



# Tenth Annual Undergraduate Research Conference

**Thursday, April 19, 2012**  
**Squires & Newman Library 1st Floor**

Office of Undergraduate Research

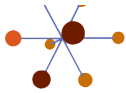


<http://www.research.undergraduate.vt.edu>



**VirginiaTech**  
*Invent the Future*

# PROGRAM



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# Thank you to our sponsors!

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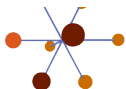
*Center for Academic Enrichment and Excellence*

*VT Alliance for Minority Participation*

*VT Graduate School*

*Interdisciplinary Research Society*

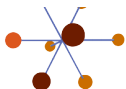
*Graduate-Undergraduate Mentoring Program (GUMP)*



**Table of Contents**

**Table of Contents**

Schedule at a Glance	4
Workshops & Special Sessions	5
Keynote Address	7
Pizza & Panel Discussion	8
Oral Presentation Detailed Schedule	
8:00 – 9:15 am (2 concurrent sessions)	9
11:00 am – 12:15 pm (2 concurrent sessions)	10
2:00 – 3:15 pm (5 concurrent sessions)	11
Poster Session #1	14
Poster Seesion #2 & Reception	16
Poster Highlights Information	18
Abstracts (listed alphabetically by student last name)	20
Index & Notes	61



**Schedule at a Glance**

**SCHEDULE AT A GLANCE**

**8:00 - 9:15 a.m. – Oral Presentations**

Sociology, English, & Film Analysis	Squires 232
Engineering	Squires 219

**9:30 - 10:45 a.m. – Special Sessions & Workshops**

How to get published: Venues and key strategies	Squires 3rd floor Brush Mountain A
An introduction to graduate studies and financing your graduate education	Squires 341/345

**11:00 a.m. - 12:15 p.m. – Oral Presentations**

Life Sciences & Math	Squires 3rd floor Brush Mountain A
History, Political Science, Religion, & English	Squires 341/345

**12:30 – 1:45 p.m. – Lunch and Keynote Speaker**

Commonwealth Ballroom  
2<sup>nd</sup> floor Squires

*The role of interdisciplinary research and training in solving the big challenges of today*

Annie Aigster, Ph.D.  
Director, Interdisciplinary Graduate Education  
The Graduate School, Virginia Tech

**2:00 – 5:00 pm Photobooth  
Invent the Future with Undergraduate Research!**

By Commonwealth ballroom

**2:00 - 3:15 p.m. – Oral Presentations**

Psychology, Communication, & History	Squires 219
Social Sciences, Law, and Foreign Languages & Literature	Squires 232
Life Sciences	Squires 341
History & Government	Squires 342
Science and Engineering	Squires 345

**3:30 – 4:45 p.m. – Poster session #1**

Commonwealth Ballroom  
2<sup>nd</sup> floor Squires

**5:00 - 6:30 p.m. – Poster session #2 with reception  
Hosted by University Libraries**

First floor of Newman Library  
near Greenberry's

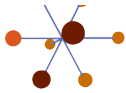
**6:30-8:00 p.m. – Pizza & Panel Discussion**

Squires 341/345

*Should I Stay or Should I Go?*

Pros & cons of staying for graduate school at your undergraduate institution.  
Also learn about graduate school abroad, Info about MS versus PhD, and  
whether taking a gap year is for you.

\*\*This conference is made possible with support from the following Virginia Tech groups: Office of Undergraduate Research, the University Libraries, the Fralin Life Sciences Institute, the Virginia Bioinformatics Institute, the Institute for Critical Technology and Applied Science, the Virginia Tech Carilion Research Institute, Office of the VP for Research, the Center for Academic Enrichment and Excellence, VT Alliance for Minority Participation, the Graduate School, Interdisciplinary Research Society, and the Graduate-Undergraduate Mentoring Program (GUMP).



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**Workshops & Special Sessions**

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**An introduction to graduate studies  
& financing your graduate education**

9:30 – 10:45 am, Squires 341/345

**Session Description:**

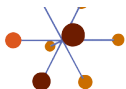
This Grad School 101 Session provides information about the graduate program search, application process, committee selection, and funding for graduate school. Admission requirements for Virginia Tech's Graduate School will be shared as well as fellowship and assistantship opportunities.



**Speaker:** Dannette Beane  
B.A., Communication Studies, Hollins  
University, Roanoke, VA  
M.A., Counselor Education, Virginia Tech  
Currently working on a Ph.D., Counselor  
Education, Virginia Tech

**Speaker Bio:** Dannette Gomez Beane is the Director of the Office for Recruitment and Diversity Initiatives in the Graduate School. She earned a B.S. degree in Communications and Spanish Studies from Hollins University, a Master of Education degree from Virginia Tech, and is currently working toward a

Ph.D. degree in Counselor Education at Virginia Tech. Before joining Virginia Tech, Dannette worked as an admissions counselor at Hollins University, a Community Work Experience Coordinator for the Roanoke Department of Social Services and as an Assistant Director for AmeriCorps College Summit Initiative. She holds membership in the Virginia Latino Higher Education Network (VALHEN), the Virginia Tech Hispanic/Latino Faculty and Staff Caucus, Blue Ridge Behavior Health Board, and the National Academic Advising Association. She has taught and co-taught courses in Construction Spanish, Leadership and Ethics, Diversity and Inclusion, and Counseling.



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**Workshops & Special Sessions**

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## How to get published

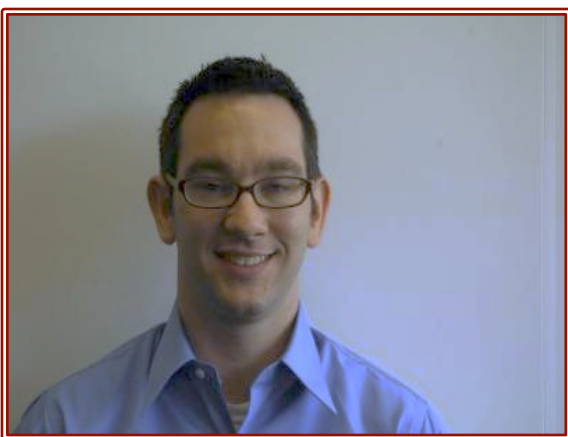
9:30 – 10:45 am, Squires 3<sup>rd</sup> Floor, Brush Mountain A

**Session Description:** Find fame and fortune by learning the secrets to getting your research published! This workshop will cover the basics of the scholarly publishing process, including structuring your research, selecting the right journal, and getting your article accepted. Workshop facilitators will share personal experiences with publishing articles and books, and will touch on authors' rights and using Virginia Tech's institutional repository: VTechWorks.



**Speaker 1:** Kyrille (Kiri) Goldbeck DeBose  
*College Librarian for Natural Resources*

**Speaker 1 Bio:** Kyrille (Kiri) Goldbeck DeBose has been the College Librarian for Natural Resources & Environment since Aug 2006, and the liaison to Animal & Poultry Science and Dairy Science since 2009. She has been actively publishing and presenting at both library and natural resource conferences and publications during this time. Her current research interests include: user perceptions of the library and services, first year experience initiatives, and studying users' research techniques and strategies.



**Speaker 2:** Patrick Tomlin  
*Head, Art & Architecture Library*

**Speaker 2 Bio:** Patrick Tomlin is Head of the Art + Architecture Library and Librarian for the College of Architecture and Urban Studies. He is the co-author of *A Practical Guide to Electronic Resources in the Humanities* and has recently published articles on student use of mobile technology, open access publishing, and scholarly communication in the arts. He is completing a Ph.D. in art history.





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**Keynote Address**

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**Keynote Address**  
*The Future of Interdisciplinary Research*

12:30 – 1:45 pm Commonwealth Ballroom, Squires

**Description:** This presentation will provide an introduction to interdisciplinary research, followed by a discussion of interdisciplinary opportunities and trends. We will explore the interdisciplinary graduate education initiatives at Virginia Tech including existing programs, new collaborations, and student involvement.



**Keynote Speaker:** Annie Aigster, Ph.D.  
Director, Interdisciplinary  
Graduate Education  
Virginia Tech Graduate School

**Speaker Bio:** Annelisse (Annie) Aigster is the Director of Interdisciplinary Graduate Education in the Graduate School at Virginia Tech. She was a National Science Foundation Integrative Graduate Education and Research Traineeship (NSF-IGERT) fellow. In 2009-10, Annie served as Program Manager of the Macromolecular Interfaces with Life Sciences (MILES) IGERT program at Virginia Tech. Annie's interdisciplinary research involved studying macromolecules at the interface of biology and chemistry. She has presented her doctorate research at professional conferences and has published her research in various journals. For over a year now, Annie has led the Interdisciplinary Graduate Education efforts of the Graduate School at Virginia Tech. The Graduate School is supporting Interdisciplinary Graduate Education Programs (IGEPs) to promote and sustain interdisciplinary graduate education and research at Virginia Tech.



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**Pizza & Panel Discussion**

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**Pizza & Panel Discussion**  
**6:30 – 8:00 pm (Squires 341/345)**

**Should I Stay or Should I Go?**

**Description:** Pros & cons of staying for graduate school at your undergraduate institution. Also learn about graduate school abroad, gather information about Master's versus PhD, and whether taking a gap year is for you.

**Panelists:**

**Risa Pesapane (Moderator)**, Natural Resources & Environment  
Fish & Wildlife Conservation

**Shernita Lee**, Interdisciplinary  
Genetics, Bioinformatics & Computational Biology (GBCB)

**Ivan Sergejev**, Architecture & Urban Studies  
Architecture

**Aly Tawfik**, Engineering  
Transportation

**Andrew Rittenburg**, Liberal Arts & Human Sciences  
English

**Zack Helmintoller**, Business  
Accounting

**Eric England**, Agriculture & Life Sciences  
Animal Poultry Science

**Monika Gibson**, VT Graduate School

**Co-sponsored by:**

Iota Delta Rho Interdisciplinary Research Honor Society

<https://interdisciplinary.graduateschool.vt.edu/?q=node/164>

**GSA Graduate Undergraduate Mentoring Program (GUMP)**

GUMP matches undergraduate and graduate students in mentoring relationships in order to expose undergraduate students to the graduate experience as they consider further study and to provide graduate students with the opportunity to develop mentoring skills as they share their own personal experiences with the undergraduate students in the program. Students are matched based on areas of academic discipline and/or interest.

VT Graduate School, <http://graduateschool.vt.edu/index.html>





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**Oral Presentations**

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**8:00 - 9:15 a.m. – Oral Presentations**

**English, Sociology, & Film Analysis (Squires 232)**

**Lamont Banks (Computer Science), Janani Ravi (English), Erica Wood (International Studies)**

*The Implementation of ePortfolios*

**Shelby Ward (English)**

*The Circus Animals' Desertion: A look at the failure of language and stability of heart*

**Thomas Minogue (English)**

*Compact of the Untamed: The Influences of Hobbesian Natural Law in The Jungle Books*

**Alyssa Hart (English)**

*Women in Wills: "Fingersmith" Usage of Victorian Property Rights.*

**Jamee Short (Communication)**

*A Film Analysis: Applying Concepts of the Cognitive Dissonance Theory to American History X*

**Engineering (Squires 219)**

**Ashley R. Taylor (Mechanical Engineering)**

*Using Accelerometers to Quantitatively Assess Infant General Movements for Early Detection and Intervention of Cerebral Palsy*

**Inga Gehrke (Industrial and Systems Engineering), Abstract page 60**

*Making investment decisions in health care with real options*

**David A. Henry and Sebastien Corner, Mechanical Engineering**

*Shipboard Autonomous Firefighting Robot: Torso Project*

**David M. McCann (Biological Systems Engineering)**

*Effects of Photochemical Oxidation on Organic Matter Lability*

**Meghan A. Canter (Biological Sciences), Abstract page 27**

*Quorum Sensing Based Actuation Regulation For Bacteria-Powered MicroRobots (BacteriaBots)*



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**Oral Presentations**

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**11:00 am – 12:15 p.m. – Oral Presentations**

**Life Sciences & Mathematics (Squires 3<sup>rd</sup> Floor, Brush Mountain)**

**Gabriel A. Mastromano (Animal & Poultry Sciences)**

*Comparable growth performance but reduced carcass weight from pigs fed a wheat-DDGS diet*

**Kristen A. Deger (Mathematics)**

*A Discrete Model of Iron Metabolism in Alveolar Macrophages and the effects of *Aspergillus fumigatus* Infection*

**Devon S. Baker (Materials Science and Engineering)**

*Preparation and Characterization of Melt Processable Polyacrylonitrile Copolymers and Blends*

**Julia L. Button (Biological Sciences)**

*Dab2: Comparative studies between anti-aggregatory drugs*

**History, Political Science, Religion, & English (Squires 341/345)**

**Victoria S. James (International Studies)**

*Call of Duty; an Examination of Drone Warfare in the Context of the Global War on Terror*

**Alexander E. Adkins (History)**

*Sanctions, 9/11, and the March to War: Iraq through the New York Times*

**Dana K. Williams (Human Nutrition, Foods and Exercise)**

*The Free Clinic of the New River Valley and Equality in Access to Medical Care*

**Rebekah F. Duke (Psychology)**

*A field study of drinking motivation: Investigating the criterion-related validity of the drinking motives questionnaire*

**Victoria A. Dounoucos (Political Science)**

*The Daily Pop Quiz: Teaching and Learning with Clickers*



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**Oral Presentations**

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**2:00 – 3:15 p.m. – Oral Presentations**

**Life Sciences (Squires 341)**

**Heather F. Reeves (Animal and Poultry Sciences)**

*Increased consumption of fat and simple carbohydrates results in obese prepubertal pigs of similar body fat*

**Catherine A. Sims (Biology)**

*Insecticide Resistance of *Anopheles gambiae* and *Culex quinquefasciatus* to Permethrin and Dichlorodiphenyltrichloroethane (DDT) in Southern Ghana*

**Josh N. Bostic (Human Nutrition, Foods, & Exercise)**

*Interaction Between Leucine Metabolism and Mammalian Target of Rapamycin (mTOR) Signaling*

**Laura B. Heironimus (Fisheries Sciences)**

*Verification of age-at-length and growth rates of variegate darters*

**Eric H. Reasor (Crop and Soil Environmental Sciences)**

*The Influence of Fall Fertilization Programs on the Traffic Tolerance and Recovery and Sprigged Bermudagrass Varieties*

**History & Government (Squires 342)**

**Robert A. Fekete (Political Science)**

*How to re-energize American political involvement by bring the Constitution into the 21st century*

**Joshua M. Deal (History)**

*Corporate Responsibility and Normalized Deviancy: Case Studies in Safety and Risk Management*

