responsible for the synthesis of enzymes which catalyze the manufacturing of lignin (CAD/CAD- like genes) have been documented to show increased expression in *Populus* (*P. deltoides* x *P. nigra*) subjected to attack by herbivory, but gene expression varies widely depending on the type of attacker. Herbivorous insects such as caterpillars have been shown to elicit vastly different responses from mechanical wounding designed to mimic their feeding patterns. We hypothesized that salivary excretions produced by caterpillars are the primary elicitor whose presence or absence contributes to differences in gene expression following herbivory and mechanical wounding. Here we examined the gene expression of CAD7 in *Arabidopsis thaliana* in response to caterpillar herbivory, mechanical wounding, and mechanical wounding with the addition of saliva. We predict that we will see a similar expression of the plants with caterpillar herbivory and mechanical herbivory with saliva, but differences with the mechanical wounding alone. This similarity in expression will show caterpillar salivary excretions as a key elicitor in response to herbivory and induce a different set of genes than mechanical wounding without saliva.

Student researcher(s): Tiffany Diaz-Calderon, Hoang-Anh Tran

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Modeling Kinetic Study: Spectator Ions Influence Aluminum Corrosion

The goal of this study is to evaluate how spectator ions and temperature impact the rate of the copper-aluminum displacement reaction. Three solutions for each halide (CuCl_2 and CuBr_2) were prepared in DI water and the reactions monitored at 20°C , 25°C , and 30°C . The absorption of copper, which can be related to concentration because of Beer's Law, was quantified via a UV-Vis spectrometer at a maximum wavelength of 805 nm for over 10 minutes. When the aluminum corrosion reaction occurs faster, the rate constant is predicted to increase. Furthermore, this study of the temperature dependence of the rate for this reaction will allow the determination of the activation energy and the frequency of collisions between copper ions and aluminum by utilizing the Arrhenius equation. This investigation explores the effects of spectator ions and temperature on the rate of the copper-aluminum displacement reaction.

Student researcher(s): Liam Deihl

Major: Classics

Research Mentor(s): Joe Romero

Project Title: Interdependent Identities in Sappho 1

This paper offers a reading of Sappho 1 in which the speaker's understanding of her own selfhood is merged inextricably with the identity she perceives in the goddess Aphrodite—that is, the speaker's sense of who she is in this particular poem relies entirely on who she understands Aphrodite to be, which, in a similar shape to the circular frame of the poem, reflects back onto the speaker the poetic production of the goddess herself. The speaker, as she exists inside Sappho 1, creates herself and her world in relation to her projection of Aphrodite, who is herself produced by the poem and the speaker's experience.

Student researcher(s): Arthur Drake Dragone

Major: Music

Research Mentor(s): Dr. Michael Bratt

Project Title: Sound and Game Design

This project started as wanting to take a pre-made game and make my own sound design for it, but I wasn't happy with any pre-fabricated scenes or games that I found so we decided to build the whole game. Using minimal knowledge of computer science and with a lot of help from free asset creators, this game has come to life over the past few months. While not a finished product, this game is being polished and perfected and I'm very happy with the pieces I wrote for the game and how I have integrated my knowledge of music and music technology that I've learned over the past three years into this project.

Student researcher(s): Rachel Evans

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: Phenotypic Characterization of AINTEGUMENTA (ANT) and EARLY RESPONSIVE TO DEHYDRATION 10 (ERD10) and Spatial and Temporal Analysis of ERD10 Gene Expression in Arabidopsis thaliana

Flower and ovule development are controlled by networks of regulatory genes. One such gene in Arabidopsis is AINTEGUMENTA (ANT). ANT, a transcription factor, functions to promote organ initiation and growth. ANT plays a role in the development of the carpel margin meristem and in the production of ovules (seed precursors). Previous transcriptome analysis identified EARLY RESPONSIVE TO DEHYDRATION 10 (ERD10) as a downstream candidate of ANT that is up-regulated in ant mutants. ERD10, a chaperone protein, protects against abiotic environmental stresses such as drought, extreme temperatures, and salinity, but has not been previously shown to have a role in flower development. If ERD10 affects ovule and floral development, then enhanced phenotypic disruptions in ant erd10 double mutants are expected.

Enhanced disruptions were observed in ant erd10 double mutants compared to the single mutants and the wild type plants. These included delayed growth, shortened stature, and fused stamens. Other phenotypic

disruptions shared between the double and single mutants included petal positional defects, narrowing of leaves and floral organs, unfertilized siliques, altered phyllotaxy (patterning of the siliques about the stem), variable internode lengths, rosette disruption, and formation of multiple tissue primordia per node. Genetic analysis confirmed the genotype of the plants exhibiting phenotypic disruptions.

The enhanced phenotypes in the *erd10 ant* double mutants indicates ERD10 has a role in the floral development that is partially independent from the function of ANT. Further analysis was performed on single and double mutants to examine the spatial and temporal gene expression of ERD10 using in situ hybridization. This technique allows for visualization of gene expression patterns by the hybridization of a labeled probe that deposits a stain at the location where the gene is expressed. This research will help provide a better understanding of the interactions between ANT and ERD10 in ovule and floral development.

Student researcher(s): Carmen Liliana Flores

Major: Music and International Affairs

Research Mentor(s): Dr. James Brooks Kuykendall

Project Title: "Lost Head" EP Performance

Carmen Liliana Flores is a singer, songwriter, composing and sound engineer at the University of Mary Washington. She studied songwriting and composing under Mark Snyder and will release "Lost Head", her first EP, in April 2018. She interned at Fast Track Studios as assistant sound recording engineer and won 3rd place in 90 Grados Karaoke competition season 9 in May 2017. She is also an International Affairs major and plans to combine both majors post-graduation.

"Lost Head" combines electro-pop and trap elements to bring to life some personal lessons learned. The EP is unforgivingly honest and explores different vocal effects and mixing techniques to have a professional sounding EP.

Student researcher(s): Andrew Franklin and Nick Atwell

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Kool Aid(ing) Adsorption

Adsorption techniques are important in wastewater treatment as they are able to remove potentially carcinogenic waste chemicals such as dyes. Dyes are a water contaminant of particular interest as they do not have well defined chemical characteristics and 10-25 % of dyes produced leave factories through wastewater.¹ This study has been conducted to model the adsorption kinetics of the dye Red 40 AC on wool. Dye concentration is determined via UV-Vis absorption measurements at 500 nm, with unknown concentrations evaluated through a standard calibration. Dye concentrations in solution are expected to decrease with time as dye adsorption to the wool surface increases. Additionally, an isothermal experiment is conducted, via water bath control, to evaluate the adsorption capacity of the wool through evaluation of eight solutions of various concentrations of Cherry Kool Aid. These isothermal data can be evaluated using Freundlich and Langmuir isotherms. The Langmuir isotherm assumes uniform surface behavior with no interaction between adsorbates; the Freundlich isotherm attempts to account for these adsorbate-adsorbate interactions. The adsorption mechanism is expected to show first order kinetics; however, previous studies have indicated a second order mechanism may be more appropriate.

Student researcher(s): Andrew Franklin, Daniel Arango, and Grace Rihl

Major: Chemistry and Environmental Science

Research Mentor(s): Dr. Leanna Giancarlo and Dr. Ben Kisila

Project Title: Metal Content in Sediments of Northern Virginia Drinking Water Reservoirs

Metals, which are abundant in soils, can exhibit a range of chemical characteristics and are important to both human and environmental health. All metals, however, can be biologically dangerous in unregulated concentrations. Metals in lacustrine sediments are typically bound as solids, but they may become reduced in the presence of organic contaminants or during regular periods of anoxia. When reduced, these metals may dissolve into solution in the associated body of water. For this reason, it is important to profile the content of various metals in the sediment of drinking water reservoirs. This study has examined both surface sediments and sediment cores, up to 50 cm in depth, taken from various locations in the Occoquan Reservoir and Lake

Manassas. These study sites are of particular interest, as they are the primary drinking water sources of Fairfax, VA and Manassas, VA, respectively. This presentation addresses the analysis of these sediment samples by two digestion methods and inductively coupled plasma atomic emission spectroscopy (ICP-AES) for the presence of up to twelve metals including Al, As, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Pb, Se, and Zn.

Student researcher(s): Scott Freiwald

Major: Biology

Research Mentor(s): Dr. Dianne Baker & Dr. Debbie Zies

Project Title: Determination of Kisspeptin 1 binding affinity to Medaka Kisspeptin 1 and 2 receptors in COS-7 Cells.

Kisspeptin is a neuropeptide responsible for regulating the reproductive hormone axis in vertebrates, thereby regulating the development of sexual organs and reproduction. Kisspeptin neuropeptide mediates these effects by binding a cell-membrane receptor, gpr-54. In the teleost fishes, kisspeptin appears to also play non-reproductive roles, ranging from brain development to metabolic regulation. In the most species of teleosts, two genes encode two distinct kisspeptins (kiss1 and kiss2), and two genes encode two distinct receptors (gpr-1 and gpr54-2). However, in most teleost species, it is not known which kisspeptin activates which receptor to cause physiological effects. The long-term goal of this project is to determine the binding preference for Kisspeptin-1 to each of the two receptors in a model teleost, the medaka (*Oryzias latipes*). To that end, we are using a mammalian cell-based in vivo receptor activation assay. After first optimizing the protocol for our cell line (COS-7), transfection reagent (FuGene), and reporter genes (luciferase and renilla) last semester, we completed receptor binding studies for kiss1 this semester. Replicate wells of COS-7 cells were transfected with the reporter gene expression vectors and with either gpr-1 or gpr-2. After two days, cells in triplicate wells were incubated with either a 10 amino acid fragment (kiss1-10) or a 15 amino acid fragment (kiss1-15), at concentrations ranging from 10⁻⁵ to 10⁻⁸ ng/□l. Luciferase activity, an indicator of activation of gpr-54 by kiss1, was then measured with a luminometer. Concentration response curves indicate that both kiss1 fragments bind to gpr54-1 with higher affinity than to gpr54-2, and that kiss1-10 has higher affinity to both receptors than kiss1-15. We will next test the binding affinity of Kisspeptin 1 and 2 to the Kisspeptin 2 receptor.

Student researcher(s): Margaret Gallagher

Major: Economics

Research Mentor(s): Dr. Rycroft

Project Title: To What Extent Does the Unemployment Rate Effect the Robbery Rate in the United States?

The unemployment rate is a relevant topic in both economics and politics. A healthy unemployment rate and its effect on the economy is often the subject of many political and economic discussions. What is often not talked about is how the unemployment rate can affect parts of society outside of monetary well-being of the United States and its people. This research uses data from 2011 to 2015 to examine the effect that the unemployment rate has on the robbery rate in the United States. Using STATA to run a linear regression the effect of unemployment rate on the robbery rate will be observed holding constant state GDP, high school graduation rate, police force size and different race.

Student researcher(s): Maggie Gallagher and Sarah Manugo

Major: Economics

Research Mentor(s): Dr. Ray

Project Title: Fredericksburg Taxi Analysis

Many city governments choose to regulate taxi fares to protect consumers, ensure customers are not being discriminated against, and increase revenue to taxi drivers. Fredericksburg's regulations involve background checks for drivers, basic standards for vehicles, and regulated fares that are based on the number of geographic zones the taxi passes through in a trip. However, in the face of unregulated transportation network companies (TNCs) like Uber and Lyft, an alternative system of taxi fares may be necessary for traditional taxi companies to remain competitive. Our analysis will look at three different alternatives to the current regulation in order to persuade the city council to change the regulation so that taxi companies can become competitive against TNCs.

Student researcher(s): Mikaela Goldrich

Major: Computer Science

Research Mentor: Dr. Jessica Zeitz

Project Title: Explaining the Gender Gap in Computer Science Undergraduate Academics

There is a gender gap in technical fields that has persisted through generations. In my research, I focus on the gender gap within computer science (CS) undergraduate academics. Diversity in technical fields starts with diversity in academics. Studies have shown that girls who are exposed to and encouraged about CS in or before high school are more likely to study and work in the field. Other factors such as role models, life goals, and perception of CS also influence a girl's decision. I surveyed UMW students in different stages of their CS degrees, in addition to students who only participated in an introductory CS class.

Most students entering introductory computer science classes today use smart phones, laptops, and tablets in their everyday lives. The intuitive user interfaces and natural comfort with technology could be shielding young people from considering how their devices work. Many young people use their devices for social media which could be shifting the perception of CS. A common opinion is that after a student finishes high school, their decision to take a CS class becomes less malleable. There may be steps that universities can take to increase exposure and encourage first year students to try a CS class. Biases from parents, other family members and non-familial figures (teachers, club leaders, etc.) can be passed through generations and change a student's self-perception.

