



PROGRAM SCHEDULE WITH ABSTRACTS

APRIL 22, 2016
University of Mary Washington
Fredericksburg, Virginia

Financial Support for Research and Creativity Day
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UNIVERSITY OF MARY WASHINGTON
IS AN INSTITUTIONAL MEMBER OF THE
COUNCIL ON UNDERGRADUATE RESEARCH
Learning Through Research



Schedule of Events

April 22, 2016

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 9:00 - 4:00

HCC Classrooms 307, 327, 328 & 329

Original Dance Recital 12:30

Media Wall HCC Main Floor

Poster Sessions 12:00– 1:00 (or as noted)

HCC Building Locations *refreshments served for all*

Original Music Performances 1:15 - 2:00

Digital Auditorium HCC

Additional Exhibits and Sessions

Monroe Hall (History & American Studies) 9:00 – 3:00

Melchers Hall (Art History) 9:00 – 10:00

Woodard Hall (College of Business) 10:00 – 10:50

Combs Hall (Modern Languages & Literatures) 1:00 – 3:30

Trinkle Hall (College of Education) 9:00 – 4:45

Trinkle Hall (Computer Science) 11:00 – 12:30

Melchers Hall Studio open house 10:00 – 4:00

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



Sessions in Monroe Hall

History and American Studies Symposium

9:00 Race and Ethnicity in American Life (Moderator: Dr. Porter Blakemore)

Room 210

Ashlyn Dacey, “Domestic Violence on Indian Reservations in the United States” (Krystyn Moon)

Shannon Ball, “Woman Must Have Her Freedom”: Birth Control Activism as Viewed Through *The Birth Control Review* and the Influence of Margaret Sanger (Jeff McClurken)

Lila Spitz, “The Depiction of African Americans in Six High School United States History Textbooks from the 1980s and the Early 2000s” (Jeff McClurken)

9:00 Representations of Women in History (Moderator: Dr. Will Mackintosh)

Room 111

Francesca Dinger, “Sky High Standards: Female Flight Attendants of the 1960s” (Claudine Ferrell)

Carolyn Ann Kowalewski, “From Wives to Public Conduct: Protestant Reformer’s Views on Women in the Sixteenth Century” (Allyson Poska)

Ashley Jenkins, “Portrayal of Republican Era Chinese Women in Popular Culture” (Susan Fernsebner)

10:00 20th Century German History (Moderator: Dr. Susan Fernsebner)

Room 210

Dana Baumgartner, “Jugend Dient Dem Fuehrer: Growing Up in the Hitler Youth” (Porter Blakemore)

Zach Young, “The German Nuclear Program: How Germany’s Technological Progress Failed to Produce the Atomic Bomb” (Porter Blakemore)

Kathleen MacIndoe, “The Forgotten Faces of Operation Valkyrie” (Porter Blakemore)

**10:00 Forging and Breaking Social and Economic Bonds in Times of War and Peace
(Moderator: Dr. Nabil Al-Tikriti)**

Room 111

Victoria Bond, “Captivity and Native American Customs during the Seven Years War” (Jason Sellers)

Corey Dyke, “Under Siege: The Struggle to Form and Maintain Allegiances in the American Civil War” (Jeff McClurken)

Lydia Hope Jones, “The Demise of a Town with Promise: A Comparative Look at the Towns of Dumfries and Alexandria and Their Varied Responses to Colonial Pressures” (Jason Sellers)

11:00 Women in American History and Contemporary Life (Moderator: Dr. Bruce O’Brien)

Room 210

Mercia Spicer, “Choosing to Stay: Seeking to Understand the Choices of Women Captives” (Jason Sellers)

Mary Fesak, “The Ideals of Pine Mountain”: Gender, Progressive Thought, and the Built Environment at Pine Mountain Settlement School (Jeff McClurken)

11:00 Cultures of Food and Sports in American History (Moderator: Dr. Claudine Ferrell)

Room 111

Jenna Williams, “It’s Going, Going, Gone”: The Policies and History Surrounding Cuban Baseball Defections in the 1990s (Krystyn Moon)

Elizabeth Eiseman, “Lacrosse Nation: How Sport Benefits Native Americans” (Krystyn Moon)

Peyton Brown, “Big on the Pig: Pork Culture in North Carolina History” (Krystyn Moon)

1:00 Representations of Sexuality and Gender Relations (Moderator: Dr. Jeff McClurken)

Room 111

Emily Bostaph, “Stuck in Their Ways: The Portrayal of Homosexuality in Popular Sitcoms and News Segments from the 1950s to the Late 1980s” (Jeff McClurken)

Bailey Ivancic, “Are You Popular?” The Depiction of Women in Postwar Social Guidance Films (Claudine Ferrell)

Megan Rebennack, “Feminist Reading on Amy Schumer” (Krystyn Moon)

**1:00 Explorations in Late Antique, Byzantine, and Medieval European History
(Moderator: Dr. Steven E. Harris)**

Room 210

Barry Lucero II, “Constantine: The Driving Force of a Christian Revolution?” (Bruce O’Brien)

Edward Harold Scheirer III, “Ideal Kingship and the Legitimacy of the Anglo-Saxon State” (Bruce O’Brien)

Shane Carlson, “Early Byzantine and Arab Naval Organizations, 655 CE-717 CE” (Nabil Al-Tikriti)

**1:00 War and Nationalism in Colonial America and the Austro-Hungarian Empire
(Moderator: Dr. Jason Sellers)**

Room 211

Heidi Scanlon, “King Philip’s War: The Attack on Medfield” (Jason Sellers)

Megan Bannon, “Pioneer Farmer: An Analysis of George Washington’s Agricultural and Animal Husbandry Practices at Mount Vernon” (Jason Sellers)

Jake Rieder, “Nationalism and the Fall of the Austro-Hungarian Empire (Porter Blakemore)

2:00 Narratives of Exclusion and Inclusion in American History (Moderator: Dr. Krystyn Moon)

Room 111

Shannon Green, “AIDS: A Catalyst for Queer Representation in the Media” (Will Mackintosh)

Daniel Webb, “Is It Because I’m Black: The 1939 Alexandria Library Sit-In and Its Effects on the Civil Rights Movement” (Krystyn Moon)

Marie Clifford, “Reinterpreting the Civil War: Creating a Narrative with the Voices of Asians, Hispanics, and Native Americans at National Park Service Sites” (Krystyn Moon)

2:00 Adventures in Digital History Project Presentations (Moderator: Dr. McClurken)

Room 210

3D Scans from the James Monroe Museum

Mary C. Fesak, Jonathan A. Hernandez, Lila B. Spitz

The Slaughter-Murray Papers

Kimberly A. Carbajo, Matthew R. Gaughan, Kathleen M. MacIndoe, Brexton L. O’Donnell

History of the ITCC/Hurley Convergence Center

Jonathon A. Baker, Andrew B. Boswell, Marissa I. Feldman, Andrew C. Steele

Diary of Civil War Soldier Stephen Gordon

Michael C. Black, Catherine A. Liberty, Alexander C. Privitt, James T. Stewart



Session in Woodard Hall

10:00 – 10:50

Room 203

Presentation of student produced video advertisements in support of the Virginia21 Get Out the Vote Campaign. Student teams were advised by Kashef Majid.

Team members: Raj Barua, Richard DeLima, Heath Holladay and Michael Macleay

Brian Goulet, Sayed Usman Khalid and Hasan Shami

Mary Grace Cooney, Shanna Davidson and Natascha Zelloe



Session in Melchers

9:00 – 10:00

Room 207

Individual Studies in Art History

Eynav Ovadia, “The Venus Problem: An Examination of Botticelli’s Mythological Paintings”
(Marjorie Och)

Nina Wutrich, “A Disputation: Lucrezia Borgia, Female Virtue, and the Hall of the Saints” (Marjorie Och)



DuPont Gallery Exhibit

10:00 – 4:00

The Department of Art and Art History is hosting their Annual Student Art Exhibit in DuPont Gallery. New York-based video artists Sandra Gibson and Luis Recoder served as our 2016 jurors and selected the student works on view. Among the works on view are student award winners:

Melchers Gray Purchase Awards

1. Michael Evert, *Horsehair Pot*
2. Kacie Waters-Heflin, *Pas de basque*

Emil R. Schnellock Award for Excellence in Painting

Taylor White, *Apoptosis*

Anne Elizabeth Collins Memorial Art Award

Dave Hansen, *Winner Winner Chicken*

Awards of Excellence

1. Michelle Pierson, *Save the Planet*
2. Hannah McConaughy, *Seeds*
3. Evelyn Savaria, *A Pleasant Conversation*
4. Lillian Schloeder, *In Memoriam*

Evelyn Savaria, *A Pleasant Conversation*
(First time award: juror's purchase)



Sessions in Combs Hall

Modern Languages and Literatures

2:15

Room 213

Lukas Chandler (German): “What Does it Mean to Lead an Ethical Life After Auschwitz?”

2:15– 3:00

Room 214

Tyler Rowe (French): “À la recherche de la femme fatale perdue: A study of the trope in Scève and Baudelaire”

2:15– 3:00

Room 215

Riska Pérez Castiello (Spanish): “¡La libertad! ¿Para quién(es)?: Un estudio comparativo de dos poemas románticos”

Ana María Johnson (Spanish): “¡Oh Gloria Inmarcesible!: Subjetividad en la prensa y la representación de las poblaciones más vulnerables en Colombia.”

3:30

Room 214

Delphine Ngo Kattal (Spanish): “*Fe en disfraz* o la expresión metafórica de la fatal miseria de la mujer afrodescendiente.”



Session in Trinkle Hall

11:00 – 12:30

Room B52

Computer Science Honors Presentation

Ruth Catlett, “One-and-dones’: A Data Science Analysis of the Impact of Leaving College Early for the NBA on a Player’s Career” (Stephen Davies)

9:00 – 4:00

College of Education Graduate Student Presentations

Room 107A

Session 1. 9:00 a.m. – 10:15 a.m.

Heather Chlebo, “Improving Sight Word Recognition Through iPad Practice” Instructional Technology

Michelle Michiniak, “Imaginative Writing in a Second Grade Classroom” Instructional Technology

Harrison Miles, “Measuring Student Perceptions on the Implementation of Instruction using Virtual Reality” Instructional Technology

Emily Nykorchuk, “There’s an App for That?” Instructional Technology

Courtney White, “Plicker-Based Assessments vs. Standard Paper-Pencil Assessments” Instructional Technology

Session 2. 10:30 a.m. – 11:45 a.m.

Sydney Bauman, “Visual Discovery and Role Play in the Classroom” Social Studies

Elizabeth Henry, “Writing for Historical Empathy in the Elementary Classroom” Social Studies

Lauren Ricci, “Visual Discovery and Historical Empathy in the Social Studies Classroom” Social Studies

Allison MacKrell, “Integrating History and Geography Using Geographic Questioning Skills” Social Studies

Bethany Alley, “Connecting to the Past: The Impact of Role-Play on Developing Students’ Historical Empathy” Social Studies

Session 3. 12:00 p.m. – 1:15 p.m.

Kelly Bryant, “The Effect of Culturally Relevant Texts and Story Play on English Language Learners’ Self-Esteem” ELL

Kristen Dennis, “A Curious & Phenomenal Association Between English & Spanish Cognates” ELL

Katie Lebling, “The Effect of Culturally Relevant Texts on English Language Learners’ Perception of Classroom Community” ELL

Christine Valvo, “The Effects of Arts Integration on English Language Learners’ Social Studies Comprehension” ELL

Corrine Wiederkehr, “The Effects of Interactive Word Walls on the Vocabulary Development of ELLs” ELL

Session 4. 1:30 p.m. – 2:45 p.m.

Kaitlyn Connolly, “Visual Discovery and Historical Empathy in the Secondary Classroom” Social Studies

Jordan Harmer, “Anonymity and Classroom Participation” Social Studies

Andrew Seymour, "A Different Kind of Exploration: The Impact of Visual Discovery on Image Analysis Skills" Social Studies

Andrew Masters, "Student Perceptions of Peer Review" Social Studies

Joselyn Beyer, "Google Tours and Persuasive Writing" Instructional Technology

Session 5. 3:00 p.m. – 4:30 p.m.

Cheyenne Falls, "Class, Class, Class! A Study of the Motivational and Engagement Effects of a Modified Whole Brain Teaching Method" English

Jessica Fisher, "The Effect of Children's Literature on the Understanding of Numeracy Skills" Special Education

Christopher Garcia, "Effect of Movement on Student Focus" Special Education

Margaret Neubig, "The Effectiveness of Manipulatives on Teaching Fractions to 2nd graders" Special Education

Katherine Taylor, "The Influence of Universal Design for Learning through Cooperative Learning and Project-Based Learning in an Inclusive Classroom" Special Education

Aubrey Kennedy, "Voice in Student Writing: The Effects of Using Personal Pronouns in Composition" English

Room B-36

Session 1. 1:00 p.m. – 2:15 p.m.

Lauren Braney, "Visual Aids: The Effects of Visual and Auditory Instruction" Visual Arts

Rachel Deutch, "Sketching, Planning, and Student Research: Effects of Preliminary Investigation on Art Students' Sense of Ownership" Visual Arts

Isun Malekghassemi, "Hearing in Silence: The Relationship between Practicing Audiation and Sight-Singing Achievement in the Secondary Chorus Classroom" Music

Kimberlee Vissi, "Sight-Singing in Color: The Effect of Color Coding on the Sight Reading of Middle School Choir Students" Music

Session 2. 2:30 p.m. – 3:30 p.m.

Sydney Allen, "Writing to Rhythm: A Qualitative Comparative Analysis Exploring The Effects of Orchestral vs. Instrumental Music on Third Graders' On-Task Performance During Creative Writing" Literacy

Erik Gajeton, "Critical Literacy Through Making Connections in the Elementary Classroom" Literacy

Lisa Johnson, "The Impact of Blogs on Student Writing: A Mixed Methods Study on How Third Graders Respond to Different Writing Mediums" Literacy

Erin Keener, "The Effects of Book Recommendations on Motivations to Read" Literacy

Session 3. 3:45 – 4:45 p.m.

Michael Arriaza, "Using Authentic Materials in a Spanish Class: Impact on Students' Cultural Knowledge and Vocabulary Development" Foreign Language

Marc DiSipio, "Dear Diary: The Effect of Regular Journal Writing on a Student's Voice, Focus, and Attitude" Foreign Language

Colleen Durkin, "The Effects of Virtual Immersion on Second Language Vocabulary Acquisition" Foreign Language

Morgan Wade, "Background Music: Distractor or Motivator?" Foreign Language

Room 204

Session 1. 9:00 a.m. – 10:15 a.m.

Michelle Craft, "Cooperative Learning and Gender in the Secondary Mathematics Classroom" Mathematics

Emma Tennant, "Blended Learning: Technology in the Secondary Mathematics Classroom" Mathematics

George Hareras, “The Impact of Picture Books on Visual Literacy and Engagement in a Science Classroom”
Science

Amanda Houghton, “The Integration of Creative Drama in the Science Classroom” Science

Danielle Galbraith, “Understanding Science Vocabulary through Inquiry Activities and Interactive Notebooks” Science

Room 106A

Session 1. 2:00 p.m. – 3:15 p.m.

Mia Boleis, “Do Differentiated Math Centers Affect Students' Attitudes Towards and Engagement in Mathematics?” Mathematics

Christine Gorsline, “The Effect of Leveled Mathematics Grouping on Kindergarteners' Ability to Count”
Mathematics

Abigail Heller, “The Effects of the Integration of Visual Arts into Mathematics Instruction in Kindergarten”
Mathematics

Alexandra Tenney, “The Effect of Personalized Word Problems on Third Grade Students' Achievement in Mathematics” Mathematics

Rebecca Kindler, “Mastery Learning and Mathematics: Achievement and Attitudes” Mathematics

Session 2. 3:30 p.m. – 4:45 p.m.

Courtney Rampey, “Gram Slam! Teaching Contextualized Grammar through Cooperative Learning”
English

Kelsey Roach, "Until I feared I would lose it, I never loved to read. One does not love breathing:" Linking
Sustained Silent Reading, Independent Choice, and Reading Comprehension” English

Samantha Robinson, “Collaboration in a Paperless Classroom” English

Georgianne Stuebner, “The Effect of the Paperless Classroom on Student Engagement” English

Taylor Agee, “Engaging Students through Instruction in the Secondary Classroom” English



Morning Oral Sessions in Hurley Convergence Center

9:00 – 11:00

Room 328

Session Chair: Dr. Liane Houghtalin (Classics, Philosophy and Religion)

Classics Panel Senior Thesis Presentations

Virginia Pierce, “Women of the *Iliad*: The Foundation for Male Authority”

Lauren Sorel, “A Retroactive International Relations Perspective on Thucydides: An
Exploration of the Mytilene and Pylos Incidents”

Sarah Christine Speacht, “An Examination of the Cultural Developments Leading Up to the
Aphrodite of Knidos”

Katherine F. Ingebretsen, "Julius Caesar as Pontifex Maximus"

Clare P. Anderson, "Cicero's Defense of the Republic through Philosophy: The Political Messages of *De Finibus*"

Daniel R. Persigehl, "Familial Pressures on Republicans during the Civil War of 44-42: Reconstructing the Life of M. Porcius Cato f. Uticensis"

William Green, "A Comparison of Agrippina the Younger and Hatshepsut"

10:00 – 11:00

Room 327

Session Chair: Dr. Gary Richards (English, Linguistics and Communication)

Panel: Tennessee Williams

Students from the fall 2015 capstone seminar on Tennessee Williams draw on their term research papers to discuss a range of topics surrounding arguably the most important U.S. dramatist of the twentieth century.

Emily Beard, "Tennessee Williams vs. the Stereotype: Does He Subvert or Reinforce?"

Gracyn Hill, "The Self-Censorship of Tennessee Williams' Fiction and Drama in the U.S. Post-War Period,"

Kelly MacRitchie, "A Different Type of Invisibility Cloak: The Progression of Homosexuality in Tennessee Williams' Stage Productions,"

Faith Rivers, "Crushed Violets and Collapsed Daughters: An Analysis of Gutman and Boss Finley,"

Joseph Young, "Everything's a Little Bit Racist: Tennessee Williams' Treatment of Black Bodies and the Legacy of Antebellum Culture"

Room 329

Session Chair: Dr. Davis Oldham (Chemistry)

Mary Fesak, "Gender and Virginia's Early-Twentieth Century Equine Landscapes" (Michael Spencer)

Dahlia Somers, "The Everyday Hero in the Complete Persepolis" (Shumona Dasgupta)

Kaitlyn Berube, "Cultural Studies, Pedagogy and Jane Eyre" (Eric Lorentzen)

Emily Bolesta, "Archiving and Digitization of Blueprints: An Internship with the National Park Service" (Cristina Turdean)

11:00 – 12:00

Room 328

Session Chair: Dr. Doug Sanford (Historic Preservation)

Diana Inthavong, “Breaking the Brutalist Stigma: The Importance of Preserving Brutalist Architecture in America” (Andrea Smith)

Phillip Buterbaugh, “Harris and Janie Porter Barrett: Creating an African American Middle-Class in a Segregated Hampton, Virginia” (1890 – 1915) (Claudine Ferrell)

Sepehr Sobhani, “80 Years of Popular Music: A Quantitative Analysis of Pop Music Trends” (Mark Snyder)

Juliane Kim, “Lord of the Rings in a Postcolonial Light” (Shumona Dasgupta)

Room 329

Session Chair: Dr. Mindy Erchull (Psychological Science)

Kathryn Hall, “Childhood and/in the Literature of Carroll and Barrie” (Mara Scanlon)

Rachel Ewalt, “Reciprocity of Humans and Nature in Eco-poetics” (Jonathan Levin)

Michelle Milligan, “The Division of Childcare and its Effect on Marriage Satisfaction and Child Adjustment in Heterosexual and Homosexual Romantic Relationships” (Mindy Erchull)

Dana Krafft, Emily Garrett, Elisa Tedesco, Diana Inthavong, Ellie Jeanes, “Application of Playground Design Through History and Theory” (Andrea Smith)



Poster Sessions – Hurley Convergence Center

10:00 – 10:50

Selected Topics in Economics Session (Bob Rycroft)

- Maggie Chenault, “The Impact of California’s Nurse to Patient Law on Occupational Injuries and Illnesses for Nurses”
- Joshua Diener, “The Effect of Concussions on High School Football Participation”

- Robert McGuigan, “The Effect of Dodd-Frank on Investment in the U.S.”
- Peter Shammas, “Causes of the Gender Wage Gap”
- Victoria Sheil, “Mixed Land Use Effect on Housing Prices: Boston, Massachusetts”
- Sophia Therriault, “Does a Change in a State’s Mental Health Spending Create an Effect on the Overall Suicide Rate?”