**Alison M. Hight (History)**

*Slaying Scottish Sith: the Protestant Reformation and the Characterization of Fairies in Early Modern Scotland*

**Daniel M. Crowder (History)**

*Armstrong in the Gold Coast and Ghana: A Study on the Foreign Works of Louis Armstrong*

**Tyler D. Abt (History)**

*On Sands Stained Red: Ordinary Men and Extraordinary Courage on Omaha Beach*



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**Oral Presentations**

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**2:00 – 3:15 p.m. – Oral Presentations**

**Life Sciences, Chemistry, & Engineering (Squires 345)**

**Sun J. Byun (Biochemistry)**

*Examination of Signaling Gene Function in Arabidopsis thaliana*

**Andrew B. Hall (Biological Sciences)**

*Identify-Y: A novel computational method for the discovery of Y chromosome sequences*

**Winston R. Becker (Engineering Science and Mechanics)**

*Micellar and Hemolytic Properties of Narrowly Dispersed Cholesterol-PEGs*

**Evan G. Hemingway (Engineering Science and Mechanics)**

*Patterned Environments for the Paramecium*

**Psychology & History (Squires 219)**

**Christian L. Hawthorne (Psychology)**

*Does Chaos in the Home Environment Relate to Children's Attention and Effortful Control?*

**Nathan H. Abernethy (History)**

*Whose Sudan? Identity, Race, and Religion in the Condominium*

**Dylan H. Brooks (History)**

*Absolutely Nothing to Mediate*



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**Oral Presentations**

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**2:00 – 3:15 p.m. – Oral Presentations**

**Social Sciences, Law, and Languages & Literature (Squires 232)**

**Rachel M. Kirk (Political Science)**

*Albert Camus's Algeria and Islam in France in the 21st Century*

**Erica L. Hetzel (Environmental Policy & Planning)**

*Ain't No Mountain High Enough? Direct and Indirect Regulation of Mountaintop Removal*

**Ausan Y. Al-Eryani (Political Science)**

*Take the Twinkie: Food (In)Equity and Market Power in the American Economy*

**Zachary L. Mannes (Psychology)**

*The relationship between parental views on alcohol and college student drinking*

**Victoria L. Deal (Psychology)**

*Using Phone Applications as a Tool for Estimating Intoxication: An Investigative Field Study*



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**Poster Presentations**

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**3:30 – 4:45 p.m. – Poster Session #1  
Commonwealth Ballroom (2<sup>nd</sup> Floor Squires)**

1. **Morgan F. Bradley, Apparel Design & Merchandising Management**  
*The ZipSwitch*
2. **Morgan E. Brizendine, Fisheries Science**  
*Spatial and temporal variation in secondary production of smallmouth bass (*Micropterus dolomieu*) from the New River, Virginia*
3. **Stephanie Y. Chin, Biology**  
*Maternal transfer of mercury in the northern watersnake, *Nerodia sipedon*: Effects on offspring performance, and learning.*
4. **Derek A. Cornwell, Psychology**  
*The Actively Caring Challenge: Encouraging discretionary behavior of others to create a culture shift.*
5. **\*William P. Diehl, Psychology**  
*Support for the Creation of Dissociative Subtype in PTSD: Physiological Heterogeneity in DSM-IV-TR Symptom Endorsement*
6. **Rachel A. Dinkins, English**  
*Using Local Logic: The Persuasive Appeal of Industrial versus Local Eating*
7. **Emily L. Gibson, Environmental Science**  
*The Effect of Varying Types of Trough Material on the Bioavailability of Iron Present in Dairy Cow Drinking Water*
8. **\*Justin O. Graves, Sociology**  
*Using the iPad2 as Assistive Technology*
9. **Kevin P. Hannon, Chemistry**  
*The effect of solvents on the optical rotation of chiral molecules.*
10. **Kyle A. Harring, Biological Sciences**  
*Reducing Surgical Site Infections in Ambulatory Surgical Centers*
11. **Alyssa C. Hosey, Biology**  
*Correlation between genome size and chromosome duplication (polyploidy)*
12. **Kelly I. Kim, Psychology**  
*Saying Neither to Paper and Plastic Bags; Committing to Making Ecological Decisions*
13. **Christian D. Laourdakis, Biochemistry**  
*DXS/DXR characterization*
14. **Julia E. Legard, Apparel, Housing, and Resource Management**  
*Stella Moon- A Fall 2012 Capsule Collection*
15. **Spencer C. Li, Biological Sciences**  
*Behavior Analysts Intervene to Increase Indirect Reciprocity in a Field Study*
16. **David R. Marshall, Biology**  
*Multiscale Peptide Self-assembly*
17. **Karan Mathur, Biochemistry**  
*Consolidated Bioprocessing of Cellulosic Biomass for the Production of Biofuels and Biochemicals at Low Cost by Using Novel Recombinant Cellulolytic *Bacillus subtilis* Strains*
18. **Emily B. McCall, Human Development**  
*Caregiver Contexts*
19. **Logan Miller, Engineering Science and Mechanics**  
*Experimental Stimulation and Feedback Control of Skeletal Muscle*
20. **Timothy V. Nguyen, Biological Sciences**  
*Probing the cell type specificity of terpene specialized metabolism in *Arabidopsis* roots*





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**Poster Presentations**

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**3:30 – 4:45 p.m. – Poster Session #1  
Commonwealth Ballroom (2<sup>nd</sup> Floor Squires)**

21. **Chase T. Noel, Food Science and Technology**  
*Molecular epidemiology of shiga toxin producing E.coli in cattle reared in pasture production systems*
22. **\*Charlotte L. Oliver, General Biology**  
*First Report of Bacterial Spot of Peony Caused by Xanthomonas sp. in the U.S.*
23. **Caitlin Parker, Psychology**  
*The Actively-Caring approach to reduce bullying among elementary school students: Using positive consequences to support incompatible alternative behavior.*
24. **Sarah M Pelham, Philosophy**  
*Translating Research on Consumer Issues for the Public*
25. **Erin S. Pennington, Psychology**  
*Hope Among Undergraduate Students: Influences of Academic Level, Self-Esteem, and Self-Compassion*
26. **Amber L. Rosser, Animal and Poultry Sciences**  
*The Effects that beta-guanidinopropionic acid has on the phosphagen system and how that affects muscle metabolism and pH.*
27. **Amir-Arsalan Safaai-Jazi, Biological Sciences**  
*The Role of Est1 Interacting Proteins in Fission Yeast Germination*
28. **Lawrence K. Satterfield, Biology**  
*Exploring Mechanism of Action for Dendritic Amphiphiles against Staphylococcus aureus and Methicillin-Resistant S. aureus (MRSA)*
29. **Caitlin S. Shaw; Brad Copenhaver; Mary Elmer; & Robert Gafney, Agricultural and Applied Economics**  
*Vulnerability in Rural Virginia*
30. **\*Karishma V. Tolani, Chemistry**  
*High throughput screening fluorescence polarization binding assay for search of inhibitors of siderophore A from Aspergillus fumigatus*
31. **Aimee M. Tolbert, Psychology**  
*Exploring relationships between parental involvement and child fears*
32. **Kartikya Tyagi, Mechanical Engineering**  
*Developing Sand Injection Prototype for Studying Sand Ingestion in Jet Engines*
33. **Elisha M. Votruba, English**  
*Dead Things*
34. **Hope H. Wentzel, Animal and Poultry Science**  
*Potential for secondary production differences in redback salamander (Plethodon cinereus) populations inhabiting north- versus south-facing slopes*
35. **Jennifer R. Williams, Biological Science**  
*Binary Toxicity of In-Hive Pesticides to Honey Bees*
36. **John Yamine, Psychology**  
*Children's Effortful Control and Home Chaos Moderate the Relationship Between Maternal Negativity and Child Behavior Problems*



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**Poster Presentations**

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**5:00 – 6:30 p.m. – Poster Session #2 and Reception  
Newman Library 1<sup>st</sup> Floor (near Greenberry's)**

1. **Kelly A. Barford, Biochemistry**  
*Circadian modulation of estrogen receptor alpha-targeted gene expression*
2. **\*Jacob J. Bean, Aerospace Engineering**  
*Attitude Control for Small Satellite*
3. **Sabrina Brooks, Biological Sciences**  
*Foraging at the Snail Diner: The effects of parasite infection on snail foraging behavior*
4. **Alexander L. Callo, Biology**  
*Cellulose Nanocrystals Conjugated with Folic Acid for the Enhanced Cytotoxicity of Irreversible Electroporation*
5. **Chelsea L. Carey, Biological Sciences**  
*Do Supertasters Have Different Drinking Water Preference Than Tasters and Nontasters?*
6. **Andrea S. Carlini, Biological Sciences**  
*Stochastic Chaos in a *S. cerevisiae* Gene Regulatory Network*
7. **Zoe R. Carroll, Wildlife Science**  
*Wing morphology and habitat stratification of low-land forest birds in Taiwan*
8. **\*Allison B. Darling, Psychology**  
*From Parasitism to Mutualism: The Relationship Between Immunology and Psychology*
9. **\*David V. Drewett, Wildlife Science**  
*Factors influencing inter- and intra-specific variation in mercury bioaccumulation by snakes inhabiting a contaminated river floodplain.*
10. **\*Stephen D. Epstein, Engineering Science and Mechanics**  
*Cancer Cell Adhesion Patterns on Metallic Substrates*
11. **Madison R. Farruggia, Mechanical Engineering**  
*Underwater Communication Techniques*
12. **Kelly Ferguson, Biological Systems Engineering**  
*An Analysis of Organic Matter During the Flood Diversion in the Atchafalaya River Basin*
13. **\*Andrew F. Gann, Jr., Political Science**  
*Justice Stone: Justice for Changing Times*
14. **\*Jane C. Giesken (Human Development), Raven Griffin (Communication)**  
*Dramatic Play in Preschoolers' Development*
15. **\*Kristin J. Haas, Biological Sciences**  
*Macroinvertebrates of Intertidal Rock Pools at Iture Rocky Beach, Cape Coast, Ghana*
16. **\*Elizabeth R. Hepner (Biological Sciences), Jeronimo Silva (Wildlife Science), and Sarah Baldwin (Biological Sciences)**  
*A Survey of Muskrat Intestinal Parasites in Virginia*
17. **\*Britanee D. Hodson and Chelsea Gilchrest, Human Development**  
*Alternative Intergenerational (IG) Programming*
18. **Ashley C. Love, Biology**  
*Changes in baseline corticosterone levels in house finches (*Carpodacus mexicanus*) during the course of an infection with the naturally-occurring bacterium *Mycoplasma gallisepticum**
19. **\*Ryan L. Powles, Biology**  
*High Throughput Microarray Study of the Effect of Heme-mediated Regulation of Per2 Stability for Gene Expression.*



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**Poster Presentations**

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**5:00 – 6:30 p.m. – Poster Session #2 and Reception  
Newman Library 1<sup>st</sup> Floor (near Greenberry's)**

- 20. **\*Jordan Richard, Fisheries Science**  
*Climate-growth relationships for a long-lived riverine fish species across southeastern USA*
- 21. **\*Jaime K. Rutter, Animal and Poultry Sciences**  
*Pigments can be used as fecal markers in cattle*
- 22. **Nicholas D. Schaum, Biology (Abstract on page 60)**  
*The role of SNPs in miRNAs on aging*
- 23. **Lauren M. Sheehan, Animal and Poultry Sciences**  
*In ovo feeding of Carnosine*
- 24. **Karandeep Singh, Biological Sciences**  
*Hepatic Tissue Engineering*
- 25. **\*Kathryn M. Slaughter, Animal & Poultry Sciences**  
*Approaches for Assessing the Temperament of Calves- Post-weaning*
- 26. **Clarissa Stiles, Psychology**  
*Couples as a User Group in Mutually Reflective Technologies*
- 27. **Mary Swanton (Human Development), Amanda Craft (Human Development & Psychology), Carissa Ervine (Human Development), Valerie Phelps (Human Development)**  
*Children's Effortful Control in Preschool Settings*
- 28. **\*Stephanie M. Welch, Civil & Environmental Engineering**  
*Calibration of Real-Time Water Quality Monitoring Instruments*



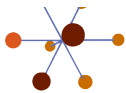
**POSTER HIGHLIGHTS**

<b>Poster Highlights</b>  <b>April 12 – April 22</b> <b>Newman Library 1<sup>st</sup> Floor (near Greenberry’s)</b>				
Student Name	Major	Mentor(s)	Mentor Department	
Jacob J.	Bean	Aerospace Engineering	Troy Henderson, Brad Atkins	Aerospace & Ocean Engineering
<b><i>Attitude Control for Small Satellite</i></b>				
Allison B.	Darling	Psychology	David W. Harrison	Psychology
<b><i>From Parasitism to Mutualism: The Relationship Between Immunology and Psychology</i></b>				
William P.	Diehl	Psychology	Russell Jones, Kelly Harrison, Angela Scarpa, John Richey	Psychology
<b><i>Heart Rate Heterogeneity in Women With Potential PTSD</i></b>				
Rachel A.	Dinkins	English	Elizabeth Mazzolini	English
<b><i>Using Local Logic: The Persuasive Appeal of Industrial versus Local Eating</i></b>				
David V.	Drewett	Wildlife Science	J.D. Willson	Fisheries & Wildlife Conservation
<b><i>Factors influencing inter- and intra-specific variation in mercury bioaccumulation by snakes inhabiting a contaminated river floodplain.</i></b>				
Stephen D.	Epstein	Engineering Science & Mechanics	Doctor Masoud Agah	Electrical & Computer Engineering
<b><i>Cancer Cell Adhesion Patterns on Metallic Substrates</i></b>				
Andrew F.	Gann Jr.	Political Science	Brandy Faulkner	Political Science
<b><i>Justice Stone: Justice for Changing Times</i></b>				
Jane C.	Giesken	Human Development	Caitlin Faas, Ruoxi Chen	Human Development
<b><i>Dramatic Play in Preschoolers’ Development</i></b>				
Justin O.	Graves	Sociology	Susan Asselin	Education
<b><i>Using the iPad2 as Assistive Technology</i></b>				
Kristin J.	Haas	Biological Sciences	Daniel Wubah, Kobina Yankson	Biological Sciences
<b><i>Macroinvertebrates of Intertidal Rock Pools at Iture Rocky Beach, Cape Coast, Ghana</i></b>				