I gathered the data using a survey and analyzed it to understand what influences a student's decision to study CS and what factors drive members of minorities away from CS. I will be presenting my findings and attempt to describe the causes and possible solutions for the gender gap.

Student researcher(s): Claire Goode

Major: History

Research Mentor(s): Dr. McClurken

Project Title: Husbands of the Women's Movement: James Mott, Theodore Weld, & Henry Stanton

Lucretia Coffin Mott, Elizabeth Cady Stanton, and Angelina Grimkè Weld are well recognized for their roles in shaping the fight for gender equality and suffrage. Their husbands offered them varying degrees of support. James and Lucretia Mott were married in 1811. Their marriage has been characterized as the ideal marriage within the reform movement. James Mott both encouraged and assisted Lucretia Coffin Mott's activism for women's rights. Angelina Grimkè and Theodore Weld were two of the most influential abolitionist orators, at the height of their powers when they married in 1838. However, their marriage marked their withdrawal from public reform work. That two such staunch activists should allow marriage and domesticity to stifle their work induced many younger feminists to consider matrimony and a career in reform work as incompatible. Henry Brewster Stanton and Elizabeth Cady married in 1840. Elizabeth Cady Stanton's marriage introduced her to the world of activism, a world she would not have been privy to without the aid of her husband. Yet the couple pursued separate goals with their reform work, only occasionally aiding one another. Additionally, Cady Stanton often felt trapped by motherhood and housework, as she raised seven children. As three of the most prominent marriages of the reform movement, they became model unions, shaping public perception of the private lives of activists. Those within the reform movement examined the marriages with an eye to their success, carefully noting the support the men offered their wives in their chosen reform work. The younger generation of women's rights advocates – those with most at stake if they formed an unhappy union – used the marriages of the Motts, Stantons, and Welds to inform their own marital decisions.

Student researcher(s): Blake Gostelow and Devin Rantz

Major: Biology

Research Mentor(s): Dr. Alan Griffith

Project Title: Examining the Diversity and Abundance of Invasive Plant Species within Urban Woodlots

The loss of biodiversity has become a well-established phenomenon. While it is widely acknowledged that maintaining large and intact areas of natural habitat is key to promoting biodiversity, this is difficult to implement in urban areas today. Urban forest systems typically consist of scattered trees and small fragmented woodlots. These woodlots persist either by design or by happenstance and are often unmanaged. Yet, the trees in urban forests provide direct benefits to local residences and businesses, like reduced energy costs, storm

water management and carbon sequestration. Furthermore, woodlots can create a patchwork of habitats which play important roles in promoting and maintaining biodiversity, like dispersal corridors between populations and even refuges for rare species. Because of their fragmented nature, urban woodlots are susceptible to invasion by alien species that are known to negatively impact species diversity. Compounding this larger problem is that land managers often know little about the species composition of these woodlots. On the campus of the University of Mary Washington, we are conducting a census of woodlots to locate invasive species. We measured mimosa and tree of heaven by recording their heights and trunk diameter. English ivy and Japanese honeysuckle extents were mapped and cover estimated. Mimosa and tree of heaven are most abundant along woodlot edges or interiors beneath canopy breaks. English ivy has greater groundcover than Japanese honeysuckle, which is often found vining into the canopies of trees and shrubs. Of the four species that were sampled, the English Ivy likely poses the greatest threat to biodiversity within the woodlots of campus. English ivy covers large portions of the forest floor, possibly suppressing the growth of native species. Our maps and geodatabase of invasive species parameters will help land managers identify areas at greatest risk of biodiversity loss.

Student researcher(s): Peter Grap

Major: Environmental Science

Research Mentor(s): Dr. Bradley Lamphere

Project Title: The effects of predation pressure on pectoral spine allometry in Margined Madtoms (*Noturus insignis*)

Madtoms, like many catfish, have venom glands surrounding their pectoral and dorsal spines, which act as a delivery structures. Previous studies have provided evidence that the venom glands possessed by madtoms are anti-predator adaptations that cause predators to reject them. While studies have been conducted to investigate the evolution of the venom, we know of no studies that have investigated the evolution of structures that deliver the venom. This study investigates the affects predation pressures may have on the morphology of the pectoral spines. We compared the relative size of the pectoral spines to the body size of margined madtoms (*Noturus insignis*) in the Rappahannock River drainage. Individuals from a range of sizes were collected at a downstream site and an upstream site, where there are fewer large piscivores. We compared allometric curves from both sites in order to test the hypothesis that the relative size of the spines would be larger in the downstream site, where there are more large predators. Field studies of morphology such as this can reveal how predators shape the evolution of their prey.

Student researcher(s): Meredith Gregory

Major: Geography

Research Mentor(s): Drs. Caitie Finlayson, Steve Hanna, and Ian Finlayson

Project Title: The Paradox of Cracker Barrel: A Case Study on Place and Placelessness

Place relates to the concept that a particular space can have certain features which make it recognizable and which can inspire an emotional attachment. Placelessness refers to the eradication of unique features, stripping away elements that make one place different from another. Cracker Barrel exists as simultaneously placeless and placefull, putting both of these elements, which at first seem like opposites, to work bringing millions of people back in time to 19th century rural America every time they walk through the door. This research explores this paradoxical notion by utilizing content and semiotic analyses in an analysis of user-generated Yelp! photos Cracker Barrels across the country create a strong sense of place through the use of theming. The homogeneity of its architecture and décor at the same time positions it as a placeless place. The sheer number and wide variety of artifacts vary little from store to store. Together, this uniformity and intentional theming help successfully create a sense of place for Cracker Barrel stores as a rural American, 19th century “home-away-from-home.”

Student researcher(s): Margaret Gregory and Melody Sepehrar

Major: Physics

Research Mentor(s): Dr. Hai Nguyen

Project Title: “Setup for Saturated Absorption Spectroscopy of 87Rb”

In analyzing the atomic structure of ^{87}Rb , the use of saturated absorption spectroscopy leads to an accurate distinguishing between the sublevels within the Rubidium atoms. This method of saturated absorption subjects the Rubidium atoms to a specific frequency so as to excite the particles into a higher energy level. In order to experimentally observe the hyperfine levels of ^{87}Rb , a laser locked at a wavelength of 780.241 nm, or a frequency of 384.230 THz is needed. To ensure accuracy in this measurement and in our findings, a reliable voltage of ± 15 V must be supplied to the laser and the circuit electronics that adjust the frequency. We found our voltage source to adjust the frequency to be unreliable and began to reconstruct this equipment. Additionally, it was discovered that the circuitry to control the gain and offset functions required modifications. With the improvement of these pieces of equipment, we can now assess the hyperfine structure of the ^{87}Rb atoms with increased precision and accuracy.

Student researcher(s): Jenifer M. Grove

Major: Biology

Research Mentor(s): Dr. Parrish Waters

Project Title: The Social Transfer of Information Between Rats

Simply put, empathy is the capacity to be affected by and/or share the emotional state of another organism. Utilizing this social adaptation has been hypothesized to increase similar behavior and prepare the observer for rapid adaptation to environmental challenges. As such, much research has been done analyzing the empathetic activation of pain-related brain areas. Although the exact mechanism of social information transfer has not been identified, these studies have confirmed increased hyperalgesia in naive cage mates and increased rates of acquisition and retention of fear behaviors. In our experiment we attempt to answer whether or not this social transfer of negative consequence generalizes to a social transfer of positive consequence. To test this hypothesis, we designed an experimental rat model of between-subject transfer of emotional information based on attentional set shifting task methods. We then used this model to measure flexible cognitive ability through Pavlovian contextual reward conditioning. Although no conclusive correlations were extracted, we advise with corrections to our model and more questions to be answered in regards to this social adaptation.

Student researcher(s): Juliette Guilloux

Major: Music and Biology

Research Mentor(s): Dr. Kevin Bartram

Project Title: Library of Congress Project: Unearthing America's Musical Treasures

The Library of Congress (LOC) is home to millions of musical works, many of which are totally unknown to musicians and to the general public. Therefore, the aim of this ongoing project is to scour the LOC and locate worthy pieces of music, to edit the music as necessary, and then to record and publish the music to make it available to orchestras and listeners. Due to the enormous number of musical holdings located in the LOC, the scope of the project has been limited to include only symphonic works by American composers. During my involvement with the project, I worked on a Passacaglia by Aaron Copland. Together with a team of two other students, and led by Dr. Bartram, I spent many hours deciphering the original manuscript score, notating the piece as sheet music using Finale software, making numerous editorial alterations, and filling in the blanks were Copland left unfinished sections of music. The final product is a printed score and a set of parts for each instrument. Although one of the goals of this project was to produce a high quality recording of the Passacaglia, we were unable to proceed due to copyright issues. However, the piece was very well received by the attendees of an orchestra directors' conference in Los Angeles in February 2018, where it was presented by the UMW Philharmonic Orchestra.

Student researcher(s): Shannon Haley

Major: Mathematics

Research Mentor(s): Randall Helmstutler

Project Title: Non-commutative Massey-Omura Encryption with Symmetric Groups

We introduce two non-commutative variations on the original Massey-Omura encryption system using conjugations in the symmetric group S_n . Patented in 1986, the original system was based on the cyclic group F^* of units in a finite field F . In place of the abelian group F^* , we will work in the non-abelian group S_n using disjoint permutations as well as maximal abelian subgroups in order to potentially create a more secure system.

Introducing the non-abelian group S_n presents the need to create a keyspace of commuting permutations and abelian subgroups of sufficient size. We analyze the security of our modified systems by examining the bit-level security of each and susceptibility to standard message attacks. Additionally, we find that the keycount for the first system grows factorially with n . We show that the keycount for the second variation grows exponentially with n while improving on the first modification by allowing any number of users to participate in communication.

Student researcher(s): Taylor Hennage and Alexandra Fellows

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: The Effects of Stress, ABA, and Auxin Treatments on the Growth of Sinapis Alba

Hormones such as abscisic acid (ABA) and auxin affect plants ability to deal with abiotic stress like water deficiently. ABA promotes shoot growth in watered plants but acts as a signal to reduce shoot growth in water deficient plants. Auxin supports cell and shoot elongation and creation of meristems in unstressed plants. To determine the role that these hormones play when plants transition into stressful conditions, white mustard (*Sinapis Alba*) plants were treated with auxin, ABA, and no hormone and then placed in water deficient, excess, or sufficient conditions. Plant height and weight was measured and qRT-PCR was used to examine the expression of the auxin response gene *INDOLE-3-ACETIC ACID (IAA1)* and the ABA response gene *RESPONSE-TO-DEHYDRATION 29A(RD29A)* as a means of ensuring that hormone treatments were effective. The daily mean heights and mean dry plant weights were compared between the nine treatment groups (control plants with control watering, control plants with increased water, control plants with decreased watering, ABA plants with control watering, ABA plants with increased water, ABA plants with decreased water, auxin plants with control watering, auxin plants with increased water and auxin plants with decreased watering). The ABA treated plants grew taller than both the auxin treated and control plants while the control plants grew taller than the auxin treated plants. The excess water plants grew rapidly then stopped growing and the water deficient plants showed increased growth initially followed by rapid decline in growth. Interactions between hormone treatment and water stress are being analyzed for a better understanding of the crosstalk between hormones and stress response in white mustard.

Student researcher(s): Mark Herring

Major: Economics and English

Research Mentor(s): Dr. Robert Rycroft

Project Title: Fresh or Rotten: Analyzing the Impact a Film's Rotten Tomatoes Score impacts its Box Office Revenue

Online reviews have become an important tool for consumers when searching for and deciding on products to buy. In the film market, the online review aggregator Rotten Tomatoes is now widely used, accepted and sometimes derided. This study asks the question to what extent does Rotten Tomatoes score affect a film's total U.S. Box Office Revenue? For every film that received wide release in the U.S. from 2014 to 2016 total box office revenue and Rotten Tomatoes score was collected. It was predicted that a higher Rotten Tomatoes score would influence a film's box office revenue positively. In addition, variables were included to account for each film's production budget, whether or not it was based on a pre-existing IP, whether it was a sequel or not, the season of a film's release and MPAA rating. (Empirical Analysis Forthcoming)

Student researcher(s): Jennifer Hill, Sophia Geron and Courtney Flowers

Major: various

Research Mentor(s): Martha Burtis

Project Title: Domain Fellows: Diving Deeper into Domain of One's Own

Over the past two semesters, these six students have participated in a new program at UMW called Domain Fellows. Each student Fellow spent this time exploring their own digital identity on Domain of One's Own and creating online projects on the platform that were intrinsically important to them. Projects included an online photography portfolio, a book review Web site, and a personal reflection blog.