11:00 – 11:50

Selected Topics in Business and Economics

- Joshua Diener, “The NFL Combine. Applications of Physical Testing as a Means of Estimating Draft Status” (Margaret Ray)
- Sophia Therriault, “Whither the Euro? A Case Study of Greece” (Steve Greenlaw)
- Ashley Rowles, “Does it Pay to Pay Less? Unit Labor Costs and International Competitiveness in the Eurozone” (Steve Greenlaw)

12:00 – 1:00

- Dana Bargh, “Triclosan induced antibiotic resistance in Staphylococcus aureus” (Lynn Lewis)
- Rachel Bellamy, Alina Arnatt-Nestor and Rebekah Carrai, “Synthesis and Analysis of Aspirin” (Ray Scott)
- Brittany Brooks, Megan Swarens, “Extinction Patterns of Electrodermal Response to Threat Stimuli as a Function of Individual Differences in Sensitivity to Social Rejection”, (Hilary Stebbins)
- Emily Byers, Sarah Cloude and James Cicio, “Movie Sequel Success” (Belleh Fontem)
- Nicole Cadman, Madeline Welsh, “Tree Surveys / Mobile GIS of Significant Trees in Fredericksburg, VA,” (Alan Griffith)
- Vidhya Cardozo, Kayla Frye and Pengcheng Zhang, “Excitation and Detection of Nanoparticles” (Hai Nguyen)
- William Catoe, “Microwave Driver Circuit for an Electro-optic Modulator” (Hai Nguyen)
- Samuel Clark, “Complementary and Alternative Medicine in the Treatment of Ewing's Sarcoma” (Rosemary Barra)
- Samuel Clark, “Optimization of SELEX Parameters for DNA Aptamer Selection” (Randall Reif)
- Emily Contompasis, Alyssa Macaranas, and Sara Fioretti, “Organic Chemistry Synthesis and Recrystallization of Aspirin Testing” (Ray Scott)

- Abby Cox, “The Effect of the Renewable Fuel Standards Program on Corn Prices” (Margaret Ray)
- Taylor Coxon, Megan Clevenger, “The Effect of Historic and Current Land Use in the Trace Metal Contamination of the James River and its Tributaries” (Ben O. Kisila)
- Crista Cummings-Bizier, Abbygail Brooks and Brittany Harris, “Viscosity: An Exploration of the Factors that Contribute to the Flow of Liquids” (Leanna Giancarlo)
- Kaylie Dalton, Henry Ross, “Sex Mediated Effect of Acute Stress on Groups of Zebrafish” (Dianne Baker)
- Meagan Darling, “Exploring the Sociality of Mice to Model Human Psychopathology” (Parrish Waters)
- Sofia Di Benigno, Viraj Munshi, “The Effect of Interleukin-12 Treatment on Cell Viability of White Blood Cells Infected with Newcastle Disease Virus” (Lynn Lewis)
- Elizabeth Dofflemyer, Melissa Pampel and Elise Pyfrom, “Solving the Schrodinger Equation: Why Quantum Mechanics is Golden (The Absorption and Scattering of Gold Nanoparticles)” (Ray Scott)
- Erica Falvey, Sara Fioretti and Laura Mangano, “Development of the HPI Stress Axis in Teleost Embryos” (Dianne Baker)
- Ellen Field, "Mythographies of Thebes in Euripides' Herakles" (Angela Pitts)
- Katie Belle Finch, “Archaeology Collections Management” (Doug Sanford)
- Kayla Frye, Vidhya Cardozo and PengCheng Zhang, “Excitation and Detection of Nanoparticles” (Hai Nguyen)
- Nick Gabriel, Jeffrey McAteer, “Automation of Intrafractional Gaze Assessment in Proton Radiotherapy of Ocular Tumors” (Gusty Cooper)
- Ian Granger, Ricky Martin and Arfa Vasim, “Enrollment Projection” (Melody Denhere)
- Dustin Gray, Danny Wehr and Matt Lloyd, “Exploring the Anxiolytic Effects of Magnolol on Zebrafish” (Dianne Baker)
- Helena Gray, “Characterization of the Yeast Mutant in ALD4” (Deborah Zies)
- Mitchell Greenwood, Sean Morris, Nick Atwell, Sonia Foley and Victoria Howell, “Quantification of BPA Content in Apple Sauce” (Randall Reif)
- Sophie Gringer, “Investigating the Maillard Reaction” (Kelli Slunt)
- Lonnie Harris, “Enzymatic Resolution of the Enantiomers of 2-ethyl-1-hexanol” (Davis Oldham)
- William Harrison, Matthew Tovar, “Quantum Mechanics of Gold Nanoparticles” (Ray Scott)
- Steven D. Hartzell, Lolita S. Jojic, “Language Recognition” (Melody Denhere)

- Sarah Heisey, Eric Hurwitz, John Lutkenhaus and Lucas Hidalgo, “Verification and Quantification of DDE in Organic and Conventional Baby Foods Using GC-MS” (Randall Reif)
- Brittany Hylander, Mary-Alison Lane, “Relationship between S100B protein and RAGE expression in Vertebrates” (Deborah O’Dell)
- Caitlin Jensen, Heath Holladay and Aaron Kaye, “The Factors Affecting Basketball Player Desirability” (Belleh Fontem)
- Ana María Johnson, “¡Oh Gloria Inmarcesible!: Subjectivity in the press and the portrayal of the most vulnerable populations in Colombia” (Maria Laura Bocaz-Leiva)
- Kristin Jones, Kristina Krumpos, “Genetically Engineering Plasmids for Nuclear Localization Studies, Part 3” (Stephen Gallik)
- Kristina Krumpos, Katherine Qualls and Sarah Roche, “Genetically Engineering Plasmids for Nuclear Localization Studies, Part 1” (Stephen Gallik)
- Elizabeth Kump, “Makeup and Hair Designs for Ben Jonson’s *Volpone*” (Kevin McKluskey)
- Samantha Lancke, “Phenology of flowering trees and shrubs in the Fredericksburg Area” (April Wynn)
- Hannah Lascano, Eisha Raja and Meagan Darling, “Response and Recovery of Cortisol in Individually-Housed Zebrafish After Acute Pen Net Stressor” (Dianne Baker)
- Juliana Laszakovits, William Davis, “Using the Exciton Model to Describe the Spectroscopy of Conjugated Dye Dimers” (Leanna Giancarlo)
- Soo Lee, Viraj Munshi and Jordan Watkins, “A Study of Dextran Diffusion into the Nucleus of Cultured Mammalian Cells” (Stephen Gallik)
- Charbel Marche, Anna Rinko and Meredith Snyder, “Alcohol Dehydrogenase Kinetics” (Ray Scott)
- Virginia Mayo, “The effect of cellular hypoxia on the killing capacity of tirapazamine in human breast cancer cell line MDA-MB-231” (Rosemary Barra)
- Taylor McConnell, “Analysis of Potential Bioaccumulation of Heavy Metals in *Eleocharis palustris* and *Juncus effusus* at an Acid Mine Drainage Site along Contrary Creek, Virginia” (April Wynn)
- Kelly McDaniel, “Synthesis of Oxidative Metabolites of DEHP” (Davis Oldham)
- Kelly McDaniel, Lonnie Harris, “Modeling Transport Properties: The Diffusion of Tartrazine across a Membrane” (Leanna Giancarlo)
- Julie Meade, Tiffany Diaz-Calderon, Sophie Gringer and Eleni Antzulatos, “Iron and Sodium determination to compare various Baby Foods using ICP-AES” (Randall Reif)
- Lauren Mosesso, Lillie Johnson, “The impact of sea level rise on phosphorus dynamics in coastal and upstream wetlands of the Rappahannock River, a sub-watershed of the Chesapeake Bay” (Ben O. Kisila)
- Sara Murphy, “Effects of Chloroquine and Rapamycin on Mouse Mammary Tumor Virus” (Lynn Lewis)

- Teresa Nguyen, “Digenetic Trematodes of Eastern Virginia: An Ode to DNA Barcoding” (Abbie Tomba)
- Alaina Nichols, Emily Bibel and Eva Turcios, “The Effect of Social Cues on Stress Response in Zebrafish (*Danio rerio*)” (Dianne Baker)
- David Nunez, “Optimization of a Ligand Binding Assay for Peroxisome Proliferator-Activated Receptors” (Kelli Slunt)
- Mary O’Dell, “Tree Fredericksburg” (Alan Griffith)
- Melisa Pilipovic, Hannah Hagy, “What’s the Big Deal? How Sales Promotions Displayed Online by Others can Impact Both Online and Offline Sales Intentions” (Kashef Majid)
- Elizabeth Pina, Samantha Alvey, “Heritage Tree Project” (Alan Griffith)
- John Robie, Joe Dolan and Brittany Armbright, “Industrial Applications of Hidden Symmetries of Graphs” (Melody Denhere)
- Leah Roth, “The Effect of Nutritional Status on the Expression of Appetite-Regulating Genes” (Dianne Baker)
- John Rowley, “Influences of Federal Legislation: The NASA Effect” (Bob Rycroft)
- Andrea Sanchez, “Determining the molecular weight of the alarm cue in the crayfish *Cambarus acuminatus* using a behavioral assay” (Abbie Tomba)
- Olivia Schiermeyer, “Thermoregulatory Habits of the Eastern Bluebird (*Sialia sialis*) and how Global Climate Change may cause Population Declines” (Andrew Dolby)
- Victoria Sheil, “Wage Variation Among States” (Margaret Ray)
- Kevin Speray, “Exploring the Relationship Between Shade Level and Incidence of seedling death in *Aeschynomene virginica*” (Alan Griffith)
- Paul Stuckey, “Temporal Dynamics of Apoptosis in Jurkat Cells” (Randall Reif)
- Paul Stuckey, Melissa Miranda-Marroquin, “Kinetics Study of Crystal Violet, Bromocresol Green, Malachite Green, and Sodium Hydroxide Using a Smart Phone Camera” (Leanna Giancarlo)
- Rachel Thomas, Kristina Krumpas, “Genetically Engineering Plasmids for Nuclear Localization Studies, Part 2” (Stephen Gallik)
- Cassandra Tomiko, Bredan Dowling, Kwame Bempong and Hoang Anh Tran, “The Analysis of Phosphates in Commercial Fertilizers by Inductively Coupled Plasma-Atomic Emission Spectroscopy and Ultraviolet-Visible Spectroscopy” (Randall Reif)
- Eva Turcios, Daniel Noyes, “A Comparison between the Location of Virginia’s Invasive Species in The University of Mary Washington Herbarium (MWCF) and the Digital Atlas of the Virginia Flora” (April Wynn)
- Caitlin Turner-Lafving, “Do Competitive Female Candidates Affect Who Turns Out to Vote?” (Chad Murphy)
- Emily Wanger, “The Effects of BAS1 on ADE2 Regulation” (Debbie Zies)
- Michael Wilkerson, Andrew Kalasky and Hallie Marsteller, “Does early fluoxetine exposure in zebrafish cause permeant effects on the stress axis?” (Dianne Baker)

- Taylor Williams, Claire Reilly and Brittany Wagner, “Anatomical Differences Between Plant Species Determine the Preservation Methods Used: Comparing and Contrasting *Pinus echinata* and *Opuntia humifusa*” (April Wynn)
- Kelly Wright, “Streamlining Treatment of Suicidal Patients in the ED” (Mary Jane Bowles)

3:00 – 3:50

Op-Eds in Labor Economics Poster Session

Students in Dr. Rycroft’s ECON 352 – Labor Economics present their posters

- Amir Abdulkader, “How to Raise the Salaries of MLB Players”
- Nathan Anderson, “The Economics of Tipping”
- John Bownik, “Teacher Compensation in Fairfax County, Virginia”
- Danielle Capra, “The United States Needs More Affordable and Accessible Child Care”
- Margaret Chenault, “The Hospitalist Model Should be Expanded in the Health Care Industry”
- Anne Cutting, “Should We Have Paid Parental Leave in the United States?”
- Joshua Deiner, “The Beneficial Labor Market Effects of Participating in High School Athletics”
- Christopher Dingus, “The Benefits of Unionization to the Economy”
- Hallie Heinzen, “How Much Would it Cost to Build a Wall Between Mexico and the U.S.?”
- Kelly Hendricks, “Paid Maternity and Paternity Leave in the United States”
- Zainab Imbabi, “TBA”
- Benjamin Nurney, “Social Security Should be Privatized”
- Kenna Sander, “The Department of Labor’s Proposed Overtime Pay Rule for Post-Doctoral Scientists is a Bad Idea”
- Eric Sargeant, “College Should not be Free”
- Alieh Shaban, “Should College Athletes be Paid?”
- Peter Shammas, “What to do About the Labor Market”
- Victoria Shell, “Should Unemployment Insurance Benefits be Taxed?”
- Thomas Updike, “Would Building a Wall Between the U.S. and Mexico be Worth it?”
- Daniel Valdez, “What Would be the Effect of Free College in the United States?”



Dance Recital – Hurley Convergence Center 12:30 Media Wall Area

Choreography by Shona Dipaula

Life Vest

(Roxann Rowley)

Dancers: Lauren Mort and Emily Warren

Life vest is a dance performance piece showcasing the incredibly powerful, sometimes even lifesaving qualities of friendship. It explores what it means to be there for a friend and never give up, even when it feels like you can't get through to them. It is summed up well by the following quote: "Because you were never really drowning in the first place."



Original Music Performances – Digital Auditorium 1:15 – 2:00

Mitsubishi Ad

Austin O'Rourke

video

Caving

Gwen Levey

Gwen Levey, voice & guitar

The Right Words to Say

Ben Jones

fixed media

Vox Lilly

Drake Dragone

Cole Masaitis, Guitar

Austin O'Rourke, Piano

Drake Dragone, Violin

Alex Rodríguez, Bass

Mitsubishi Ad

Joe Checks

video

Alina's Song/Diary (remix) feat. Ramona Thomas

A. Bryant & M. Carlton

Producer: Flannery Collins
Recording Engineer: Cole Maistisis
Mix Engineer: Mya Payne
Assistant Recording Engineer: Josh Sheats
Mastering Engineer: Flannery Collins
Instrumentals produced by: Mason Carlton
Artist: Alex Bryant (AB)
Feature Artist: Ramona Thomas

A Moment's Hesitation

Cole Masaitis

Cole Masaitis, Guitar
Austin O'Rourke, Piano
Drake Dragone, Violin
Alex Rodríguez, Bass

Save Me

Daniel Francis Shea III

Fixed media

Invocation

Michael Prime

Becky Brown- Harp
Justin Carrico- Electric Bass
Stephen Hennessey- Electric Guitar
Mary-Paige Rogers- Banjo
Michael Prime- Euphonium
Gracie Hardy- Clarinet
Austin O'Rourke- Timpani

House

Mya Payne

video

Cole Masaitis, Guitar

Austin O'Rourke, Vibraphone, Tape Decks, Suspended Cymbal

Drake Dragone, Violin

Alex Rodríguez, Bass

Winston Givler, Guitar

Program Notes:

Faculty mentor: Dr. Mark Snyder

MUTC 100: Technology for Musicians students: Austin O'Rourke, Ben Jones & Joe Checks

MUTC 370: Electronic Music student: Mya Payne

MUTH 483 & MUPR 336: Music Composition students: Michael Prime, Drake Dragone, Cole Masaitis, Austin O'Rourke, Gwen Levey & Daniel Shea

MUTC 340: Audio Production students: Flannery Collins, Mya Payne, Cole Masaitis & Josh Sheats

Gwen Levey is a singer/songwriter from the D.C. and Northern Virginia area. She recorded her first demo with Grammy-winning producer, Jeff Jones, in NYC when she was 14.

Gwen has been showcased in several SAW Young Songwriter's Showcases with artists such as Margot MacDonald, Owen Danoff, and James Britton and Jamie Boyd of Throwing Plates. She has participated in several singing competitions, such as *American Idol*, and most recently was invited to audition for *The Voice* where she had the opportunity to audition in front of country artist Blake Shelton.

Gwen currently attends the University of Mary Washington in Fredericksburg, Virginia and plans to pursue a career in songwriting and theatre. She has performed at venues that include the Kennedy Center's Millennium Stage, Jammin' Java, Eddie's Attic, The National Cherry Blossom Festival Tidal Basin Stage, Ebenezer's Coffeehouse, Catalyst Studios, The Colonial Tavern, Blackstone Coffee, and Home Team Grill.

Drake Dragone is a composer, performer, and multi-instrumentalist from Richmond, Virginia. Currently studying Music Composition at the University of Mary Washington, Drake is honing in his musical skills while living in Fredericksburg. His compositions vastly range in style and genre, paying homage to even vaster influences: artists such as Josh Homme, Eddie Vedder, Steely Dan, Kendrick Lamar, and Dave Grohl. Drake plays guitar and provides vocals in two Richmond bands, Tredegar and The Andrew Elmore Experience, along with his own solo work under the name Manakin.

Joe Checks is a second year Music Major at the University of Mary Washington. He loves all kinds of music from a rageton to classical. His favorite medium to create his music is the computer. Joe also has a passion for the technology aspect of music. With his love of Music and computers, Joe strives to combine his passions to create pieces of art that will leave his audience wanting to hear more.

A Moment's Hesitation - The inspiration for this piece was drawn from some of the video game music that made me the musician I am today, and nostalgia.

Cole Masaitis is a Junior at the University of Mary Washington. He is a music major who aspires to compose scores and be a sound designer for media. Cole has experience in booking concerts, performing live music, and composing musical works. *Blue Veined Child*, by Justin Carrico

Daniel Shea is an edm artist who is passionate about his music. He has gone through many hardships in life and as a way of coping with them he pours his heart and soul into music. He loves making music and looks forward to his future when it comes to succeeding in the world of edm.

Invocation was largely influenced by the 5th movement of Berlioz's *Symphony Fantastique*, "Dream of a Witches Sabbath". *Invocation* tells a story of witches during a ritual, beginning with the initial gathering, and moves on towards the beginning of the rite itself. The piece then moves to a calmer section as the witches see their spell starting to take effect and culminates with the completion of the ritual and the ancient spirits freed.

Michael Prime is a composer and performer, his instruments including euphonium and harp. He is currently a junior at the University of Mary Washington double majoring in Music and Computer Science. He studies composition with Dr. Mark Snyder.

House by Mya Payne

This piece is a representation of the thoughts that control you as you try to sleep: the hopelessness that ensues. The word "house" represents the mind and the thoughts that dwell inside. These thoughts eventually become you and the thoughts win the battle over sleeping. I was inspired by my own inability to sleep while having recurring thoughts interrupting my sleep.

Mya Payne is pursuing a degree in Spanish with a minor in Linguistics, but she has always enjoyed creating and listening to music. She especially enjoys working with synthesizers and creating dimensional melodies and harmonies. Mya has taken Electronic Music and will complete Audio Production this spring, 2016.

Memory Aberration examines the shape and edges of memories as a physical phenomenon. This piece aims to portray the nebulosity of human memory and the methods they take in deteriorating.

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

Austin's compositions have been described as "organic," "touching," and "incredibly emotional." His works have been presented at the UMW Undergraduate Research Symposium, Electro Acoustic Barn Dance, Root Signals, N_SEME, and the West Fork New Music Festival. His piece "Hazel Colored Nebula" has been awarded 2015's ASCAP Morton Gould Young Composer Award. AustinORourke.com



Afternoon Oral Sessions in Hurley Convergence Center

1:00 – 2:00

Room 328

Panel: Selected Topics in Business and Economics

Alli Jakubek, “The Effect of Crime on Major League Baseball Game Attendance” (Margaret Ray)

Sara Armor and Kenneth Vucmanic, “Anticipating Spontaneity – When Being Spontaneous is a Bad Thing” (Kashef Majid)

Kelsey Dean and Ben Drucker – “The Effects of Media Distractions on Academic Performance at UMW” (Belleh Fontem)

William Wilkinson, “Modeling Workforce Dynamics at NSWC Dahlgren” (Chris Garcia)

Alex Bergner, Sarah Karwowski, Sara Armor, Maddy Spear, Matthew Floyd, Kenneth Chisholm, Emma Ferraiuolo and Amy Wells, “Effectiveness of Aikido Training on Behavioral and Academic Outcomes at Courthouse Academy: A Statistical Analysis” (Chris Garcia)

Room 329

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

Panel: Rappahannock Review

Now in its third year of production, UMW's literary journal Rappahannock Review has garnered attention both locally and nationally. A product of the hard work from the students of English 314, the magazine has provided them experience in a professional publishing work environment. The editors will introduce the next two issues of the magazine and then discuss the inner-workings of the magazine production, its trials, and its triumphs. The assistant editors will read from selected works of fiction, nonfiction, and poetry from both issues.