**POSTER HIGHLIGHTS**

<b>Poster Highlights</b>  <b>April 12 – April 22</b> <b>Newman Library 1<sup>st</sup> Floor (near Greenberry's)</b>				
Student Name	Major	Mentor(s)	Mentor Department	
Elizabeth R. Hepner	Biological Sciences	Lisa Belden	Biological Sciences	
<b><i>A Survey of Muskrat Intestinal Parasites in Virginia</i></b>				
Britanee D. Hodson	Human Development	Shannon Jarrott	Human Development	
<b><i>Alternative Intergenerational (IG) Programming</i></b>				
Charlotte L. Oliver	General Biology	Elizabeth Bush, Mary Ann Hansen	PPWS	
<b><i>First Report of Bacterial Spot of Peony Caused by Xanthomonas sp. in the U.S.</i></b>				
Ryan L. Powles	Biology	Carla V. Finkelstein, Roderick Jensen	Biological Sciences	
<b><i>High Throughput Microarray Study of the Effect of Heme-mediated Regulation of Per2 Stability for Gene Expression.</i></b>				
Jordan Richard	Fisheries Science	Andrew Rypel	Fish & Wildlife Conservation	
<b><i>Climate-growth relationships for a long-lived riverine fish species across southeastern USA</i></b>				
Jaime K. Rutter	Animal & Poultry Sciences	Ronald Lewis	Animal & Poultry Sciences	
<b><i>Pigments can be used as fecal markers in cattle</i></b>				
Kathryn M. Slaughter	Animal & Poultry Sciences	Ron Lewis	Animal & Poultry Sciences	
<b><i>Approaches for Assessing the Temperament of Calves- Post-weaning</i></b>				
Karishma V. Tolani	Chemistry	Pablo Sobrado	Biochemistry	
<b><i>High throughput screening fluorescence polarization binding assay for search of inhibitors of siderophore A from Aspergillus fumigatus</i></b>				
Stephanie M. Welch	Civil & Environmental Engineering	Vinod Lohani, Mark Roger	Engineering Education	
<b><i>Calibration of Real-Time Water Quality Monitoring Instruments</i></b>				



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**ABSTRACTS**

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**Nathan H. Abernethy**

*Whose Sudan? Identity, Race, and Religion in the Condominium*

Decolonization in the Sudan or the Anglo-Egyptian Condominium has often been overlooked by historians of modern Africa, as the Sudan is somewhat Arab, and questionably fits into the scope of the decolonization of the continent. While these are in fact valid points to make, the history of the decolonization of the Sudan is largely based on the identity of the Sudan, and historical constructs misconceptions of placing the people of the Sudan into the correct context. This research argues that the Sudan suffered from an identity crisis, as the majority of the political movements and outlets were not organic in the sense that they saw their advent and cultivation within the Sudan; in addition to this, the very name of the Anglo-Egyptian condominium suggests a people, occupying the largest geographic region of Africa, without an identity. Through examining the Sudan through mainly British sources, this research places the north and south of Sudan under a lens of understanding how religion, culture, ethnicity, and race carved out a destiny for several groups of people under Western rule, and more importantly, how their ability or inability to fit into established patterns of social classification determined their fate leading up to, and after self-determination was achieved in 1956.

**Mentor: Matt Heaton**

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**Tyler D. Abt**

*On Sands Stained Red: Ordinary Men and Extraordinary Courage on Omaha Beach*

The landings on Omaha Beach have been immortalized in the minds of Americans by movies such as *The Longest Day* and *Saving Private Ryan*. Countless books have been written on the subject. Despite the large body of work on Omaha Beach, sloppy work by historians on what actually happened has led to a lack of scholarly critique on the operation. Many works just focus on telling the story of the men and the various acts of individual heroism that occurred. There are other angles from which to approach Omaha Beach. What caused Omaha Beach to be the bloodiest engagement of D-Day? Was the planning flawed? What could have been done better? By tracing the path of Omaha Beach from its planning phases all the way

to the brutal combat with young soldiers on the ground, I have attempted to answer these questions. The words of the men who were there provided excellent insight into the fog of war, and various secondary sources were helpful, too. I have uncovered the multitude of flaws in planning and execution of the landings. Faulty work by historians such as Stephen Ambrose has distorted common perception on certain issues on Omaha Beach.

**Mentor: Peter Wallenstein**

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**Alexander E. Adkins**

*Sanctions, 9/11, and the March to War: Iraq through the New York Times*

As another chapter of American military history has closed with the withdrawal of forces from Iraq, a question has repeatedly risen: why did the 2003 invasion of Iraq happen? Using over 600 articles from the *New York Times* from 1 January 2001 to the day before the invasion, 19 March 2003, I analyze what the lead up to war looks like through the eyes of an American newspaper. Analysis includes both qualitative and quantitative trends over the 27 months before the invasion. The result of my research was that the war in Iraq was arguably inevitable, due to aggravating factors on both sides, far after 2001 and there was no turning back once the international rhetoric started in 2002.

**Mentor: Michael Alexander**

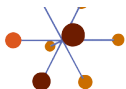
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**Ausan Y. Al-Eryani**

*Take the Twinkie: Food (In)Equity and Market Power in the American Economy*

How do “desert community” members exercise market power in an inequitable food system? The purpose of the study is to examine how American citizens classified as low-income and/or have low-access to supermarkets shape the food market with their market decisions? decisions that often lead to the purchase of cheap, nutritionally deficit food items as the most viable resort. The research will address the issue through the lens of political economy. The methods used will include a thorough examination and discussion of relevant literature, methodological observations of the physical environment “food desert” communities find themselves in, observations onto how their



**ABSTRACTS**

market decisions are made and the externalities that subsequently arise. Further, a discussion of the present state of the American food system, in addition to the main market actors that have come to shape that system will also be noted. Results shall include the logic of market dynamics, market failures and market distortions, among other concepts related to the question proposed. Moreover, an assessment into the solutions to countering the negative effects of an inequitable food system will be critiqued. Subsequently, a discussion to possible alternatives to promote increased access, stronger market power, and ultimately, higher levels of employment for “desert communities” will be included.

**Mentor: Courtney I. P. Thomas**

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**Devon S. Baker**

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*Preparation and Characterization of Melt Processable Polyacrylonitrile Copolymers and Blends*

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Polyacrylonitrile copolymers are used in industry for to make textile fibers, barrier films, and precursors for carbon fibers. All of these applications would benefit from the ability to melt process high acrylonitrile content copolymers. Incorporation of a co-monomer such as methyl acrylate to a high level is often used to reduce the melting temperature of the AN copolymers to a temperature where the material can be melt processed without incurring thermal degradation. The objective of this research is to investigate the thermal and rheological properties of a series of glycerin blends of a series of AN/MA copolymers of varying AN content between 85 and 95 weight % AN. These AN/MA copolymers were blended with differing weight % glycerin, and their thermal and rheological properties were tested. Some initial research has shown that AN/MA copolymers form miscible blends with highly polar materials such as water and glycerin, reducing the  $T_m$  of the copolymers. Glycerin will plasticize 85/15 AN/MA, but the effect may not be sufficient in higher AN-content copolymers, such as 95/5 AN/MA, to make them melt-processible.

**Mentor: Sue Mecham**

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**Lamont P. Banks, Janani Ravi, Erica Wood**

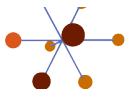
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*Implementation of ePortfolios*

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ePortfolios, generally defined as multimedia technology that better connect students to university courses, are relatively new additions to the pedagogical toolbox. These innovative tools are used to both improve students' reflective abilities and to increase the integration of technology within academic courses. ePortfolios have the potential to be diversely applied across institutions, fields of study, and discipline. However, there are also problems hindering the progress of ePortfolios; we argue that in addressing these concerns, the presence of ePortfolios can expand not only across disciplines but can also positively impact student diversity found within and across disciplines and majors in academia. The current authors aim to understand the past, present, and future roles, perceptions, and challenges of ePortfolios in academia, specifically at Virginia Tech. This project utilizes qualitative methodology through the use of semi-structured interviews with current instructors (e.g. faculty and graduate students) including a sample size of approximately nine. Preliminary analyses are underway, the authors expect to find how Virginia Tech faculty and students perceive ePortfolios, what they find are challenges with the ePortfolio, and how they foresee ePortfolio application at the University level.

**Mentor: Ellington Graves**

**ABSTRACTS****Kelly A. Barford*****Circadian modulation of estrogen receptor alpha-targeted gene expression***

The circadian rhythm is an important method of controlling the body's internal clock and adapts to environmental changes. When this clock is disrupted, various diseases have been shown to arise, including breast cancer. Period 2 (PER2), a circadian protein, is the key protein that drives the circadian clock. Cancers, such as breast and ovarian, have shown a loss of PER2 function. This connection between loss of PER2 and the development of estrogen-related tumors has led to a correlation between this protein and estrogen receptor alpha (ERalpha). ERalpha mRNA oscillates during the day, similar to PER2, but instead of peaking during the day, ERalpha peaks at night. Up-regulation of ERalpha has been shown to influence tumor growth, and if this mechanism can be determined it will lead to a better understanding of estrogen-related cancers, specifically breast cancer. The focus of this project is the effect of Per2 on ERalpha. This will be done through increasing the level of Per2 in MCF-7 cells and analyzing the expression of the downstream genes through qRT-PCR.

**Mentor: Carla Finkielstein**

**Jacob J. Bean*****Attitude Control for Small Satellite***

The aim of this research is to design, model, develop, and study a new form of small satellite attitude control that has never been applied. Linear mass actuators provide possible applications in satellite attitude control systems and re-entry vehicle stabilization and steering. The aim of this research is to study linear mass actuators as a primary control system for a small satellite such as a CubeSat (10x10x10 cm cube). The system that we are developing will use 3 small masses placed on actuators within the cube. Currently, a major focus area within the research is determining optimal placement of these mass actuators that will provide effective attitude control. The dynamics that govern the attitude of the satellite have been formulated and are being modeled using MATLAB. Transfer functions are used in Simulink to determine accelerations of the masses and Euler integration methods are used in the MATLAB script to solve the kinematic differential equation that

maps the rotation of the composite body frame to the inertial frame. The goal of this research is to validate the current dynamics formulation and to continue further research to develop a more robust attitude control system.

**Mentor: Troy Henderson, Brad Atkins**

**Winston R. Becker*****Micellar and Hemolytic Properties of Narrowly Dispersed Cholesterol-PEGs***

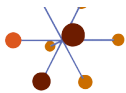
Critical micelle concentrations and hemolytic activities of narrowly dispersed cholesterol-PEGs were measured. Cholesterol-PEGs were made by polymerization of ethylene oxide initiated with cholesterol. The crude products were fractionated by column chromatography and characterized by GPC. PEG lengths varied from n=9 to 215; PDIs were <1.05. CMCs were measured with a surface tension technique and a dye release technique. Hemolytic activity was measured by the release of heme at 595 nm and reported as the concentration required for 10% hemolysis (EC10). Values of CMC showed a gradual decrease with increasing PEG length. Values of EC10 showed a maximum at n=19-23.

**Mentor: Rich Gandour**

**Josh N. Bostic*****Interaction Between Leucine Metabolism and Mammalian Target of Rapamycin (mTOR) Signaling***

The primary nutrient regulator of the anabolic Mammalian Target of Rapamycin (mTOR) pathway is the Branched Chain Amino Acid Leucine. Intracellular BCAA levels are regulated in part by the Branched Chain Amino Transferase (BCAT) isoenzymes, BCATc and BCATm. The BCATc isoenzyme is deregulated in many forms of cancer and may be under the control of cMyc, an

oncogene which is activated in many human tumors. Given that cMYC expression has been shown to be suppressed by the mTOR inhibitor rapamycin, we were interested in discovering whether rapamycin treatment has an effect on BCAT levels. Here, using EL4 lymphoma as a model, we investigated the effects of varying concentrations of rapamycin and Leucine on cell growth, mTOR activation, and levels of BCATc and



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## ABSTRACTS

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cMyc. Rapamycin exhibited a negative correlation with cell growth and mTOR activation in a dose dependent fashion. BCATc was found to be markedly down-regulated by treatment with rapamycin, a novel finding which may indicate a connection between BCATc and the mTOR signaling pathway. Moreover, BCATc suppression by rapamycin occurred at dosages which failed to suppress cMYC, indicating that rapamycin's effect on BCATc may be independent of cMYC control. Our results provide evidence of the connection between BCATc and the pathways controlling growth and differentiation in cancer cells.

**Mentor: Susan Hutson, Elitsa Ananieva**

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### Morgan F. Bradley

#### *The ZipSwitch*

Cold Blacksburg mornings giving way to warm afternoons led to the frustration of having something else to carry around campus: my jacket! This research aimed toward the design and creation of a convertible jacket that is both functional and aesthetically pleasing to female college students. After a thorough competitor analysis and survey of the target market, I chose this garment due to its high level of practical usages throughout the college days for schooling and outdoor activities. In order to be more versatile and functional, I created a jacket that easily converts into a cross-body bag. A light jacket can be donned for long day hikes, backpacking trips, or treks downtown to grab a bite to eat. This convertible jacket eliminates the need to search for a safe place to store a jacket due to frequent weather changes in our mountain town, or simply the arrival to a destination. It is a casual, very lightweight jacket with a detachable hood that zips into a cross-body bag, with multiple pockets accessible whether jacket or bag. The final outcome of this project combines the market research of the consumer needs and functional design domain of creative scholarship.

**Mentor: Ji-Hyun Kim**

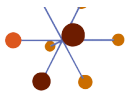
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### Morgan E. Brizendine

#### *Spatial and temporal variation in secondary production of smallmouth bass (*Micropterus dolomieu*) from the New River, Virginia*

Production is a core measure of energy flow through ecosystems and the services that ecosystems provide to humans. Here, we provide multiple estimates of secondary production of smallmouth bass (*Micropterus dolomieu*), a valuable game fish, from the New River, VA and examine patterns in production both spatially (upstream versus downstream) and temporally (2005 versus 2010). Annual production of smallmouth bass at a site near Blacksburg in 2005 was 2.43 g m<sup>-2</sup> but declined to 1.71 g m<sup>-2</sup> in 2010. There was a 2-3 fold loss in production for the 3-6 year old age classes. This result supports recent complaints by anglers of a lack of medium-sized bass from this and other sections of the New River. Furthermore, results suggest that over time, changing environmental conditions, angling, or increased interspecific competition may be having a significant negative effect on New River smallmouth bass production.

**Mentor: Andrew Rypel, John Copeland, Bonnie Myers**



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## ABSTRACTS

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### Dylan H. Brooks

#### *Absolutely Nothing to Mediate*

The Dan River Mill Strike lasted from September 1930 to January 1931. In January of 1930 the management of the mill announced a 10% pay cut. At this time the mill had an "Industrial Democracy," which was a company union. The United Textile Workers of America (UTWA) in cooperation with the American Federation of Labor (AFL) began to organize the mill gaining around 4,000 members to the local union. In September the union voted to strike after another pay cut was announced and after workers were fired, it appeared, for union activity. This paper looks at the 1930 -1931 strike in detail, showing in depth what caused the strike, how it played out and the aftermath. It then turns to briefly look at the 1951 strike to show a comparison between the two. The former having taken place during the depression and before the New Deal, as well as in the beginning of what would become a turbulent decade for labor. The latter after the depression and the New Deal. As well as on the heels of the prosperous late 1940s; a period in which labor was doing well in the industrial industries. While both strikes were very different and took place for different reasons, they were both lost for the same reasons, lack of funding. In the 1930 strike the workers could not continue the strike due to lack of funding for basic necessities. In the 1951 strike it was hard for the union to keep the workers out because they were afraid they would lose amenities they had bought on credit.