In addition, the Fellows served as ambassadors for Domain of One's Own to the rest of campus. They hosted several Domain Day events, at which UMW students could sign up for their own domain, and they promoted

the project and their program at Club Carnival in the fall and spring. They also launched introduced "domainsosaurs" to UMW and launched a corresponding social media campaign.

Student researcher(s): Brittany Horne

Major: Art History

Research Mentor(s): Joseph Dreiss

Project Title: A Study of the Gender-Bias Surrounding Camille Claudel and Her Mental Illness

Camille Claudel, a female artist in the nineteenth century, struggled her entire life against internal and external gender-bias. This struggle affected not only her work and her life but also the memory of her. This study explores the factors that contributed to these biases and the toll these biases took on Claudel's life.

Student researcher(s): Kenyon Huber-Wilker

Major: International Affairs

Research Mentor(s): Dr. Kramer

Project Title: The Demise of Democracy?

Freedom of the press is a cornerstone of modern democracies. It is no surprise that long time illiberal states, such as China and Venezuela, and their leaders constantly seek to restrict this freedom and eliminate any voices of dissent. The more surprising trend, however, is the recent loss of press freedoms in once budding liberal democracies in Eastern Europe such as Hungary. Hungarian PM Viktor Orbán has used democratic institutions to censor the press and create what he has dubbed "an illiberal democracy". The Hungarian example is a cautionary tale of what could happen in Western countries when freedom of the press is curtailed, even when done so under the guise of democracy.

Student researcher(s): Asia Huff and Tekirah Britton

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: Antimicrobial Properties of *Aloe barbadensis* in response to growth in various wavelengths of light

Aloe barbadensis (*Aloe*) has potent anti-microbial properties. For over a century, it has been used as a topical treatment for skin burns, rashes, and cold sores. It has also been shown in scientific studies to inhibit the growth of both *Escherichia coli* (*E.coli*) and *Staphylococcus aureus* (*S.aureus*). We examined the effects of exposure under different wavelengths of light on the antimicrobial properties and general plant health of *Aloe*. Four *Aloe* plants were grown under 602 nm (white light – visible spectrum), 632 nm (red), or 452 nm (blue) light for 12 hours per day for 4 weeks. *Aloe* extracts and tissue for RNA isolation were taken from each plant once per week. Extracts were examined for antimicrobial potency through a zone of inhibition test on *S.aureus* and *E.coli*. Additionally, the gene expression levels of *OCTAKETIDE SYNTHASE* (*OKS*), a gene responsible for giving *Aloe* its antimicrobial properties, was examined via qRT-PCR to determine differences in expression between treatments. We predict that plants exposed to 452 nm wavelength would have the greatest *OKS* gene expression levels as well as the greatest zone of inhibition. We predict that the 632 nm wavelength will have the lowest levels of expression and smallest zone of inhibition because the 452 nm wavelength is more beneficial to the health of the plant.

Student researcher(s): Eric Hurwitz

Major: Biochemistry

Research Mentor(s): Dr. Randall Reif

Project Title: Investigating the Reusability of Affinity Coated Surfaces

The use of affinity-coated surfaces to immobilize cells is commonly applied to cellular separations and microfluidic devices. Most of the time, these devices are discarded after a single use and the time and cost of replacing them can rapidly add up. The goal of this study was to assess the reusability of affinity coated microfluidic devices previously used to capture Jurkat T-lymphocytes for real-time analysis. The affinity surface is created using a series of proteins that result in a layer of anti-CD71 which can bind and capture Jurkat cells. The reusability of these microdevices was assessed by measuring the binding efficiency (number of cells bound post-wash/number of cells bound pre-wash) after cleaning the devices with various reagents. Results indicate

that devices cleaned with ethanol after being used to capture cells can be recoated with the affinity surface proteins and maintain a high binding efficiency. The average binding efficiency for this device was $95.9\% \pm 4.3\%$ before cleaning and $95.5\% \pm 2.1\%$ after cleaning with ethanol and reapplication of the affinity surface. Devices cleaned with ethanol but not recoated with the affinity surface showed an initial binding efficiency of $96.2\% \pm 3.3\%$ that dropped to $24.8\% \pm 14.8\%$ after cleaning with ethanol. The results indicate that ethanol significantly reduces the affinity of the surface for the cells. Further investigation of other cleaning reagents, such as NaOH and PBS (as a control), will be discussed. Lastly, all experiments conducted with anti-CD71 will be repeated using anti-CD95 for cell capture. Overall, the results indicate that affinity surfaces can be cleaned and reused or potentially reused without cleaning if a decrease in binding efficiency is acceptable for the experiment. Adaptation of the methods presented here could save money and time for research involving affinity coated microfluidic devices in the future.

Student researcher(s): Emily Hutchins and Arshuman Sheikh

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: Characterizing Novel Lactose Operon Mutant in Escherichia coli through Beta Galactosidase Assay

UV light is a non-ionizing radiation that can cause mutations in DNA. In bacteria, along with other organisms, the UV light excites electrons to form covalent bonds between adjoining thymines within DNA. Induced mutagenesis of a -uvr-phr- strain of E.coli with mutations in DNA repair mechanisms, was accomplished by exposure to UV light for 10s, 30s, 60s, and 120s. Colonies were screened for mutations in the lactose operon through plating it on MacConkey Agar, in which mutations that prevent lactose metabolism appear clear rather than red. Lactose operon mutants were further characterized by β -galactosidase assay, a qualitative test to determine if the mutation is located within LacY or LacZ (two of the genes in the lactose operon). LacZ mutants lack a function enzyme to breakdown lactose (or its analog ONPG) while Lac Y mutants lack the ability to move lactose (or ONPG) across the membrane. The breakdown of a lactose analog, ONPG, results in the development of a yellow color allowing for the determination of the function of the LacZ gene and further addition of chloroform allows for the determination of the LacY gene product by replacing the function of the LacY product. UV mutagenized candidates can be screened for mutations with this assay and further confirmation will be conducted by repeating the assay in the presence of β -galactosidase (replacing the function of LacZ). Different wavelengths of UV lights have different mutagenesis potential and can be examined for efficiency of producing lactose operon mutations in further experiments. Additionally, mutation location can be further confirmed through complementation analysis by transforming mutants with plasmids containing function copies of either the LacY or LacZ genes.

Student researcher(s): Hannah Jabusch

Major: Business Administration and Accounting

Research Mentor(s): Smita Oxford

Project Title: Women in Accounting

This study is concerned with the rise of women in the accounting field. There is a lot of talk about the wage gap and other gender related issues in the workplace. Women in the accounting field are a niche to research within this hot topic. Many studies have found that there are very few women who are partners or CEOs of fortune 500 companies. I believe the same disparity is happening in accounting firms. Figuring out ways to combat the disproportion and informing other women about different methods to get to the top is my objective throughout this research project.

In this study, I asked a series of questions about different women's time at the company where they work, any gender discrepancies that they have experienced or witnessed, and how they succeeded in the accounting field. I expect their answers to the questions to align with the research I have already performed on the subject. I believe that even with their success in the workplace they still faced problems because they are women and the problems that they faced will also be encountered by the next generation of women in the accounting field.

I expect that their answers will be congruent with my hypothesis that more women are in top level jobs now than in the past, but if younger generations of women are not rising up to achieve principal positions then there will be an even bigger gap between the number of men and women in leading jobs. With the responses that

were given, I will be able to communicate that knowledge to the younger generation of women who will be entering into the workforce in the near future.

Student researcher(s): Deziree Jackson and Emily Rudich

Major: Sociology

Research Mentor(s): Tracy Citeroni

Project Title: The Hookup Culture and Gender

Hooking up has become engrained in popular culture in college. Hooking up can include anything from just kissing or sexual intercourse; there is no concrete definition for hooking up. We sought to better understand the power relations that exist within the hookup culture and if it equally benefits men and women the same. In order to understand this, we examined how college students participate and observe the hookup culture through interviews and reviewing literature on hookups. Given this data, we concluded that many individuals believe that men benefit more from hookups, there has never been a clear definition of a hookup to leave it open for people to interpret, and regret among sexes seems to be disproportionate.

Student researcher(s): Mariah Jensen-Wachspress

Major: Biology

Research Mentor(s): R Parrish Waters

Project Title: Toxicity of Iron-Oxide nanoparticles in an in vivo setting

Previously synthesized superparamagnetic iron-oxide nanoparticles (SPIONs) are a potential treatment for the aggressive brain cancer, mesenchymal glioblastoma multiforme. To be effective in an in vivo environment, SPIONs need to be coated with a heterobifunctional poly(ethylene) glycol polymer as to not illicit an unwanted immunological response. The significance of this research study is to map how SPIONs crosslinked with the polymer clears from a model organism, and to assess the potential toxicity of the treatment. Briefly, nanoparticles modified with the polymer crosslinked to a fluorescent tag (green fluorescent protein: GFP) was injected into the left gastrocnemius muscle of a mouse model organism. Urine was collected for 28 days and assessed via fluorescence spectroscopy. The resulting data showed that the majority of the SPION-GFP complex was excreted in the first four days, but a small amount of SPIONs remained in the urine even after the 28 day urine collection period. Because of this, the organs of the model organism are being assessed for any mass SPION accumulation. It is imperative that this data be collected to ensure the viability of this method for treating an otherwise terminal brain cancer.

Student researcher(s): Cheyenne Johnson

Major: Historic Preservation

Research Mentor(s): Dr. Lauren K. McMillan

Project Title: "Drop It Like It's Hot": Understanding the Context of Arms and Armaments of the Union Winter Encampments at Sherwood Forest Plantation, Stafford County, VA (44ST615)

Sherwood Forest Plantation is located in Stafford County, VA along the outskirts of the downtown Fredericksburg region. During the summers from 2015-2017 a section of the plantation, dubbed the Duplex Area was heavily excavated by the University of Mary Washington Field School. The Duplex Area correlates to the occupation of the site by Union troops and officers, who encamped at Sherwood Forest during the winter of 1862-1863. The overwhelming majority of Civil War related artifacts were recovered in the Duplex Area. This paper presents the results of an analysis of the arms related artifacts found in order to understand the number and variety of weapons represented in the site. This research seeks to place them within a contextual narrative of the Union Army and Sherwood Forest. The paper will also discuss similarities and differences between nearby union encampments during this time frame.

Student researcher(s): Lindsey Jones

Major: Chemistry

Research Mentor(s): Davis Oldham

Project Title: Synthesis of piperidinol-based inhibitors of KasA: A novel treatment for Mycobacterium tuberculosis infection

Tuberculosis is the leading cause of death from infectious disease in the world. Although tuberculosis drugs exist, the rise of multidrug-resistant and extensively drug-resistant tuberculosis has created a need for new research. Identifying novel, effective drugs for treatment of tuberculosis could reduce the cost of care and treatment time, saving millions of lives. The enzyme KasA, which synthesizes part of the bacterial cell wall, has been identified as an attractive drug target. A virtual screen using KasA discovered a compound, 4-(4-bromophenyl)-1-pyrenemethyl-4-piperidinol (1), which inhibited bacterial growth. In this research, derivatives of compound 1 were created for future testing with live bacteria. A lithium-halogen exchange reaction was used to attempt to create a piperidinone-based derivative with varied substituents, but the method yields were low and difficult to purify. A Grignard process was also attempted with similar results. Alkylation of 4-bromophenyl-4-piperidinol and 4-chlorophenyl-4-piperidinol was successful in creating six derivatives with phenylmethyl, naphthylmethyl, and pyrenemethyl substituents in yields from 51-85%. Additional derivatives can be made with changes in the aryl group of the piperidinol and N-alkyl groups. In future research, these derivatives can be tested in vitro to determine suitability for future tuberculosis drug research.

Student researcher(s): Sarah Jordan, Abby Friedman and Allison Burgess

Major: Environmental Science

Research Mentor(s): Dr. Melanie Szulczewski

Project Title: Survey of Legacy and Other Contaminants in Soils and Waters of Central Virginia Golf Courses and Public Places

Historic use of lead and arsenic and other heavy metals have resulted in widespread legacy contamination of the environment, especially in soils and, in certain areas, waters. In addition, concerns continue to develop regarding the presence of organic chemicals in the environment, such as pesticides and emerging contaminants such as pharmaceutical drugs and personal care products (PPCPs). The distribution, effects, and risks of these emerging contaminants are not yet well understood, although multiple recent studies have analyzed their presence in agricultural fields from manure or sewage sludge applications. Both of these types of contaminants may be adversely affecting urban and suburban areas. In this study, the occurrence of several metals and organic chemicals were investigated in soils and surface waters in and around Fredericksburg, Virginia, taken from three land use classes: public buildings, public parks, and area golf courses. The soil and water samples and extracts were analyzed by ICP-AES and HPLC spectroscopy. Preliminary results will show what areas and sources may be of concern to ecological and human health in this region.