1:00 – 2:30

Room 327

Session Chair: Dr. Elizabeth Johnson-Young (English, Linguistics and Communication)

**Panel: Modern Issues in Communication
Students of Communications 341 Class**

Elaina Finkelstein, David Mercer, Eric Shaw and Dallas Tarkenton, “Intimate Relationships and the College Experience”

Christina Brown, Kelsey Greenwood, Grace Howie, Tasherit Sturm Dahal and Nelia-Sol White, “Dealing with Stress: College Students and Caffeine Intake”

Christine Ayad, Caty-Scarlett Coleman, David Hart, Colton Hayden and Max Johnson, “Images of Masculinity in Modern Film and College Student Perceptions of Masculinity”

Mikey Barnes, Morgan Moncrief, Christa Snyder and Olivia Taylor, “College Students Social Media Use and News Gathering”

Brian Goulet, Bridget Johnson, Ray Celeste Tanner and Ryland Willis, “College-Related Facebook Use and its Relationship to College Student Success and Satisfaction”

Cameron Bierkan, Ryan Hastings, Faith Martino and Mark Noel, “The Impact of Classroom Social Media Use and College Student Success”

Gabrielle Christie, Samantha Davenport, Sharla Hargis, Rowen Keifer-Hankins and Janelle Pierangelino, “Modern Film Portrayals of Interracial Relationships and College Student Perceptions of Interracial Relationships”

Stratton Gilmore, Daniel Greene, Catalina Ruiz de Gamboa and Andrea Stegman, “Twitter and Celebrity Relevance”

2:00 – 3:00

Room 307

Panel: Econometric Analysis

Sarah Van Giezen, “The Economic Determinants of Domestic Terrorism” (Bob Rycroft)

Victoria Rudicille, “The Effect of Federal Legislation on Breastfeeding Rates” (Bob Rycroft)

Rob Wimberly, “The Effect of Trade Promotion Authority on the Conclusion of Trade Agreements” (Steve Greenlaw)

Room 328

Session Chair: Dr. Charlie Sharpless (Chemistry)

Sydney Welch, “Evaluating the Spatial Relationship and Statistical Differences Between Various Snail and Parasite Collection Sites Along the Rappahannock River Watershed” (Abbie Tomba and Brian Rizzo)

Maggie Johnston, “Brominated Flame Retardants: The Hidden Environmental and Health Implications” (Chuck Whipkey)

Parminder Singh, “An Effective Screening Tool to Reduce the Rate of Readmissions for Diabetic Patients” (Mary Jane Bowles and Pamela McCullough)

Sean Morris, “Temporal Dynamics of Apoptosis in Jurkat Cells” (Randall Reif)

Room 329

Session Chair: Dr. Eric Gable (Sociology and Anthropology)

Eniola Afolayan, “‘We the People’: An Anthropological Analysis of Property Rights Discourse and Practice” (Eric Gable)

Melanie Fuechsel, “Slave Housing versus Population: A Look into the Disparity Through Data Analysis” (Brian Rizzo)

Karen Smith, “Analyzing the Spatial Distribution of Carbon Emissions in Virginia” (Brian Rizzo)

3:00 – 4:00

Room 327

Session Chair: Dr. Suzanne Sumner (Mathematics)

Amy Bowden, “The Anthropogenic Allee Effect in Whale Population Models” (Suzanne Sumner)

Sean Mayer, “Harmonic Maps and their Applications” (Yuan-Jen Chiang)

Alison Loughry, “Course Evaluation” (Melody Denhere)

Room 328

Session Chair: Dr. Parrish Waters (Biological Sciences)

Brittany Harris, “The Determination of the Enthalpy of Fusion for Straight Chain Alkanes using Differential Scanning Calorimetry” (Leanna Giancarlo)

Kimberly Kerns, “Optimization of RNA SELEX Parameters” (Randall Reif)

Hannah Belski, “Understanding the Individuality of Mice” (Parrish Waters)

Room 329

Session Chair: Dr. Hai Nguyen (Physics)

Lukas Chandler, “Reconciling the Knowledge-Gap in the Physician-Patient Relationship: Relational Autonomy in the Ethics of Care” (Jason Matzke)

Mary Loyd, “Best Practice Guidelines for Skin Care of the Breast Undergoing Radiation Therapy” (Mary Jane Bowles and Pamela McCullough)

Alexandra Hoenscheid, “A Conflict of Authority: Analyzing the Influence of Swiss Democratic Values in the Diocese of Chur” (Daria Pezzoli-Olgiati)

Girard Bucello IV, “Trouble with the Neighbors: A Case Study of the Political Relationship Between the Baltic States and Euro-Atlantic Security Institutions after Russia’s Annexation of the Crimean Peninsula” (Jack Kramer)



Abstracts

Listed Alphabetically By Student Researcher

Student Researcher(s): Eniola Afolayan

Major: Anthropology

Research Mentor(s): Eric Gable

Project Title: "We the People": An Anthropological Analysis of Property Rights Discourse and Practice"

The purpose of this research is to demonstrate what anthropology can contribute in bringing notions of personhood back to a more central place in the discourse on property. While the everyday rhetoric around property rights tends to focus on land and land rights, here I assert that beneath that rhetoric is the set of ideas about what it means to be a person by normative American standards. I look to anthropology to specify what these standards are, as well as review the discipline's other contributions to the concept of property rights. Pacing Maurer (2003), I will suggest that property is an interesting topic for anthropology to study because of the duality of the concept: it is both ideology and jurisprudence.

Student Researcher(s): Clare P. Anderson

Major: Classics, Latin

Research Mentor(s): Liane Houghtalin

Project Title: Cicero's Defense of the Republic through Philosophy: The Political Messages of *De Finibus*"

The Roman orator and politician, Marcus Tullius Cicero, played a significant role in the failed attempt to save the Roman Republic from the emerging Roman Empire. For a time, Cicero was unable to be as verbal a defender as he wished because of the danger it presented to him. Instead he took advantage of his literary skills and embedded his political messages in philosophical works, using the genre to camouflage his intent. In the course of this presentation, his work, *De Finibus Bonorum et Malorum*, will be explored for such messages. Dedicating this work to Brutus, Cicero specifically addresses his concerns to him. *De Finibus*, written in 45 BC, presents the search for the highest good in man's life; and the fact that Cicero employs the philosophy of Antiochus, the philosophy to which Brutus adhered, as one of the best keys to the search shows his attempt to influence Brutus. Also, by comparing the *De Finibus* to letters which Cicero wrote to Brutus in the year 43 BC, it is evident that Cicero was doing more than exploring philosophy. The letters were written at a time of great political upheaval and Cicero no longer used hidden language. He was blatantly political. In his letters there are political themes that connect directly to the language and ideals expressed within *De Finibus*. Through this study, it becomes clear that Cicero intended to encourage Brutus through philosophy to fight against the rise of Caesar and save the Republic.

Student Researcher(s): Dana Bargh

Major: Biology

Research Mentor(s): Lynn Lewis

Project Title: Triclosan induced antibiotic resistance in *Staphylococcus aureus*

Triclosan is a broad-spectrum antimicrobial agent that is commonly used in a variety of products including operating room scrubs in hospitals, pillowcases, cutting boards, disinfectants and a myriad of other products. Triclosan use has been shown to reduce the incidence of hospital-acquired infections, but there have also been reports of triclosan resistance in pathogenic bacteria. Of particular concern is the possibility that microorganisms that are resistant to triclosan could also gain cross resistance to antibiotics. This would make treatment for diseases much more difficult. There has been conflicting data about whether or not triclosan resistance also induces antibiotic resistance, even when similar methods were utilized. Because the research is inconclusive, more research on this topic is necessary. This study focuses specifically on *Staphylococcus aureus* which causes staph infections when found in an area of the body normally not colonized by this bacterium,

such as the bloodstream, joints, bones, or heart. If triclosan resistance does induce antibiotic resistance, this would limit the already scarce treatments available for staph infections and MRSA. This study attempts to induce triclosan resistance in a strain of *S. aureus* that is sensitive to many antibiotics and a MRSA strain that has previously existing resistance to antibiotics. Triclosan resistance was induced by growing the *S. aureus* and MRSA in increasing levels of triclosan. The zones of inhibition for the *S. aureus* and MRSA were measured prior to inducing triclosan resistance, then measured again after triclosan resistance was achieved and compared to determine if antibiotic sensitivity had also occurred.

Student Researcher(s): Rachel Bellamy, Alina Arnatt-Nestor, Rebekah Carrai

Major: Chemistry

Research Mentor(s): Ray Scott

Project Title: Synthesis and Analysis of Aspirin

In this experiment, aspirin was synthesized from salicylic acid. The aspirin was synthesized by combining salicylic acid with acetic anhydride and crystallizing the solution. The solution was then filtered and recrystallized to be filtered again. The percent yield for the crude amount of synthesized aspirin before recrystallization was 180%. The percent yield for the crude aspirin immediately after the second filtration was 120%. The final percent yield of the completely dry synthesized aspirin was 68%. The purity was then tested using melting point, IR spectroscopy, and thin layer chromatography. Commercial aspirin and salicylic acid were also used during the IR spectroscopy and thin layer chromatography. A melting point apparatus was used for the synthesized aspirin in order to determine range in which it melted. The results showed that the synthesized aspirin's melting point was from 135.8°C -138.5°C. The literature value of the melting point for commercial aspirin is 136°C, while salicylic acid's melting point is 159°C. The IR data shows the functional groups for the synthesized aspirin and the commercial aspirin were the same, while there were some differences compared to the salicylic acid. The chromatography results showed that the R_f value for both the synthesized aspirin and the commercial aspirin were 0.81, while the R_f value for salicylic acid was 0.67. The synthesized aspirin matched the commercial aspirin's characteristics as determined through IR, melting point, and chromatography, proving the synthesized aspirin's purity.

Student Researcher(s): Hannah Belski

Major: Biology

Research Mentor(s): Parrish Waters

Project Title: Understanding the Individuality of Mice

In previous studies, scientists have used mice for their versatility as a whole animal model in examining human conditions. In many studies, the mouse's behavior is the output and ultimately determines the result of the experiment. However, the mouse's natural ethology is rarely prioritized in interpreting these results. What this experiment aims to do is develop an ethologically valid model to more fully understand the mouse's behavior and in turn its response to stressful stimuli. Primarily, this study focuses on social stress; the most potent stressor animals can encounter. To induce this social stress, we house five male CD-1 mice together in a cage in which they compete for dominance. The design of this experiment consists of two components: behavioral and physiological. We performed several established tests of dominance, including a Tube Test for which we constructed an algorithm to generate a quantitative score of dominance, called a TDR (Total Dominance Ratio). To support these data, we determined fecal steroid hormone concentrations throughout the experiment and measured monoamines from several critical regions of the brain. Through both of their behavioral and physiological measures, we hope to see consistent patterns emerge that characterize dominant or subordinate mice. Future directions of this project will include incorporating RFID technology as well as additional social stressors to model human pathologies.

Student Researcher(s): Kaitlyn Berube

Major: English

Research Mentor(s): Eric Lorentzen

Project Title: Cultural Studies, Pedagogy and Jane Eyre

The field of cultural studies is one that has received much academic attention. However, a vast majority of the research applies to higher education and college, with occasional forays into foreign teaching and writing classes. The idea of cultural studies teaching as it applies to secondary education is almost completely unexplored, especially the ways in which it can be placed into practice. This is a serious problem due to the positive effects cultural studies can have on the critical thinking skills of students. Keeping cultural studies locked behind the gate of higher education keeps a large section of the population from the chance to develop those skills, and more should be done to push cultural studies into earlier schooling. The following article takes two stances-- first, the value of cultural studies as it applies to teaching in middle and high school and the reasons to do so. After the values of cultural studies have been adequately discussed, a method for implementing it into practice using the example text of Jane Eyre will be analyzed with the purpose of giving teachers an idea of how to implement cultural studies into their classrooms through literature.

Student Researcher(s): Emily Bolesta

Major: Historic Preservation

Research Mentor(s): Cristina Turdean

Project Title: Archiving and Digitization of Blueprints: An Internship with the National Park Service

For my capstone project I performed an internship in the Fall 2015 semester with the Fredericksburg and Spotsylvania National Military Park, operated by the National Park Service. The Park Service, a government organization in charge of preserving and maintaining the national parks and cultural heritage of America, is a wonderful organization and I was eager to support them with the knowledge and skills I have gained over my four years at Mary Washington. My role was to design and create a catalog for the blueprints and architectural drawings held by the park, proceeding then to produce a comprehensive inventory of the documents. The documents ranged in age from the 1920's to the present day, and spanned a variety of materials including vellum paper, blue lines, and the more well known blueprints. The overall goal was the long-term preservation and digitization of the documents for use in internal maintenance work, scholarly research, and the access by general public.

The comprehensive inventory was developed in Microsoft Excel, in which I produced a series of categories to adequately record each drawing, including pertinent diagnostic information and a condition assessment. Throughout the semester I was able to develop the catalog system and submit 1,912 documents. In keeping with the major goals of the project, I also oversaw the digitization of nearly 75% of the collection. Prior to leaving the internship I produced instructions for the continuation of the comprehensive inventory, as well as made recommendations for future preservation. Taking part in this internship was a wonderful hands-on experience, and I feel that my archival skills developed as a result.

Student Researcher(s): Amy Bowden

Major: Mathematics

Research Mentor(s): Suzanne Sumner

Project Title: The Anthropogenic Allee Effect in Whale Population Models

This research project analyzes the causes of declining populations of various endangered whale species. Researchers such as Courchamp et al. have formulated a mathematical model on the premise of the Anthropogenic Allee Effect, which assumes that species rarity and value are positively correlated and that this correlation fuels increasing demand for the species to ensure the market price exceeds the growing costs of harvesting the declining species. Three mathematical models are illustrated, covering the cases when price and cost are constant, price is constant while cost exponentially decreases, and price inversely decreases whereas cost exponentially decreases. For each of these models, equilibrium levels of whale populations are determined and presented along with their stability analysis.

Student Researcher(s): Brittany Brooks, Megan Swarens

Major: Psychology

Research Mentor(s): Hilary Stebbins

Project Title: Extinction Patterns of Electrodermal Response to Threat Stimuli as a Function of Individual Differences in Sensitivity to Social Rejection

Individuals vary in their expectations, perceptions, and reactions to social rejection which is known as rejection sensitivity (RS). Whether an individual is measured as having high (HRS) or low (LRS) rejection sensitivity influences learning about threat. Based on a study done by Olsson, Carmona, Downey, Bolger, and Ochsner (2013), classical fear conditioning was used to assess extinction of the conditioned response between HRS and LRS participants. We included a nonsocial threat level to the original three categories of social threat, social neutral, and nonsocial neutral stimuli distinguished by Olsson, Carmona, et al. to evaluate whether people with HRS show slower GSR extinction to all threatening stimuli or just threatening faces. We hypothesized those with HRS would take longer than those with LRS to extinguish the conditioned response to angry face stimuli specifically, indicating that they may learn about threatening faces in a different manner than those with low sensitivity to rejection.

Student Researcher(s): Girard Bucello IV

Major: International Relations

Research Mentor(s): Jack Kramer

Project Title: Trouble with the Neighbors: A Case Study of the Political Relationship Between the Baltic States and Euro-Atlantic Security Institutions after Russia's Annexation of the Crimean Peninsula

This paper assesses the European security community in the aftermath of Russia's annexation of Crimea from the perspective of the three Baltic countries. The research qualitatively analyzes government documents, official statements, and publications by and interviews with scholars and policymakers to determine how recent Russian behavior has affected the perspective of the Baltic states, and how they have affected NATO and the EU. This paper finds that the annexation of Crimea vindicated those in the Baltic who had expected such behavior, and determines that the Baltic states have leveraged the EU and NATO to refocus attention on their eastern flank.

Student Researcher(s): Phillip Buterbaugh

Major: History

Research Mentor(s): Claudine Ferrell

Project Title: Harris and Janie Porter Barrett: Creating an African American Middle-Class in a Segregated Hampton, Virginia (1890-1915)

In 1889, Harris Barrett and his fellow Masons opened the Peoples Building and Loan Association and provided loans that funded the building of over four-hundred houses and businesses. In 1903, he secured the funding for a school that would take his name, the Harris Barrett School, a two-room schoolhouse in Tuskegee, Alabama. In 1890, Janie Porter Barrett opened the first African American settlement house. The Locust Street Social Settlement helped to teach domestic skills and a normal education to the African American citizens of Hampton. In 1907, she formed the Virginia Federation of Colored Women's Clubs (VFCWC) and united all African American women's clubs in Virginia. In 1915, Harris Barrett's death pushed his widow further into her work to uplift, and she became Superintendent of the Virginia Industrial School for Wayward Girls, the first correctional facility for African American girls in Virginia.

Grover Fountain, the Barretts' grandson-in-law, said, "Janie was the driving force behind Harris's accomplishments." Or, could they have pushed each other to greatness? The proposed presentation will address the interdependence of Barretts' personal, business, and philanthropic relationships. Additionally, the presentation will highlight their accomplishments and show how Harris and Janie Porter Barrett helped to usher in Hampton, Virginia's African American middle class.

Harris and Janie Porter Barrett were truly significant figures in African American and Virginian history. This is not just about a History 485 research project, but research that one day could be a central chapter in a monograph that will clarify the histories of Virginia, African Americans, and the Settlement House Movement. In 1925, Janie Porter Barrett donated a letter from Frederick Douglass to the Woodson Collection at the National Archives because she understood the importance in preserving the voice of the

slave. Now, it is time for the Barrett's voices to be heard and Creativity Day is a perfect venue for shedding a light on their accomplishments.

Student Researcher(s): Nicole Cadman, Madeline Welsh

Major: Environmental Science (N. Cadman), Biology (M. Welsh)

Research Mentor(s): Alan Griffith

Project Title: Tree Surveys / Mobile GIS of Significant Trees in Fredericksburg, VA

Reforestation is meant to diversify plant life in cities and towns. This process is best done through planting of saplings of different species to increase plant diversity. Tree Fredericksburg, organized by Anne and Carl Little, works with the city of Fredericksburg, VA to plant a variety of trees in neighborhoods across the city. The purpose of our data collection of trees was to educate people in Fredericksburg about the diversity of tree life and how that benefits the city and its residents.

Student Researcher(s): Vidhya Cardozo, Kayla Frye and Pengcheng Zhang

Major: Biophysics

Research Mentor(s): Hai Nguyen

Project Title: Excitation and Detection of Nanoparticles

The up-conversion of nanoparticles has many applications in the fields of biology and medical research, such as single molecule spectroscopy, colloidal dynamics, protein isolation, and controlled investigation of biological processes. the purpose of the project is to study the excitation and detection of nanoparticles with infrared laser beam of wavelength 915 nanometers. furthermore, this project serves as a preparation and introduction to dr. hai's research project "quantitative efficiency analysis of a single optically trapped up-converting nanoparticle". the experimental setup of the project references many studies on up-converting nanoparticles using laser beams of wavelength 980 nanometers. the advantages of using 915 nm lasers includes lower water absorption and deeper tissue penetration, which is ideal for medical applications.

the eventual goal of this project is to prepare and set up the experimental procedures and equipments for the optical trapping of nanoparticles.

Student Researcher(s): Ruth Catlett

Major: Computer Science

Research Mentor(s): Stephen Davies
Project Title: "One-and-dones": A Data Science Analysis of the Impact of Leaving College Early for the NBA on a Player's Career"

College basketball a highly popular sport and in the wake of March Madness one wonders what will happen to key players next year. The National Basketball Association (NBA) currently restricts players from entering the draft until they are 19. This leads some players to enter college simply as a practice and "waiting area" for the NBA. These players - often termed "one-and-dones" - stay for a year and then at their earliest chance, enter the draft. Did staying in college longer allow NBA-bound players more practice and experience playing under pressure, or were players better off by leaving college early to play while they were still young?

Using R I gathered individual player data from both college and the NBA. This required significant work in gathering, fusing, and cleansing electronic data from multiple sources into a usable form. I then investigated various accepted performance aggregation metrics, and settled on efficiency (EFF) which is a relatively simple measure that consolidates a player's yearly performance (including points, rebounds, assists, etc.) into a single number. Using machine learning techniques, I divided the players into "clusters" (small groups of statistically "similar" players) based on their freshman-year data and then examined each cluster individually. For each cluster I analyzed whether there was a significant difference between the one-and-dones and the others. In this way I could examine the likely effect that additional college experience would have had on a player's NBA career. This analysis could find little significance between the "one-and-dones" and the "more-and-dones", meaning perhaps a player's NBA performance is not hurt by coming out early.

Student Researcher(s): William Catoe

Major: Physics

Research Mentor(s): Hai Nguyen

Project Title: Microwave Driver Circuit for an Electro-optic Modulator

Electro-optic modulators (EOM) are optical devices used to modulate a beam of light through the electro-optic effect. The electro-optic effect may be utilized to modulate the phase, amplitude, frequency, or direction of a beam with bandwidths extending into the gigahertz range. Generally, a nonlinear optical material is used in which the refractive index is changed by an external control stimulus such as an electric field applied to a crystal. In the final apparatus of this experiment, we will be utilizing a phase modulation EOM driven by a microwave signal at 6.385 GHz. In this stage of the experiment, however, the microwave components and circuit to be used to drive the phase modulator in the final experimental setup were characterized.

The microwave components required for the experiment are the Mini Circuits ZX95-6840C+ voltage controlled oscillator (VCO), and the ZVE-3W-83+ amplifier. Additional components were provided to add flexibility to the circuit capability, such as the Mini Circuits ZX05-73L+ mixer, and the ZFSWA2-63DR+ switch.

The eventual goal of this project is to integrate the microwave driver circuit into the optical circuit and develop the capability to conduct slow-light experiments using a rubidium vapor test cell.