**Mentor: Peter Wallenstein**

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### Sabrina Brooks

#### *Foraging at the Snail Diner: The effects of parasite infection on snail foraging behavior*

Parasites can affect the behavior of some animals. Snails typically feed at dawn and dusk, and during this time they are exposed to predators that are normally not the definitive host for their parasitic infection. Parasite infections can alter this feeding pattern, which will increase the probability of infection or transfer to the next host. *Helisoma trivolvis* snails were used in this experiment with *Echinostoma trivolvis*, a trematode parasite that uses these snails as both first and second intermediate hosts. We examined how infection by

*Echinostoma trivolvis* can affect the foraging behavior of *Helisoma trivolvis* snails. We examined foraging behavior in snails either exposed or not exposed to cercariae (second intermediate host infection). We used two assays to assess foraging behavior. First, we examined how the frequency of snails on resource tiles changed over twelve hours and the rate at which the snails in the different infection groups reached the tiles. The second assay compared the amount of lettuce consumed within 25 hours among snails in the different infection groups. We did not see a difference in proportion of snails on the resource tiles between cercariae exposed and non-exposed snails. For the lettuce trials, there was no difference in the amount of lettuce consumed among infection categories. Overall, we did not see dramatic differences in foraging based on infection status in *Helisoma* snails.

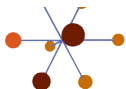
**Mentors: Lisa Belden (VT) and Jeremy M. Wojdak (Radford)**

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### Julia L. Button

#### *Dab2: Comparative studies between anti-aggregatory drugs*

Cancer patients, especially those in the metastatic stage, have been found to have highly elevated platelet counts. The thrombocytosis (high platelet count) symptom has been associated with poor prognoses in many cancers. Platelets play a role in metastasis by forming platelet-tumor cell masses in the circulatory system preventing recognition and activation of an immune response. Anti-platelet drugs are supported to be potential cancer therapies by preventing the activation and aggregation of platelets in the bloodstream, thus preventing cancer cells from surviving and proliferating in target metastatic tissues. Disabled-2 (Dab2) is a protein that inhibits platelet aggregation by binding to sulfatides found on the outer-leaflets of the platelet cell membrane. The focus of this project is to compare the cytotoxic potential of currently prescribed anti-aggregatory drugs, including aspirin and plavix, to Dab2, a sulfatide-deficient form of the protein and a recombinant peptide comprising the sulfatide binding motifs. Our results show the N-terminus portion of the Dab2 exhibits less cytotoxic effect than current anti-aggregatory drugs, while inhibiting

**ABSTRACTS**

platelet/cancer cells association. These results provide basis for the use of Dab2 as part of an adjuvant therapy to treat cancer.

**Mentor: Carla Finkielstein**

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**Sun J. Byun***Examination of Signaling Gene Function in Arabidopsis thaliana*

Studying mutants is key to understanding gene function in model systems. I have been examining the function of four related genes that encode inositol polyphosphatase 5-phosphatases (5PTases) in the model plant, *Arabidopsis thaliana*. 5PTases are enzymes that terminate signaling by the second messenger inositol 1,4,5 trisphosphate, which is key for various cellular events in eukaryotes. The question I am addressing is whether four different 5PTase genes are functionally redundant. The objectives are 1) to identify the impact of a FRA3 loss- and gain-of-function and 2) to identify a 5ptase 12/13/14 triple mutant. The approach taken involves growing mutants, observing phenotypes, performing genetic crosses, isolating genomic DNA from plants, and performing diagnostic PCR reactions. We found that a mutation in FRA3 results in the development of serrated leaves, late flowering and a dramatic decrease in trichomes. Together these phenotypes suggest FRA3 mutants are altered in cellulose content. To obtain a 5ptase 12/13/14 triple mutant, we crossed 5ptase12/13 and 5ptase13/14 double mutants. We are currently genotyping F2 progeny from this cross to identify triple mutants.

**Mentor: Glenda Gillaspay**

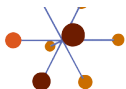
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**Alexander L. Callo***Cellulose Nanocrystals Conjugated with Folic Acid for the Enhanced Cytotoxicity of Irreversible Electroporation*

Instead of optimizing a targeted drug delivery regimen with CNC-FA-DOX (Cellulose nanocrystals-folic acid-doxorubicin), we plan on testing the conductive abilities of CNCs for the purpose of targeted electroporation. By conjugating folic acid to CNCs, we can continue to target cancer cells that overexpress the folate receptor. Now, though, the CNCs will act as a conducting agent, such that the necessary voltage to kill cells can be lowered. This will cause the surrounding tissues to escape electroporation treatment unscathed, whilst the cancer cells suffer irreversible lethal electroporation. Therefore, our goal was to 1) determine the extent to which CNCs are conductive 2) optimize CNC concentration such that maximum conductivity is measured 3) optimize voltage level on the electroporator such that damage is only done to malevolent cells, and not benign tissue. Cell viability assays using CellTiter Blue were used to determine cell viability before and after electroporation. Thus far, CNC-FA actually increases cell viability in conjunction with electroporation. Further tests will determine whether different parameters continue to show this effect.

**Mentor: Yong Woo Lee, Katelyn Colacino**



**ABSTRACTS****Chelsea L. Carey*****Do Supertasters Have Different Drinking Water Preference Than Tasters and Nontasters?***

The increasing demands on the world's water supplies have led to water reuse (wastewater to drinking water) and desalination as viable means of producing drinking water. The resulting pure water is devoid of minerals and, although it is good for hydration, it has no nutritional value and does not taste good. Remineralization of desalinated water is typically done by passing it through limestone (calcium carbonate) which increases the calcium content. Magnesium, another key mineral found in natural water, which is essential for cardiovascular health, is not typically added during remineralization because of its more bitter taste. Through the use of supertasters, individuals genetically predisposed to have an unusually high amount of taste buds, we will determine drinking water preferences related to the magnesium content of water. We will determine if taster status corresponds to a liking for magnesium and if taster status correlates with a perception of bitterness for calcium and magnesium.

**Mentor: Andrea Dietrich****Andrea S. Carlini*****Stochastic Chaos in a *S. cerevisiae* Gene Regulatory Network***

Chaos theory, a relatively new mathematical concept, studies dynamical systems which exhibit highly sensitive dependence upon initial conditions. Researchers have identified and quantified chaotic events within living systems as well as stimulated this behavior in simple chemical and physical reaction systems. However, no attempts have been made to induce, and consequently maintain, chaos within living systems. This study was motivated by whether a synthetically engineered model could exhibit chemical chaos in a living organism. A simple three-component model of a gene regulatory network that exhibits chaos is being constructed and will be optimized via a genetic algorithm to withstand excess stochastic noise, which may be any form of unpredicted fluctuations in the system; the algorithm produces offspring of the original parent by perturbing the governing mathematical

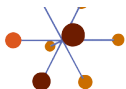
parameters and performing tournament selection using calculated Lyapunov exponents. Once a robust deterministic chaos model has been established, modifications to account for stochasticity (using Gillespie's algorithm) may be implemented. Simulations of this hypothetical network may then be compared with laboratory results using live yeast cells in a microfluidics chamber. The ultimate goal of this project is to understand what effects stochastic noise will have on the signatures of a chaotic trajectory in the microscopic environment of a yeast cell.

**Mentor: John Tyson, Mark Paul****Zoe R. Carroll*****Wing morphology and habitat stratification of low-land forest birds in Taiwan***

I made an effort to understand connections between wing morphology and habitat stratification of lowland forest birds in Hui-Ban, Taiwan. I proposed that canopy-dwelling birds would have long wings with high aspect ratio values and low wing loading values. In addition, birds that lived in the midstory or understory would have short wings with low aspect ratio values and high wing loading values. Understanding these relationships is key to conservation and preservation of such species. Mist nets were used in the field to capture individuals of 31 different species, from which 16 forest species were analyzed. Using single factor ANOVA, the species were compared to see if their quantitative values correlated with their location in the forest, and if there were distinct differences between wing shapes in canopy, midstory, and understory groups. My hypothesis was partially supported, and I suggest that there may be more influences acting on differences in wing shapes than just location in the forest.

**Mentor: Fang-Yee Lin, Dean Stauffer**



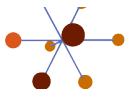
**ABSTRACTS****Meghan A. Canter*****Quorum Sensing Based Actuation Regulation For Bacteria-Powered MicroRobots (BacteriaBots)***

Nature has perfected cells to survive and efficiently perform specific functions such as sensing, motility, self-healing, transportation and communication. The challenge we as engineers face is to harness these functions and adaptability to our needs. We aim to exploit the sophisticated and robust machinery of bacteria for actuation, sensing, communication, and control of a new class of micron scale robotic systems called BacteriaBots. A BacteriaBot is a bio-hybrid swimming microrobot realized by interfacing an ensemble of live engineered *Escherichia coli* (*E. coli*) bacteria with a microfabricated robot body. Mobile networks of BacteriaBots can be utilized as intelligent, reconfigurable and adaptable networks to address challenges in sensing, manufacturing, and transport and delivery of cargo at reduced length scales. In this work, we have introduced a novel quorum sensing-based (i.e. cell density dependent regulation of target genes) method to regulate mobility in BacteriaBots. It has been previously shown that the Intra-species bacterial communication signal, autoinducer 2 (AI-2), directly increases *E. coli* motility through enhanced transcription of five motility genes. In the work presented here, AI-2 was synthesized and introduced in the experiment environment at known concentrations to quantify enhanced motility of *E. coli* strain MG1655 as a function of AI-2 concentration.

**Mentor: Bahareh Behkam****Stephanie Y. Chin*****Maternal transfer of mercury in the northern watersnake (Nerodia sipedon): Effects on offspring performance, and learning.***

Few studies examine contaminants, such as mercury (Hg), in snakes, much less maternal transfer and effects, despite snake abundance and their high trophic position in ecosystems where Hg is prevalent. The objectives of this study were to determine if Hg is maternally transferred in northern watersnakes (*Nerodia sipedon*) and evaluate effects of maternal Hg on offspring. We captured gravid female watersnakes (N=31) by hand along the South River in Waynesboro, VA, where an extensive Hg contamination gradient exists. We measured maternal Hg levels using non-lethal sampling techniques and following birth, assessed terrestrial and aquatic locomotion, foraging ability (i.e., prey eaten, strike efficiency, handling time), and learning (i.e., improvement in foraging measures over successive trials) in their offspring (N=609). Results suggest that maternal transfer of Hg does occur in *N. sipedon*, but no significant effects of maternal Hg were observed on locomotion. However, offspring from mothers with high Hg exhibited reduced willingness to feed in foraging trials and decreased strike efficiency. All litters showed decreasing strike efficiency throughout learning trials, but offspring from contaminated areas were consistently worse. This is the first study on maternally derived contaminant effects in snakes and will contribute to understanding this contaminant exposure pathway in wildlife.

**Mentor: John D. Willson**



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**ABSTRACTS**

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**Derek A. Cornwell**

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*The Actively Caring Challenge:  
Encouraging discretionary behavior of  
others to create a culture shift.*

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Abstract This study evaluated the Actively Caring for People (AC4P) Challenge, an intervention designed to increase individuals' frequency of recognition for AC4P behavior. An effective intervention was designed to overcome factors holding people back from actively caring for others. Summary "Actively Caring for People" (AC4P) is any behavior that goes beyond the call of duty to help others. Students were challenged to reward, using a green wristband with the embossed message of "Actively Caring For People," individuals observed performing such discretionary behavior. For two consecutive weeks, researchers explained that every participant could take five wristbands to promote AC4P and complete the challenge. During Week 3, a text message intervention with group support was implemented to increase the commitment of AC4P. For three weeks, students were assessed on dispositional factors. Preliminary analysis indicates a lower group commitment for observing and recognizing AC4P behavior, but a higher percentage of participants followed through with their group commitment during Week 3 than Weeks 1 and 2. After each observation and subsequent recognition with a wristband, participants recorded on data sheets: the recognized behavior, their relationship to the recipient, relative difficulty recognizing the individual and barriers to observing and rewarding the AC4P behavior.

**Mentor: E. Scott Geller**

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**Daniel M. Crowder**

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*Armstrong in the Gold Coast and Ghana:  
A Study on the Foreign Works of Louis  
Armstrong*

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The United States Government thought of Louis Armstrong as an ambassador. He traveled all over the world spreading American good will. One of the places Armstrong went was the Gold Coast (later Ghana) before decolonization. He played concerts in the capital city of Accra during his stay. This became a major chapter in the CBS special *Satchmo the Great*. Armstrong was not covered solely by CBS while he was in the Gold Coast. The *Daily Graphic* also followed the visit closely. This was the primary

newspaper in the Gold Coast at the time. It was based out of Accra, the capital city. What the *Daily Graphic* did with Armstrong's visit was extremely powerful. They turned him into a figurehead for Gold Coast independence. Gold Coasters were at a very trying time in their national struggle for independence from Britain. Armstrong represented something they could all rally around to become one nation as they achieved their independence. I will attempt look in detail at the relations between Armstrong and The Gold Coast as seen through the eyes of the *Daily Graphic*. The media of the Gold Coast chose a very particular way to cover the visit of Louis Armstrong so as to make him a national figurehead for the Gold Coast.

**Mentor: Matthew Heaton**

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**Allison B. Darling**

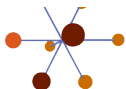
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*From Parasitism to Mutualism: The  
Relationship Between Immunology and  
Psychology*

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Among the numerous studies investigating the association between immunological illnesses and concurrent psychological problems, most have emphasized that the latter arise from a sudden change in lifestyle. Many do not illuminate that physiological and psychological deficits are linked, often in a vicious cycle, on a more organic basis. Various interleukins, a group of cytokines, possess not only critical roles in the development and maintenance of the immune system, but are also crucial for brain development. Interleukin (1L-1B) functions on astrocytes in the brain, facilitating neurological connections in the hippocampus, and subsequently, assists in memory formation. T-cells and many classes of interleukins have been shown to be substantially decreased in reportedly depressed cancer patients. Conversely, cancer patients who report being more optimistic, have higher T-cell counts, interleukins, and have reported more positive associations and memories post diagnosis.