Student researcher(s): Caitlin Kelly

Major: Art History

Research Mentor(s): Dr. Joseph Dreiss

Project Title: Intersectionality and the Academic Discourse of Frida Kahlo

Frida Kahlo is a ubiquitous cultural icon who is frequently steeped in controversy and notoriety. As a female, bisexual, Communist minority, she is frequently fetishized and stereotyped in a way that affects academic and popular interpretations. My independent study seeks to apply the lens of intersectionality theory to her historiography in Art History in order to dissect how exclusionary perceptions of her identity have affected the academic understanding of her artwork, and the effect of this aforementioned understanding on the "image" of Frida Kahlo.

Student researcher(s): Corinne Kuge

Major: Sociology

Research Mentor(s): Debra Schleef

Project Title: Evaluating Gender: Gender Bias in UMW's Student Feedback on Faculty Teaching

In the world of instructor evaluations, research has been done with mixed results seeing a presence of gendered stereotypes. Differences in gender are not normally seen in quantitative analyses, but stand out in qualitative analyses. If gender stereotypes play a part in the way that students see professors and write their evaluations, than theoretically, there should be differences in evaluations that are for men and women. To find the difference, 2016-2017 UMW faculty evaluations were used (15,915) in a quantitative assessment, and 202 comment sections of evaluations for a qualitative analysis. The quantitative portion of the UMW evaluation consists of 12 scaled questions (1 - strongly disagree, 5 - strongly agree). Math heavy courses, rank of professor,

level of course were the controls. Most t-tests proved women to rank higher on the t-test scores, except for men instructors of math courses showed to class on time more than women, returned graded materials in reasonable time and when tenured men returned materials in reasonable time. The 202 comments were tested to see if professors were described as having being organized, knowledgeable, clarity, emotional work, and excitement. Most of the comment sections rated professors highly, and students talked about how helpful an instructor is the most. Contrary to the quantitative, men had about the same positive comments as women, except for in helpfulness. Surprisingly, men were commented on more times about excitedness. Women had more comments about their organization, but the same amount of positive comments as men had in the category. Overall, it was expected that women were to have higher scores, since the higher population of instructors that are women and the literature on the subject. With few significant exceptions, men had scored higher on more organizational aspects of courses when they were instructors teaching math heavy courses.

Student researcher(s): Skyler Larsen

Major: Biology

Research Mentor(s): Dr. Alan Griffith

Project Title: Biodiversity between Native and Non-Native Species Maintained at UMW

In order to maintain the environment in these times of modern urbanization, it is necessary to maintain a healthy urban forest as loss of natural forests causes more carbon to be released into the air, accelerating global warming and reducing biodiversity through habitat loss. Urban forests are usually defined as the collection of trees that grow in an urban environment, often planted by humans. Urban forests provide benefits to wildlife by promoting biological interactions like providing a food or nest source. In addition, urban forests are an esthetic resource for the neighborhoods in which they grow. Urban forest maintenance is complicated by additions of foreign trees, which may or may not fulfill the biological roles necessary for local species to thrive. To maintain the valuable urban forest at UMW, we must first know what it contains. This information was obtained by working with the Heritage Tree Project, a UMW project devoted to identifying, measuring, and creating a database of historical trees specifically, and all trees on campus in general. Counts of individuals and measures of biodiversity were obtained from this data. In this project, I took a count of the maintained trees on campus from the Heritage Tree Project, while also mapping the trees using ArcGIS. The two most common types of trees on campus were flowering dogwood (*Cornus florida*, 78) and eastern red cedar (*Juniperus virginiana*, 194). I will also present species counts of native and non-native species on UMW's campus. Biodiversity data is helpful as it allows landscape managers to plant trees that would be beneficial to other local wildlife, or at least find species that perform similar functions. In addition, it can be used in conjunction with data from the woodlots on campus to determine if these non-natives are spreading, and how they interact with native species.

Student researcher(s): Natalie LeMay

Major: Political Science

Research Mentor(s): Dr. Emile Lester & Dr. Mary Beth Mathews

Project Title: The Implementation of Religious Literacy Courses in American Public Schools

Religious literacy is defined as a basic level of knowledge and understanding of major world religions and beliefs. Most of the literature on the subject agrees that students benefit from exposure to other religions, both civically and mentally. The Religious Freedom Institute of the Newseum has created a curriculum in order to bring non-partisan religious education back into public schools with the goal of increasing tolerance for communities of different faiths. The curriculum, titled the Georgia 3Rs project, is being piloted in Georgia, a predominantly Christian evangelical state. In my thesis, I study the effectiveness of prior examples of religious literacy courses and offer suggestions on how to present current and future programs to better gain public support and approval.

Student researcher(s): Marshall LeMert

Major: Classics

Research Mentor(s): Joseph Romero

Project Title: The Tomb of Alexander: It's Disappearance, Final Location, and its meaning to the field of Archaeology

The Tomb of Alexander the Great has endured throughout the years as a historical and archaeological mystery. Many different types of scholars have put forth many different conclusions as to where the body has been deposited and how it was deposited there. The lack of effective primary evidence makes a study of the subject difficult, and will be discussed. Using what evidence has been found or produced, including but not limited to excavation reports, accounts of ancient historians, and architectural analyses of Ancient Alexandria, the movements of the corpse of Alexander during the Wars of the Diadochoi will be reconstructed. The Ancient Palace of Alexandria wherein the mausoleum said to have contained his body will be examined, and an alternative conclusion as to the whereabouts of this mausoleum will be presented based on the findings from the examination of the above primary evidence. A conclusion that the Serapeum of Alexandria being the only remaining portal into the palace will be proven using the information presented.

Student researcher(s): Kirsten E. Littlefield

Major: Biology

Research Mentor(s): Dr. Lynn O. Lewis, Dr. Rosemary Barra and Dr. Parrish Waters

Project Title: The Effect of Treatment with Ultra-Dilute Phytolacca decandra on the Cellular Viability of Mouse Mammary Tumor Virus Infected Cells

Mouse mammary tumor virus (MMTV) is a milk-transmitted retrovirus known to induce breast cancer in mice. Despite the lack of treatment options for human breast cancer, a series of homeopathic protocols originating from the Prasanta Banerji Homeopathic Research Foundation have produced promising results in the treatment of severe diseases including breast cancer. Phytolacca decandra, also known as pokeweed, is a poisonous plant prescribed by these protocols as a treatment for breast cancer. Due to the widespread use of mice as animal analogs for humans, various concentrations (none, 30C, 200C, 1000C) of Phytolacca decandra will be applied to two different mouse cell lines (normal mouse mammary epithelial cells and MMTV infected mouse mammary epithelial cells) for 0, 24 and 72 hours. Following this treatment, an MTT assay will be carried out in order to quantify Phytolacca decandra's effect on cellular viability. This experiment will be replicated three times in order to demonstrate reproducibility. By conducting this research, I intend to define Phytolacca decandra's potential as a treatment for virally induced breast cancer.

Student researcher(s): Paige LoBue and Allison Sellers

Major: Sociology

Research Mentor(s): Dr. Tracy Citeroni

Project Title: The Physical and Emotional Scars of Breast Cancer

This research has been a small case study with exploratory intent to hear about women's experiences with breast cancer. We believe this research is sociologically relevant and an important topic to discuss if we ever hope to break the stigma that breast cancer is an "easier" or "better" cancer to have. The physical and emotional scars left behind from a breast-altering surgery can cause women with breast cancer to struggle with their femininity and sexuality, and raise questions of identity and normalcy. Through the interviews, we have gained a deeper understanding how their diagnosis has changed (or not changed) their outlook on life, perceptions of care, self-esteem and relationships with romantic partners.

Student researcher(s): Laura Mangano and Makenzie Katzer

Major: Biology

Research Mentor(s): Dr. Dianne Baker

Project Title: Effect of Benzo[a]pyrene on Expression of Alzheimer's Disease Marker Genes in Zebrafish (Danio rerio)

Previous epidemiological studies report that environmental pollutant exposure is linked to the development of neurodegenerative diseases such as Alzheimer's disease (AD). Benzo[a]pyrene (BaP), a high molecular weight polycyclic aromatic hydrocarbon, is a developmental toxicant ubiquitously found in the environment. To date, few studies have examined the role of BaP on the development of neurodegenerative disease. This study aimed to test the hypothesis that benzo[a]pyrene exposure causes Alzheimer's disease-like gene expression in model organisms. To test this hypothesis, we measured the effect of early BaP exposure on the expression of five genes that encode for AD related proteins in the model organism; *Danio rerio* (zebrafish). We predicted one or more of these genes would be dysregulated in the treated fish. We exposed replicate groups of 50 zebrafish

embryos to either 5 or 50 nM BaP or to an equivalent volume (504 μ l/L) of the solvent DMSO from 0.5 to 96 hours post fertilization. Following exposure, embryos were reared in normal conditions until maturity (8 months). Brains were dissected from 46 males and stored in TriReagent. Total RNA was isolated from each brain and cDNA was synthesized from RNA. This cDNA was then used as the template in quantitative PCR to measure expression of five AD-related genes: Presenilin 1 (Psen1), amyloid precursor protein a and b (appa, appb), and microtubule associated protein tau a and b (mapta, maptb). We found that in fish exposed to BaP as embryos appb expression was significantly upregulated relative to controls (2.44 \pm 0.49-fold increase after 5nM BaP exposure, and 2.05 \pm 1.13-fold increase after 50nM exposure; ANOVA, $p=0.023$), but expression of other genes was unchanged. These findings suggest that embryonic exposure to BaP can cause long-term effects on the genetic factors of neurodegenerative diseases, and provide clues that BaP may constitute an important environmental risk factor for AD in humans.

Student researcher(s): Lexy Maratellos

Major: Sociology

Research Mentor(s): Dr. Leslie Martin and Dr. Tracy Citeroni

Project Title: Attitudes towards Renting/Renters in Fredericksburg

The goal of my research is to address attitudes around rental housing in Fredericksburg in collaboration with the Fredericksburg City Planning Department. The study will explore the opinions of interested community members on the issue of rental housing. The nature of my research is exploratory and non-positivist. I will conduct approximately 10 in depth interviews with willing and interested homeowners and other members of the Fredericksburg community about their experiences with renting, and renters in their community. This study is a continuation from the fall semester, which was more focused on the attitudes of members of the Fredericksburg City Council and City Planning Department. From that research, I found possible underlying biases that I wanted to further explore. I am seeking to determine what factors guide perceptions of renting and renters in Fredericksburg City, the extent and makeup of any possible stigma around renting and renters, and what effects the possible stigma may have on general perceptions and decisions important to the experience of renting in Fredericksburg City.

Student researcher(s): Kimberly McFarland

Major: Biology

Research Mentor(s): Dr. Randall Reif

Project Title: Optimization of RNA Purification for RNA Aptamer Selection

Aptamers are short, single-stranded DNA or RNA molecules that exhibit binding with high specificity and affinity to a chosen target due to their structural conformation in a manner similar to antibodies. They are generated through a process called Systematic Evolution of Ligands by Exponential Enrichment (SELEX), which isolates the molecules 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 preceding SELEX, including RNA transcription, reverse transcription, and gel purification, were investigated. Gel purification of RNA was tested using different concentrations of polyacrylamide (8%, 10%, 12%) in the gels. RNA yield after purification was lower than expected, so a larger DNA sequence was used to determine if higher yield can be obtained for longer RNA strands. Additionally, poor separation of the polyacrylamide gel was found to be a recurrent problem despite making new buffers and reagents, and this likely contributes to poor yield. Preliminary results show improvement with the addition of TBE to the urea and acrylamide solution. Future experiments will attempt to improve yield of RNA purification, followed by attempting the full SELEX process with a standard protein (BSA). Funding for this project came from the University of Mary Washington Undergraduate Research Fund and the Chi Beta Phi Meadors Research Grant.