Student Researcher(s): Lukas Chandler

Major: Philosophy and German

Research Mentor(s): Jason Matzke

Project Title: Reconciling the Knowledge-Gap in the Physician-Patient Relationship: Relational Autonomy in the Ethics of Care

The presentation investigates the challenges of knowledge in the physician-patient relationship, both the patient's lack of expert medical knowledge and understanding of his or her medical condition as well as the physician's ignorance of the patient's values and belief systems. Employing a feminist ethic of care, the aim is to bring attention to this dual epistemological difficulty in the patient-provider relationship. A feminist ethic of care provides a lens for understanding, establishing empathy for the patient, and seeking methods in which a patient may become empowered. Channeling the ideas of Dr. Edmund Pellegrino, the presentation seeks to address challenges of moral agency in the patient-provider dynamic while simultaneously appealing to relational autonomy in moral psychology. The work concludes with an evaluation of the benefits and limitations of a feminist formulation of autonomy in the patient-provider relationship. Additional research conducted on the care and justice orientations in medical ethics will also be included as a conclusive evaluation of the research.

Student Researcher(s): Lukas Chandler

Major: Philosophy and German

Research Mentor(s): Jennifer Hansen-Glucklich

Project Title: What Does it Mean to Lead an Ethical Life After Auschwitz?

This is a culmination of a two-semester senior thesis research for German. The moral ramifications of the Holocaust are still a relevant aspect to our global society and how we approach ethics. Confronting the consequences of the Holocaust (for survivors, the world, and education) is not as simple as just attending to "unresolved" events of the past. The matter is much more complex and demands moral attention beyond the simplistic assertion that "this should not have happened." Arguably, for some, there is no resolution to be found, for their view of the world (Weltanschauung) or trust in humanity (Weltvertrauen) was destroyed through the evils of the Nazi regime. Accounts from Jewish philosophers Jean Améry, Hannah Arendt, and Theodor Adorno provide a variety of analyses as to how one may approach the moral consequences humanity faces after Auschwitz. Coming to terms with the past (Vergangenheitsbewältigung) is an essential concept for evaluating ethics in a post-Holocaust world. In this sense, morality and history sometimes inform one another. The presentation focuses on the thesis of Jean Améry, that to lead an ethical life means to keep the moral truth of the Nazis' actions alive by harboring resentments

Student Researcher(s): Samuel Clark

Major: Biology

Research Mentor(s): Rosemary Barra

Project Title: Complementary and Alternative Medicine in the Treatment of Ewing's Sarcoma

Botanical and herbal medications are among the most common complementary and alternative medications (CAM) used by cancer patients, both in the treatment of cancer and the management of cancer symptoms. However, information concerning the safety and efficacy of many CAM treatments has not been established in controlled settings. *Rosmarinus officinalis*, commonly known as rosemary, has been implicated as a possible cancer chemo preventive agent as well as a treatment due to its inherent antioxidant activity. It has been demonstrated in several cancer lines that rosemary extracts (RE) have a significant anti-proliferative effect through modifications on the cell cycle. RE's have not been tested on Ewing's sarcoma cell lines, although it is the second most common cancer in children, comprising approximately 1.5% of childhood cancers. This study aimed to evaluate the proliferative activity of RE's on a Ewing's sarcoma cell line. Also, one of RE's main active components, rosmarinic acid (RA) was evaluated. Both of these analyses used the MTT viability assay. Contrary to the effects on other cell lines, this study indicated a significant increase in cell proliferation. The Folin-Ciocalteu assay was used to determine the approximate phenol concentration within an RE. RE was applied to the system at concentrations of 30 ug/mL, 15 ug/mL, 7.5 ug/mL, and 3.5 ug/mL, an increase in cell viability by 119%, 140%, 157%, and 289% respectively, was demonstrated. When the RA was applied to the system at concentrations of 30 ug/mL, 15 ug/mL, 7.5 ug/mL, and 3.5 ug/mL, an increase in cell viability by 120%, 175%, 246%, and 310% was recorded. These results suggest that RA is the major active component of the extract. This increase in cell viability may be due to changes in cell cycle regulation by the retinoblastoma protein (Rb). An Rb ELISA kit should provide evidence of upregulation of the Rb protein.

Student Researcher(s): Samuel Clark

Major: Biology

Research Mentor(s): Randall Reif

Project Title: Optimization of SELEX Parameters for DNA Aptamer Selection

The primary research goal for this project was initiate a method called Systematic Evolution of Ligands by Exponential Enrichment (SELEX). SELEX is used to discover aptamers, which are oligonucleotides (RNA or ssDNA) that bind to target molecules with high affinity and specificity due to their three dimensional conformation. Aptamers have been developed for a multitude of targets including; inorganic and small organic molecules, peptides, proteins, carbohydrates, antibiotics, and cells. High affinity aptamers are isolated by introducing DNA molecules with random sequences to a specific target molecule. The DNA molecules that bind to the target are then extracted, amplified, and used in subsequent rounds of SELEX. After each round of SELEX the DNA pool shifts toward higher affinity binding to the target molecule. The DNA library was constructed, its amplification optimized, and the purification of the DNA examined. The filtration and purification of the aptamer-protein complex through a nitrocellulose membrane was tested. This project was designed to make an efficient, reproducible, procedure for future researchers within the lab.

Student Researcher(s): COMM 341 Students

Topic: Communication and Digital Studies

Research Mentor(s): Elizabeth Johnson-Young

Project Title: Modern issues in Communication

College students are faced with myriad issues: school, relationships, and even multi-tasking with their online presence and what to do with their free time. The eight research projects presented in this panel session explore what shapes college student perceptions of the world around them, such as views of masculinity and relationships; what impacts their college experience and grades, including social media use in and outside of the classroom; and some of the many ways students cope with their stresses, including caffeine intake. Through qualitative and quantitative social science approaches, these projects provide insight into these issues.

Student Researcher(s): Emily Contompasis, Alyssa Macaranas, Sara Fioretti

Major: Chemistry

Research Mentor(s): Ray Scott

Project Title: Organic Chemistry Synthesis and Recrystallization of Aspirin Testing

The synthesis of acetylsalicylic acid was prepared, and then the purity of the aspirin sample was tested. The reaction of salicylic acid and acetic anhydride into acetylsalicylic acid and acetic acid by esterification was demonstrated. The yield of the aspirin sample was 2.1525 grams compared to the theoretical yield of 3.92 grams. The purity was assessed through melting point determination where the melting ranges were 132.5-138.8°C, 134.1-140.7°C, 135.2-140.0°C, and 133.5-140.1°C compared to the literature melting point of 136°C for aspirin. TLC showed R_f values of 0.64 for commercial aspirin, 0.71 for the synthesized aspirin, and 0.94 for the salicylic acid. Infrared spectroscopy showed a sign for synthesized aspirin and commercial aspirin with a high peak at 1740 cm^{-1} for 55% for commercial aspirin, and a smaller peak of 75% at 1740 cm^{-1} for synthesized aspirin. The synthesized aspirin overall was not entirely pure with a yield of 54.85% and a percent error of 45.15% due to loss of crystals during recrystallization and filtration.

Student Researcher(s): Taylor Coxon, Megan Clevenger

Major: Geology

Research Mentor(s): Ben O. Kisila

Project Title: The Effect of Historic and Current Land Use in the Trace Metal Contamination of the James River and its Tributaries

The progressively declining ecological condition of the Chesapeake Bay is attributed to the influx of contaminants associated with sediment loads supplied by its largest tributaries. Anthropogenic development in the James R. Basin varies spatially and temporally, and the distribution of trace metal contaminants in sediment reflects the evolution of land uses in this large basin. The continued suburban expansion around of Richmond, Charlottesville and Newport News alters fluvial system hydrodynamics, allowing for the remobilization of trace metals once thought sequestered. Understanding the impact of legacy sediment mobilization is critical to understanding contaminant distributions in large, rapidly urbanizing basins across the globe. The spatial distributions of Al, Fe, Cd, As, Se, Pb, Cu, and Zn, in the major tributaries and main stem of the James were obtained with sediment grab samples. Grab sample data was supplemented with data from the Virginia Department of Environmental Quality. Future statistical analyses of data will include spatial hot spot analysis in ArcGIS 10.3 and Pearson correlations between downriver distance, metal concentrations, and historic mining and land use covers. Metal concentrations ($\mu\text{g g}^{-1}$) in surface grab samples along the main stem of the James ranged from 0 (Cd) to 684 (Zn), with extreme elevations in Pb, As, Se and Cd being associated with urban, industrial, and residential development around Richmond. Zn and Cu were elevated in mountainous reaches, with maximum concentrations ranging from 160 to 175 $\mu\text{g g}^{-1}$. Future t-test analyses on tributary sediment will ascertain the impact of tributaries on sediment metal concentrations in the James, which will then provide insight into which sub-systems supply the greatest metal load to the James. Correlations between historical land-use and metal levels will demarcate sources of contaminated legacy sediments

Student Researcher(s): Crista Cummings-Bizier, Abigail Brooks, Brittany Harris

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Viscosity: An Exploration of the Factors that Contribute to the Flow of Liquids

Viscosity, which has many applications in several areas such as manufacturing and the food industry, is the resistance of a given liquid to flow. It is known that an increase in temperature will reduce the viscosity of a liquid. To better understand the factors that influence viscosity, the effects of the size (radius), charge, and concentration of cations including sodium, lithium, and potassium (as chloride salts) and an anion, iodide (from its sodium salt), along with a non-electrolyte, glucose, on the viscosity of the polymer carboxymethylcellulose (CMC) were explored. The metal salts and glucose were added in three concentrations, approximately 0.167M, 0.206M, and 0.237M, to a 0.50%(w/v) CMC solution and measured using both an Ostwald and an Ubbelohde viscometer. The purpose of this study was to determine if the

assumptions made in relation to viscosity measurements are accurate, such as increasing density correlates to increased viscosity, and to show experimentally that the viscosity of the CMC solution will decrease with increasing positive charge due to polymer aggregation caused by cations interacting with the negative charges on the polymer itself. It is assumed that with increasing density, the viscosity of the CMC solution will increase and increased concentration of cations will cause the viscosity of the polymer solution to decrease.

Student Researcher(s): Kaylie Dalton, Henry Ross

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: Sex Mediated Effect of Acute Stress on Groups of Zebrafish

Zebrafish (*Danio rerio*) are an advantageous model organism employed in labs throughout the world. Their short generation time, high fecundity, and ease of care make them ideal specimens for study. One application of their use is in the study of the hypothalamic-pituitary-interrenal axis (HPI). The HPI regulates the stress response in zebrafish as in other vertebrates. One measurement of the functionality of the HPI is whole-body cortisol concentration. It has been shown that the whole-body cortisol of zebrafish rises in response to acute stress but it is unknown whether or not this effect is influenced by the sex ratio of a population. This study aims to determine the influence tank sex ratios play on the cortisol response to stress. We hypothesize that the presence of male fish blunts the stress response of tank populations. To test this, groups of fish were sorted into mixed-sex and all female tanks and cortisol concentrations were measured 15 and 60 minutes after exposure to an acute stressor. We predict that cortisol levels in mixed-sex tanks will be lower following an acute stressor than those of segregated tanks. This study will provide insight into the influence that tank sex ratios have on cortisol levels.

Student Researcher(s): Meagan Darling

Major: Biology

Research Mentor(s): Parrish Waters

Project Title: Exploring the Sociality of Mice to Model Human Psychopathology

Mice are social animals that form hierarchies, in which higher-ranking (dominant) animals display aggressive behavior toward lower-ranking (subordinate) animals. These social interactions are intensely stressful and have profound effects on the physiological and behavioral state of both the dominant and subordinate individual. The effects of this social stress often resemble the symptoms of human stress-related pathology, including depression, PTSD, and addiction. Multiple laboratory paradigms utilize social stress in mice to model these disorders. However, many of these paradigms fall short of ethological and ecological validity: they use short-term and/or heavily weighted interactions between animals, which do not match the true nature of mouse social interactions, and are therefore less applicable to human pathology. Our model attempts to address this deficit. I assess the position of mice in dominance hierarchies and the stability of these hierarchies to analyze their effects on physiology and behavior.

Student Researcher(s): Meagan Darling, Hannah Lascano, Eisha Raja

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: Response and Recovery of Cortisol in Individually-Housed Zebrafish After Acute Pen Net Stressor

Zebrafish (*Danio rerio*) are model animals used in scientific study to understand physiological processes, including the stress response. Many researchers disrupt the natural conditions of zebrafish by subjecting them to individual housing, unaware that housing conditions may impact hormone levels of test subjects. Understanding the effects of isolation on the stress response over time in zebrafish is crucial for recognizing confounding variables and designing sacrificial procedures. Previous research suggests that levels of cortisol, a potent stress hormone, peak in group-housed fish at 15 minutes post-stressor and that levels in individually-housed fish increase up to and possibly after 15 minutes post-stressor. An experimental population of 35 zebrafish were individually housed for 15 days then exposed to an acute pen net stressor. Cortisol levels were measured at 0, 5, 15, 30, 60, and 90 minutes post-stressor via competitive ELISA. We predict that

individually-housed fish will peak in cortisol expression around 15 minutes after an acute stressor, but that they will take longer to return to time-zero levels than the established time for group-housed fish. The results of this experiment will be useful to adjust handling, treatment, and sacrificial protocol in zebrafish studies to avoid confounding data rooted in acute stressor application and in individual housing.

Student Researcher(s): Sofia Di Benigno, Viraj Munshi

Major: Biology

Research Mentor(s): Lynn Lewis

Project Title: The Effect of Interleukin-12 Treatment on Cell Viability of White Blood Cells Infected with Newcastle Disease Virus

The effect of Interleukin 12 administration was tested on cellular viability of white blood cells when subjected to Newcastle Disease Virus. Interleukin 12 has been linked to stimulating both the humoral and cell mediated immune system during times of infection. Interleukin 12 is also known to be minimally cytotoxic, which means that larger doses of the cell signal can be given without harming the cells, although there may be harm to some respiratory cells. White blood cells were used to provide a simulation of the effect of the immune system on viral infection. In order to acquire a satisfactory amount of white blood cells, Interleukin 2 was used to increase cell proliferation. Once white blood cells were isolated from human blood, they were grown for several days, and then were subjected to Interleukin 12 and Newcastle Disease virus. After a three day incubation, an MTT Assay was done and it was determined that Interleukin had no statistical significant effect on the white blood cell's viability. However, a trend was observed in the data, and it is plausible that any statistical insignificance may be caused by procedural errors.

Student Researcher(s): Shona Dipaula

Major: Psychology

Research Mentor(s): Roxann Rowley

Project Title: Life Vest

Life vest is a dance performance piece showcasing the incredibly powerful, sometimes even lifesaving qualities of friendship. It explores what it means to be there for a friend and never giving up, even when it feels like you can't get through to them. It is summed up well by the following quote: "Because you were never really drowning in the first place."

Student Researcher(s): Elizabeth Dofflemyer, Melissa Pampel, Elise Pyfrom

Major: Chemistry

Research Mentor(s): Ray Scott

Project Title: Solving the Schrodinger Equation: Why Quantum Mechanics is Golden (The Absorption and Scattering of Gold Nanoparticles)

The purpose of this lab was to explore the Schrodinger equation by measuring a gold colloid solution's wavelength spectrums in the presence of electrolytes and nonelectrolytes to determine their affect by color change, pH change, and maximum absorbance wavelengths. Using the maximum absorbance wavelengths, change in energy for the particle and the estimated radius of the particle were determined to be used in the Schrodinger equation to find the quantum number n_2 . Electrolytes NaCl, HCl and NaOH were found to affect the color, pH and maximum absorbance wavelengths of the gold nanoparticles due to agglomeration. The maximum absorbance wavelengths were also used to calculate the change in energy from Planck's equation and used the calculated change in energy and the radii for particles derived from the "Nanosphere Optics Lab" to determine the quantum number n_2 from Schrodinger's equation for each of the six solutions prepared and measured in the Genesys spectrometer.

Student Researchers: English 314 Class Members

Research Mentor(s): Dr. Elizabeth Wade

Project Title: Rappahannock Review

Now in its third year of production, UMW's literary journal Rappahannock Review has garnered attention both locally and nationally. A product of the hard work from the students of English 314, the magazine has

provided them experience in a professional publishing work environment. For the presentation, the editors will introduce the next two issues of the magazine, the spring issue coming out in April, and special theme issue on heat coming out in August. The editors will then discuss the inner-workings of the production of the magazine, its trials, and its triumphs. Next, the assistant editors will read from selected works of fiction, nonfiction, and poetry from both issues. After the readings, a brief Q&A will take place. This panel will exhibit ways in which the Rappahannock Review acts as a platform both for writers across the world who seek a place for their work to be appreciated, and for students who wish to acquire real world experience in publishing.

Student Researcher(s): Rachel Ewalt

Major: English and Environmental Science

Research Mentor(s): Jonathan Levin

Project Title: Reciprocity of Humans and Nature in Ecopoetics

There is disdain toward the idea of separating man and nature within ecocriticism, the study of the relationship between literature and the environment, as that tendency has led to a lack of care towards the environment and environmental issues. Perhaps one way to counteract this tendency would be to recognize the preoccupation that ecocritical writing, particularly poetry, has with humans and the reciprocal effect nature and people have on each other.

Student Researcher(s): Erica Falvey, Sara Fioretti, Laura Mangano

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: Development of the HPI Stress Axis in Teleost Embryos

Zebrafish (*Danio rerio*) are an excellent model organism for studies of the stress endocrine axis due to the similarities of their stress axis components with those of higher vertebrates, including humans. The Japanese medaka (*Oryzias latipes*), is another popular model organism for many areas of biological research; their stress axis, however, has been much less studied. To increase our understanding of the stress axis in both species, we are examining the embryonic development of the stress axis in each by measuring expression of key genes regulating synthesis of, and response to, the predominant stress hormone, cortisol. We hypothesize that the timing of changes in gene expression of key proteins of the stress axis differs between the two species due to differences in ontogeny. To test this hypothesis, we collected embryos throughout embryogenesis in both species. We have isolated RNA from these embryos and synthesized cDNA from these samples using reverse transcription. We are currently using quantitative PCR to measure expression of the genes encoding these key proteins in zebrafish, and will compare the observed developmental pattern of gene expression with that of previously reports for embryonic zebrafish. We will then complete similar analyses on RNA samples collected from the medaka embryos. Finally, we will compare the expression patterns of the two species. This work will provide essential information for future studies using either species as a model for studies of the stress axis in vertebrates.

Student Researcher(s): Mary Fesak

Major: Historic Preservation

Research Mentor(s): Michael Spencer

Project Title: Gender and Virginia's Early-Twentieth Century Equine Landscapes

During the late-19th and early-20th centuries, nouveau riche families moved to the foothills of Virginia. These Gilded Age elites purchased old plantations and converted them into hobby farms. Because racing was such an integral part of their social life and culture, the elites built stables. Scholarly publications have largely ignored the stables constructed by these elites. The stables have only been identified and briefly described through national register nominations and cultural resource surveys. With so little attention being paid to equine structures, the manifestations of gender by women on the built environment have not been identified. Upper-class women increasingly participated in the male-dominated fields of race horse ownership and breeding as part of the expansion of women's gender roles during the Progressive Era.

Case studies examining the manifestation of gender through the settings and layouts of the equine complexes and the aesthetics and interior layouts of the stables show that men used the public visibility and stylistic treatments of their stables to serve as statements of their masculinity and competitiveness. While perceptions of female propriety prevented women from constructing stables as public statements of their identities, their placements of their stables within their equine landscapes shows that they placed their broodmare barns in locations of prominence to assert that women could become expert breeders.

The development of a context for the Virginia's early-to-mid 20th century equine landscapes could help the Department of Historic Resources identify and preserve these resources. Because these landscapes are often overshadowed by the properties' mansion houses, their historical significance is often overlooked by owners, scholars, and institutions. This study encourages preservationists to reevaluate their approach to preserving these layered landscapes. The evaluation of the influence of gender on the landscape contributes to understandings of women's history and their contributions to the built environment, changing narratives about the extent of male domination in the horse industry.

Student Researcher(s): Ellen Field

Major: Biology and Classical Archaeology

Research Mentor: Angela Pitts

Project Title: Mythographies of Thebes in Euripides' Herakles

This poster examines the use of Mythographies - the creation of myths- in the Athenian tragedy "Herakles" by Euripides. Topics include using Mythographies to explain the character/ personality behind the ancient city of Thebes, disussing the duality of Herakles and the city Thebes and the importance of myths in Euripides' work.

Student Researcher(s): Katie Belle Finch

Major: Historic Preservation

Research Mentor(s): Douglas Sanford

Project Title: Archaeology Collections Management

Under the supervision of Professor Sanford, I learned the important skills of collections management within an archaeological collection. At the Historic Preservation lab, I helped to inventory, organize and relabel the temporary collections. At the Trinkle sub-basement, I helped inventory and organize the Brompton collection. In addition, I helped to integrate a pest management system for the collection.