**Mentor: David W. Harrison**

**ABSTRACTS**

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**Victoria L. Deal**

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*Using Phone Applications as a Tool for Estimating Intoxication: An Investigative Field Study*

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One of the sources of alcohol-related harm is the widespread inability of college students to understand their current level of intoxication and its implications. While breathalyzers are impractical for most individuals, phone applications that estimate an individual's BAC may serve a similar role without the costs. This study had two aims: 1) to determine the accuracy of phone applications in estimating an individual's BAC and 2) to determine if information provided by these phone apps shifts participant's perceptions of their level of intoxication and its effects. Trained research assistants (RAs) approached pedestrians in downtown Blacksburg. The RA would randomly pull up one of four BAC-estimation phone apps. In one condition, they would then help the participant enter in phone application information to estimate their BAC. After receiving the phone application's estimation of their BAC, participants were asked questions about their level of intoxication and risk for a variety of alcohol-related negative outcomes. In the other condition, participant's answered the questions about intoxication and risk prior to completing the phone application. Results indicated that all phone applications were highly inaccurate in estimating BAC. However, participants' perceptions of safety and intoxication changed as a function of this information. It seems apparent phone applications may currently be doing more harm than good until more accurate BAC-estimation algorithms are developed.

**Mentor: E. Scott Geller**

**Joshua M. Deal**

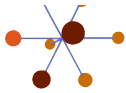
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*Corporate Responsibility and Normalized Deviancy: Case Studies in Safety and Risk Management*

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Why is it that some corporations have experienced disastrous risk management failures while others have remained unscathed? The purpose of this research is to discern, through the use of case studies, how corporate governance, organization, leadership, and risk management systems explain why some firms encounter disaster and others do not. Three case studies of firms who have experienced such failures are used to illustrate commonalities among these firms. Each of these has a complementary case study of a well governed firm that has avoided such problems in order to discern what it is that these firms have done to avoid risk management failures. It was found that the strongest factor in risk management failures was the occurrence of normalized deviancy from standards of risk management and safety due to a lack of strong risk management and safety values in corporate culture. Those firms that have avoided failures have created robust corporate cultures that value risk management and safety at every level. From these findings I have included many recommendations as to how best structure corporate governance and goals such that a robust corporate culture may be nurtured.

**Mentor: Thomas Stanton**



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**ABSTRACTS**

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**Kristen A. Deger**

*A Discrete Model of Iron Metabolism in Alveolar Macrophages and the effects of Aspergillus fumigatus Infection*

Aspergillus fumigatus is an airborne fungal pathogen that causes airway complications. The fungus' conidia are inhaled, triggering the innate immune response. The first line of defense against the fungus is alveolar macrophages, phagocytic cells of the immune system. Macrophages depend on iron availability, since iron is essential for the growth and proliferation of all cells in the body. Iron is also required for the virulence of A. fumigatus. Therefore, iron availability greatly impacts the interaction between macrophages and the fungus. Once the immune response is triggered, the host is alerted to restrict iron availability, creating a battle for iron as macrophages attempt to restrict iron from the fungus, while the fungus tries to acquire enough iron to survive. We present a mathematical model of iron metabolism in macrophages and their interaction with A. fumigatus using discrete modeling techniques. The network species are represented as nodes in a transition table and have one of three discrete states representing the concentration of the species. To analyze the model's stability we used the software CYCLONE. The results describe A. fumigatus' effects on the iron regulatory network and can help us to understand the fungus induced changes in iron regulation that result from the host's immune response.

**Mentor: Reinhard Laubenbacher**

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**William P. Diehl**

*Support for the Creation of a Dissociative Subtype in PTSD: Physiological Heterogeneity in DSM-IV-TR Symptom Endorsement*

Heart rate variability (HRV) was measured at baseline and task in two groups of women aged 18-22 with a history of sexual assault and potential PTSD. Groups were formed based on whether or not they endorsed dissociative amnesia on the Structured Clinician Interview for the DSM-IV (SCID). Subjects endorsing dissociative amnesia had significantly lower root mean squares of

successive differences (RMSSD) compared with non-dissociative subjects after the Stroop Emotional task  $p = .032$ . Together, these findings suggest the SCID PTSD symptom of dissociative amnesia to be a critical factor in distinguishing subtypes of women with potential PTSD. In addition, this study suggests these subtypes are unidentifiable until emotionally provoked.

**Mentor: Russell T. Jones, Kelly Harrison, Angela Scarpa, John Richey**

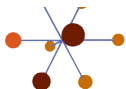
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**Rachel A. Dinkins**

*Using Local Logic: The Persuasive Appeal of Industrial versus Local Eating*

My research question focused on why individuals choose, or are forced to choose, the industrial food system versus a local food system. The development of the industrial food system we have in America stems from cultural practices and habits that have evolved. My study's purpose is to show the persuasive appeal of the industrial and local food systems, in hopes to point out cultural habits that both help and hurt consumer's food choices. This project emanated from a curiosity to examine local foods movement's appeal. Through studying books, films, news articles, presentations, and health data as well as conducting personal interviews, I developed an argument for my initial research question. In explaining the persuasive appeal of both industrial and local eating, I argue how the persuasive appeals of each system make sense differently and to different audiences. Choosing industrial food means facing mass-produced, inexpensive, and easy foods that are produced by companies' who only want to make a profit. In contrast is the local food system which values sustainability, care for its products and customers, knowledge, and community. My paper results in the argument that appeals of both systems make sense in different ways and to different people.

**Mentor: Elizabeth Mazzolini**

**ABSTRACTS****Victoria A. Dounoucos*****The Daily Pop Quiz: Teaching and Learning with Clickers***

In recent years, technology has gained a firm foothold in higher education classrooms. Student response systems are among the most common teaching technologies incorporated into classrooms today (Immerwahr 2009; Winograd & Cheesman 2007). These personal devices permit students to contribute their individual opinions and quiz responses in real-time during class, even when classes are too large to easily facilitate group discussion. Given clickers' growing popularity over the last decade, dozens of studies have sought to evaluate clickers' effects on learning (e.g., Beavers 2010; El-Rady 2006). Most research data can be grouped into one of three general categories: (1) examples of pedagogical techniques, (2) user perception studies, and (3) quasi-experimental tests of knowledge change. Nearly every study identifies benefits gained by the incorporation of clickers in the classroom. However, evidence about the nature of the causal link between "clicking" and these claimed benefits is typically absent. To fill this void, we theorize that students benefit from using clickers in class, because: clicker quiz questions connect each day's material to exams, and clicker quizzes may improve student attendance and engagement. Opinion surveys and behavioral data were used to study this relationship. We find that clickers may enhance students' performance through a number of mechanisms that operate simultaneously, although with different intensities for different students.

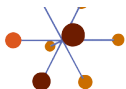
**Mentor: Craig Brians**

**David Drewett*****Factors influencing inter- and intra-specific variation in mercury bioaccumulation by snakes inhabiting a contaminated river floodplain.***

Although recent recognition of global reptile declines has led to a new-found enthusiasm in reptile conservation, snakes remain one of the most understudied vertebrate groups. Environmental contamination has been proposed as a major threat to reptiles, and snakes may be particularly susceptible because they are long-lived and feed at high trophic levels. Mercury (Hg) is a notable contaminant because of its widespread distribution, and toxicity to humans and wildlife. Although Hg is well studied in other taxonomic groups, our knowledge about Hg accumulation in snakes is limited. In this study, we aimed to shed light on the factors that put snakes at risk of Hg contamination by examining several snake species from a historically Hg contaminated river floodplain in central Virginia. Specifically, we used nonlethal sampling techniques to evaluate Hg bioaccumulation within and among four snake species. We examined tissue Hg concentrations in relation to snake demography, feeding ecology, and habitat preference to shed light on the relative importance of factors that put snakes at risk of exposure to contaminants. Additionally, our results increase our understanding of the roles that snakes play in Hg transfer within food webs and will help guide restoration and remediation efforts currently underway in Virginia.

**Mentor: J.D. Willson**



**ABSTRACTS****Rebekah F. Duke*****A field study of drinking motivation:  
Investigating the criterion-related validity  
of the drinking motives questionnaire***

This study investigated the relationship between drinking motives and student drinking in a field setting. Participants completed the Drinking Motives Questionnaire (DMQ; Cooper, 1994) and were administered breathalyzer tests in a downtown bar setting. The Drinking Motive Questionnaire was used because it is the most widely used measure of drinking motives (Kuntsche, Knibbe, Gmel, & Engels, 2005). Relationship between BAC and drinking motive constructs of the DMQ was assessed. Results indicated that several of the constructs of the DMQ were significantly correlated with BAC. A confirmatory factor analysis (CFA) demonstrated that coping, enhancement, and social motives were related to student intoxication. However, several psychometric concerns also emerged from the study. Specifically, the factor structure and measurement invariance across gender are areas in need of further research for the DMQ.

**Mentor: E Scott Geller****Stephen D. Epstein*****Cancer Cell Adhesion Patterns on Metallic Substrates***

The goal of the project is to quantitatively investigate cancerous and noncancerous mammalian cell adhesion mechanisms and patterns on gold substrates. The purpose of the study is to assist in cancer cell detection. A quantitative study of the adhesion patterns of mammalian cells on gold substrates will provide valuable information for detection of cancerous mammalian cells using micro devices. The parameters investigated in this study are the width of the gold substrates and the cell type. A photo resist mask was created using LayoutEditor, which incorporated gold columns of widths ranging between 10 $\mu$ m and 100 $\mu$ m with fixed spacing between the columns of 200 $\mu$ m. The gold columns were patterned using photolithography and light-off techniques. Cancerous and noncancerous mammalian breast cells were placed on the micro-chip in 35 mm petri dishes. Florescent microscopy was used to capture images of cell position after

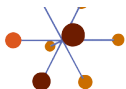
24 and 48 hours. The cells were counted by hand using ImageJ and the Cell Count Plugin and categorized as: on the gold substrate, on the gold substrate boundary, and off of the gold substrate. The project has resulted in a quantitative measure of the proportion of cancer and noncancerous mammalian cells adhered on the gold substrate as a function of the proportion of area patterned by the gold substrates. It was found that a significantly larger proportion of the noncancerous mammalian cells adhered to the gold substrates as compared to the cancerous ones.

**Mentor: Masoud Agah****Madison R. Farruggia*****Underwater Communication Techniques***

The purpose of the research performed during the last Fall semester was to determine which method, optical or acoustic, would be sufficient in communicating data between an object stationed on land and an object stationed in an enclosed underwater environment (such as a pool). Extensive research was done on existing systems by studying the existing literature and at the end of the semester it was determined that for the particular situation that we were considering, an optical device would have a better chance of success. This semester the focus of my research was shifted to determining specific characteristics for such an optical device. This would include defining an optimal range, power rating and communication protocol for the optical sensor. Research on communication protocols and current optical devices has been conducted, and a small scale testing device is almost completed. By the end of the semester we plan on having a communication device consisting of a transmitter and receiver, as well as a defined protocol and ideal range specifications.

**Mentor: Alexander Leonessa**





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**ABSTRACTS**

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**Robert A. Fekete**

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*How to re-energize American political involvement by bring the Constitution into the 21st century*

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While there is steady political participation in the United States the most important form of participation needs reforms to encourage a larger voter turnout rate, while using methods of modernizing the Constitution while maintaining respect for the original intent of the document. The research examined three potential reforms to the electoral system that could have the effect of increasing the overall representativeness of the elections. The methods used in the study were a literature review of the issues and the and also a content analysis of those proposed reforms. The three reforms that were examined in the study were: 1) term limits on members of Congress, 2) changing the method of electing the House of Representatives to a Single-Transferable Vote and 3) modifying the electoral college from the win-take-all method to the district method.

**Mentor: Brandy Faulkner**

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**Kelly Ferguson**

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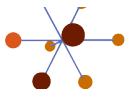
*An Analysis of Organic Matter During the Flood Diversion in the Atchafalaya River Basin*

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In 2011, the lower Mississippi River basin had the highest river stages over the recorded record. In response to this, the Morganza spillway was opened to prevent flooding in Baton Rouge and New Orleans. The floodwater was routed through the spillway into the Atchafalaya Floodway River Basin (AFRB) for the first time since 1973.

Although river diversions of this type are proposed to manage both river flows and excess nutrients, there are few if any studies quantifying the nutrient fate and transport from a large-scale river diversion. Through cooperation with multiple stage agencies, samples were collected throughout the AFBR over the flood period. Dissolved organic matter is one important water quality constituent; for example, DOM can act as a reduced carbon source for heterotrophic metabolism. Here, we studied both DOM quantity and quality over the flood. DOM quality was found using fluorescence. Parafac modeling from the excitation emission matrices (EEMs) produced 13 distinct DOM components. Initial results suggest that the DOM pool became less labile through the swamp, suggesting that a combination of processing and swamp carbon sources altered the DOM quality.

**Mentor: Durelle Scott, Nathan Jones**

**ABSTRACTS****Andrew F. Gann, Jr.*****Justice Stone: Justice for Changing Times***

Justice Stone restored some of the legitimacy to the Supreme Court through his decisions especially with the Commerce Clause. I examine his jurisprudence to determine his ideas about formalistic and non-formalistic approaches to the clause. He was able to gain power and legitimacy for a body of government that was lacking it. I also examined his concept of conflict of laws and the effect on public policy. A content analysis of his jurisprudence reveals his impact on Constitutional Law. My findings were that he changed the courts' course of deliberation in Commerce Clause decisions and that his jurisprudence has endured.

**Mentor: Brandy Faulkner**

**Emily Gibson*****The Effect of Varying Types of Trough Material on the Bioavailability of Iron Present in Dairy Cow Drinking Water***

This project will include research on the solubility and bioavailability of iron in groundwater supplied to dairy cows. This research combines an investigation of water quality and its influence on the chemical speciation of iron between the reduced ferrous form, which is bioavailable, and the oxidized ferric form, which is precipitated and much less available as a nutrient to cows and their milk.

Dairy cows consume 20-30 gallons of water a day and their drinking water can be a major source of iron in their diet. Many farmers pump groundwater from wells for their livestock, which generally contains bio-available ferrous iron. However, when the water sits stagnant in water troughs, the iron can oxidize to ferric iron, which is less soluble and less bioavailable. My hypothesis for this experiment is that the longer the ferrous groundwater stands in the dairy cow's drinking trough, the less nutrients the cow will consume as the ferric iron precipitates and thereby causes a nutrient depletion in the cow's diet. In turn, the amount of bio-available soluble iron that results in the milk of the livestock can ultimately affect the nutritional needs of calves and people who consume the milk. With the use of water stagnation, local groundwater will stand in troughs made from various materials, for varying lengths of

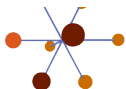
time. Iron content will be monitored using FAA spectrophotometry to characterize the metals in water.