Student researcher(s): Julie Meade and Emily Henry

Major: Chemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Now You See Me Now You Don't: A Kinetics Experiment on Disappearing Ink

Disappearing ink, a famous chemical reaction used in forensics and Hollywood movies, is the result of a redox reaction between potassium permanganate and oxalic acid. In order to better understand the kinetics of this

reaction, we propose a simple and cost effective kinetics experiment using UV-vis spectroscopy. This study determines the molar absorptivity constant of potassium permanganate using the Beer-Lambert Law and compares it to the literature value of 2455 M⁻¹cm⁻¹. Using varying concentrations of potassium permanganate and oxalic acid, the rate of the reaction was found. Using the method of initial rates, the order with respect to potassium permanganate and oxalic acid was also calculated and the rate constant determined graphically using the slope of a first order reaction plot. The activation energy was investigated from the change in the rate constant as the temperature of the reactants is increased from 25°C to 65°C. Overall, this investigation aims to improve the understanding of the kinetics of the “disappearing ink” reaction.

Student researcher(s): Liam Missios

Major: Economics

Research Mentor(s): Dr. Don Lee

Project Title: The Impact of Foreign Direct Investment on the Composition of the Labor Force

This study examines the impact of foreign direct investment (FDI) on female employment. I use a fixed-effects model with a panel of 70 countries to estimate the impact of FDI on female employment at the sector level. I then disaggregate the data and estimate the effect of FDI on female employment in both developing and developed countries. This is based on the assumption that motivation for FDI differs based on the receiving country's stage of development. I find that FDI inflows cause a slight increase in female employment in the service sector of both developing and developed countries. I also find evidence that FDI inflows have a slightly positive impact on female employment in the industrial sector of developed countries.

Student researcher(s): Liam Missios

Major: Economics

Research Mentor(s): Dr. Robert Rycroft

Project Title: The Impact of "Ban the Box" Legislation on the Crime Rate

Since the late 1990s, and particularly since 2010, US states have begun passing “ban the box” legislation. These laws prohibit employers from asking prospective employees to indicate whether they have a criminal record on job applications. Proponents of this type of legislation claim that it will prevent convicted felons from having difficulty finding employment long after their conviction. In my paper I estimate to what extent the adoption of “ban the box” legislation impacts the overall crime rate. If convicted felons are better able to find employment, they will be less likely to be repeat offenders. The marginal benefit of committing a crime is generally less for an employed person than for an unemployed person. To test this hypothesis, I use a differences-in-differences regression model. In 2010, New Mexico adopted a “ban the box” law, but neighboring Arizona did not pass similar legislation until 2017. I use county- and city-level data regarding crime rates from before and after 2010 (but before 2017) from both New Mexico and Arizona to estimate the impact of “ban the box” legislation on crime rates.

Student researcher(s): Cristina Montemorano and MacKenzie Norris

Major: Anthropology URES 197

Research Mentor(s): Dr. Eric Gable

Project Title: An Auto-Ethnography of a Pilot Study for An Intel Analysis Software Program

Hundreds of analysts work within U.S government intelligence agencies such as the CIA to collectively write reports that are then used by policymakers. The quality of such reports depends on the kinds of the information available to intel analysts, their personalized experience in analyzing similar material in the past, and their ability to evaluate this information without bias in an inevitably incomplete informational environment inevitably. According to IARPA, the Office of the Director of National Intelligence, the intelligence community needs to "take real risks, solve hard problems, and invest in high-risk/high-payoff research that has the potential to provide our nation with an overwhelming intelligence advantage." Currently IARPA is funding research on computer programs that act as aids to making judgements and evaluating information. These programs are being studied to ascertain whether they can help to improve quality of reasoning as well have quality of delivery in such reports. University of Mary Washington students are a part of this pilot study, along with other university students across the country, testing the utility of software programs' argumentation style, reasoning, and mechanized determination and resolution of sample intelligence questions. Examining their personal

experiences in learning to learn the software the students have been engaged in an auto-ethnography in order to provide subjective insights into the efficacy of managing computer-driven data analysis, particularly when human intuition becomes an asset and when mechanized structure fails. They also delve into the language inherent to the intelligence community and methods of communication and collaboration between individuals on a largely digital platform.

Student researcher(s): Sean Morris

Major: Biochemistry

Research Mentor(s): Dr. Randall Reif

Project Title: Timing Cellular Suicide: Elucidation of the Temporal Dynamics of Apoptosis

Apoptosis, a process in which a cell systematically triggers its own death through a family of enzymes called caspases, is widely utilized in the body. Malfunction of apoptosis may lead to serious health problems including cancer. While the stages of apoptosis are known, the timing 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 rhodamine 110 based fluorescence caspase probes, 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 initiated from 4.3 to 5.3 hours after induction, lasting 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 AMC based dye is being investigated. Knowledge of the timing of caspase activation could be helpful when designing therapies that affect apoptosis.

Student researcher(s): Joshua Morris and Melissa Pampel

Major: Chemistry

Research Mentor(s): Dr. Randall Reif

Project Title: Determination of the Concentration of Riboflavin in Milk Sample by Fluorescence

Vitamin B2, also known as riboflavin, is common in eggs, milk, meat, and almonds, and when in contact with light it undergoes irradiation decomposition and produces lumichrome and lumiflavin. In this experiment the analysis of riboflavin in a milk sample will be performed through fluorescence. Fluorescence is a technique that can be used to determine concentration of riboflavin through the proportionality with the intensity of the emission. Riboflavin is required for cell respiration and may help prevent migraines. Milk is one of the highest dietary contributors of total riboflavin for men and women in the U.S. The extraction of riboflavin is difficult because milk contains fats and proteins that would interfere with the fluorometer scans and is naturally cloudy. The use of reconstituted nonfat dry milk samples will be used to help alleviate some of these issues. The UV-Vis Spectrometer will be used to take an absorbance spectrum from mid wavelength range to find the maximum wavelength to approximate the best excitation wavelength. Stock solutions of riboflavin will be prepared and analyzed by the fluorometer to obtain an excitation and emission spectrum. The signal at a certain concentration will be used to create a standard curve that will be linear and within the LOQ and LOD. The concentration of riboflavin in the milk sample can be determined by using the signal produced and the calibration curve. The unknown concentration of the milk sample should fall into the calibration curve range.

Student researcher(s): Shannen Nowakowski

Major: French

Research Mentor(s): Dr. Koos

Project Title: Women's Fashion Under the Occupation

My research documents fashion during the German Occupation period of France. Due to wartime effort rations, materials for fashion were limited. With fewer resources to create clothing, magazines like Marie Claire promoted the recycling and repurposing of old clothes. My research presents typical outfits for women during the period as well as information about life under the occupation.

Student researcher(s): Lizzie O'Meara

Major: Historic Preservation

Research Mentor(s): Dr. Lauren McMillan

Project Title: Wine Bottle Seals at Nomini Plantation (44WM12)

Nomini Plantation (44WM12), located in Westmoreland County, Virginia, was just one component of a 17th-century community known as Appamatucks. Despite the difficulties and obstacles faced by the people of the early colonial Chesapeake, this community flourished. The focus of this paper is on the late 17th-century occupation of Frances Gerrard and her fifth husband, William Hardidge II. Using wine bottle seals recovered from Nomini Plantation, I will explore how entertaining and alcohol consumption was used to maintain social status and community connections. Several of these seals were marked with Hardidge's initials, including one dated to 1686. This paper also explores early Chesapeake society and the social and community connections revealed through bottle seals and how these objects were used to physically exemplify social rank, illustrating one's merit on the socio-cultural stage during this transitional time in the region.

Student researcher(s): Alexandra Piercy

Major: Biology

Research Mentor(s): Dr. R Parrish Waters

Project Title: The effect of cognitive stimulation on senescent cognitive decline.

While the problems associated with pathological cognitive decline (such as Alzheimer's Disease) are well recognized, normal cognitive deficits associated with senescence present a less understood problem. This study aims to determine whether daily cognitive stimulation can attenuate the normal cognitive decline that is associated with senescence using a mouse model. We housed mice in two environments; the control mice lived in a standard mouse cage, while our experiment group had to navigate a maze to obtain food. We constructed a holeboard test to determine working and spatial memory in our mice both before and after being housed in their respective environments for 21 days. We will also assess neurophysiological markers of cognition in the hippocampus, a brain area that is implicated in learning as well as cognitive decline.

Student researcher(s): Mackenzie Quick and Curtis Pilcher

Major: Geology (Mackenzie), Environmental Geology (Curtis)

Research Mentor(s): Dr. Chuck Whipkey and Mr. Woodie Walker of Friends of the Rappahannock

Project Title: Geology of Hunter's and Ficklen Islands

The fall line of Virginia is a transition zone between the Coastal Plain and the Piedmont regions. The transition between these two regions creates a unique geology in Fredericksburg, Virginia and all other cities that are along this fall line. Specifically, Hunter's Island and Ficklen Island, two small islands on the Rappahannock River, exemplify typical fall line geological features in Fredericksburg. To identify the geological trends of Hunter's and Ficklen islands, several trips were made to measure strike and dip orientation, and identify rock types found on the islands. The rocks on the islands are a mixture of metamorphic rocks, such as plagioclase-rich Gneiss, and garnet-bearing intrusive igneous rocks. The strike and dip orientations of the islands show a general southeast azimuthal value and match the historic deformation of rocks in the area. This field research, along with research on previous studies in the area, provide a picture of the historical geology of Fredericksburg, and of these two small islands along the Rappahannock River fall line.

Student researcher(s): Tirzah Rao and Jasmine Pope

Major: Sociology and Biology (Rao), and Sociology (Pope)

Research Mentor(s): Dr. Tracy Citeroni

Project Title: Starving for Food Justice

Millions of pounds of food every year end up in landfills which ultimately has a huge environmental impact as it contributes to the release of methane gas - an even more powerful greenhouse gas than carbon dioxide. However, not much is being done on the local level to understand how food waste is being generated, and more importantly, how to reduce unnecessary food waste at the local level. In order to best understand what type of food waste is being generated in our community, how it is produced, and what restaurants in our area are doing to help eliminate food waste, we interviewed restaurant owners and chefs who told us how they handle food waste in their establishments. Initially we hypothesized that the food waste we would encounter

would create a surplus of food which we could donate to those in need through a food recovery program. However, after conducting our initial interviews we discovered that the type of food waste most prevalent in our community is food scraps and would be better dealt with by composting which also has a whole host of beneficial environmental impacts. Aside from reducing the emission of methane which is produced while transporting the waste to landfills, composting helps reduce the need for chemical fertilizers, and helps eliminate 99.6% of VOC (volatile organic chemicals) in the air. Ultimately we concluded that although not much is being done to start a food recovery program to help deal with the food waste in our local community, restaurants are willing to participate in one in the future. A few restaurants would even be interested in working with us to start a program to help reduce the amount of waste that ends up in landfills and we hope our research can be a starting point for such a program.

Student researcher(s): Andrew Rasure and Shannon Brindle

Major: Physics

Research Mentor(s): Dr. Nguyen Hai

Project Title: Exploration of Parameters for Upconverting Nanoparticles

This is an ongoing research project to compare the performance of wavelengths around 980 nm and 915 nm as they excite NaYF₄ nanoparticles and the effects that this will have on biological tissue such as overheating due to water absorption of said wavelengths. The experimental setup of this project references many previous experiments on up-converting nanoparticles using laser beams of 980 nm wavelength. The advantages of using a 915 nm laser includes lower water absorption and deeper tissue penetration, which is ideal for medical applications. It was recognized that nanoparticles have the potential to facilitate research of biological processes at the molecular level. The benefits of using nanoparticles include orthogonal bioimaging and photo-modulation which removes the potential tissue damage that results from radiation while optimizing penetration. The tracking of drugs through the blood-brain barrier when receptors are present for the nanoparticles is also one of the many applications of studying UCNPs.

Student researcher(s): Grace Rice

Major: Sociology

Research Mentor(s): Dr. Tracy Citeroni

Project Title: Test Tube Babies Talk Back

My research focuses on the experiences of sperm donor conceived young adults. I seek to understand how growing up donor conceived impacted their lives and shaped who they are today. Additionally, a goal of my research is to give donor conceived individuals a platform to speak about the sperm bank industry and let their stories be told. A key finding in my research is that donor conceived individuals want to be seen as normal, and that they do not like being seen as "alien test tube babies." A major point of my research is how the individual's childhood was affected by being donor conceived, especially in regards to how honest the parents were with the individual. My research is a small exploratory project, where I interviewed eight donor conceived individuals. My research covers a wide array of sociological themes. Everything from what it means to be family to the complex issues that arise from being born into a highly unregulated medical industry is discussed in my research.