Student Researcher(s): Kayla Frye, Vidhya Cardozo, PengCheng Zhang

Major: Physics

Research Mentor(s): Hai Nguyen

Project Title: Excitation and Detection of Nanoparticles

The up-conversion of nanoparticles has many applications in the fields of Biology and medical research, such as single molecule spectroscopy, colloidal dynamics, protein isolation, and controlled investigation of biological processes. [1] The purpose of this project is to study the excitation and detection of nanoparticles with infrared laser beam of wavelength 915 nanometers. Furthermore, this project serves as a preparation and introduction to Dr. Hai's research project on "Quantitative Efficiency Analysis of a Single Optically Trapped Up-converting Nanoparticle". The experimental setup of this projects references many studies on up-converting nanoparticles using laser beams of wavelength 980 nanometers. The advantages of using 915 nm lasers includes lower water absorption and deeper tissue penetration, which is ideal for medical applications. [5]

The eventual goal of this project is to prepare and set up the experimental procedures and equipments for the optical trapping of the nanoparticles.

Student Researcher(s): Melanie Fuechsel

Major: Historic Preservation

Research Mentor(s): Brian Rizzo

Project Title: Slave Housing vs. Population: A look into the disparity through data analysis

This powerpoint presentation will look at Virginia Slave Housing and Population through the eyes of historic preservation and tools of GIS. The focus is on the disparity of known slave populations in the early 1800's, as collected in historic census records, against the evidence of slave housing from records and field observations. The audience would be walked through the process of data collection, analysis for the project, a short history of the census process, and final product of this primary research.

Student Researcher(s): Nick Gabriel, Jeffrey McAteer

Major: Physics (N. Gabriel), Computer Science (J. McAteer)

Research Mentor(s): Gusty Cooper

Project Title: : Automation of Intrafractional Gaze Assessment in Proton Radiotherapy of Ocular Tumors

Over 1750 patients have been treated for ocular tumors at F.H. Burr Proton Therapy Center since the program was transferred from Harvard Cyclotron in March 2002. The treatment workflow and techniques have remained largely unchanged in this time. Patients undergoing ocular radiotherapy are instructed to look in a specific direction in order to orient the eye properly to optimize treatment. Proper orientation of the eye, called gaze, is confirmed with X-ray images, and patients are instructed to maintain this gaze for the duration of the treatment once it is achieved. In order to provide quantitative feedback on the gaze during treatment, software has been designed that automatically detects and tracks pupil position, and allows a physician to set a reference pupil position at any time (particularly when proper gaze is achieved) for comparison with subsequent frames. A user interface has been developed to display video frames and plot gaze deviation data in real time. In the most recent form of this software, features have been added to the user interface to make it a more comprehensive tool for doctors. Further investigation has also been conducted into gaze tracking techniques, including various pupil tracking algorithms and morphological transformations of the eye images.

Student Researcher(s): Ian Granger, Ricky Martin, Arfa Vasim

Major: Mathematics

Research Mentor(s): Melody Denhere

Project Title: Enrollment Projection

The concept of making realistically accurate forecasts of student enrollment is singularly important to planning for many school administrators. Institutional researchers benefit tremendously from such forecasts as these fundamentally aid in the planning and budgeting aspects of higher education institutions. Institutional policies such as tuition policy, faculty staffing and budget forecasting are all directly affected by student enrollments. In this work, we studied four different methods of enrollment projection. These methods spanned from the traditional ones such as the cohort survival method and regression analysis, to more recent methods of Markov modeling and fuzzy time series analysis. Our goal was to find the method that most accurately predicts future enrollment as well as determine the pros and cons of each method. Historic enrollment data from the University of Mary Washington was used to determine the effectiveness of each of the methods studied. This was achieved by analyzing the prediction errors when part of the data was used as train data and the remaining used to test the derived model.

Student Researcher(s): Dustin Gray, Danny Wehr, Matt Lloyd

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: Exploring the Anxiolytic Effects of Magnolol on Zebrafish

Saiboku-to, a traditional herbal medicine, has been used for hundreds of years for the treatment of a wide variety of symptoms. First isolated by Fujita et al. in 1972, magnolol has been identified as the primary anxiolytic agent in this medicine. Magnolol has been shown to have cortisol-lowering effects on mammalian models, including humans, however, there is little research on its effects on the zebrafish model. The zebrafish model (*Danio rerio*) is superior to larger organisms in that they breed in larger numbers and can be manipulated for research with ease due to their small size. In our study, we measured whole-body cortisol

levels of zebrafish before and after exposure to an acute stressor following acute administration of magnolol. We randomly divided 72 adult, mixed sex zebrafish into nine 1.4 liter tanks, with eight fish in each tank. Three tanks of fish were exposed to a low dose of magnolol (5 µg/L) while another three were exposed to a high dose (50 µg/L). The remaining tanks served as the control group with no magnolol applied. To elicit a stress response in the fish, they were chased with a small net for two minutes. From each tank, two fish were extracted and euthanized after the stressor at 30, 45, and 60 minute intervals following the stressor, with two being removed prior as a baseline. Cortisol extracted from samples will be measured using a human salivary cortisol assay with treatments being compared using a multi-way ANOVA. We hypothesized that magnolol, the active ingredient in Saiboku-to, will exert anxiolytic effects on zebrafish. We predict that following an acute stressor, subjects receiving magnolol will exhibit lower cortisol levels; varying on dosage

Student Researcher(s): Helena Gray

Major: Biology

Research Mentor(s): Debbie Zies

Project Title: Characterization of the Yeast Mutant in ALD4

Saccharomyces cerevisiae can use a variety of substrates as a carbon source: pyruvate, lactate, glucose, or ethanol to make ATP depending on the availability of the substrate. Yeast prefers to use fermentation to process ethanol even when oxygen is available. Yeast can use respiratory metabolism to convert ethanol or glucose to acetate. There are several enzymes involved in the metabolism of respiratory substrates. Our focus will be aldehyde dehydrogenases. Once ethanol or glucose is converted to acetaldehyde, it can be metabolized by oxidation to acetate. This process can also occur in two different subcellular localizations in yeast: the mitochondria and the cytosol. Mitochondrial aldehyde dehydrogenases are encoded by ALD4 and ALD5. They use NAD⁺ and NADP as co-enzymes and are activated by potassium ions. Pyruvate is converted to acetaldehyde by enzyme pyruvate decarboxylase. Cytosolic enzymes ALD2 and ALD3, which use only NADP as a cofactor and are activated by magnesium ions, catabolize acetaldehyde to acetate in the cytoplasm. While previous research suggests that cytosolic enzymes are responsible for formation of acetate from glucose and mitochondrial enzymes from ethanol, it is speculated they may compensate for each other under certain conditions.

Yeast growth on ethanol is of interest for a variety of applications. One common application is in wine manufacturing to maintain the right balance of acetic acid to ethanol for optimum taste. Yeast has difficulty metabolizing ethanol as a carbon source without ALD4, as ALD4 produces several enzymes that is able to convert it to acetate. Thus, our hypothesis is that yeast deleted for ALD4 should not be able to grow on ethanol or at least be severely inhibited in growth. To test this hypothesis the growth of two strains of the laboratory yeast BY7472, a wild-type and an ALD4 knockout mutant, will be measured over a range of ethanol concentrations.

Student Researcher(s): William Green

Major: Classics – Classical Civilization

Research Mentor(s): Liane Houghtalin

Project Title: A Comparison of Agrippina the Younger and Hatshepsut

Examinations and comparisons of female political figures from antiquity are well known in modern scholarship. Agrippina the Younger of the Roman Empire and Hatshepsut of Eighteenth Dynasty Egypt have been examined separately by multiple scholars, but seem not to have been compared to one another. Each of these women had strong family ties and the means to use them to further their goals, both personal and political. Agrippina the Younger was part of the Julio-Claudian dynasty that hosted a number of Roman Emperors, including the first, Augustus; and she used her family ties, along with marriage, to further her quest for power within her political sphere. Hatshepsut was also part of a politically powerful family. She gained power through marriage to her half-brother, Tuthmosis II, and was able to rule as a pharaoh through control of her very young stepson, Tuthmosis III. Some of the methods these two women used for gaining political power were similar; however, their goals and the actions they took to reach them differed. This paper will investigate the approaches these two female political figures used to gain power and which of the two left a more lasting effect on their people and on history.

Student Researcher(s): Mitchell Greenwood, Sean Morris, Sonia Foley, Victoria Howell

Major: Chemistry

Research Mentor(s): Randall Reif

Project Title: Quantification of BPA Content in Apple Sauce

Bisphenol A (BPA) is a compound that is used as a base for plastic that is very strong, and thus has been widely utilized in food and liquid containers, which need to withstand impacts in shipping. In a 2008 paper, however, the National Toxicology Program released a study showing that BPA “some concern” for “developmental toxicity for... infants.”

In this experiment, we will determine the concentration and amount of BPA in four brands of applesauce using GC-MS, through standard addition. Applesauce was picked because it is slightly acidic (which will lead to a quicker epoxy breakdown), and is widely consumed by children (for which BPA poses the biggest threat).

A calibration curve will be created using standard additions of Anthracene-d, and the amount of BPA will be calculated using the slope of the curve. GC-MS will be used because it will allow us to separate trace concentrations of BPA from the matrix and analyze the amount. The FDA limit on healthy exposure to BPA is 5mg/kg, and assuming the average weight of a toddler is 12kg, we expect to see no more than 20mg of BPA in one container, considering the healthy limit is 60mg in one day.

Student Researcher(s): Sophie Gringer

Major: Chemistry

Research Mentor(s): Kelli Slunt

Project Title: Investigating the Maillard Reaction

The Maillard reaction is responsible for many flavors and odors in food, such as caramelization or the char on seared meat. The purpose of these experiments was to investigate the products of the Maillard reaction occurring when amino acids (glycine or tryptophan) and monosaccharides (fructose, glucose, and galactose) were heated together. The resulting mixtures were characterized based on physical properties and with thin layer chromatography (TLC) and infrared spectroscopy. Column chromatography was attempted to separate products from the reaction of glucose with glycine. The visible melting and browning of the samples as the mixture was heating to 200°C occurred at different rates, possibly indicating the formation of distinct Maillard products. Separation of the resulting mixtures by TLC using plates impregnated with a fluorescent dye indicated that multiple, fairly polar compounds were formed in the heating process. A few of the resulting compounds exhibited fluorescence on the TLC plate rather than quenching the fluorescence of the dye. The column chromatography failed to separate the mixtures, possibly due to the polarity of the molecules produced. Initial characterization data will be presented for the different mixtures.

Student Researcher(s): Kathryn Hall

Major: English

Research Mentor(s): Mara Scanlon

Project Title: Childhood and/in the Literature of Carroll and Barrie

This presentation addresses the effects of panopticism and normalizing judgement in Lewis Carroll's *Alice's Adventures in Wonderland*, *Through the Looking-Glass and What Alice Found There*, as well as J. M. Barrie's *Peter and Wendy*. Both authors show the negative effects of panopticism and normalizing judgement, while simultaneously having positive examples and their own main characters taking part in it as well. These examples and the implications the writers are making will be explored, as well as essential background information about the Victorian era and Michel Foucault's theory of panopticism and the normalizing judgment that stems from it. Overall, the presentation will conclude that the authors' uses of panopticism and normalizing judgement are primarily negative, as they advocate first for the freedom of childhood and not the conformity to society.

Student Researcher(s): Brittany Harris

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: The Determination of the Enthalpy of Fusion for Straight Chain Alkanes using Differential Scanning Calorimetry

Surface chemistry is a prominent field of study due to the importance of adsorbed monolayers, films of one molecule thickness, and their self-assembly and significantly impacts areas such as nanotechnology and biomimetics. In order to better understand this self-assembly, the enthalpy of adsorption and subsequently the thermodynamics for the adsorption were investigated. Differential scanning calorimetry (DSC) experiments involving straight chain alkanes of varying chain length, specifically decane, dodecane, tetradecane, pentadecane, and octadecane were conducted. The enthalpies of fusion (liquid to solid transitions) were extracted from the thermograms along with the melting point. These enthalpies are found to be 23.22kJ/mol, 31.46kJ/mol, 35.16kJ/mol, 26.82kJ/mol, and 48.03kJ/mol, respectively. Thermograms of a graphite surface were also collected over the temperature range for the alkanes; no exothermic or endothermic peaks were observed, revealing that graphite does not melt in the same range. DSC studies using these alkanes as adsorbates and graphite as the surface were conducted to examine the heat of adsorption or enthalpy for the “sticking” of the alkane to the surface.

Student Researcher(s): Lonnie Harris

Major: Chemistry

Research Mentor(s): Davis Oldham

Project Title: Enzymatic Resolution of the Enantiomers of 2-ethyl-1-hexanol

Diethylhexyl phthalate (DEHP) is a known chiral persistent organic pollutant found in many different consumer products, and the toxicities of its stereoisomers and their metabolites are not well known. To determine their adverse health effects, each enantiomer has to be synthesized. Using lipase PS from *Burkholderia cepacia* in dichloromethane at 0°C for 48 hours, 2-ethyl-1-hexyl acetate was obtained in 55% yield (75:25 e.r.), while (R)-(1) was obtained in 29% yield (96:4 e.r.). The acetate was then hydrolyzed to recover the enriched alcohol (82% yield). The enriched alcohol was acetylated a second time to yield (S)-(1) in 39% yield (91:9 e.r.). R-(1) and phthalic anhydride were reacted in 1:3 pyridine/toluene at 100°C for 2 hours to synthesize (R)-monoethylhexyl phthalate ((R)-MEHP) in 50% yield. The resulting (R)-MEHP was reacted with (R)-(1) in the presence of N,N' -diisopropylcarbodiimide and 4-dimethylaminopyridine in dichloromethane for 19 hours at room temperature to synthesize (R,R)-DEHP in 36% yield. Future work will synthesize the other isomers of DEHP and further purify (1).

Student Researcher(s): William Harrison, Matthew Tovar

Major: Chemistry

Research Mentor(s): Ray Scott

Project Title: Quantum Mechanics of Gold Nanoparticles

This paper presents a nanoparticle based study of electron quantum energy levels. A sample of gold nanoparticle solution was synthesized via the Turkevich method, and placed into solutions of various electrolytes and nonelectrolytes. Absorption spectroscopy was performed on each of the solutions made and compared to an online optics simulator to find the diameter of the nanoparticles. It was found that strong acid solutions strongly stimulated the aggregation of nanoparticles, while strong bases and nonelectrolytes had hardly any effect, if any at all. The diameter of the nonaggregated nanoparticles was determined to be 40 nm with a change in energy of 3.82×10^{-19} J, while the diameter of the aggregated nanoparticles was 200 nm with an energy change of 3.61×10^{-19} J. This increase in length also increases the principle quantum number, which by order of classical physics decreases the amount of kinetic energy a particle has. Because of this, it is mathematically concluded that the electron's kinetic energy was lower at larger diameters.

Student Researcher(s): Steven D. Hartzell, Lolita S. Jojic

Major: Mathematics

Research Mentor(s): Melody Denhere

Project Title: Language Recognition

Pattern recognition is a field in machine learning that is increasingly receiving research attention due to recent technological advancements. It has applications in many areas including cryptography, text classification (spam/non-spam emails), image processing and speech recognition. The ability to mathematically determine which language a document is written in is a significant achievement in pattern recognition. Many languages descend directly from others, while some evolve to incorporate aspects of different languages. Furthermore, the spelling and grammar rules of specific languages are not always consistent. In this work, we utilized a powerful technique of n-grams to classify different languages. By organizing the frequencies of specific n-grams, we were able to make mathematical sense out of lines of text. The bulk of our research involved various techniques of analyzing these frequencies. We primarily examined k-nearest-neighbor, multidimensional scaling, and 3D histograms. With these techniques, our goal was to consistently differentiate various Latin-text languages. English, French and German texts were used to illustrate the performance of the classifier under different settings.

Student Researcher(s): Sarah Heisey, Eric Hurwitz, John Lutkenhaus, Lucas Hidalgo

Major: Chemistry

Research Mentor(s): Randall Reif

Project Title: Verification and Quantification of DDE in Organic and Conventional Baby Foods Using GC-MS

The growing concern of pesticide use in agriculture has led to increased demand for organically produced fruits and vegetables. However, few studies directly compare organic and conventional products and their respective pesticide content. In this study, samples of non-organic and organic baby food (carrot and green bean varieties) will be subject to dispersive solid phase extraction cleanup (dSPE) in order to isolate any pesticides present. The resulting samples will be analyzed using GC-MS in order to verify the presence of and quantify dichlorodiphenyldichloroethylene (DDE), a pesticide commonly used in the production of carrots and green beans thought to have carcinogenic effects. It is expected that the products not labelled as organic will contain higher amounts of DDE relative to their organic counterparts.

Student Researcher(s): Alexandra Hoenscheid

Major: International Business

Research Mentor(s): Daria Pezzoli-Olgiati

Project Title: A Conflict of Authority: Analyzing the Influence of Swiss Democratic Values in the Diocese of Chur

With its strict hierarchy and the Vatican set as the center of absolute authority, the Catholic Church has traditionally been far from a democratic institution. In Switzerland, recent tensions between Catholics in the diocese and the Bishop of Chur suggest that democratic values and the Catholic hierarchical structure are in increasing conflict. This paper will examine ongoing disputes between the people and the Bishop of Chur and the extent to which Swiss direct democratic values contribute to them. First, a framework of the major Swiss democratic values will be introduced. Appropriate context for the structure of the Roman Catholic Church and the organization of the Diocese of Chur will then be provided. Next, democracy's influence on the Catholic laity's protests against the Bishop of Chur will be analyzed. Finally, the influence of democratic values on the attempts of Zurich's Catholic governing bodies to create their own diocese will be determined.

Student Researcher(s): Brittany Hylander, Mary-Alison Lane

Major: Biology

Research Mentor(s): Deborah O'Dell

Project Title: Relationship between S100B protein and RAGE expression in Vertebrates

In this research we studied the relationship between S100B protein and the RAGE receptor. It is known that at nanomolar concentrations, S100B produces neurotrophic effects on surrounding cells while micromolar

levels lead S100B to induce neurotoxic effects. We hypothesized that if cells were exposed to a constant high level of S100B, this would lead to a change in RAGE expression as seen through immunohistochemical techniques. To test this hypothesis we examined the levels of RAGE protein in cultured glioblastoma cells that were exposed to high and low concentrations of S100B. After being exposed, some cells were homogenized while others were fixed. Homogenized cells were used to determine the concentration of RAGE receptors in the cells through an indirect ELISA using an antibody to RAGE receptor. Immunocytochemistry using the anti-RAGE receptor was performed on the cells that were fixed. The cells were then dehydrated, cleared, mounted onto slides and photographed. The results of this experiment are discussed.

Student Researcher(s): Katherine F. Ingebretsen

Major: Classics – Classical archaeology

Research Mentor(s): Liane Houghtalin

Project Title: Julius Caesar as Pontifex Maximus

Julius Caesar was one of the most famous men in history, let alone in Roman history. His rise to power streamlined Rome's change from a republic to an empire ruled by one man with absolute civil, military, and religious power. This presentation will examine Julius Caesar as the pontifex maximus, the chief priest of Rome, a position which had a great amount of authority and esteem. After giving a background and an overview of the position of chief priest, as well as a biography of Caesar, this presentation will explore what may have given Julius Caesar the idea to run for the chief priesthood, as well as his motivations for doing so. Finally, the presentation will look at the ramifications of Julius Caesar's pontificate in terms both of Roman religion and his personal legacy and how it legitimized Augustus' taking of the position for himself after the death of Marcus Lepidus, giving the princeps—the emperor—ultimate religious, civil, and military power over Rome for centuries to come.

Student Researcher(s): Diana Inthavong

Major: Historic Preservation

Research Mentor(s): Andrea Smith

Project Title: Breaking the Brutalist Stigma: The Importance of Preserving Brutalist Architecture In America

The number of Brutalist style structures in the United States continues to decrease at an alarming rate. This presentation will cover the significance of Brutalism on the evolution of Modern architecture, and go over case studies that exemplify the importance for the preservation of Brutalism.

Student Researcher(s): Ana María Johnson

Major: Spanish

Research Mentor(s): Maria Laura Bocaz-Leiva

Project Title:

—Oh Gloria Inmarcesible! was a book deemed pornographic by the national Colombian press in the 80's. Through various research sources I have been able to determine what became of the infamous publication. This short story collection, as the writer herself describes it and as it appears on the title page of the book, is not just a series of “imaginary short stories.” In addition to short stories, the text contains a series of visual collages constructed from newspaper articles published in Colombia during a period of national upheaval as well as a short drama. My presentation will examine the use of standard language as it appears in the Colombian press, in particular the newspapers EL TIEMPO and EL ESPECTADOR, and the use of spoken colloquial language practiced in particular areas of the country. I will establish that the text is decisive in its tone of denunciation against public and controversial institutions such as the Armada Nacional, among others. The text also denounces the subjectivity of the press in reporting facts that relate to corruption from the government, as well as the strenuous conditions that some of the most vulnerable populations of the country are exposed to. With this in mind I want to prove that more than a “pornographic book of short fiction,” Oh Gloria Inmarcesible! is a work of literature as rich in its textual structure as in its content.