**Mentor: Andrea Dietrich**

**Jane C. Giesken, Raven Griffin*****Dramatic Play in Preschoolers' Development***

The purpose of this study was to examine play by observing the influence of intersubjectivity, mind-mindedness, and theory of mind on children's development (Vygotsky, 1967). Since dramatic play allows children to integrate and use different skills by working through imaginative scenarios, we specifically focused on it for this project. Our research question was, "does the frequency and type of dramatic play differ across preschoolers?" Three types of dramatic play included: solitary, parallel, and group. Our sample was made up of 41 preschool children who ranged in age from 18 months to five years and were divided into three classrooms of toddlers, young preschoolers, and older preschoolers. Observations were recorded fall 2011 using The Play Observation Scale (Rubin, 1982). Examining mean scores of all observations (n=244), there was more group dramatic play than solitary or parallel dramatic play. There were significant differences in time spent on different types of dramatic play based on age of the children. Toddlers spent the most time in solitary play. The two classrooms of younger and older preschoolers had more group play. These differences indicate preschoolers are at different places developmentally as evidenced by their varying use of different types of dramatic play.

**Mentor: Victoria Fu, Ruoxi Chen**

**ABSTRACTS****Justin O. Graves***Using the iPad2 as Assistive Technology*

As students with disabilities transition from high school to higher education, it is critical that they advocate for accommodations that ensure accessibility to the curriculum, information technology, and digital learning. As assistive technology moves in the direction of mobile technologies, the purpose of this study was to examine iPad applications for college students with disabilities. Graves reviewed free applications that

were appropriate for use in the college environment and could enhance productivity and support the individual's needs as a student.

He will describe how he uses apps in his daily activities as a successful college student.

Categories of iPad applications he determined useful for college students included:

- a) built-in accessibility options
- b) research & information
- c) reading, listening, note-taking & e-readers<sup>2</sup>
- d) productivity & memory
- e) motivational
- f) physical & mobility

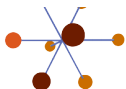
Ratings are assigned to each application using a simple rubric adapted from Webaim's POUR Website Accessibility criteria<sup>1</sup> – perceivable, operable, understandable and robust. These criteria were applied to mobile technology in the form of the iPad, and included simple and intuitive, internet connectivity, robust, presentation of content, and navigation. A one to five scale was used to rate individual apps with 5 as the highest rating. Over 80 apps were reviewed and the top 40 were included in the manual.

**Mentor: Susan Asselin**

**Kristin J. Haas***Macroinvertebrates of Intertidal Rock Pools at Iture Rocky Beach, Cape Coast, Ghana*

The study reports on the richness, composition, diversity and density of macroinvertebrates along with variations in salinity and temperature within rock pools in the three subzones of the intertidal zone at Iture Rocky Beach, Ghana (5° 6' N; 1° 10' W). The belt transect sampling technique was employed in sampling the organisms using a 50 cm x 50 cm quadrat while temperature and salinity were recorded using a thermometer and a refractometer respectively. Salinity generally decreased upshore with average values ranging from 3.05 (± 0.21) ‰ to 3.80 (± 0.0) ‰ in the lower shore, and 1.60 (± 0.0) ‰ to 3.80 (± 0.0) ‰ in the upper. Temperature however increased upshore, from mean of 27.50 (± .71) °C to 31.00 (± 0.0) °C in lower shore pools and 29.00 (± 0.0) ‰ to 34.00 (± 0.0) ‰ in the upper shore pools. A total of 14 species of macrofauna comprising molluscs, crustaceans and coelenterate were sampled. Most of the invertebrates were rare in the subzones (< 1% composition) while few were abundant (> 50% composition). Diurnal variability in distribution of macrofauna in the subzones was largely dictated along salinity gradients and weather conditions especially temperature regimes. Subzones with higher salinities had higher invertebrate diversity while higher species richness occurred at lower shore on sunny days possibly due to temperature effects, and middle shore on cloudy days probably due to effects of the striking waves at lower shore.

**Mentor: Daniel Wubah, Kobina Yankson**

**ABSTRACTS****Andrew B. Hall*****Identify-Y: A novel computational method for the discovery of Y chromosome sequences***

Computational methods for discovering Y chromosome sequences rely on leftovers of assembly, and are ill suited for low quality genomes. We report Identify-Y, a simple and fast in silico algorithm to discover Y chromosome sequences independent of assembly quality. Identify-Y classifies sequences into one of three categories by calculating the chromosome quotient, the frequency of alignments from a female next-generation sequencing database, divided by the frequency of alignments from a male next-generation sequencing database. Autosomal sequences are present in the same number in males and females and have a chromosome quotient near one. X chromosome sequences are twice as numerous in females as in males and have a chromosome quotient near two. Y chromosome sequences are only present in males and have a chromosome quotient near zero. We found a region of chromosome quotients near zero, distinct from the chromosome quotients of autosome and X chromosome sequences that are highly enriched for Y chromosome sequences. In the malaria mosquito *Anopheles stephensi*, we report the identification of 462 Y chromosome sequences. One of the Y chromosome sequences was discovered to contain an expressed sox transcription factor gene, making it the second mosquito Y chromosome gene ever found.

**Mentor: Jake Tu****Kevin P. Hannon*****The effect of solvents on the optical rotation of chiral molecules.***

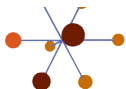
The purpose of this research is for the development of accurate mathematical models to approximate the absolute configuration of optical active species in different solvents. Many biological molecules have a chiral center and the measurement of their rotation of plane polarized light is difficult to accurately measure. If a computational method is developed that can accurately predict optical rotation, it will benefit many companies/research groups that deal with optically active species. Solvents have a profound

effect on the optical rotation; sometimes, it can even change the sign of rotation. Coupled Cluster Singles and Doubles (CCSD) is used for the accurate calculation of optically active species in different type of solvents. Many methods were employed to see how solvents affect optical rotation. Treating the solvent as an embedded potential is one method that is being employed. Another technique is to directly use a few water molecules around the solvent and see how much the optical rotation is affected.

**Mentor: Daniel Crawford****Kyle A. Harring*****Reducing Surgical Site Infections in Ambulatory Surgical Centers***

This project focuses on re-engineering the health care delivery process in out-patient Ambulatory Surgical Centers (ASCs) so as to reduce healthcare associated infections, in particular, surgical site infections, during outpatient processes. As healthcare evolves in the U.S. there is a constant emphasis on cutting costs; one of the easiest ways to do this is to minimize hospital stays, especially after surgery. This has led to increased usage of ASCs. These centers face a huge problem as they continue to grow and take on more responsibility, namely the lack of standardized guidelines for best practices. Through this project, we hope to understand the effects of this lack of guidelines on surgeon's techniques and sterilization practices, through analysis of post-operative surgical site infections, and to compare these results with surgical site infections from hospitals. The objective of this research is to find the critical points throughout patient contact which are major contributors to surgical site infections. Methodologically, the project will involve reviewing the medical literature, obtaining risk estimates from the literature, and constructing decision trees for the current process, using process and work flow analysis and risk assessment/management. After compiling and analyzing the information, we will design interventions in order to mitigate the risks involved with surgical site infections. - In the process of organizing and compiling our results.

**Mentor: Ebru Bish**



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**ABSTRACTS**

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**Alyssa C. Hart**

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***Women in Wills: "Fingersmith" Usage of Victorian Property Rights.***

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Sarah Waters incorporates property, inheritance, and wills into her Neo-Victorian novel *Fingersmith*. She provides a historically accurate representation of Victorian property rights, especially as they apply to women. The process of marriage as a means for gaining property stands as the starting scheme within the novel and continues to be important through the conclusion. However, the means by which property is exchanged and received throughout the novel is unconventional often involving trickery and subterfuge, thus adding a twist to the standard inheritance plot. Exploration of the Victorian legal rights of women and their property supplies a knowledge base to analyze Sarah Waters' novel. Research into the legal context of this historical novel illuminates the reason and purpose of Waters' inclusion of such material within *Fingersmith*.

**Mentor: Nancy Metz**

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**Christian L. Hawthorne**

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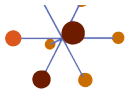
***Does Chaos in the Home Environment Relate to Children's Attention and Effortful Control?***

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A chaotic home environment is likely to interfere with children's sustained attention skills because of frequent distractions and disruptions in chaotic homes. Kochanska, Murray, and Harlan (2000) found that infants who had more focused attention displayed greater effortful control, defined as the ability to control one's behavior. Therefore, chaos in the home may be related to less effortful control through its association with attention. Investigating relations among these variables will allow for a greater understanding of how children's effortful control develops. My hypothesis was that more chaos would be associated with less attention, which would in turn be associated with less effortful control. Pilot data was collected from twenty parents and their 3-5 year old children attending a local day care center. Parents reported on the degree of chaos in the home, and children were observed completing tasks to measure their effortful control and attention. Children's effortful control and attention were positively correlated, but chaos in the home was not significantly associated with attention or effortful control. Having a small sample size and participants from predominantly middle-class families may have limited the findings from the pilot study. Currently, a larger sample of participants is being recruited from Head Start centers, which should allow for more diversity in the measure of chaos in the home. Preliminary data from the Head Start sample will be presented.

**Mentor: Cynthia Smith**





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**ABSTRACTS**

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**Laura B. Heironimus**

*Verification of age-at-length and growth rates of variegate darters*

Fish population dynamics are strongly influenced by variation in fecundity and mortality rates across different-aged individuals. For example, populations are more stable if breeding individuals come from multiple cohorts because overall fecundity is not reliant on the strength of a particular year-class. Understanding variation in fecundity and mortality is especially important for imperiled species, where population sizes may be small and predicting risk of extinction based on failed year-classes is important to wildlife managers. Age and growth rates of many stream fishes can be estimated from the distinct rings laid on otoliths (small ear bones) during growth cessation periods, similar to tree-ring age analysis. We extracted otoliths from a wide size range of variegate darters (*Etheostoma variatum*) and estimated age- at- length and growth rates by year. We found variegate darters live up to seven years, three years older than previously thought based on less accurate ageing techniques. We found rapid growth during the first two years, and large individuals (>80 mm standard length) were 4-7 years old. Ageing fish from otoliths gave a larger range of age classes than previously suspected. This knowledge will help us understand population dynamics of variegate darters and will inform management of this imperiled stream fish.

**Mentor: Paul Angermeier, Jane Argentina**

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**Evan G. Hemingway**

*Patterned Environments for the Paramecium*

Microorganisms move in their natural environments encountering numerous obstacles. Often, these obstacles include the boundary within which they move, such as the wall of a host organism. These walls are typically not smooth, and affect the way these organisms navigate in their environment. We are interested in studying the effect of a wavy-walled channel on a paramecium's motion. The paramecium does not simply move through these channels in a straight line. Instead, their trajectories reveal interesting data about wavelength, amplitude, and velocity. It's clear from our video data that the paramecium propels

itself differently in various wavy channels. We want to compare the results of a paramecium's trajectory through various patterned channels with their trajectory in a straight channel and draw conclusions about the effects of various patterned surfaces on the paramecium's motion. Our research could provide a more fundamental understanding of the behavior of a microorganism in its natural environment.

**Mentor: Sunghwan Jung**

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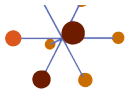
**David A. Henry, Sebastien Corner**

*Shipboard Autonomous Firefighting Robot: Torso Project*

Can an autonomous humanoid torso be developed that can throw a 2.5 pound mass a distance of 30 feet. The purpose of this study is to develop a lightweight and robust robotic torso for the SAFFiR Graduate team. The graduate team has been charged with developing a humanoid robot that can assist with the fire suppressing activities aboard a navy vessel. They have designed a set of humanoid legs and have started testing the walking algorithms. They are in need of a torso that can perform the fire suppressant tasks which include throwing a fire suppressant canister and manipulating a fire extinguisher. Both of these tasks present difficult challenges for robotic locomotion and this research project's goal is to design and then manufacture a torso that can accomplish those goals. The engineering design methodology is being followed to uncover the best possible design for the torso. Tools such as simmechanics and NX are being used to assist the design phase. The concept has been selected and plans are to have a working prototype developed by the 1st of June 2012.

**Mentor: Dennis Hong**





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**ABSTRACTS**

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**Elizabeth R. Hepner, Sarah Baldwin,  
Jerónimo Silva**

*A Survey of Muskrat Intestinal Parasites in Virginia*

Infectious diseases of humans and wildlife have increased dramatically in recent decades. These diseases can have an impact on global health, agriculture and biodiversity. Despite these increases, we still know relatively little about disease in natural wildlife populations. In many cases, we lack even basic information about what parasites and pathogens are present in wildlife species. This prompted us to conduct a survey on local populations of muskrats, a common semi-aquatic rodent found in the United States. We conducted necropsies on donated muskrat carcasses collected from across Virginia, and began to establish a baseline database on parasites of muskrats, with a focus on the macroparasitic worms in the gastrointestinal tract. Since 2008, we have necropsied over 100 individuals. Three genera of parasitic flatworms dominated the samples – Echinostoma, Quinqueserialis and Wardius. As these parasites have complex life cycles involving multiple hosts in addition to muskrats, we can potentially use the presence of these parasites to infer something about the ecological communities of the sites at which the muskrats were collected. We have also completed some analyses regarding the distribution of the parasites among hosts. We have not seen any significant relationship between total worm burden and either sex or mass of the host. Our research provides an important baseline for understanding of potentially emerging diseases and can improve how we manage wildlife disease

**Mentor: Lisa Belden**

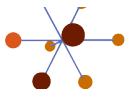
**Erica L. Hetzel**

*Ain't No Mountain High Enough? Direct and Indirect Regulation of Mountaintop Removal*

This study examines the direct and indirect regulation of mountaintop removal coal mining through the Clean Water Act, Surface Mining Control and Reclamation Act, and the Endangered Species Act. Specifically, this paper explores whether the ESA can effectively be used to limit the use of mountaintop removal coal mining. As mountaintop removal has become more prevalent in the Appalachian Mountains, coal companies have reaped great profits while many communities within Appalachia suffer from water contamination, higher incidences of cancer and birth defects, decreased life expectancies and some of the highest poverty rates in the nation. As mountaintops are removed with millions of pounds of explosives daily, thousands of acres of forest are demolished, hundreds of miles of streams are buried, entire communities must deal with flooding, toxic waste impoundments loom threateningly on the fringes of valleys, endangered species are slowly being eradicated and species which once flourished are now becoming threatened. Primarily utilizing legal periodicals and reviews, case law and federal statutes, this study analyzes how the ESA can be applied to help eradicate or minimize the impacts of mountaintop removal. Through this

study I hope to help bring to light the lack of enforcement that currently allows MTR to continue at a rapid pace, the species that are being threatened by habitat loss and the harm the communities surrounded by this practice must endure on a daily basis.