Student researcher(s): Abigail Richardson and Tianni Sicam

Major: Sociology

Research Mentor(s): Dr. Leslie Martin

Project Title: Engagement with the Central Rappahannock Regional Libraries

This research was conducted in response to the Central Rappahannock Regional Library's (CRRL) concern that people between the ages of 20-30 were not utilizing the library and its vast resources. We began our research by visiting a Central Rappahannock Regional Library location to see the actual landscape of the library, what they offered, and overall observe what this specific library branch offered to people ages 20-30. In order to verify if the libraries concern was even a valid one, we surveyed local community members, inquiring about their use of the local libraries.

Our survey questions consisted of: How old are you? Do you have kids? Have you ever heard of the CRRL? Do you go to the CRRL, yes or no? If yes, what resources do you utilize at the library?

These surveys were conducted in Central Park, downtown Fredericksburg, and on social media sites such as Facebook and certain UMW community pages.

Once the surveys had all been conducted, we organized our results into age categories and compiled attendance rates for each age group. This analysis verified that the CRRL, in fact, did have a valid concern. They were largely missing the attendance of people in the 20-30 age range. We continued our study to determine why exactly this was the case? Once pinpointing some of the contributing causes of reduced millennial attendance at the library, we were better able to understand what improvements and additions needed to be made to the library and its offerings in order to see an increase in attendance rates of people ages 20-30.

Student researcher(s): Grace Rihl and Andrew Franklin

Major: Geology (Rihl), Chemistry (Franklin)

Research Mentor(s): Dr. Ben Kisila and Dr. Leanna Giancarlo

Project Title: Sedimentation rate and trace metal input history in Lake Manassas and the Occoquan Reservoir, Virginia, USA

Contemporary increases in anthropogenic land use and cover alterations in fluvial basins has led to significant increases in sedimentation in lakes and reservoirs worldwide. The sediment fluxes and associated contaminant inputs, i.e. nutrients, trace metals, and organic matter, have led to significant environmental problems such as loss of capacity and progressive decline in water quality. This study analyzes the environmental evolution of two reservoirs within the Occoquan basin, a sub-watershed of the Chesapeake Bay. Lake Manassas is located in the upper reaches of the watershed, characterized by mixed land use and cover of mostly forest, residential, and agriculture, whereas Occoquan Reservoir is located in the urbanized lower reach of the basin in the heavily populated suburban zone south of Washington, D.C. Three sediment cores from each lake were used in ²¹⁰Pb based sediment accumulation rate and organic matter content analysis. Analysis of the distributions of Al, Fe, Cd, As, Se, Pb, Cu, and Zn in the sediments was also completed on the sediment cores and on grab samples from the two lakes. Hydroacoustic geophysical survey and watershed GIS-based models were also used to further evaluate sediment fluxes and basin soil erosion rates.

The preliminary results of ²¹⁰Pb based sedimentation rate estimates ranges from 0.126 g cm⁻² yr⁻¹ in the upper reaches to 0.099 g cm⁻²yr⁻¹ in the lower reaches of Occoquan Reservoir, with temporal values showing progressive modern increases from 0.066 to 0.154 g cm⁻²yr⁻¹. Lake Manassas, located in the upper basin, had comparable average sedimentation rates of 0.130 g cm⁻² yr⁻¹ and a temporal range of 0.071 to 0.157 g cm⁻² yr⁻¹. Further analysis will provide insight into the role of urbanization-related increase in impervious surfaces in exacerbating modern sediment production via degradation of lower reaches floodplains, as well as contribution from upstream mixed land use sediment source zones. Correlations between historical land use, and temporal and spatial trace metals distribution will also help evaluate the history of trace metals loading and probable sources in the basin.

Student researcher(s): Isobel Rissing

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: SEUSS and ERD10 genes importance in ovule production in stressful environments in *Arabidopsis thaliana*

Arabidopsis thaliana is the model plant, with a sequenced genome and many genetic tools for manipulating its genes. Because of this it is a good system to better understand the crosstalk between ovule (seed) production and environmental sensing in plants. One critical gene responsible for flower development and ovule formation is SEUSS (SEU). As a transcription factor, SEU regulates the expression of other genes and when mutated causes reductions in ovule number and malformed flowers. Previous genetic studies have identified genes that function downstream of SEU and are potential targets of its gene regulation. Once such candidate is EARLY RESPONSIVE TO DEHYDRATION 10 (ERD10) which has been shown to be up-regulated in the flowers of *seu* mutants. ERD10 is a chaperone protein that protects the plant from a variety of stresses, including drought and salinity, but has not been shown to have any role in flower development or ovule formation.

Single mutants of *seu* and *erd10* as well as the *seu erd10* double mutant were examined for flower disruptions and ovule inhibition after genetic analysis to confirm each genotype. In situ hybridization will be used to determine where ERD10 is being expressed in flower tissue through the use of a probe designed to be

complementary to the ERD10 mRNA. This probe will bind to the mRNA and deposit a colored precipitate that will allow for visualization of the mRNA location both spatially and temporally. We expect to see little ERD10 expression in the erd10 mutant, but the location and timing of ERD10 expression in seu and seu erd10 plants will provide indications of how these genes function to integrate the developmental programming for seed production with that of the response to environmental stress.

Student researcher(s): Beja Julia Romero

Major: Classics and Art History

Research Mentor(s): Dr. Suzie Kim

Project Title: "The King Jade": A Study of a Qing Dynasty Masterpiece

This Presentation will examine what is broadly considered one of the greatest Jade carvings of the Qing Dynasty Sage King Yu Controlling the Flood, also known as The King Jade. This Presentation will answer why this jade sculpture was carved during this time, for this patron (the Qianlong emperor). As such, it will contain a synthesis of the information about the jades of this period, so as to provide appropriate context for the jade's creation, and to give an analysis of the subjects of the piece. To accomplish this, this presentation will have three major subtopics that will help explain the creation of this jade carving: the history of the Qing Dynasty, so as to provide political and social context for the creation of the piece, background information on the production of Jades in the Qing Dynasty, and usage of such works in the daily lives of the Chinese at this time. The conclusion I have drawn from this is that this piece was made to aggrandize the Qianlong emperor by drawing parallels between him and a previous mythologized emperor, to bring nature into the emperor's dwelling place, and to show the Qianlong emperor's power and excellence in connoisseurship.

Student researcher(s): Beja Julia Romero

Major: Classics and Art History

Research Mentor(s): Professor Pitts and Professor Houghtalin

Project Title: The Gender-Fluid Athena

Athena, within the context of the Odyssey, is gender fluid because her actions defy the gender roles which defined what it was to be that specific gender. She was a warrior when women were supposed to stay home, she was a virgin when women were only supposed to be child-bearers, but, most importantly, she spoke out in public. Her attributes made her able to reflect being multiple genders while being neither at the same. She accomplished this in how, where, and why she spoke—as well as in the forms that she chose to take when she was doing so. Ultimately, while she held aspects of both genders, she cannot be defined by either—living as a unique blend of the two and using them to her advantage whenever possible, but never letting either fully define her.

Student researcher(s): Emily Rothstein

Major: International Affairs, Sociology

Research Mentor(s): Dr. Surupa Gupta and Dr. Tracy Citeroni

Project Title: Democracy in Nepal: a case study on democratic transition and federalism

The academic problem that I studied is the process through which a state becomes a democracy using Nepal as a case study. I specifically looked at how the leftist forces helped lead the country to democracy; put another way, how did the Maoist insurgency act as a tipping point for the promulgation of the 2015 constitution and the resulting federal system? Through interviews with academics and community engagement organizations I analyzed the context and effects of the social and political climate and change.

In the past twenty years Nepal has experienced a large amount of change in the structure of the government. The country is currently in its second attempt at a democracy after moving through a ten year civil war led by the Maoists and focused in the countryside. The democratic transition of Nepal is a result of external actors, the Maoists, identity groups, and other national factors, and it provides a case study to further examine the process through which a country establishes a federal system, applies a constitution, and moves towards stability and development.

Student researcher(s): Brandon Rozek, Stefano Coronado, Ethan Ramirez

Major: Physics and Computer Science

Research Mentor(s): Dr. Maia Magrakvelidze

Project Title: Beowulf Cluster for Research & Education

As theoretical simulations become more complex, the amount of computational power needed to solve the models increase proportionally. Thus in order to keep up with the trend, we set out to design and construct an array of computers, called a Beowulf cluster, to serve the need by using a scheduling service to break apart large computational problems and distribute a piece of it to each computer in the cluster. As each computer solves its piece of the problem, it sends it back to the master where it recombined and presented to the user. This principle of parallelizing serves to cut down the total computational time, enabling the user to build more complicated and physically accurate models. Our cluster is designed with modularity and usability in mind so that additional computers can be added to the cluster with minimal user configuration and researchers from any discipline can run the system without extensive prerequisite knowledge. Proof of concept has been demonstrated and future work will involve refining and optimizing the system; Large Universal Networked Array of Computers (LUNA-C).

Student researcher(s): Anna Ruuskanen

Major: Environmental Science - Natural Track

Research Mentor(s): Dr. Abbie Tomba

Project Title: Life Cycles of Digenetic Trematodes Infecting *Elimia virginica*

Digenetic trematodes are endoparasitic flatworms in the phylum platyhelminthes which can have medical, economic and ecological effects such as causing schistosomiasis in humans, loss of fish harvest, or altering host behavior. All trematodes require two hosts, a mollusk and a vertebrate to complete their life cycle. However, the identity and life cycles of many trematodes that are not economically or medically important are unknown. Here we try to identify larval trematodes infecting the freshwater snail *Elimia virginica*. Previous research has shown that *E. virginica* can be infected by trematodes belonging to several families including Opeocolidae which typically use fish from the family Cyprinidae as definitive hosts. Identifying larval trematode stages is difficult because they are morphologically cryptic; therefore, molecular techniques are used to match larval and adult stages. First, *Elimia* and Cyprinid fish were collected from the Rappahannock and Little Rivers in Virginia. Snails were collected by hand and fish were collected using an electro shocker. Both were dissected for parasites, which were preserved in ethanol. Parasite DNA was then extracted, either the mitochondrial cytochrome c oxidase (COI) gene, or internal transcribed spacer 1 (ITS1) region were amplified with PCR, and then sent for sequencing. Of the *E. virginica* collected, 7% from Little River and 3.5% from the Rappahannock river, were infected with trematodes. Two species of Cyprinids were collected. *Nocomis micropogon* had no trematodes and one out of four *Notropis hudsonius* were infected. 5 COI sequences were successfully amplified from larval and adult parasites as well as 2 ITS1 sequences. Of those, 2 COI and 1 ITS1 samples were successfully sequenced, all were obtained from snail parasites. We expect that the trematodes found in *N. hudsonius* will match at least one of the species of trematode found in *E. virginica*.

Student researcher(s): Madalyn Rymer

Major: English: Creative Writing

Research Mentor(s): Dr. Colin Rafferty

Project Title: Multi-Narrative Creative Nonfiction

While multi-narrative writing has been explored widely in fiction, but there is much less work in creative nonfiction that takes advantage of the unique structure of multi-narrative storytelling. Through my independent study, I read through different examples of multi-narrative creative nonfiction works that combined everything from memoir, to profile, to investigative journalism, as well as several fiction articles and poetry articles that explored the same concept. My research leads me to understand different aspects of the multi-narrative form. This includes the use of the author in the story as a narrator or character, the balance between the narratives to keep reader interest, and how to transition between the narratives. I have compiled all of this research and conducted interviews from several sources to create the multi-narrative creative nonfiction piece, "Freckles."

Student researcher(s): Jacquelynn Seaward

Major: Economics

Research Mentor(s): Dr. Robert Rycroft

Project Title: The Effect of Online Film Critique on the Demand for the Cinema Industry

To what extent has, the presence of film critique websites influenced the demand of the film industry? Specifically, the goal of this analysis is to determine how influential movie reviewer websites have been on the consumer demand for movies over time. According to economic theory, demand is determined by factors that influence a consumer's desire to consume a good. In this empirical analysis, it is expected that the demand curve for the cinema industry will shift inward (decrease) in response to the presence of online film reviewers. The rationale for this hypothesis is that movie reviews, bad reviews especially, will have influenced a consumer's willingness to pay to see a film in a theater when it is considered bad. While a consumer might still see a movie out of curiosity, with the availability of cinema substitutes such as VHS and DVD, they would more likely to wait until the film is released in another format. Thus, it is expected that over time box office revenue for films will have decreased. The effect of online film critic websites will be measured by a pooled sample of movies ranging from the years 1985 to 2015. This will account for years before and after the creation of IMDB, Rotten Tomatoes, and Metacritic created in 1990, 1998, and 1999 respectively. The scores/ratings given will be used to control for the effects caused by higher or lower scores. A dummy variable for bad reviews relative to good reviews will account for this also. Likewise, dummy variables will account for the creation of the aforementioned websites as well as substitutes such as DVD (1995), Netflix (1997), and Hulu (2007). Although, VHS was invented in 1976 it's a technology that has become obsolete. The last movie to be released on VHS was in 2006. Thus, VHS will not be included as a substitute in this analysis. In addition to the film rating from the three critique websites, various other control variables will be examined to determine the effect on the film's revenue. In keeping with the demand theory, there will data collected on population and median income by year. Furthermore, surveys about preferred genre and audience rating will provide an adequate measure of the tastes and preferences of consumers in regards to a specific film type.