Student Researcher(s): Maggie Johnston

Major: Environmental Science

Research Mentor(s): Chuck Whipkey

Project Title: Brominated Flame Retardants: The Hidden Environmental and Health Implications

This paper will address the effects of brominated flame-retardants on both environmental and human health and determine whether the benefits of using these flame-retardants outweigh the costs. Four types of brominated flame-retardants are examined: Polybrominated Diphenyl Ethers (PBDEs), Tetrabromobisphenol A (TBBPA), Hexabromocyclodecane (HBCD), and Polybrominated Biphenyls (PBBs). These flame-retardants are released into the environment through the production, use, and disposal of everyday products, such as electronics, furniture, textiles, automobiles, and construction materials. It is then determined that all four of these primary brominated flame-retardants have adverse effects on human health, including endocrine disruption, developmental neurotoxicity, and carcinogenicity. In the environment, these flame-retardants additionally have a high potential for bioaccumulation and long-range transport and adversely affect the health of organisms. It is then concluded that despite the benefits of reduced fire potential, the adverse effects of these brominated flame-retardants outweigh the benefits, and alternative sustainable flame-retardants must instead be developed and used.

Student Researcher(s): Kristin Jones, Kristina Krumpos

Major: Biology

Research Mentor(s): Stephen Gallik

Project Title: Genetically Engineering Plasmids for Nuclear Localization Studies, Part 3.

The long-term goal of this research project is to create recombinant plasmid expression vectors that can be used by future students to study the nuclear localization of proteins and the nuclear localization signal (NLS). Due to its relatively high molecular weight and its natural fluorescence, a fusion protein consisting of multiple copies of green fluorescent protein (GFP) linked to an NLS is an ideal reporter protein for nuclear localization studies. A problem that must be addressed when engineering any fusion protein is the potential for individual components to lose their natural properties and functionality. When engineering a fusion protein consisting of multiple copies of GFP, the possibility that the individual GFP components of the fusion protein will not fluoresce and therefore will not be detected in cells is a potential problem. The question we are attempting to answer with this study is does the proximity of the two GFP proteins in a double GFP fusion protein affect the ability of the GFP proteins to fluoresce? The specific objective of this research study is to alter the proximity of the two GFP proteins in a double GFP fusion protein by reducing the number of amino acids in the linker peptide that separates the two GFP proteins in the fusion protein.

Student Researcher(s): Kimberly Kerns

Major: Biology

Research Mentor(s): Randall Reif

Project Title: Honors Capstone: Optimization of RNA SELEX Parameters

Systematic Evolution of Ligands by Exponential Enrichment, or SELEX, is a method of selectively purifying and amplifying stereospecific, high affinity RNA aptamers (oligonucleotides) for certain target ligands. First, a random DNA sequence is obtained, purified, amplified, and reverse transcribed into RNA. Then, the target is exposed to this random sequence RNA, and the RNA that binds to the target is extracted and amplified. This procedure is repeated for every successive step of SELEX isolating RNA with the highest affinity for the target. Because there are many different methods for conducting PCR, RNA transcription, reverse transcription, and RNA and DNA purification, it is essential to develop a standard, efficient method by which the SELEX experiment can be conducted. This experiment focuses on the optimization of the RNA transcription process as well as the filtration and purification of the aptamer-protein complex through a nitrocellulose membrane, specifically the extraction and amplification of the aptamer sequence. This is designed to create an abbreviated and efficient procedure which future researchers can follow to expedite the RNA SELEX process.

Student Researcher(s): Juliane Kim

Major: English

Research Mentor(s): Shumona Dasgupta

Project Title: ENGL 491: Lord of the Rings in a Postcolonial Light

I will present about my senior individual study, in which I examined elements of Postcolonial theory within J.R.R. Tolkien's Lord of the Rings trilogy. Although Tolkien and his biographers tend to dismiss any claims that his work had any real-world correlations in racial and gender ideologies, it is clear from researching the history of Tolkien and looking at Postcolonial theory, that Tolkien was a man of his time and his epic trilogy reflects this. I specifically looked at Orientalist and colonial discourse in the trilogy while keeping in mind ideas about gender that permeate the text. For background I studied the biographical details of Tolkien's life, the character of the author himself, the prevalent ideas of the era in which he lived, and his intentions in creating the trilogy.

Student Researcher(s): Dana Krafft, Emily Garrett, Elisa Tedesco, Diana Inthavong, Ellie Jeanes

Major: Historic Preservation

Research Mentor(s): Andrea Smith

Project Title: Application of Playground Design Through History and Theory

Students in the Preservation Planning Laboratory from the Historic Preservation Department researched the history and theory of playground design and subsequently designed a playground based on their findings. The students first researched the history of playgrounds and how they have evolved over time. In relation to the evolution of playgrounds, various theories of children's play emerged that changed the ways playgrounds were designed and used throughout history. In addition to developing a general context for playgrounds, the students worked to design a playground that applied the theories previously determined. To gain inspiration for specific elements of the playground being created, the students examined existing playgrounds from around the world. The students then used the theories and design inspirations to construct a three-dimensional model of the playground. The model aided in the visualization of the playground layout and relationship between elements. In addition to playground design, the outcome of this course is a primer to planning community spaces.

Student Researcher(s): Kristina Krumpos, Katherine Qualls, Sarah Roche

Major: Biology

Research Mentor(s): Stephen Gallik

Project Title: Genetically Engineering Plasmids for Nuclear Localization Studies, Part 1.

The long-term goal of this research project is to create recombinant plasmid expression vectors that can be used by future students to study the nuclear localization of proteins and the nuclear localization signal (NLS). Due to its relatively high molecular weight and its natural fluorescence, a fusion protein consisting of at least 3 copies of green fluorescent protein (GFP) linked to an NLS is an ideal reporter protein for nuclear localization studies. The specific objective of this research study is to add additional copiers of a GFP gene to a commercially-available plasmid that contains 1 copy of a GFP gene linked to 3 tandemly-arranged NLSs, to create two new plasmids, one containing 2 copies of the GFP gene linked to the 3 NLSs and one containing 3 copies of the GFP gene linked to 3 copies of the NLSs. In addition, it is an objective of this project to determine the cellular localization of the fusion proteins expressed by these plasmids. Once created, these two new plasmids can be further modified to reach the goals of the long-term research project.

Student Researcher(s): Elizabeth Kump

Major: Theatre

Research Mentor(s): Kevin McCluskey

Project Title: Makeup and Hair Designs for Ben Jonson's *Volpone*

For my senior project, I will design theatrical makeup and hair for the characters of Ben Jonson's play *Volpone*. This project will not only give me the chance to display the skills I've learned from my classes and experiences in the theatre department, but also provide me with creative challenges that I have not yet faced

before. While next season's shows provide a nice variety of different design opportunities, those plays will most likely be done in a more realistic or period style, while Volpone contains allegorical characterizations that will allow me more creativity and flexibility in the aspects of makeup and hair. At the beginning of the design process, I will read, then research the play, its historical and literary context, materials, application techniques, and any other information and images to start building a concept for my designs. Then, once I have determined an overarching concept for the visual world of the play, I will then delve deeper into the individual characters, gather more research, and begin designing. Once I have drafted, revised and finalized my designs I will then select a few of my strongest designs to execute, and acquire and budget for materials and select volunteers to act as models for the execution of the designs. I will then test and experiment with application techniques until I have perfected them, from that point doing a full final application on the model complemented with costumes from the chest up and taking photographic evidence from all angles. I will then analyze and evaluate my designs and finished applications, reflecting on the successes and shortcomings in each design, and what I would change to make them more effective.

Student Researcher(s): Samantha Lancke

Major: Biology

Research Mentor(s): April Wynn

Project Title: Phenology of flowering trees and shrubs in the Fredericksburg Area

Phenology is the study of the timing of seasonal biological events such as flowering, budding, or leaf-outs, and can be used to determine the effects that climate change has had on both local and regional ecosystems.

The purpose of this study is to research and draw conclusions about the effects that climate change has had on the plant phenology of the Fredericksburg area. For this study, data was collected using the University of Mary Washington herbarium as well as other online collections and current observations.

Student Researcher(s): Juliana Laszakovits, William Davis

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Using the Exciton Model to Describe the Spectroscopy of Conjugated Dye Dimers

A common experiment in physical chemistry is the conjugated dyes lab, utilized to study the effect of increased conjugation on the energy solution to the Schrodinger equation for a particle in a one-dimensional box. Traditional observations are that as the length of the conjugated system increases, the maximum absorbance wavelength red shifts. To expand upon this lab, the formation of dimers is studied and explained using the exciton model. Following Horng et al.,¹ 1,1'-diethyl-2,2'-cyanine is used to study the effect of dimers on the observed absorbance spectrum. As concentration increases, dimers form more readily resulting in a second blue-shifted peak relative to the monomer. Dimer formation for the 3,3'-diethylthiacyanine dye system in the concentration range of 1-10 μM is also investigated. Using the absorption maxima obtained, the geometry and transition moment of the dipole will be predicted.

1. Horng, M.-L.; Quitevis, E. L. "Visible Absorption Spectroscopy And Structure of Cyanine Dimers in Aqueous Solution: An Experiment for Physical Chemistry." J. Chem. Educ. 2000, 77, 637.

Student Researcher(s): Soo Lee, Viraj Munshi, Jordan Watkins

Major: Biology

Research Mentor(s): Stephen Gallik

Project Title: A Study of Dextran Diffusion into the Nucleus of Cultured Mammalian Cells

The nuclear pores that penetrate the nuclear envelope are equipped with elaborate complexes called nuclear pore complexes that serve as complex molecular gates through which molecules enter and leave the nucleus. Transport through these nuclear pores utilizes two types of transport mechanisms, simple diffusion, a passive process, and a highly-selective facilitated transport mechanism known as nuclear import. The nuclear import mechanism requires the presence of a nuclear localization signal (NLS) embedded in the structure of the protein and is capable of transporting proteins as large as several hundred thousand Daltons through the nuclear pore complex. Simple diffusion is limited to molecules less than 70,000 Daltons, with the rate of

diffusion inversely related to the size of the molecules. The specific objective of this study is to determine the usefulness of a permeabilized cultured mammalian cell model to detect the simple diffusion of fluorescently-labeled dextrans, varying in molecular weight from 3,000 to 70,000 Daltons, into the nucleus.

Student Researcher(s): Alison Loughry, Nora Benedetto, Magdalen Osei Brantuo

Major: Mathematics

Research Mentor(s): Melody Denhere

Project Title: Course Evaluation

Student ratings of teaching effectiveness of instructors have been used for decades. Many studies and debates have been held concerning the appropriateness of using student ratings to measure teaching effectiveness, especially concerning decisions such as promotion and tenure. Issues that are widely debated include the type of questions included, the response rates and the scores distribution and how these all translate to teaching effectiveness. We analyzed response rates of course evaluations for the University of Mary Washington over the past four years to determine if there were any significant trends. Different exploratory data analysis tools were used to graphically and numerically summarize the data. We also considered the effect of different factors on the response rate by conducting Analysis of Variance (ANOVA) tests and t-tests. The Bonferroni method was used for making multiple comparisons and regression analysis was useful in determining the significance of the relationship among factors. Significant differences in response rates over the years, across semesters, between the two campuses (Stafford and Fredericksburg), across different student levels and across departments were observed in some instances.

Student Researcher(s): Mary Loyd

Major: Nursing

Research Mentor(s): Mary Jane Bowles, Pamela S. McCullough

Project Title: Best Practice Guidelines for Skin Care of the Breast Undergoing Radiation Therapy

An evidence based standard for skin care is an essential adjunct for the over two hundred thousand women undergoing radiation therapy to the breast. However, a survey showed no such standard exists for four radiation oncology centers operating within a sixty mile radius of each other. Current skin care practices revealed a wide range of recommendations and restrictions for washing the skin as well as applying deodorant and moisturizer to the treatment field. A literature review provided the evidence which revealed current standards for skin care are based on historical perspectives or physician preferences rather than clinical evidence. Women trust the education received by nurses regarding skin care of the breast is based on the very best practice standards. Nursing-led research and theory application is vital to closing the gaps which exist between current and best skin care practices.

Student Researcher(s): Charbel Marche, Anna Rinko, Meredith Snyder

Major: Chemistry

Research Mentor(s): Ray Scott

Project Title: Alcohol Dehydrogenase Kinetics

This project was conducted with the intent of determining the rates at which the enzyme alcohol dehydrogenase (ADH) can metabolize the organic molecules ethanol and methanol. Once this information was gathered, the point in which the enzyme became saturated, called V_{max} , and the value that can be used to determine the enzyme's substrate affinity, called K_m , were found by producing a Michaelis Menten Plot and a Lineweaver-Burk Plot. To find the rates at which both substrates were metabolized, ethanol and methanol were combined with the coenzyme nicotinamide adenine dinucleotide (NAD^+), Tris Buffer pH 9, Water, and the enzyme ADH. As the reaction took place, NADH was formed and changed the absorbance of the mixture. The change in absorbance was used to calculate the velocity of the reaction via Beer's Law. The velocity was then plotted against the substrate concentrations to form a Michaelis Menten Plot and a Lineweaver-Burk Plot. These graphs provided the information necessary to calculate each substrates' V_{max} and K_m . It was found that ethanol was much easier for ADH to metabolize than methanol.

Student Researcher(s): Sean Mayer

Major: Mathematics

Research Mentor(s): Jen Chiang

Project Title: Harmonic Maps and their Applications

In this mathematics study we develop the theory of harmonic maps. Starting with the definition of a surface, we talk about manifolds and develop the tools for the theory of harmonic mappings. Examples are given of harmonic maps. Applications of harmonic maps are discussed.

Student Researcher(s): Virginia Mayo

Major: Biology

Research Mentor(s): Rosemary Barra

Project Title: The effect of cellular hypoxia on the killing capacity of tirapazamine in human breast cancer cell line MDA-MB-231

The purpose of this experiment was to evaluate the killing effects of hypoxia on the cytotoxic drug tirapazamine. One of the major drawbacks with chemotherapeutic drugs are their inability to work in low oxygen environments. Tirapazamine is a hypoxic cytotoxin that was made specifically to target cells growing in low oxygen conditions. With breast cancer, the tumors exhibit a higher degree of hypoxia therefore making them an ideal candidate for testing. The breast cancer cell line used was MDA-MB-231. Previous studies have shown that this specific cell line is typically unresponsive to many chemotherapeutic drugs. It was anticipated that the cells treated with tirapazamine under hypoxia would exhibit higher cell death, lower cell viability, than the cells treated under normoxia. Cells were grown in 96-well plates. A control plate was placed in normoxia with no drug treatment. Two plates were placed in normoxia and treated with 30µmicrograms/mL of tirapazamine. Two plates were treated with 30µmicrograms/mL of tirapazamine and placed in a hypoxic chamber and gassed with nitrogen to create the hypoxic environment. An MTT assay was performed and cells treated with tirapazamine with hypoxia exhibited little to no cell viability. Cells treated with tirapazamine under normoxia conditions exhibited decreased cell viability in comparison to the untreated control, however, not to the extent as cells treated under hypoxic conditions. These results support my hypothesis that under low oxygen conditions, tirapazamine's killing capacity is increased and is an ideal treatment option for breast cancer in regards to targeting cells specifically growing in areas of hypoxia.

Student Researcher(s): Taylor McConnell

Major: Biology

Research Mentor(s): April Wynn

Project Title: Analysis of Potential Bioaccumulation of Heavy Metals in *Eleocharis palustris* and *Juncus effusus* at an Acid Mine Drainage Site along Contrary Creek, Virginia

The soils, sediments, and surrounding environment at Contrary Creek, in Louisa County, Virginia have been negatively affected by acid mine drainage (AMD) from 3 pyrite mines abandoned over 100 years ago. Heavy metals such as iron, lead, manganese, arsenic, and zinc are found at high concentrations in the soils, stream water, and sediments leaving them highly acidic, with some locations having an average water and sediment pH values as low as 3.01 and 3.34 respectively. Acid mine drainage causes soil and sediment to accumulate heavy metal contaminants and plants to bioaccumulate these metals. Contamination and bioaccumulation varied significantly depending on site location, pH, and soil content. Three sites along the Contrary Creek were determined for a summer and fall collection of sediment and plant (*Eleocharis palustris* and *Juncus effusus*) samples. The sediment samples were analyzed for pH, bioavailable and total metal concentrations, and organic matter content, with comparisons made between the two seasons. The plant samples were analyzed for total metal concentrations and comparisons between species and seasons were conducted. Bioaccumulation factors were determined by taking the ratio of the total metal concentration in the shoot to the total metal concentration in the soil in order to assess bioaccumulation potential of each species.

Student Researcher(s): Kelly McDaniel

Major: Chemistry and Mathematics

Research Mentor(s): Davis Oldham

Project Title: Synthesis of Oxidative Metabolites of DEHP

Di(2-ethylhexyl) phthalate (DEHP) is a persistent organic pollutant (POP) that is widely used as a plasticizer in polyvinyl chloride (PVC). Since DEHP is not chemically bound to PVC, it leaches into the environment, allowing for human exposure through inhalation, ingestion, and intravenously. In the body, DEHP is broken down into mono(2-ethylhexyl) phthalate (MEHP) and a variety of oxidative metabolites. The purpose of this research is to synthesize enantiomerically pure oxidative metabolites of DEHP to benefit future metabolism, biomonitoring, and toxicity studies. Two alkenols, which are precursors to the oxidative metabolites, were successfully synthesized. 2-allyl-1-hexanol was produced by the alkylation of diethyl allylmalonate with 1-iodobutane, a tandem hydrolysis/decarboxylation, and a lithium aluminum hydride (LAH) reduction. 2-ethyl-5-hexen-1-ol was prepared in an analogous manner, beginning with the alkylation of diethyl ethylmalonate with 4-iodo-1-butene (prepared from 4-bromo-1-butene). The resulting malonate underwent hydrolysis, decarboxylation, and LAH reduction. Products were verified by ¹HNMR and GC-MS and purified via column chromatography. These alkenols will be enzymatically resolved and undergo esterification and oxidation reactions, allowing both enantiomers of each oxidative metabolite to be produced.

Student Researcher(s): Kelly McDaniel, Lonnie Harris

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Modeling Transport Properties: The Diffusion of Tartrazine across a Membrane

Diffusion is a transport property in which solute particles move from a region of high concentration to one of low concentration. Diffusion across a cellular membrane is important in numerous biological processes such as drug uptake; however, biological membranes can be incredibly complex and difficult to study experimentally. A suitable model is cellulose dialysis tubing because its permeability is similar to that of a lipid membrane. The diffusion of charged molecules is particularly significant in biological systems; in this investigation the diffusion of tartrazine (TTZ), an inexpensive food dye and cell stain, across a membrane is monitored by placing TTZ solutions in a cellulose dialysis membrane, immersing the membrane in deionized water, and recording the conductance of the surrounding solution over time. Initial trials have shown that the diffusion of TTZ can be visually observed due to its intense yellow color. Conductance measurements will be used with Fick's first law to determine the diffusion rate, flux, permeability coefficient, and diffusion coefficient of TTZ through cellulose in water. The experimentally determined diffusion coefficient will be compared to the literature value of $4.9 \times 10^{-10} \text{ m}^2/\text{s}$ (1). This experiment may ultimately be used to investigate similarly charged molecules such as the antidepressant drug amitriptyline hydrochloride.

(1) Ribeiro, I. A. C.; Faustino, C. M. C.; Guedes, R. C.; Alfaia, A. J. I.; Ribeiro, M. H. L. Exploring Drug Diffusion through a Membrane: A Physical Chemistry Experiment for Health and Life Sciences Undergraduate Students. *J. Chem. Educ.* 2015, 92, 924–927.

Student Researcher(s): Julie Meade, Tiffany Diaz-Calderon, Sophie Gringer, Eleni Antzulatos

Major: Chemistry

Research Mentor(s): Randall Reif

Project Title: Iron and Sodium determination to compare various Baby Foods using ICP-AES

The purpose of this experiment is to determine the difference between iron and sodium levels in homemade baby food compared to store bought baby food. To determine the difference, we examined 6 different samples of baby food, 3 store bought and 3 homemade, using the ICP-AES. The baby food samples will be stage one Gerber Carrots, stage one Gerber Bananas, Gerber Oatmeal, homemade carrot baby food, homemade banana baby food, and homemade oatmeal. In order to be able to run the samples through ICP-AES, they will first be acid-digested using nitric acid and hydrochloric acid. The ICP-AES was used to create a calibration curve of iron and sodium standards, and to examine our samples to determine the concentration of iron and sodium in the baby food samples. Overall, we anticipate that the results will show that store bought baby food has a high concentration in both iron and sodium.

Student Researcher(s): Michelle Milligan

Major: Psychology

Research Mentor(s): Mindy Erchull

Project Title: The Division of Childcare and its Effect on Marriage Satisfaction and Child Adjustment in Heterosexual and Homosexual Romantic Relationships

Gender roles influence the division of child care within marriages, and this division of labor affects overall marriage satisfaction within heterosexual and homosexual relationships. When the division of labor is considered equal, marriage satisfaction is greater, which has been linked to more positive outcomes related to child adjustment.