**Mentor: Jesse J. Richardson, Jr.**

**ABSTRACTS****Alison M. Hight*****Slaying Scottish Sith: the Protestant Reformation and the Characterization of Fairies in Early Modern Scotland***

My thesis analyzes the cultural impact of the Reformation in Early Modern Scotland, by examining the change in folk fairy belief between the 15th and 17th centuries. This change is tracked primarily through testimony from Scottish witch-trials, though other primary sources, such as medieval folk ballads and treatises by King James VI, and Rev. Robert Kirk, are used to supplement the trial evidence. The purpose of the study is to add to recent revisionist scholarship suggesting that the Protestant shift was actually a gradual movement that took close to a century to filter down from the noble elites to the Scottish masses, rather than a sweeping and immediate change that was widely welcomed. By focusing on fairy belief, which was a product of fundamental folk culture, we can examine how the Reformation affected Scottish culture, as well as the speed at which the change occurred. Evidence showed that fairy belief was initially very persistent, despite the cultural and religious attack launched by Protestantism, but that it could not overcome a zealous, second wave of Presbyterian fervor. Ultimately, Scottish fairies became demonized before eventually disappearing altogether, showing that the Reformation had a delayed, but ultimately successful impact on Scottish culture.

**Mentor: Marlian Mollin, Michael Alexander**

**Britanee D. Hodson, Chelsea Gilchrest*****Alternative Intergenerational (IG) Programming***

This case study on intergenerational programming (IG) will assess the physiological and psychosocial benefits of senior volunteerism, seniors as mentors, and small-group activities tailored to

participants' interests. This study also provides an insight to IG as an outlet for restless children, and as an alternative activities through the use of technology when direct, planned contact cannot be implemented due to the absenteeism of one group. Participants include a variety of willing dependant

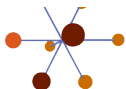
seniors and preschool children interacting at a shared site IG program. Unlike most recent IG research, this study focuses on informal IG with unequal ratios of adults and children. Cohorts will meet four days a week at alternate times of the day. Case study data will be gathered from the older adult participants, family caregivers, adult and child care staff, and administrators. Our project is unique in that the researchers will be participant observers throughout the study in order to obtain the most accurate qualitative data. Implications may include decreased solitary behavior from both cohorts, and enhanced behavioral, cognitive, and affective development. It is expected that collected data will help care facilitators make programming and staffing decisions about best practices for seniors as volunteers and mentors for preschoolers.

**Mentor: Shannon Jarrott**

**Alyssa C. Hosey*****Correlation between genome size and chromosome duplication (polyploidy)***

The goal of the project was to make correlations between genome size, polyploidy, and chromosome number in Canary grasses (genus *Phalaris*). Polyploidy is an important factor in genome evolution in plants. In particular, this phenomenon has played a major role in the evolution of the economically and ecologically most important plant family, the Poaceae (grasses), where polyploidy is estimated to be involved in about 80% of grass species (Hilu 2004). Canary grasses have two basic chromosome numbers  $x=6$  and  $x=7$ . Chromosome numbers were determined with the acetocarmine method and visualized under a compound microscope. C-Values were found using the Kew Royal Botanic Gardens C-Value database. These values were compared to a molecular phylogenetic tree made using nuclear region DNA sequences. Interestingly, the loss of a chromosome in the  $x=6$  species was correlated with a decrease in genomic content. This could have impeded the evolution of the  $x=6$  species because these species are present in only a few habitats and have less genome duplication than the  $x=7$  species.

**Mentor: Khidir Hilu**

**ABSTRACTS**

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**Victoria S. James**

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*Call of Duty; an Examination of Drone Warfare in the Context of the Global War on Terror*

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The purpose of this research was to analyze a contemporary issue or case in international affairs (such as terrorism, environmental degradation, or international human rights promotion) from two different theoretical perspectives. It was important to speculate how a scholar espousing a particular theoretical perspective (realism, liberalism, Marxism, poststructuralism, feminism, etc.) would depict the causes, implications, and solutions to the problem, and then oppose that depiction from the point of view of another theoretical perspective. I chose to evaluate the issue of drone warfare in the context of the United States' Global War on Terror in the starkly contrasting theoretical perspectives of realism and feminism. I wanted to explore the defining foundation, justifications and potential consequences of the United States' use of drones in its self-proclaimed Global War on Terror. I examined hundreds of newspaper and online news sources in addition to books by theorists such as E.H. Carr, David Harvey, Francis Fukuyama, J. Ann Tickner and Michele Foucault. While the results are contrasting due to the particular theories applied, it is clear that the proliferation of drone use by the United States military and intelligence community is likely to be permanent phenomena when fighting current and future wars. It was also clear that the proliferation of drones will also become a fixture in the national air space by approximately 2015.

**Mentor: Stefanie Georgakis**

**Kelly I. Kim**

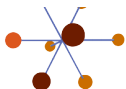
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*Saying Neither to Paper and Plastic Bags; Committing to Making Ecological Decisions*

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The stages in the life cycle of plastic and paper bags compromise people's health and the environment. The raw materials used for producing them cause ecological damage, the transportation of them adds extra pollution, and if the plastic bags are recycled, it is very difficult and expensive, and it use valuable resources in the process. In order to get the community in a southwest Virginia college town to reduce plastic and paper bag use, we conducted a field study involving commitment and education/information. When customers entered the store, they were given flyers explaining the environmental impact of disposable bags. It offered an alternative to disposable bags and promoted the use of reusable bags. Upon exiting the store, customers were offered a hang tag for their rear-view car mirror as a reminder to commit to bringing their reusable bags for their groceries. Behavioral observations were made during baseline and intervention. During the intervention phase, the store manager calculated a saving of 33,000 plastic and paper bags, and the purchase of over 300 reusable cloth bags.

**Mentor: E. Scott Geller**

**ABSTRACTS****Rachel M. Kirk*****Albert Camus's Algeria and Islam in France in the 21st Century***

Given increasing Islamophobia and the recent laws passed concerning the wearing of different forms of the hijab in schools and public places in France, it is important to draw historical parallels given France's colonial history in North Africa. Despite France's tumultuous history with Algeria, one of the most renowned French writers of the 20th century, Albert Camus, spent most of his life there. Camus held the complicated identity of being a European in Algeria (referred to as a  *pied noir* ) during the Algerian War. Many of Camus' works possess political and cultural undertones regarding the questions of assimilation, the role of language, national identity, and the treatment of religious and ethnic minorities. These are also the same questions that France is currently trying to flesh out today within their current political and quotidian society, especially in regards to Muslim women wearing the hijab and its relation to  *laïcité*  (secularism). How does singling out certain religious or ethnic traits inform what it constitutes to be "French" and what can Camus inform to the answer to the questions institutions in France are trying to answer? Through analyzing the journalism and literary writings of Camus, I contend that his works can help us to understand the current treatment of Muslims in France and help define what it means to be "French".

**Mentor: Janell Watson, Chad Levin**

**Christian D. Laourdakis*****DXS/DXR characterization***

The purpose of our study is to target the methylerythritol phosphate (MEP) pathway in  *P. falciparum*  since is not present in humans. This metabolic difference can be exploited to kill the parasite while still being safe for humans. In order to find new drugs against the MEP pathway, we had expressed the first two enzymes of this pathway (DXS and DXR) from  *E. coli*  and  *M. tuberculosis*  using  *E. coli*  as an expression system. Purification of these enzymes has been achieved by using His tags on the enzymes and Ni<sup>2+</sup> affinity chromatography and quantification using spectrophotometry at a selected wavelength 280nm. A coupled enzymatic assay was used to determine the kinetic parameters of DXS.

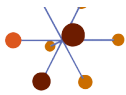
Preliminary results include standardization of the enzymatic assay. The EcDXS-MtDXR coupled assay was used to screen natural extracts from plants. Several extracts were found active against these enzymes and sent to be purified/fractionated. Questions that are attempting to be addressed include: what are possible inhibitors of DXS and DXR, how effective are they, and can they then be used in culture to be uptaken into the apicoplast where the reaction takes place in the malaria parasite.

**Mentor: Maria Belen Cassera**

**Julia E. Legard*****Stella Moon- A Fall 2012 Capsule Collection***

The objective of this creative scholarship project was to create a capsule the collection for a new label, Stella Moon, designed and developed by myself. The target market for this collection is a woman in her mid to late twenties with edgy style and bold taste, celebrating her curves. To meet the expressive needs of this target market, which also served as an inspirational source to the collection, chose an array of bold and saturated color schemes, such as deep red and jet black. One of the collection pieces was selected and constructed as a prototype. A pattern for the prototype was prepared using draping technique. For the construction of the garment, both machine and couture sewing techniques were utilized. Outcome of the construction of the garment achieved the objective of the project by perfect fitting to accentuate the curves of a woman but also reflects confidence of the wearer.

**Mentor: Ji-Hyun Kim**



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## ABSTRACTS

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### Spencer C. Li

#### *Behavior Analysts Intervene to Increase Indirect Reciprocity in a Field Study*

The Norm of Reciprocity (NR) has been popularly studied in a variety of social science disciplines. Indirect reciprocity (IR) involves two beneficial acts among three individuals and comes in two forms: downstream and upstream. Downstream reciprocity focuses on reputational gain whereas upstream reciprocity focuses on recent positive experiences. Student researchers observed a line of dining patrons during their purchase of a meal at a buffet-style dining hall. In two weeks, 129 total trials were conducted for the study. The sample size (n=486) consisted of mostly college age students.

Four different intervention phases were used to assess the impact of an intervention on individuals' propensity to reciprocate indirectly. The first phase was a baseline condition with a sign prompt. The second phase involved a trained confederate, paying for the meal of the person behind him/her in line and walking away with no human interaction. The third phase involved a trained confederate, paying for the meal and interacting with the person behind him/her. The fourth phase returned to baseline with a sign prompt only.

The results showed an increase in reciprocity among individuals during the second and third phases of the study. Specific data results will be discussed during the presentation.

**Mentor: E. Scott Geller**

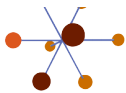
### Ashley C. Love

#### *Changes in baseline corticosterone levels in house finches (*Carpodacus mexicanus*) during the course of an infection with the naturally-occurring bacterium *Mycoplasma gallisepticum**

Suppression of the immune system during exposure to stressors may allow organisms to reallocate resources to other physiological processes such as foraging, thereby enhancing their immediate survival. The stress response, however, also responds to infection in ways that help regulate the immune system. Higher induction of corticosterone (CORT), the stress hormone in birds, may help prevent acute phase responses from progressing to unreasonable levels, acting as a brake on a costly innate component of the immune response. In this study, we examine how baseline CORT levels in house finches influence and respond to infection with the bacterial pathogen, *Mycoplasma gallisepticum* (MG). Prior work found that free-living house finches with this infection had higher CORT levels, but could not address whether the higher levels were a cause or consequence of infection. We found that baseline CORT levels prior to infection did not predict the severity of disease, suggesting that at least in the laboratory, higher baseline stress hormone levels do not increase susceptibility to disease. Experimental infection with MG resulted in significantly higher CORT levels at days 5 and 14 post-infection and, within the infected treatment, individuals with higher disease severity had the highest baseline CORT levels. These results suggest that increases in stress hormone levels during infection may be responsible for the higher levels previously observed in free-living infected house finches.

**Mentor: Dana Hawley, Igancio Moore**





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## ABSTRACTS

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### Zachary L. Mannes

#### *The relationship between parental views on alcohol and college student drinking*

An online questionnaire was created to determine the relationship between high school and college drinking and how parents contributed to how much their kids drank after leaving home and going to college. This study further examines moderators of this relationship such as amount of alcohol available in parent's house, parental levels of alcohol consumption, and whether parents let their children drink at home with them. This study's sample was comprised of 362 undergraduate students at . Of the participants, 34% were freshman, 26% were sophomores, 20% were juniors, and 19% were seniors, who were predominately female (72%). The dependent measure of college alcohol consumption was found by asking two questions: "On average, how many occasions do you consume alcohol each month?" and "On average, how many alcoholic drinks do you consume each drinking occasion?" Results showed a significant positive relationship between high school drinking and college drinking ( $r = .421, p < .01$ ). Additionally, even when controlling for high school drinking as a covariate, students who were punished for drinking in high school consumed significantly more alcohol in college,  $F(1, 348) = 35.00, p < .01$ . This punishment affect was even greater if parent's drank with their children at home or if parents kept alcohol in the house. Results indicated a emphasis should be given to reinforcing good behavior instead of punishing bad behavior.

**Mentor: E. Scott Geller**

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### David Marshall

#### *Multiscale Peptide Self-assembly*

The research project is focused on the self-assembly of short peptide aggregates know as prions. Prions are responsible for many neurodegenerative diseases such as Alzheimer's, Parkinson's, and Type II Diabetes. Although the affected proteins are different in each of these diseases, the event responsible for their malfunction appears to be the same- the proteins all form into aggregated clusters of prions which prevent them from carrying out their functions. How or why these proteins form into prions is unknown

and so this research is very important in potentially developing a cure and prevention for the aforementioned and other diseases.

The initiation of prion formation involves a hydrophobic template peptide that induces an a to b transition in another peptide, the "adder" peptide. When these peptides are isolated no aggregation occurs, but when they come together, they readily assemble into prions. Spectroscopic analytical techniques were used to describe a prion catalytic event and the progression of aggregation over time; the instrument shows a change from the a to b transitions of the adder peptide and tells us if there is prion formation and the rate of the formation. While keeping the template constant, a-helix peptide features such as length, a-helix content, and hydrophobicity will be explored to note the effect on prion initiation and progression. The ultimate goal is to develop a thermodynamic framework for peptide aggregation at physiological conditions.