Student researcher(s): Amanda Sharps

Major: Sociology

Research Mentor(s): Dr. Tracy Citeroni

Project Title: Is Current Health Care Policy Effectively Assisting Women Veterans?

I have designed this project with the primary aim of understanding women veterans, about their experience with their current health care and how policy plays a role in women veterans' interactions with their health care. The nature of my research is exploratory and non-positivist. I am conducting this research as part of my training in sociological research methods. This topic is sociologically interesting because our Nation's Armed Forces has historically been a highly masculine environment. Because health care can-not be gender neutral in certain aspects including reproductive care, postpartum care, and other areas I will explore it would be of interest to explore a gender minority within the Armed Forces. I am being trained in the use of qualitative methodologies and this small case study is all original research with exploratory intent. I will be closely supervised through this process by my professor. Currently, I am employed at a Service Disabled Veteran Owned Small Business (SDVOSB) and my network through this employment will lead me to connections for willing participants to gain rich narrative and really in-depth research. I also have been relatively trained in the area of Veteran health care policy, which will allow me to connect with veteran participants and hopefully allow them to open up more freely during the interview.

Student researcher(s): Chance Shaw and Deziree Jackson

Major: Sociology

Research Mentor(s): Dr. Leslie Martin

Project Title: Understanding Legal Rights

Arraignment is the first appearance the accused makes in front of a judge. During this process, they are advised of their charges and enter a plea of guilty or not guilty. Previous research as concluded that there are many problems within the arraignment process such as overcrowding and questioning whether the accused comprehend their constitution rights read to them. We sought to better understand if the accused comprehend what their rights fully are when told during arraignment; if not, is there anything that can be done to improve their comprehension. In order to understand this, we examined how the issue is portrayed by judges and lawyers through interviews and analyzing field notes taken during observing arraignment over the past two months.

Given this data, we concluded that the language of arraignment rights are complex and intimidating and although it is a formal process, it has informal approaches, which can impede on understanding rights.

Student researcher(s): Jeremiah Smith

Major: Business Administration

Research Mentor(s): Dr. Belleh Fontem

Project Title: On a Class of Chance-Constrained Nonlinear Programming Problems

We consider the non-convex problem of minimizing a linear deterministic cost objective subject to a probabilistic requirement on a nonlinear multivariate stochastic expression attaining, or exceeding a given threshold. The stochastic expression represents the output of a noisy system featuring the product of mutually-uncorrelated, uniform random parameters each raised to a linear function of one of the decision vector's constituent variables. We prove a connection to (i) the probability measure on the superposition of a finite collection of uncorrelated exponential random variables, and (ii) an entropy-like affine function. Then, we determine special cases for which the optimal solution exists in closed-form, or is accessible via sequential linear programming. These special cases inspire the design of a gradient-based heuristic procedure that guarantees a feasible solution for instances that fail to meet any of the special case conditions. The application motivating our study is a consumer goods firm seeking to cost-effectively manage a certain aspect of its new product risk. We test our heuristic on a real problem and compare its overall performance to that of an asymptotically optimal Monte-Carlo-based method called sample approximation. Numerical experimentation on synthetic problem instances sheds light on the interplay between the optimal cost and various parameters including the probabilistic requirement and the required threshold.

Student researcher(s): Madison Smith

Major: Biology

Research Mentor(s): Dr. Lynn Lewis

Project Title: Public Perception of the Flu Shot

Influenza is a substantial issue regarding public health, and hesitancy to receive the flu shot inhibits efforts to reduce the burden of seasonal flu each year. The goal of this study is to determine the perceptions and ideas students at the University of Mary Washington (UMW) have towards the flu shot as well as to determine factors that influence their decision to receive the shot. Students at UMW (n=177) completed a self-administered survey concerning their opinions and personal experiences regarding the shot. Preliminary results show that those who annually get the shot tend to believe it is important and worth getting. Alternatively, those who do not annually get the shot tend to have a more diffuse range of opinions. Only 27% of the surveyed population received the flu shot annually, but 63% say it is necessary for most people to get it yearly. Consequently, the main reason students do not receive the flu shot is not because they consider it useless or harmful, but rather they do not feel like going.

Student researcher(s): Sophia Somsen & Katherine Greener

Major: Business Administration

Research Mentor(s): Dr. Kashef Majid

Project Title: How Sharing Harms the "Sharing" Economy

With the multi-billion dollar success of platforms within the sharing economy, specifically Airbnb, it's not clear which hosts are best positioned to profit the most. In this paper, we will conceptualize the sharing economy and discuss the influence of situational norms on the act of sharing within this economy. Our hypotheses seek to determine whether the degree of sharedness of an Airbnb accommodation affects demand. The degree of sharedness within Metro D.C. listings was tested against occupancy rates as well as median home values of the zip codes. Our findings revealed that private accommodations have higher occupancy rates, except where the median home value is higher. Those who are willing to remove the sharing from their shared accommodations appear primed to profit the most the sharing economy.

Student researcher(s): John Strangfeld

Major: Historic Preservation

Research Mentor(s): Dr. Lauren McMillan

Project Title: Spatial Distribution and Geographic Analysis of Nomini Plantation (44WM12), Westmoreland County, VA

Nomini Plantation (44WM12) is located on the cliffs over Nomini Bay in Westmoreland County, Virginia. The site was occupied between the mid-17th century to the late 18th century. Rising sea levels and the eroding cliffs both threaten the future of the plantation site, requiring the site to be researched and revisited. The focus of the current reanalysis project being conducted at the University of Mary Washington, and of this paper, is on the 17th century component of the site. This poster will reexamine the archaeological site by digitizing the original field maps and analyzing the distributions of excavated artifacts. Additionally, maps of historical land patents will be georectified onto modern maps of the surrounding area to help locate nearby potential sites. The goal of this project is to indicate points of interest on the property that warrant further investigation and study data that has been collected in previous excavations.

Student researcher(s): Poornima Rachel Sunder

Major: Biochemistry

Research Mentor(s): Nicole Crowder

Project Title: Synthetic Routes to Bromo-Terminated Phosphonate Films and Alkynyl Pyridine Compounds for Click Coupling

Copper catalyzed azide alkyne cycloaddition, a common click reaction, requires a terminal azide and a terminal alkyne, where the resulting triazole ring can have a variety of substituents, based on the starting materials. The terminal azide can be installed through an SN2 reaction with a bromo-functional group during an in situ click reaction. In this work, several synthetic routes to a bromo-terminated phosphonate film on copper oxide surfaces were explored. Synthetic parameters were confirmed using solution reactions before being conducted on the modified surfaces. Sonogashira coupling with pyridine-based compounds was conducted to yield a desired alkynyl species. Click reactions between the synthesized bromo-terminated phosphonate film and a model terminal alkyne confirmed the possibility of using this route for catalytic applications.

Student researcher(s): Lauren Taylor

Major: English: Creative Writing

Research Mentor(s): Mr. Colin Rafferty

Project Title: Multimedia Essays & Publishing

Trends in the writing community are currently evolving quickly, and analyzing major tendencies of these changes is crucial for a writer to understand the direction in which literature and publication is headed. The Internet and technological advances in storytelling provide a chance for writers to express their ideas and convey meaningful messages in ways that go beyond traditional prose that is printed out on paper or typed out and pasted online. Technology has given rise to the multimedia essay. Multimedia essays are nontraditional ways for writers to tell a story through a form of technology or media communications and come in diverse forms; common trends on the Internet today include audio, video, and digital essays. They can come in traditional poetic forms or prose forms but use digital trends and identities to further engage readers in new ways. Along with identifying these trends, I want to join this community as a writer of the multimedia essay. I will compose my own narratives by blurring the conventional lines of tradition and genre to enter the niche, technologically-advanced world of multimedia essays and look towards the possibilities that lie in the future of writing styles and new revision methods.

Student researcher(s): Mariam Tekle and Morgan Hutt

Major: Biology

Research Mentor(s): Dr. Deborah Zies

Project Title: Determining the Role of the YIL158W and YDL199C Genes in *Saccharomyces cerevisiae* in DNA Repair

Research has shown that DNA damage can be induced by environmental stress factors, radiation, oxidative stress, and exposure to mutagens. All organisms possess genes involved in repairing that damage. While the main DNA repair genes have been well characterized, there are still likely to be many genes that contribute to successful DNA repair. The genes of interest for our research were chosen from the large-scale study published in the research paper written by Jaehnig and his colleagues, Checkpoint Kinases Regulate a Global Network of

Transcription Factors in Response to DNA Damage. These researchers treated wild type yeast cells with the known mutagen methyl methanesulfonate (MMS) and identified all of the genes that changed in expression when treated. Our research aim is to determine if our two chosen genes YIL158W and YDL199C, play a role in DNA repair. We have completed a bioinformatics analysis on the two genes. In order to confirm the results of the large-scale MMS treatment from Jaehnig et al., we treated our wild types strains with MMS and measured the gene expression of YIL158W and YDL199C using QPCR. Our preliminary results suggest that both genes increase in expression upon exposure to MMS. To confirm the cell cycle phenotype of the yeast deletion strains, we have begun experiments to calculate the budding index. We have collected budding index data for wild type cells and are currently working to standardize our evaluation of bud sizes. Future experiments will compare wild type cells to deletion cells in the budding index, confirm other characteristics of our two genes that were identified in the bioinformatics analysis, and further characterize our two genes using new DNA repair assays.

Student researcher(s): Matthew Tovar

Major: Biochemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Finding the (Nano)Cure: How uniquely synthesized nanomaterials can revolutionize the field of neuro-oncological theragnostic medicine

This presentation describes an alternative method for the treatment of terminal glioblastoma multiforme using Superparamagnetic Iron Oxide Nanoparticles (SPIONs). Due to their small size, SPIONs have unique nanomagnetic properties, which can be exploited to denature cellular structures key in inducing apoptosis. These nanomagnetic properties, which vary as a function of SPION diameter, were characterized in order to determine an optimal particle size (OPS) that releases a favorable amount of heat upon application of an external magnetic field. A heterobifunctional poly (ethylene) glycol polymer crosslinked to a targeting ligand (TWEAK) was added to the surface of these SPIONs (with approximately 20 nm diameter). This nanoparticle functionalization was confirmed via fluorescence spectroscopy and transmission electron microscopy. It is hoped that the targeting mechanism, combined with the unique nanomagnetic properties of the SPIONs, will create a breakthrough in the treatment of glioblastoma, the deadliest brain cancer.

Student researcher(s): Matthew Tovar, Sarah Balenger, Ashley Parkhurst, and Emily Matuczinski

Major: Biochemistry

Research Mentor(s): Dr. Leanna Giancarlo

Project Title: Synthesis, Optimization, and Bioconjugation of Electrochemically Synthesized Magnetic Nanoparticles to Induce Irreversible Damage to Glioblastoma Invasive Rim Cells

In the last ten years, there have been no significant advancements in the treatment of the aggressive brain cancer Glioblastoma Multiforme (GBM). This research describes an alternative method for the treatment of this cancer. Superparamagnetic Iron Oxide Nanoparticles (SPIONs) have been synthesized and optimized for use in targeting and neutralizing invasive rim cells present in mesenchymal GBM. The average sizes of the synthesized SPIONs are precisely tailored via a time-controlled reaction, making available an optimal particle size (OPS), having a single magnetic domain. At OPS, the SPIONs can release a maximum amount of heat when exposed to an external magnetic field. Using transmission electron microscopy, vibrating sample magnetometry, and thermometric analysis, the OPS was determined to be 20.6 nm +/- 5.9 nm. A heterobifunctional poly (ethylene) glycol polymer crosslinked to a targeting ligand (ITEM4) was added to the surface of the SPION, and its presence on the SPION was confirmed via fluorescence spectroscopy and transmission electron microscopy. These SPIONs can now be modified to selectively target and destroy the cellular membranes of GBM cells.