Student Researcher(s): Sean Morris

Major: Biochemistry

Research Mentor(s): Randall Reif

Project Title: Temporal Dynamics of Apoptosis in Jurkat Cells

Apoptosis, a process in which a cell systematically triggers its own death in response to DNA damage or external stimuli, is widely utilized in the body. Malfunction of the apoptosis process can lead to serious health problems such as cancer. There are several known pathways that execute apoptosis utilizing a family of enzymes called Caspases. The (intrinsic) pathway is the focus of this research, and initiates caspase activity through mitochondrial depolarization.

The goal of this research project was to find suitable initiators of apoptosis in Jurkat T-Lymphocytes and elucidate their temporal dynamics with respect to caspase activity. Microfluidic devices were fabricated to capture cells and view this process. To identify suitable inducers of apoptosis to use, cells were exposed to several compounds and monitored over six hour time periods using Fluorescence Microscopy. Caspase activation was confirmed with the use of a caspase-specific fluorogenic probe, L-bisaspatic acid rhodamine 110.

Hydrogen Peroxide was found to have the highest amount of caspase activity with respect to what this project was looking for, and was therefore chosen. Apoptotic cells with active caspase enzymes consistently reached peak intensity two hours after caspase activation began. Using these results, mitochondrial depolarization will be tracked simultaneously with caspase activity utilizing MitoTracker Red.

Student Researcher(s): Lauren Mosesso, Lillie Johnson

Major: Environmental Geology

Research Mentor(s): Ben Kisila

Project Title: The impact of sea level rise on phosphorus dynamics in coastal and upstream wetlands of the Rappahannock River, a sub-watershed of the Chesapeake Bay

Progressive Increase in phosphorous (P) loading in surface water bodies by runoff continues to create concern for water and land managers globally due to its association with declining water quality despite stricter management of anthropogenic-caused nutrient fluxes into waterways. In addition, the rise in sea level and associated increased flooding periods and changes in salinity gradients is likely to alter P dynamics in wetlands and floodplain soils. The objective of this study is to analyze the impact of sea level rise on P sorption and desorption processes in three Rappahannock River wetlands soils, a sub-watershed of the Chesapeake Bay.

Student Researcher(s): Sara Murphy

Major: Biology

Research Mentor(s): Lynn Lewis

Project Title: Effects of Chloroquine and Rapamycin on Mouse Mammary Tumor Virus

The main purpose of this study is to examine the effectiveness of two drugs, chloroquine and rapamycin (sirolimus), in hindering viral replication in mouse mammary cells infected with Mouse Mammary Tumor Virus (MMTV), a transforming retrovirus. A secondary purpose is to examine the cytotoxicity of these drugs on healthy mammary cells to establish their biosafety at different concentrations. Chloroquine has been shown to have anti-retroviral effects and rapamycin has been shown to have both anticancer and antiviral

effects making them ideal for use against MMTV. Experimental protocols concerned with cell viability and quantifying viral titer such as MTT Assay and monodansylcadaverine (MDC) autophagy/cytotoxicity dual staining were employed. Since MMTV inserts its own genome into the host genome, an estradiol solution of 10ng/ml was used activate the virus, followed by treatments with rapamycin and/or chloroquine. The results have shown that rapamycin has maintained cell viability with levels comparable to untreated cells. Chloroquine has a narrower range that it is effective but has also shown to maintain cell viability. In regards to cytotoxicity, rapamycin and chloroquine are cytotoxic to the cells at concentrations higher than 400 nM and 10 μ M respectively.

Student Researcher(s): Delphine Ngo Kattal

Major: Spanish and French

Research Mentor(s): Marcelo Fajardo

Project Title: Fe en Disfraz o la Expresión Metafórica de: –la fatal miseria de la mujer afrodescendiente

Fe en disfraz (2009) novela de mayra santos febres es una obra que expresa la triste realidad socio-cultural: de la mujer afrodescendiente en la sociedad eurocéntrica latinoamericana. A través los hechos históricos y la ficción narrativa, se pone de relieve la cosificación y los conflictos de una mujer afrodescendientes puertorriqueña y su historia. Sin embargo el contexto narrativo e histórico que presenta contrapone una crítica a la descaracterización que sufren las mujeres afrodescendientes y de su situación en el caribe y más allá. La novela presenta una relación amorosa sadomasoquista entre el narrador martin y fe verdejo su jefa y se cuestiona la triple discriminación social, de raza y género hacia la mujer, la inferiorización y auto límites que se hace padecer fe. Se analiza la inversión de los roles hegemónicos y subalternidad que refuerzan la marginalización de la mujer y la hacen más vulnerable en la sociedad eurocéntrica en que vive. Este trabajo analiza el relato de la vida de fe y su extraña relación de dependencia con martin en la que se exponen cómo las desigualdades raciales continúan condicionando la vida de la mujer afrodescendiente, en este caso la puertorriqueña.

Student Researcher(s): Teresa Nguyen

Major: Biology

Research Mentor(s): Abbie Tomba

Project Title: Digenetic Trematodes of Eastern Virginia: An Ode to DNA Barcoding

Digenetic trematodes parasitize organisms from a variety of taxa, primarily using snails as intermediate hosts and vertebrates as definitive hosts. Within Eastern Virginia, common intermediate hosts include, *Elimia virginica* and *Leptoxis carinata* (Gastropoda: Pleuroceridae). There is evidence that these parasites have behavioral and physiological effects on their intermediate hosts, such as increasing food consumption and castration. These effects imply that trematodes could have larger ecological effects, with potential variation between each species. The identity of individual trematode species that parasitize snails within the Rappahannock and Little Rivers (Fredericksburg, and Hanover Co., VA) remains unknown due to the morphologically cryptic larval stages present inside the snail hosts. However, DNA barcoding using the cytochrome c oxidase (COI) gene makes species identification possible. In previous work, we isolated DNA from 3 potentially different trematode taxa, 1 of which belongs to the order Echinostomatidae with the other 2 belonging to the family Collyriclidae. For this study, additional larval COI gene sequences will be isolated and COI sequences from adult trematodes will be compared to those of the larval stages. Snails and fish were collected from the Rappahannock River. From the snails, we isolated 12 new larval trematode samples. Three of the samples were germ balls, 3 were sporocysts, and the other 6 were sporocytes that had shed cercariae. Based on the morphology of those 6 cercarial samples, we determined that there are at least 2 taxa. Five of these 6 had cup tail cercariae and the sixth cercaria sample had a monofurcated tail. Previously, we had dissected 159 fish from the Rappahannock River site. Three of these fish, all *Notropis procerne*, yielded adult trematodes. DNA analysis of these 12 larval samples and the adult samples is still ongoing.

Student Researcher(s): Alaina Nichols, Emily Bibel, Eva Turcios

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: The Effect of Social Cues on Stress Response in Zebrafish (*Danio rerio*)

Previous studies have shown that social cues increase the stress response to a net stressor in the model organism, the zebrafish (*Danio rerio*). We hypothesized that social cues also heighten stress response of zebrafish to a predator. To test this, we sorted fish into 16 replicate tanks; six tanks contained groups of five fish and ten tanks contained individual fish. Half of the tanks were then placed immediately adjacent to a tank containing a predator fish to allow visual contact while the other tanks had no visual contact to serve as a control. After 15 minutes, fish were euthanized and stored at -80°C. Bodies were then homogenized in a phosphate buffer solution and cortisol was extracted with diethyl ether. A human ELISA salivary cortisol kit will be used to measure the stress hormone, cortisol, and cortisol concentrations will be compared among groups. We predict that the group-housed fish that were visually exposed to a predator will have higher cortisol levels, due to social signals.

Student Researcher(s): David Nunez

Major: Biochemistry

Research Mentor(s): Kelli Slunt

Project Title: Optimization of a Ligand Binding Assay for Peroxisome Proliferator-Activated Receptors

Peroxisome Proliferator-Activated Receptors (PPAR) are a group of protein receptors that, when activated by phthalate esters, have caused tumor formation in rats. Because phthalate esters are used to plasticize commercial products such as water bottles and food can liners, potential exposure can occur if the compounds leech from the polymer into the foodstuff. Dr. Davis Oldham is synthesizing stereospecific metabolites of phthalates in order to determine the impact of chirality on impact on PPAR. An in-house thermal shift assay could be useful to determine whether or not a particular phthalate could bind to the PPAR-Ligand Binding Domain (LBD). In a thermal assay, proteins are heated in the presence of a hydrophobic dye. Upon denaturation of the protein, the dye binds to the newly exposed hydrophobic regions and the dye-protein complex fluoresces. The more stable a protein is, the higher temperature of denaturation (T_m). In the presence of a ligand, the protein complex should be more stable and therefore exhibit a shift to a higher T_m . Parameters that impact the fluorescence intensity such as pH, dye concentration, and protein concentration were optimized using the protein lysozyme. These optimized parameters were applied to the assay with the PPAR γ -LBD, in the absence and presence of a ligand. The T_m for the PPAR γ -LBD was determined to be 31.83°C. The known PPAR γ ligand, rosiglitazone, was added to the PPAR γ -LBD and the T_m increased to 53.14°C. The T_m of PPAR γ -LBD varied from 51.62 – 53.14°C as the concentration of rosiglitazone was decreased. The molecules estrone and tryptophan were investigated as possible negative controls but exhibited non-specific binding to the PPAR γ . Optimization conditions and suggestions for future studies will be presented.

Student Researcher(s): Mary O'Dell

Major: Biology

Research Mentor(s): Alan Griffith

Project Title: Tree Fredericksburg

This project involved GIS mapping for a local nonprofit organization called Tree Fredericksburg, whose purpose is to maintain the urban forest of Fredericksburg. Our duties included measuring trees planted by Tree Fredericksburg and inputting the data on GPS devices called JUNO 3Bs, and mapping the positions of these trees.

Student Researcher(s): Eynav Ovadia

Major: Art History

Research Mentor(s): Marjorie Och

Project Title: The Venus Problem: An Examination of Botticelli's Mythological Paintings

Botticelli's paintings of Venus present unsolved dilemmas to researchers. Why do these paintings portray women as the central figures in the narrative when 15th century gender dynamics marginalized women, and

what messages are viewers meant to understand from these works of art? My research attempts to answer these questions through an analysis of the "Venus and Mars", which was created between 1483 and 1484.

Student Researcher(s): Daniel R. Persigehl

Major: Classics -- Latin

Research Mentor(s): Liane Houghtalin

Project Title: Familial Pressures on Republicans during the Civil War of 44-42: Reconstructing the Life of M. Porcius Cato f. Uticensis

This paper examines the impact of various pressures of family on the motivations of Roman men who joined the Republican cause during the Roman civil war of 44-42 B.C. Unlike those in the previous civil wars, the majority of prominent figures were young and inexperienced since much of the previous generation had fallen in battle or were otherwise killed. Such unestablished politicians would ordinarily have fallen back on a network of kin and family friends in order to obtain influence in the public arena. Young Romans typically lived almost entirely in the shadows of their fathers, with regard both to their political aspirations and to their general reputation. With the exceptions of M. Brutus, Cicero, and Cassius Longinus, however, many Republicans were the children of men killed by the armies of Julius Caesar and would thus be freer to choose their own direction in life. This analysis was made by constructing a biography of M. Porcius Cato, son of the famous M. Porcius Cato Uticensis and a somewhat notable legate under Brutus. Evidence for his life was gathered largely from Plutarch's biographies of Cato the Younger and Brutus and by applying scholarship on topics such as the structure of the Roman family, political alliances through marriage, obligations of pietas, and the nature of clementia.

Student Researcher(s): Virginia Pierce

Major: Classics – Classical civilization and English

Research Mentor(s): Liane Houghtalin

Project Title: Women of the *Iliad*: The Foundation for Male Authority

The Iliad is a tale known for its epic heroes and their struggles, such as the wrath of Achilles, the noble deeds and tragic death of Hector, and the power of Agamemnon leading the armies of the Achaeans against Troy. There is little room reserved for female characters, however, as men dominate the epic with battle, violence, and conquest. Women have little autonomy, and as a result their experiences are based on the decisively few roles that the social standard allows them to maintain. In my analysis of the Iliad, I will focus on these female roles to reveal that despite their limited representation in the Iliad and their limited autonomy, female characters had a profound effect as being the underlying structure of authority for men in Homeric society.

In my analysis I will focus on four female characters in varying forms of captivity: Briseis, Chryses, Andromache, and Helen. These characters all hail from different conquered locations, and are the $\gamma\rho\alpha\varsigma$, or war-prize, for their captors. In ancient Greek culture, especially that associated with the Iliad, there was great honor in $\gamma\rho\alpha\varsigma$, and through this lens women were working symbols of power via the honor that they bore. They therefore represented a foundation of authority for their male captors and carried enormous power in maintaining a man's reputation outside the realm of warfare.

Student Researcher(s): Elizabeth Pina, Samantha Alvey

Major: Biology

Research Mentor(s): Alan Griffith

Project Title: Heritage Tree Project

This project aims to bring awareness to the importance of historical heritage trees on campus and provide essential data regarding the specific heritage trees for future research efforts. These trees help to enrich campus life and history. Data collected was the tree DBH, canopy lengths in both the North-South and East-West directions, and the tree height. Data results varied depending on the tree species and age of the tree. Future monitoring of these trees can help to ensure tree protection and possibly encourage a larger diversity of trees to be incorporated on campus.

Student Researcher(s): John Robie, Joe Dolan, Brittany Armbricht

Major: Mathematics

Research Mentor(s): Melody Denhere

Project Title: Industrial Applications of Hidden Symmetries of Graphs

Symmetries of graphs can be used to predict information about real-world networks. A graph, $G(V,E)$, is a group of a set of vertices, V , and a set of edges, E . Graph isomorphisms are permutations of the group that map $G \rightarrow G$ and represent changes within a closed network. Automorphisms, an isomorphism that preserves vertex-edge connectivity, provide us with symmetries of the graph. The normalizer group provides the so-called “hidden symmetries” of the graph. This presentation describes a novel approach to the computation of normalizers as well as the merits and disadvantages of the method. The syntax and semantics particular to an author can be modeled by forming a word adjacency network, labeling “function words” as the vertices of a graph and assigning adjacency values to edges. Graph symmetries provide probabilistic insight into authors’ future writing styles and can expand the amount of data associated with an author. This data can be used as an expanded training set for an algorithm written to classify input texts of unknown authorship as belonging to a particular author. The computational tractability of the normalizer is discussed along with regression models of the computer run-time of such a computation. The viability of including the hidden symmetries into a training set is also discussed.

Student Researcher(s): Leah Roth

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: The Effect of Nutritional Status on the Expression of Appetite-Regulating Genes

Obesity, metabolic syndrome, anorexia nervosa, and other illnesses associated with food intake are critical problems throughout the world. To develop pharmacological therapies to treat such conditions, recent research has focused on studying appetite regulation at the molecular level. It is now known that many extracellular proteins, or peptides, serve as signal molecules in the brain to regulate appetite: “orexigenic” peptides stimulate appetite, whereas “anorexigenic” peptides inhibit appetite. However, little is known regarding the regulation of the genes encoding these peptides. In this study, we are examining the effects of nutritional state on the expression of putative appetite-regulating peptides in the model organism, the zebrafish. To determine whether expression of these genes changes in response to nutritional stress, three tanks of adult male zebrafish were fasted while three control tanks were fed to satiety for a total of thirteen days. On days 1, 3, and 13, brains were collected from 12 fish in each treatment group. Total brain RNA was extracted and synthesized into complementary DNA by reverse transcription. We are currently developing quantitative PCR (qPCR) assays for genes encoding the orexigenic peptides NPY (neuropeptide Y), and AgRP (agouti-related protein), the anorexigenic peptide CART (cocaine and amphetamine-regulated transcript), and melanocortin receptor 4 (MC4R), the receptor for the anorexigenic melanocortin. Using these assays, we will measure the mRNA levels from each gene to compare expression between fed and fasted fish. We predict that in fasted fish, mRNA encoding the orexigenic peptides NPY and AgRP will be higher, and mRNA encoding the anorexigenic peptide CART and MC4R will be lower, than in fed controls. We expect this study to give us insight on the molecular mechanisms connecting energy state and appetite.

Student Researcher(s): Andrea Sanchez

Major: Biology

Research Mentor(s): Abbie Tomba

Project Title: Determining the molecular weight of the alarm cue in the crayfish *Cambarus acuminatus* using a behavioral assay

Chemical signals play an important role in aquatic ecosystems. Crayfish in particular use chemical signals to find food, mates and sense danger. Alarm cues are chemical signals used by a wide variety of organism to detect predation. In crayfish the alarm cue is a conspecific damage released signal. Response to alarm cues in crayfish is well documented and includes a decrease in locomotion, feeding and increase in time spent in defensive positions. However, there is limited research on the identity of the alarm cue. Previously we determined that the alarm cue is present in the hemolymph of the crayfish *Cambarus acuminatus* as

demonstrated by decreased locomotion. In this experiment we used a paired design to determine the molecular weight of the alarm cue in *C. acuminatus* by using a behavioral assay and hemolymph fractioning. Crayfish were collected from Horsepen Run (Stafford Co. VA) and divided into donors and trial subjects. The hemolymph was first separated into fractions of >30kda and <30kda through centrifugation creating two size treatments. Treatments were prepared by combining food odor with fractioned hemolymph to be injected into the tanks. Food odor was used to stimulate crayfish's locomotion. Crayfish locomotion was observed for four minutes, including two minutes after injection of the control (water), followed by two minutes after addition of the selected treatment. Locomotion was determined by the amount of time the walking legs were moving. Mean change in locomotion (treatment-control) was compared between the two size treatments. The same methods were used to conduct another paired experiment using >10 kda and <10 kda fractions. We hypothesize that the alarm cue is found in the hemolymph and is between 30 kda and 10 kda. Preliminary results show a trend that the alarm cue is less than 30kda.

Student Researcher(s): Olivia Schiermeyer

Major: Biology

Research Mentor(s): Andrew Dolby

Project Title: Thermoregulatory Habits of the Eastern Bluebird (*Sialia sialis*) and how Global Climate Change may cause Population Declines

The Eastern Bluebird (*Sialia sialis*) is a native cavity nesting species that utilizes nest sites year-round. After the introduction of European Starlings and House Sparrows in the 1800s, bluebird populations drastically declined. This resulted in a movement to protect the bluebirds from extinction and artificial nest boxes were installed across their range in the United States. In recent years, Eastern Bluebirds have experienced significant population declines once again in the eastern United States. This is thought to be caused by harsh winters preventing the birds from effectively thermoregulating to conserve energy. However, due to global climate change, winters will likely become more mild and may not have a significant impact on the bluebird populations in the future. During the breeding season in the spring and summer, Eastern Bluebirds utilize specific nesting sites (including natural cavities and artificial nest boxes) with a variety of characters that allow them to efficiently thermoregulate and incubate eggs. Due to increasing summer temperatures, bluebirds and their offspring could be in danger of overheating in their typical nesting cavities. Thus, global climate change could disrupt the normal thermoregulatory habits of Eastern Bluebirds, resulting in population declines.

Student Researcher(s): Parminder Singh

Major: Nursing

Research Mentor(s): Mary Jane Bowles, Pamela S. McCullough

Project Title: An Effective Screening Tool to Reduce the Rate of Readmissions for Diabetic Patients

Newly diagnosed diabetic patients present with co-morbidities and require numerous lifestyle changes. Non-compliance continues to be problematic despite provision of discharge education. Screening upon admission and diagnosis may predict risk factors associated with non-compliance and current screening tools have limitations. New tools are needed to include clients with poor health literacy and social determinants of health impeding care. Piloting a tool which targets vulnerable populations and addresses the barriers to compliance is crucial in reducing hospital readmissions.

Keywords: type 2 diabetes, readmissions, screening tool

Student Researcher(s): Karen Smith

Major: Environmental Science

Research Mentor(s): Brian Rizzo

Project Title: Analyzing the Spatial Distribution of Carbon Emissions in Virginia

Climate scientists around the world agree that the main culprit of climate change is the greenhouse gas, carbon dioxide. Carbon dioxide is emitted into our atmosphere through natural processes. However, the majority of carbon emissions today are from anthropogenic sources. Carbon emissions are a combination of many different factors, such as population density, development, transportation, and electricity production. This research determines the spatial distribution of carbon emissions in Virginia and investigates the

relationship between carbon emissions and anthropogenic factors. The data was gathered from the Vulcan Project and the US Census. Spatial Statistics were used to analyze the data in ArcGIS. It was found that the most influential factors on total emissions are electricity production and transportation.