Student researcher(s): Hoang-Anh Tran

Major: Chemistry

Research Mentor(s): Davis Oldham

Project Title: Synthesis of Oxidative Metabolites of the Environmental Contaminant DEHP

Diethylhexyl-phthalate (DEHP) is a persistent organic pollutant and likely endocrine disrupting compound; it is a component of soft plastics such as PVC. DEHP is not directly bound to the polymer; it leaches out to external environment easily. Humans can be exposed to DEHP through inhalation, ingestion, and intravenous

contamination. When DEHP enters the body, it is converted into three main oxidative metabolites: 2-carboxy MMHP (1), 5oxo-MEHP (2), and 5-carboxy MEPP (3) by cytochrome P450. Synthesis of these metabolites is necessary to understand the biological effect of phthalates. The synthesis of 1 relied on a malonic acid synthesis, beginning with alkylation of diethyl allylmalonate with 1-iodobutane, followed by hydrolysis with KOH and decarboxylation. The resulting acid reduced to 2-allyl-1-hexanol (4) by lithium aluminum hydride (LAH). An alkene-containing phthalate was obtained by an esterification of phthalic anhydride and the alcohol 4 followed by ruthenium –catalyzed oxidative cleavage in 6% yield. Metabolite 2 was similarly synthesized using diethyl ethyl malonate and 4-iodo-1-butene, followed by Wacker reaction in 27% yield. The metabolites 1 and 2 were successfully synthesized; metabolite 3 will be synthesized using similar methodology. These metabolites will be used as analytical standards and for toxicological studies.

Student researcher(s): Andrew Unger

Major: Classics

Research Mentor(s): Joe Romero

Project Title: The Song of Achilles: Queering the Life of Achilles

Madeline Miller's *The Song of Achilles* is a novel which rewrites the life of Achilles to modernize his sexuality. This thesis explores how the novel achieves this goal, how her work is understood by modern readers, and how these readers then go on to perceive the life of Achilles in original texts through the horizon of expectation that she has provided. The thesis also provides theoretical and historical bases for this understanding of Miller's work.

Student researcher(s): Hannah Wiers

Major: Political Science

Research Mentor(s): Dr. Rosalyn Cooperman and Dr. Tracy Citeroni

Project Title: Sex Education in Public Virginia Universities

Currently no national standard for teaching sex education in public schools exists. Because of this, individual states and the localities within them are left with deciding how to execute a sex education curriculum for middle and high school students. Schools can choose to provide abstinence-only education, comprehensive sex education (that includes information about condoms, birth control, and other forms of contraception), or just leave the subject alone entirely. In Virginia sex education is not mandatory nor does it have to consist of medically accurate information if it is in fact provided. This means that when 18-year-olds begin attending college and exploring sexual relationships with minimal supervision for the first time, they are doing so with widely different amounts of knowledge. What are public Virginia universities doing to close this knowledge gap? This research investigates what (if any) legal requirements are in place for sex education on a college campus and the sex education programming of a small selection of public Virginia universities.

Student researcher(s): Rebeckah Wood and Shelley Lyons

Major: Biology

Research Mentor(s): Dr. April Wynn

Project Title: Allelopathic Potential of *Fagopyrum esculentum* (Buckwheat) at Different Ages

Buckwheat (*Fagopyrum esculentum*) is an allelopathic plant, meaning that it produces allelochemicals, or chemical secretions that can inhibit the growth of other susceptible plants. Buckwheat is able to suppress the growth of nearby weeds through allelochemicals, produced in the leaves, stems, and roots of buckwheat, that are exuded from its roots and through allelochemical residues that have been left in the soil after growth. This weed-suppressive activity can be advantageous in agriculture. Many allelochemicals have been identified in buckwheat using high-performance liquid chromatography (HPLC), and a majority of them are phenolic compounds, including gallic acid. While the allelochemicals have been identified, the age at which buckwheat plants begin to produce allelochemicals has not been examined. The goal of our study was to determine the age (in the number of weeks after planting) that buckwheat begins to produce gallic acid and thus when its allelopathic potential is greatest. Lettuce, a plant known to be susceptible to the allelochemicals produced by buckwheat, was co-planted with buckwheat of different ages in order to test the allelopathic potential in vivo. Additionally, to examine allelochemical production, gallic acid concentrations in the leaf tissues of buckwheat at one, two, three and four weeks after planting are being determined through HPLC analysis. Lettuce dry

weights did increase over four weeks, however, statistical analyses did not find this change to be significant. The findings of this study will provide the timing in which allelochemicals are released during development and provide farmers with more information on the time frame for planting cover crops as weed control.

Student researcher(s): Nina Wutrich

Major: Art History

Research Mentor(s): Dr. Marjorie Och

Project Title: Representations of Lucrezia Borgia and the Image of the Holy Woman in the Late Quattrocento and Early Cinquecento

Throughout her life, Lucrezia Borgia (1480-1519), the daughter of Pope Alexander VI, appropriated the imagery of holy women and other moral exemplars in her portraiture. This appropriation of imagery evolved as Lucrezia herself matured; the representations shift from those where Lucrezia disguises herself as a morally exemplary woman such as Saint Catherine of Alexandria, to those where she presents herself, in her role as Duchess of Ferrara, as a morally exemplary holy woman in her own right.

Student researcher(s): Jennaveve Yost, Victoria Power, Emily Saldanha, and Erynn Sendrick

Major: Psychology

Research Mentor(s): Dr. Holly Schiffrin

Project Title: Development of a Consolidated Helicopter Parenting Scale (CHPS) and its Relationship to Intelligence Mindsets

We developed a consolidated helicopter parenting (HP) scale from the: Helicopter & Autonomy Supportive Parenting Scale (Schiffrin et al., 2014), Helicopter Parenting Instrument (Odenweller et.al., 2014), Helicopter Parenting Scale (LeMoyne & Buchanan, 2011), Helicopter Parenting (Padilla-Walker & Nelson, 2012), and Over-Parenting Scale (Bradley-Geist & Olson-Buchanan, 2014). Results of an EFA yielded 10 items with a Cronbach's alpha of .93 for mothers and .90 for fathers. Then, we examined whether HP mediated the relationship between parents' failure and children's intelligence mindsets in emerging adults (EAs). When parents had a failure mindset, both mothers and fathers were more likely to engage in helicopter parenting, but only father's HP mediated the relationship between parents' failure mindset and children's intelligence mindset.

Student researcher(s): Pamela Zaelke

Major: Economics

Research Mentor(s): Dr. Robert Rycroft

Project Title: Predicting the 2018 NBA Championship Winner

Every team that plays a sport wants to win its league championship. Which teams advance to the playoffs for the chance to play in the National Basketball Association's championship game is determined by eighty-two regular season games. Measured for both offense and defense, statistics referred to as "the four factors" are commonly used to evaluate basketball team performance since identified by Dean Oliver in 2004: effective field goal percentage, turnover percentage, the ratio of free throws to field goal attempts, and rebounds. Additional research shows that along with what happens on the court, home game attendance is highly correlated with winning games. Fans like to watch their team win, so more tickets are sold during winning seasons. Players perform better in front of large, supportive crowds, meaning the fuller the house, the more games won. Since home court advantage during post season play is determined during the regular season, attendance during the regular season plays an important role in playoff success. Clearly, it is in a team's best interest to fill its stadium, and star players can help to make that happen, but they do not come cheap, so the total salary of a team's roster is used to account for special talent and the overall strength of a team. Regression analysis combining the elements of play with organizational factors provides a model for measuring team success, which is quantified by the total number of wins during both the regular and post seasons. All other data, that is, all the independent variables, collected for the last three seasons, come from the regular season only. This study forecasts the 2018 NBA championship winner using only regular season statistics.

Student researcher(s): Alyssa Zanzucchi and David Jett

Major: Environmental Science, Geology

Research Mentor(s): Dr. Chuck Whipkey

Project Title: Environmental Implications of gas drilling in the Taylorsville Basin

Hydraulic fracturing in the Taylorsville Basin of northeastern Virginia is currently under consideration to extract oil and natural gases for consumption. The Taylorsville Basin is a Triassic shale deposit formed as a result of oceanic and lacustrine sediments deposited during oceanic transgressions and regressions. The basin is located in the Coastal Plain of Virginia and spans across five counties, across the Potomac river and into parts of Maryland. Hydraulic fracturing, or “fracking”, is a process in which vertical wells are drilled into the subsurface and turn horizontal into rock strata in order to pump a mixture of water, chemicals and sand to fracture the rock formations. The sand pellets hold fractures open to allow the flow of oils and gases to travel back up the well. Although there are certain economic benefits felt by natural gas extraction, fracking also comes with potential environmental implications. This study aims to assess the major potential environmental impacts of fracking in the Taylorsville Basin in terms of groundwater contamination caused by well casing failures and disposal of the pumped liquids, as well as seismicity caused by well fluid injections. This was accomplished by examining previous studies of groundwater contamination, well casing failures, injection induced earthquakes (including their magnitudes and range), and in what geologic setting they occurred. These results were then considered in context to the geology and hydrogeology of the Taylorsville Basin to assess the potential effects of fracking in the area.

Student researcher(s): Alyssa Zanzucchi

Major: Environmental Science

Research Mentor(s): Dr. Bradley Lamphere

Project Title: Land use change and fish assemblages in Spotsylvania Co., VA from the 1980s to the present

Over the past 35 years, Spotsylvania County has undergone a rise in residential and commercial land uses from the previous highly rural and agricultural areas. Land use changes are especially problematic in temperate areas such as Virginia due to developing in consideration of the many streams and wetlands. Development near fluvial systems can have an effect on the local fish assemblages residing in the streams in terms of habitat loss or fragmentation, as well as water quality issues concerning polluted runoff from nearby impervious surfaces. This article addresses the fish assemblage changes in response to land use development from the 1980s to the present. Fish assemblage data retrieved from samples taken in the 1980s in Spotsylvania County was recovered from the University of Mary Washington archive, and samples were also taken from the same sites in the present to compare the results. Land use data from the 1980s was taken from the 1987 Spotsylvania County Land Use Comprehensive Plan report and present land use data was extracted from GIS maps of Spotsylvania County land use and land cover data. Fish assemblages from past and present data were then categorized based on tolerance levels to infer and compare stream quality. The hypothesis is that tolerance levels in fish species present in the streams would increase over time due to higher rates of development. The results show little change in tolerance levels within the compared streams, suggesting similar effects of rural agricultural land with residential and commercial land. Understanding fluvial and biotic responses to urbanization can help in future planning of land use when developing around freshwater systems.

Student researcher(s): Nicole Ziesing

Major: Sociology

Research Mentor(s): Dr. Leslie Martin

Project Title: Evaluation of FUSE Program in Fredericksburg Area

This research aims to discover the effectiveness of a new program targeted towards addressing homelessness in the Fredericksburg region. Participants will have been recruited into the program (titled FUSE, Frequent Users Systems Engagement), provided with permanent housing, and also provided the option of an array of services to help maintain them in housing. This project explores how one Fredericksburg FUSE participant has experienced homelessness and how the FUSE program has worked for them. The evaluation will focus primarily on an interview of their homelessness and housing experience. The research will also include data from local hospitals and jails along with interviews with social service agency staff involved with the FUSE program.

Student researcher(s): Theodosius Zotos

Major: Economics

Research Mentor(s): Dr. Robert Rycroft

Project Title: The Adverse Effects of Income Inequality on Tertiary Education Attainment: An Evaluation of OECD Membership

Income inequality and tertiary education are among the most controversial, and arguably the most important, topics in today's political climate. As globalization continues to re-shape the needs of labor markets worldwide, the demand for individuals with specialized skills regarding technology, medicine, engineering, etc. continues to rise. Countries are now faced with providing their citizens with modern educational opportunities and firms are seeking workers who are equipped and prepared for the 21st century economy. As these challenges begin to become more relevant in everyday life across the globe it is necessary to understand what effects they have and how to adapt to the market. The following paper examines the relationship of income inequality through the scope of Organization for Co-Operation and Development (OECD) members and attempts to quantify the extent of which it, *ceteris paribus*, effects tertiary education attainment. A panel regression is conducted, analyzing a 5-year period of 30+ countries. Referencing previous literature, the theory motivating this research suggests that income inequality will have a negative effect on tertiary education attainment in a country. The model operates under the theory of opportunity cost and marginal benefit/marginal cost. Countries with steep income inequality will experience lower levels of tertiary education attainment as its constituents may not want to invest time and/or money in education because the cost is higher than the net benefit. Narrower chances of social mobility stifle educational endeavors beyond secondary education.



Acknowledgement

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