Student Researcher(s): Sepehr Sobhani

Major: Music

Research Mentor(s): Mark Snyder

Project Title: 80 Years of Popular Music: A Quantitative Analysis of Pop Music Trends

There is wealth of data on the internet specifically about music. This data ranges from subjective critics, objective metrics on songs. This research will focus on the latter. By synthesizing the top songs in the U.S by year since the 1940s, and combining the data with meta-data on individual songs, a conclusion for how the industry has changed over the years, and how it reacts to change can be discerned. Research into pop music is not a new phenomenon. Because of how lucrative a song has the potential to be, research is often done on what makes a pop song successful, or what is fashionable for a given month or week in pop music. The significance of the research being proposed, and what sets this research apart from previous projects is this study will cross correlate aspects of music with other national metrics and political events. Ideally, conclusions drawn from this study will allow music to be used as an economic and political indicator to aide in public policy decisions. This study will also be holistic and look to draw conclusions on trends spanning 80 years, a time frame that is larger than most other studies. The research will demonstrate that music is more than simple source of entertainment and can work as a unifying indicator of the national psyche.

Student Researcher(s): Dahlia Somers

Major: Business Administration and English

Research Mentor(s): Shumona Dasgupta

Project Title: The Everyday Hero in the Complete Persepolis

In *The Complete Persepolis*, Marjane Satrapi argues that the quiet lives of Iranian citizens whose small acts of resistance and ability to survive, while contending with an oppressive regime, demonstrate an everyday lived heroism. The graphic novel criticizes the fundamentalist mindset and applauds people's small subversions through discreet struggle. After the fundamentalists gain power, people split into three paths: they become supporters, sometimes fanatics like *The Guardians of the Revolution*, or they disagree by small actions. Despite the panoptic policing that pervades society people still live life as unaltered as possible. I argue that their change and influence on society, while slow, makes a large difference given time. Although differing from the typical flashy hero, the ability to survive under brutal conditions is heroic in and of itself.

Student Researcher(s): Lauren O. Sorel

Major: Classics – Classical civilization

Research Mentor(s): Liane Houghtalin

Project Title: A Retroactive International Relations Perspective on Thucydides: An Exploration of the Mytilene and Pylos Incidents

This paper aims to establish the International Relations perspective of Constructivism as being the most practical for understanding Thucydides' *The Peloponnesian War*. To illustrate the strength of this perspective, this paper offers a comparison to the insight gathered through the other dominant perspectives in International Relations: Idealism and Realism. Due to their complexity and impact on the war, the Mytilene and Pylos incidents will serve as test cases for Thucydides' whole work. This paper analyzes both incidents from all three perspectives in order to illustrate which school of thought is the most insightful. Leading up to the war Athens and Sparta both created identities for how they believed their city-states should act and be perceived. The role that Athens created for itself was characterized by a need for power, a belief in the superiority of democracy and themselves, and the openness of the city of Athens. The role that Sparta created for itself was characterized by a belief in the superiority of oligarchic rule, the importance of Greek freedom, and the strength of the Spartan army. Since both city-states, in both incidents, let these roles guide their responses, the Constructivist perspective makes the most sense in explaining their reactions.

Student Researcher(s): Sarah Christine Speacht

Major: Classics – Classical archaeology

Research Mentor(s): Liane Houghtalin

Project Title: An Examination of the Cultural Developments Leading Up to the Aphrodite of Knidos

The Aphrodite of Knidos is a monumental piece of artwork and a stepping stone for the conception and thought of female nudity in western art. Though the original statue is lost, and therefore its appearance and positioning, its copies help guide us to a general acceptance of what the original looked like. Scholars such as Havelock and Iris Love have tried to solve the mystery surrounding the statue by attempting to put an appearance to it and by placing it in the context of ancient Greece. Female nudity was a foreign concept that ancient Greeks would have found unwelcome, so the question must be asked "why was this statue created?" The changing artwork of the Greeks reflected their expanding physical terrain and intellectual drive. The purpose of my study is to understand the Greek cultural changes that would have allowed for the conception of a full-scale female nude statue of Aphrodite. This paper will show that the mixture of Near Eastern influences, the cultural aspects of life that Aphrodite represents, and the developing depiction of the female body beginning in the Archaic period were key cultural changes that allowed for the Aphrodite of Knidos to be sculpted.

Student Researcher(s): Kevin Speray

Major: Biology

Research Mentor(s): Alan Griffith

Project Title: Exploring the relationship between shade level and incidence of seedling death in *Aeschynomene virginica*.

Aeschynomene virginica is a federally threatened obligate wetland species found exclusively in freshwater tidal marshes along the eastern coast of North America. The author hypothesizes that competition for sunlight plays a role in preventing high establishment for *A. virginica* seedlings and thus keeps populations small. No previous data exist to show what kind of shade tolerance *A. virginica* has. The present experiment was performed to determine if *A. virginica* seedlings respond negatively to increasing levels of shading. The prediction for the experiment is that plants grown in higher shade levels will experience decreased growth and increased death rate compared to those grown in full sunlight. One hundred twenty *A. virginica* seedlings were randomly divided into two replicates of three light treatments containing 20 seeds each. Treatments were 100% sunlight, 60% sunlight, and 20% sunlight and were manipulated using layers of 40% shade cloth. Treatments were illuminated for 14 hours a day. After two weeks, average plant height as well as death rate were recorded for each experimental unit and an ANOVA was performed to determine if significant differences exist between trials. Incomplete data at present pose an obstacle to the making of conclusions in regard to the hypothesis. However, current observations suggest that seedlings in full sunlight experienced shorter growth and a higher death toll than those grown in a shaded environment, contrary to the prediction. At the finish of this project, we hope to be able to conclude whether or not light competition contributes to seedling mortality, and indirectly to the rarity of this plant in the wild.

Student Researcher(s): Paul Stuckey

Major: Chemistry

Research Mentor(s): Randall Reif

Project Title: Temporal Dynamics of Apoptosis in Jurkat Cells

Apoptosis, programmed cell death, is a natural process cells undergo in the body. Breakdown of this process can lead to a myriad of known health problems including heart disease and cancer. Although apoptosis can be induced either intrinsically or extrinsically, this work focuses on the induction of apoptosis through the extrinsic pathway. Anti-CD95 antibodies when bound to the Fas(CD95) receptor on the cell membrane induce apoptosis. Adhering the anti-CD95 antibodies onto a microfluidic device via a series of chemical scaffolding reagents allowed all cells captured inside the device to be exposed to a known apoptosis initiator. The captured cells were examined via fluorescence microscopy over a 6 hour period for fluorescence from one of two different fluorogenic probes, L-bisaspatic acid rhodamine 110 (D2R), or the Caspase 3 specific variation, Z-DEVD-R110. Intensity of the probes can be used to indicate cells that have active caspase

enzymes which are the main indicators of apoptosis. Future work on this research project includes the investigation of caspase inhibitors on the speed of the apoptosis process.

Student Researcher(s): Paul Stuckey, Melissa Miranda-Marroquin

Major: Chemistry

Research Mentor(s): Leanna Giancarlo

Project Title: Kinetics Study of Crystal Violet, Bromocresol Green, Malachite Green, and Sodium Hydroxide Using a Smart Phone Camera

Some reaction rates or kinetics studies can be monitored by the change in color of the reactants. These processes normally utilize a spectrophotometer; however, spectrophotometers are expensive and inaccessible for most high school chemistry laboratories and even more so for third world countries. Here, we present an easy and inexpensive method using a smartphone camera that will allow students to learn about kinetic rate laws spectroscopically, in particular by monitoring the change in color of dyes during reaction with sodium hydroxide. Crystal Violet, Bromocresol Green, and Malachite Green are members of the triphenylmethane dye family, and all of them possess an electron deficiency at the tertiary carbon position, where the hydroxide ion may be able to attack and form a colorless carbinol derivative. Preliminary experimental results confirm that a smartphone is capable of capturing the change from colored to colorless solution; this confirmation as well as rate of the reaction for each dye using the smartphone method will be presented.

Student Researcher(s): Tennessee Williams Panel

Research Mentor(s): Gary Richards

Project Title: Tennessee Williams Seminar Research Papers

Students from the fall 2015 capstone seminar on Tennessee Williams draw on their term research papers to discuss a range of topics surrounding arguably the most important U.S. dramatist of the twentieth century. In her paper "Tennessee Williams vs. the Stereotype: Does He Subvert or Reinforce?," Emily Beard, senior double major in geology and English, interrogates Williams' handling of Polish and Italian stereotypes in works such as *A Streetcar Named Desire*, *The Roman Spring of Mrs. Stone*, and *The Rose Tattoo*. In her paper "The Self-Censorship of Tennessee Williams' Fiction and Drama in the U.S. Post-War Period," Gracy Hill, junior English major, explores Williams' tendency toward self-censorship in autobiographical works like "The Angel in the Alcove," *The Glass Menagerie*, and *Vieux Carré*. In her paper "A Different Type of Invisibility Cloak: The Progression of Homosexuality in Tennessee Williams' Stage Productions," Kelly MacRitchie, senior English major completing the elementary education program, charts Williams' evolving depictions of homosexuality via *A Streetcar Named Desire*, *Cat on a Hot Tin Roof*, *Suddenly Last Summer*, and *Vieux Carré*. In her paper "Crushed Violets and Collapsed Daughters: An Analysis of Gutman and Boss Finley," Faith Rivers, senior English major, delineates Williams' critique of governmental power in the age of McCarthyism as evinced in *Camino Real* and *Sweet Bird of Youth*. Finally, in his paper "Everything's a Little Bit Racist: Tennessee Williams' Treatment of Black Bodies and the Legacy of Antebellum Culture," Joseph Young, recent December graduate with a major in English, indicts Williams for his vexed treatment of black bodies in works such as *Sweet Bird of Youth*, *Vieux Carré*, and "Desire and the Black Masseur."

Student Researcher(s): Rachel Thomas, Kristina Krumpos

Major: Biology

Research Mentor(s): Stephen Gallik

Project Title: Genetically Engineering Plasmids for Nuclear Localization Studies, Part 2.

The long-term goal of this research project is to create recombinant plasmid expression vectors that can be used by future students to study the nuclear localization of proteins and the nuclear localization signal (NLS). Due to its relatively high molecular weight and its natural fluorescence, a fusion protein consisting of multiple copies of green fluorescent protein (GFP) linked to an NLS is an ideal reporter protein for nuclear localization studies. To study the behavior of fusion proteins containing multiple copies of GFP, but lacking the NLS, the specific objective of this research study is to delete the 3 NLSs embedded in the two plasmids created by Krumpos et al, creating plasmids containing 2 copies GFP genes and 3 GFP genes, but lacking the NLSs. The expression of these plasmids in mammalian cells will result in the synthesis of a fusion protein

containing 2 copies of the GFP protein (total molecular weight approximately 54,000 daltons) and a fusion protein containing 3 copies of the GFP protein (total molecular weight approximately 81,000 daltons), respectively. The lack of NLSs in these expressed proteins will prevent them from utilizing the classical nuclear import mechanism and limit them to entry into the nucleus via simple diffusion.

Student Researcher(s): Cassandra Tomiko, Bredan Dowling, Kwame Bempong, Hoang Anh Tran

Major: Biochemistry

Research Mentor(s): Randall Reif

Project Title: The Analysis of Phosphates in Commercial Fertilizers by Inductively Coupled Plasma-Atomic Emission Spectroscopy and Ultraviolet-Visible Spectroscopy

Many commercially available fertilizers contain phosphates that cause an increase in oxygen levels, toxic algae, and the death of wildlife in many of the surrounding bodies of water. The purpose of this experiment is to determine the concentration of phosphates in several brands of fertilizer and compare those values to the concentration of phosphates in river water. Samples of two brands of fertilizer will be acidulated with perchloric acid and nitric acid. These samples and samples of river water diluted with nanopure water will be analyzed against standard concentrations of potassium phosphate by ICP-AES. In the next portion of our experiment, we will react samples of fertilizer and river water with ammonium molybdate and sulfuric acid to form ammonium phosphomolybdate. These samples will be analyzed in the ultraviolet range at 340 nm. We expect to find that samples of reservoir water collected from the Idlewild community will have concentrations of phosphate less than 1.28 μM and that data obtained from both methods will show similar results.

Student Researcher(s): Eva Turcios, Daniel Noyes

Major: Biology

Research Mentor(s): April Wynn

Project Title: A Comparison between the Location of Virginia's Invasive Species in The University of Mary Washington Herbarium (MWCF) and the Digital Atlas of the Virginia Flora

The Digital Atlas of the Virginia Flora provides the most extensive information available for geographic locations of vascular plants in Virginia. Information is pooled from several herbaria and reflects the collections of multiple Virginia colleges such as Virginia Tech, William and Mary, and James Madison University. The digital format of the atlas allows for continued expansion and cross-referencing of taxonomic information in an effort to represent a historical record of species as they exist both morphologically and ecologically within the state. The University of Mary Washington Herbarium (MWCF) comprises over 5300 specimens predominantly from Virginia, as well as locales abroad including Jamaica, New Zealand, and the British Virgin Islands. Our goal in examining the MWCF collection is to catalogue invasive species specimens (as listed by the Virginia Department of Conservation and Recreation) by invasiveness: high, medium, and low. Analysis and referencing of the invasive species within the MWCF has not previously been conducted and provides an excellent opportunity to update the Atlas with geographic distribution of these species from data in our collection. Comparison of the locations of invasive species within our collection to the Digital Atlas will highlight any discrepancies and prompt updates to the Atlas. Curation of the Atlas is important in order to reflect current and representative information from as many herbaria as possible for educational and tracking purposes.

Student Researcher(s): Caitlin Turner-Lafving

Major: Political Science

Research Mentor(s): Chad Murphy

Project Title: Do Competitive Female Candidates Affect Who Turns Out to Vote?

I analyze voter turnout trends from recent congressional elections in which there were competitive female candidates. My main focus is whether or not more women vote in these elections, but I look at a wide range of demographic trends and how they relate to voting behavior.

Student Researcher(s): Emily Wanger

Major: Biology

Research Mentor(s): Debbie Zies

Project Title: The Effects of BAS1 on ADE2 Regulation

Adenine biosynthesis is the process in which adenine is created, as well as guanine. Both are nucleotides present in the nucleic acid structures in our DNA. Adenine is key in making DNA, RNA and Proteins as well as being an important component of basic cellular activities like cellular respiration and the formation of ATP. For these reasons, it is essential to study the pathway by which adenine is synthesized and regulators that affect this process. The nonessential gene under observation is BAS1 in yeast, also known as CYP734A1 in humans, which encodes a transcription factor involved in purine biosynthesis pathway. BAS1 with the help of BAS2 is responsible for the positive regulation of several ADE genes, including our focus ADE2, a gene in the 'de novo' pathway. We hypothesize that if BAS1 were deleted the expression of ADE2 would decrease but not completely stop. We also hypothesize that the expression of ADE2 would be related to whether or not adenine is present in the environment, with more growth occurring when adenine is in the media. To measure these, we will perform a Northern blot experiment using an ADE2 probe. With this, we will be able to see the effects of BAS1 on ADE2 regulation and the effects of adenine in the environment on BAS1.

Student Researcher(s): Sydney Welch

Major: Biology

Research Mentor(s): Abbie Tomba, Brian Rizzo

Project Title: Evaluating the Spatial Relationship and Statistical Differences Between Various Snail and Parasite Collection Sites Along the Rappahannock River Watershed.

Digenetic trematodes are parasitic flatworms that complete their life cycle in at least two hosts, an intermediate host and a definitive host. The first host is usually a mollusk such as a snail and the definitive host can range from a variety of vertebrates including fish, snakes, amphibians etc. Parasites found in collected snails were processed and sequenced for species determination. Species identification of the parasites contributes to the understanding of trematode diversity and the ecological effects within the Rappahannock River watershed. The snails collected were measured for shell width, the sex was determined and they were dissected for parasitic infection. This data was compiled into an Excel sheet that was processed using Arcmap programs leading to the creation of a geographic representation. The processed snail data was placed into a geodatabase and the collected snails were assigned to polygon features representing each collection site. The raw non-spatial data was transformed into data with spatial and geographic properties. Various ArcMap 10.1 (GIS) programs and tools were used to statistically analyze the parasite collection data comparing the individual sites with each other. Differences in number of males vs females, infection, location of infection and snail shell width were then compared statistically between all of the sites.

Student Researcher(s): Michael Wilkerson, Andrew Kalasky, Hallie Marsteller

Major: Biology

Research Mentor(s): Dianne Baker

Project Title: Does early fluoxetine exposure in zebrafish cause permeant effects on the stress axis?

As the use of pharmaceuticals increase worldwide we continue to discover their presence in water effluent and their detrimental effects on aquatic organisms. Fluoxetine is a psychiatric drug classified as a selective serotonin reuptake inhibitor (SSRI) that has been found at levels as high as 1 µg/ L in freshwater environments. Previous research in zebrafish (*Danio rerio*) has demonstrated that this concentration disrupts the acute cortisol response to stress. The present study examines whether early exposure to fluoxetine causes chronic effects on the stress axis in zebrafish (*Danio rerio*). We exposed larval zebrafish to 0 (control), 1 µg/L, or 25 µg/L of fluoxetine 48 hours post fertilization for 7 days. After 42 days of growth in fluoxetine-free water, fish were exposed to an acute stress, and pools were sampled at 0, 15, and 60 minutes. An enzyme linked immunosorbent assay (ELISA) kit will be used to quantify cortisol concentrations. We predict an impairment in the stress axis response in both fluoxetine exposures, indicated by a decrease in whole – body cortisol concentrations. The stress axis response is highly studied because it is critical for the survivability and reproduction of vertebrate and invertebrate species, and chronic impairment may be deleterious.

Student Researcher(s): Taylor Williams, Claire Reilly, Brittany Wagner

Major: Biology

Research Mentor(s): April Wynn

Project Title: Anatomical Differences Between Plant Species Determine the Preservation Methods Used: Comparing and Contrasting *Pinus echinata* and *Opuntia humifusa*

Preservation of plants is imperative for the comparison of current plant species within herbarium collections. Preservation methods include the following processes: plant extraction, freezing, drying and mounting; each requiring proper materials and handling. Over time, these methods have adapted to biological/technological advancements, such as the increased importance of DNA analysis or the changes in plant classification. Each plant class, due to their anatomical differences, requires its own unique method for preservation. In the case of conifers, Krylon was a glue used in the past to mount specimens; however, it has recently been discovered that this method hinders any possible DNA extraction that can be useful for the molecular identification and classification of species. Furthermore, the preservation methods of conifers versus those of succulents differs greatly, as conifers have abscission layers that cause shedding of needles whereas succulents have dense leaves that have a high water content; these anatomies require different methods of preservation. Abscission layers need to be boiled and soaked in solution before pressing, yet most flowers can simply be dried. Upon examining the biological explanations for current recommended preservation methods, we are able to determine why prior methods have been altered and improved and consider possible methodological improvements that might be appropriate as technology changes in the future.

Student Researcher(s): Kelly Wright

Major: Nursing

Research Mentor(s): Mary Jane Bowles

Project Title: Streamlining Treatment of Suicidal Patients in the ED

The healthy people 2010 campaign reported that approximately 500,000 people required emergency department (ED) treatment as a result of a suicide attempt per year in the United States. Mental illness carries a negative connotation and is often misunderstood by the general population. The social stigma causes people with mental illness to feel isolated and ashamed. Since people are reluctant to receive help, they reach the acute phase of mental illness and seek treatment in the ED. With the rising population resorting to crowded EDs for mental health treatment, EDs are not able to operate as effectively; consequently affecting the treatment of both medical and psychiatric patients. Busy and noisy EDs are not ideal environments for suicidal patients, expediting their care is beneficial to both the patients and medical staff. By initiating a triage protocol for suicidal patients, care for the patients begins as soon as they are triaged.

Student Researcher(s): Nina Wutrich

Major: Art History

Research Mentor(s): Marjorie Och

Project Title: A Disputation: Lucrezia Borgia, Female Virtue, and the Hall of the Saints

Lucrezia Borgia, daughter of the controversial Renaissance pope Alexander VI Borgia, has been depicted in art, literature, and music, many times since her death in 1519. However, no confirmed painted portraits of her survive to this day. What do survive are written descriptions, and portrait medals depicting Lucrezia in profile. Pope Alexander, upon his accession to the papacy, had commissioned the artist Pinturicchio to decorate a suite of rooms in the Vatican Palace, now known as the Borgia Apartments. One of these rooms, the Hall of the Saints, contains frescoes that depict the lives and works of many holy figures. Three of these frescoes, those of Saints Catherine and Barbara, as well as the Old Testament heroine Susanna, are remarkable due to their central figures' resemblance to the extant descriptions and images of Lucrezia Borgia. I assert that these holy women are depictions of Lucrezia. My evidence for this not only includes the aforementioned descriptions and depictions of Lucrezia's physical appearance, but also is based on iconography. In 1494, the year that I assert Pinturicchio and his workshop completed the decoration of the Hall of the Saints, Lucrezia married the first of her three husbands, Giovanni Sforza. Through iconography as well as the hagiography and biblical accounts of the subjects of these frescoes, it is clearly visible that Pinturicchio and the Borgia

family intended for the images of these three holy women to be viewed as a series of didactic images that displayed Lucrezia's virtues and values to her new Sforza relatives.



Acknowledgement

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

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