**Mentor: Justin Barone**

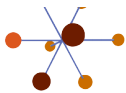
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### Gabriel A. Mastromano

#### *Comparable growth performance but reduced carcass weight from pigs fed a wheat-DDGS diet*

Corn prices are increasing due, in part, to ethanol production, resulting in increased feed costs for swine producers. The objective of this experiment was to determine if a wheat-dried distiller's grain (DDGS) based diet (WD) would reduce cost efficiency of gain compared to a corn-SBM (CS) based diet. Fifty pigs (24 gilts and 26 barrows) were segregated by gender and housed 2-3 pigs/pen with free access to feed and water over a 53-d study. One-half of pigs were fed CS diet (85.92% corn, 12.50%SBM, 1.58% others) and the remainders were fed WD diet (50.50% wheat, 40% corn DDGS, 7.00% SBM, 2.5% others). Feed disappearance was monitored daily and pigs were weighed every 14 d. At the end of the study, pigs were transported about 6 h to a commercial slaughter facility. Initial BW was not different ( $P=0.83$ ) between CS ( $68.5\pm 1.7$  kg) and WD ( $68.0\pm 1.7$  kg) treatments. Overall ADG, ADFI, and G:F was not different ( $P=0.48$  to  $0.67$ ) between CS ( $1.17\pm 0.03$  kg/d,  $3.80\pm 0.09$  kg/d,  $0.32\pm 0.01$ , respectively) and WD ( $1.14\pm 0.03$  kg/d,  $3.85\pm 0.08$  kg/d,  $0.31\pm 0.01$ , respectively). Final BW was not





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## ABSTRACTS

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different ( $P=0.23$ ) between CS ( $131.3\pm 1.8$  kg) and WD ( $128.2\pm 1.7$  kg) treatments but hot carcass weight (HCW) was reduced ( $P=0.009$ ) 5.6% in WD compared to CS pigs. Dietary treatment had no effect on ham weight ( $P=0.41$ ); however, pigs eating WD had lower picnic ( $P=0.008$ ), boneless loin ( $P=0.03$ ), belly ( $P=0.06$ ), and butt ( $P=0.10$ ) weights compared to controls. Ultrasound measurements of last rib backfat (BF) and longissimus dorsi eye area (LEA) were recorded before transportation; BF was reduced ( $P<0.001$ ) in WD ( $1.30\pm 0.03$  cm) compared to CS ( $1.52\pm 0.03$  cm) pigs; however, treatment had no effect on LEA ( $42.1\pm 0.4$  cm for CS vs.  $41.5\pm 0.4$  cm for WD).

Feed cost ( $\phi$  per kg) was 9.45% lower ( $P<0.001$ ) in WD ( $37.97\pm 0.33$ ) compared to CS ( $41.94\pm 0.33$ ). Even though feed cost was reduced using the WD treatment, there was no difference in profit due to lower HCW in WD pigs. Further investigation in lengthening the trial period may be necessary to increase profit when feeding the WD diet.

**Mentor: Jeffery Escobar**

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### **Karan Mathur**

#### *Consolidated Bioprocessing of Cellulosic Biomass for the Production of Biofuels and Biochemicals at Low Cost by Using Novel Recombinant Cellulolytic *Bacillus subtilis* Strains*

The research project was a very intriguing project for a biochemistry major like me. We combined the ideas of applied microbiology, molecular biology, genetic engineering, enzyme engineering, and metabolic engineering, to develop certain recombinant cellulolytic *Bacillus subtilis* strains that can produce sufficient cellulase and hemicellulase, hydrolyze pretreated lignocellulosic biomass to pentose and hexose sugars, and ferment mixed sugars to high-yield liquid biofuels, biochemical or other value-added bioproducts in a single fermentation step and without addition of any costly rich nutrients. If we could get the bacteria to do this, we would be able to make numerous bioprocesses much more efficient. *Bacillus subtilis* has many advantages for industrial applications because it is safe to work with and is tolerant in many environments, among other reasons. Directed entailed three steps, the first being diversification. Diversification is when the gene

encoding the protein being studied is mutated and recombined at random to create a large library of gene variants. In the next step of selection, the library was tested for the presence of mutants possessing the desired property using a selection method called screens. In the third amplification step, the mutants identified in the screen were replicated, enabling sequencing of their DNA in order for us to understand what mutations had occurred.

**Mentor: Xiao-Zhou Zhang**

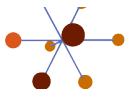
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### **Emily B. McCall**

#### *Caregiver Contexts*

Alzheimer's disease is a disease that not only affects the one who has the illness, but also those who care for them as well. Caregiving can be a very stressful process for people who are often pushed into this role in transition from another. The research question for the current study was to determine if there is a relationship between setting of dementia care and caregiver stress, and if so what is the relationship. Robinsons (1983) Caregiver Strain Index is used to measure stress levels. Stress is measured through interviews with caregivers using a timeline to map significant events that occurred during the time of caregiving. In interviews using a timeline to map significant events, caregivers are asked about two different points on the timeline as well as current stress to determine any changes through the time of caregiving. The research has not finished so there are currently no results to document, but research will be done by the time of the conference.

**Mentor: Alison Galway**

**ABSTRACTS****David M. McCann*****Effects of Photochemical Oxidation on Organic Matter Lability***

Anaerobic microbial metabolic activity is one way to denitrify water supplies, therefore increasing water quality. If this suboxic microbial metabolic activity can be increased by more labile dissolved organic matter (DOM), more denitrification can occur. Among many methods for increasing DOM lability, irradiation from the sun is becoming a larger possibility. Because of that, this project's main objectives were to determine the effect of photochemical oxidation from UV light on DOM lability and to analyze variation of DOM lability from photochemical oxidation across water sample origins with varying surrounding land use. To conduct the testing, water samples from Strouble's Creek and soil samples for soil-water extracts from the Beef Center were collected. These water samples were irradiated under a solar simulator, with tests ranging from 4-48 hrs, sampling accordingly. After irradiation, the samples were checked for absorbance on a spectrophotometer and then checked for carbon and nitrogen composition on a Shimadzu Total Organic Carbon Analyzer. The tests showed a decreasing trend in absorbance at 254 nm over time, indicating a breakdown of DOM, and therefore increased lability. Specific UV absorbance (SUVA) also had a decreasing trend, indicating an aromaticity decrease, meaning the DOM lability increased.

**Mentor: Durelle Scott****Logan Miller*****Experimental Stimulation and Feedback Control of Skeletal Muscle***

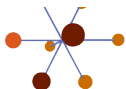
The development of strategies that could improve the quality of life of individual with loss of mobility and sensation is extremely important. One such strategy, called Functional Electrical Stimulation (FES), has been used to restore the motor functions through electrical stimulation of muscles. Considerable research efforts have been made since then to improve the effects of FES; however, it has not yet entered regular clinical use due to inconsistent and unreliable functional benefits. At this time, most FES systems are based on simple open loop control techniques and use predetermined stimulation parameters. Therefore, they cannot adjust output according to the actual effect nor are they sensitive to either external disturbances or changes in the internal parameters. The increased need for effective and operable FES equipment has motivated the

exploration of autonomous closed-loop systems, in which produced movement is measured with sensors in real-time and the stimulation pattern is modulated accordingly. The sensors collect data relevant to the subject's dynamic status and computes appropriate stimulation amplitude, frequency, and pulse width. This information is communicated to a stimulator which then delivers the corresponding train of electric stimuli to the excitable tissues via electrodes. This project aims to test and experimentally validate a closed-loop system for FES.

**Mentor: Alexander Leonessa, Robert Grange****Thomas R. Minogue*****Compact of the Untamed: The Influences of Hobbesian Natural Law in The Jungle Books***

Among the state of nature theorists Thomas Hobbes is mostly recognized for his declaration that the life of man is "solitary, poor, nasty, brutish and short," (Hobbes 83) but that statement is tempered by the unassailable natural laws of man. Though the natural condition of man contains neither justice nor injustice, those qualities can be attained "partly by his [or her] passions, and partly by his [or her] reason" (Hobbes 84) through the conduit of natural law (Stanford). The parallel in Kipling's *The Jungle Books* is the manifestation of the Jungle Law in "How Fear Came," and as the author qualifies "there are, of course, hundreds and hundreds more, but these will serve as specimens of the simpler rulings." (Kipling 843) Despite the imperial influence of empire on his work and the parallels social systems of *The Jungle Books* have to the Indian caste system, the Jungle Law is inextricably accompanied by the laws of nature formed by Hobbes to explain the condition of humanity, superseding the laws of man. The suffusion of the Law's ideals through Kipling's work, and the many stories in it, are illustration and accompaniment to the natural law Hobbes claims humans live by.

**Mentor: Kathryn Graham**

**ABSTRACTS****Timothy V. Nguyen***Probing the cell type specificity of terpene specialized metabolism in Arabidopsis roots*

Plants produce numerous secondary or specialized metabolites that aid in their interaction with the environment. These secondary compounds are often synthesized in specific cell types or tissues as a consequence of selective pressures by beneficial or harmful organisms. We have found that in roots of *Arabidopsis thaliana* the formation of terpene defense metabolites is largely

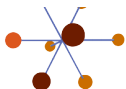
restricted to specific cell types such as the epidermis, the cortex, or the vascular tissue. For example, a recently identified terpene synthase enzyme producing the C20-diterpene rhizathalene, is exclusively expressed in the root stele. We are investigating to what extent the formation of this terpene is limited to the vascular tissue or whether other root tissues have maintained the metabolic and regulatory program to produce the compound. To this end, we will swap the expression of the terpene synthase gene TPS08 encoding rhizathalene synthase between root tissues by fusing TPS08 to different promoters with activity in the root epidermis and cortex. Several constructs were generated with C-terminal fusions of TPS08 to a myc-tag or GFP to allow for immuno- and in vivo detection of the terpene synthase protein. We are currently in the process of transferring these constructs into *Arabidopsis* via *Agrobacterium*-mediated transformation. Transgenic plants will be tested on the expression of TPS08 and formation of rhizathalene in the different cell types and may be subjected to bioassays with root herbivores.

**Mentor: Dorothea Tholl**

**Chase T. Noel***Molecular epidemiology of shiga toxin producing E.coli in cattle reared in pasture production systems*

The main purpose of my research project was to determine the duration and transmission of VTEC, mainly *E. coli* O157:H7, in cows and their calves in a pasture production model. The research was important to the cattle and farming industry because we looked into how and where cows transmit and pass on virulent bacterial genes. The genes of interest were *stx1* and *stx2* which are genes that produce shiga toxin from *E. coli* O157:H7. This toxin does not harm the cows when present in their guts, however, it causes many problems in the human gut. This toxin is known to cause serious gastrointestinal illness and can even cause death in infants or elderly people. The research protocol involved collecting samples from the Shenandoah Valley Agricultural Research and Extension Center, which is controlled and ran by , and then analyzing those sample for the virulent genes. This was done by isolating the DNA from the fecal samples, using a PCR system and specific primers to select for the virulent genes of interest, and then using gel electrophoresis to visualize the bands coding for the specific genes. This lab work was mainly done over the summer of 2011. The research showed that there was incidence of shiga toxin producing *E. coli* in many of the cows in the research facility and that it appeared most mothers did pass on their virulent genes to their calves. Further research is needed on this subject.

**Mentor: Monica Ponder**

**ABSTRACTS****Charlotte L. Oliver*****First Report of Bacterial Spot of Peony Caused by Xanthomonas sp. in the U.S.***

Peony (*Paeonia* sp.) cultivars with symptoms of diffuse, circular leaf spots and blight were submitted to the Plant Disease Clinic in 2008 and 2009. Bacterial streaming from spots was observed by phase-contrast microscopy. The bacterium was identified as a Xanthomonad by phenotypic and biochemical tests and as *Xanthomonas axonopodis* pv. *carotae* by fatty acid analysis. Four cultivars of peony were used for Koch's postulates. Excised young leaves were disinfested and inoculated with a bacterial suspension and incubated in a moist chamber. Leaf spots were observed on 'Karl Rosenfield' leaves in 18 to 20 days. Bacterial streaming was observed from leaf spots and the bacterium was identified as a Xanthomonad by phenotypic and biochemical tests. Four loci of the bacterial isolates recovered in 2008 and 2009 and bacteria recovered during the Koch's postulate experiment were amplified using a multilocus sequence typing approach (Young et al., 2008) and sequenced. Sequences representing the four loci of the bacterial isolates were aligned to confirm similarity. Using sequences in the Plant Associated and Environmental Microbes Database (PAMDB.org), a phylogenetic tree was constructed that placed the bacterium in the *Xanthomonas hortorum* group. To our knowledge, this is the first report of *Xanthomonas hortorum* on peony in the United States.

**Mentor: Elizabeth Bush, Mary Ann Hansen**

**Caitlin Parker*****The Actively-Caring approach to reduce bullying among elementary school students: Using positive consequences to support incompatible alternative behavior.***

Can bullying behavior be reduced by promoting alternative, incompatible behaviors? This field study evaluated 491 students, grades 2-6, from a single Northern Virginia elementary school. The prosocial intervention, Actively Caring for People (AC4P), used an incentive-reward contingency to encourage "actively caring" behavior (i.e.,

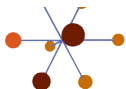
discretionary prosocial behavior). Specifically, students were instructed to observe the prosocial behavior of their classmates and document the kind acts in the form of stories. Daily, the teacher chose three stories to read to the class, and selected one of them for special recognition. The two students from that story – the prosocial performer and observer – were then given green wristbands to wear for the day. Students self-reported their prosocial and bullying behaviors each week for six consecutive weeks. Observed bullying was reduced by 50.4% from Baseline to Week 6 (at program conclusion). The marked reduction in bullying behavior suggests the needs for large-scale application of this positive and proactive AC4P approach.

**Mentor: E. Scott Geller**

**Sarah M. Pelham*****Translating Research on Consumer Issues for the Public***

Through this study under the supervision of Celia Hayhoe, I create and review publications for the Virginia Extension website ([www.ext.vt.edu](http://www.ext.vt.edu)). These publications cover family resource management topics such as scams, identity theft, estate planning, and other consumer-related issues. These publications allow Virginians access to information about many legal aspects of these consumer issues, and it provides them with steps to take in the case that they must deal these conditions. In order to write the publications, I research to find qualified and scholarly sources, especially utilizing information found on government websites, other extension websites, and other specific organization's websites. When examining my sources, I ensure that the ones I utilize are unbiased and reliable. I pull from these sources, and synthesize the information for a targeted audience. This process makes my research unique, because I am using the works of scholars and translating it into material that the general public can comprehend. Besides publications on consumer issues, I am also writing a publication about how to distinguish between biased and unbiased sources. Following the term of this research, I will have completed a designated number of these publications and have them submitted for review.

**Mentor: Celia Hayhoe**

**ABSTRACTS****Erin S. Pennington*****Hope Among Undergraduate Students: Influences of Academic Level, Self-Esteem, and Self-Compassion***

This study focuses on hope beliefs pertaining to goal agency and pathways, views of self-compassion in the face of adversity, and evaluative self-esteem in college students (Neff, 2003; Snyder, 1993). One hundred eighty-five undergraduate students completed online questionnaires on their self-based views for extra credit. Results indicated that individuals with greater self-compassion reported a lower belief in personal ability to achieve goal success. Individuals with greater self-esteem reported a greater belief in personal ability to achieve goals and indicated belief in having more approaches for attaining desired goals. These results contribute to current knowledge about the benefits of hope and associations of hope with personal adjustment and success in college settings (i.e., Snyder et al., 2002).

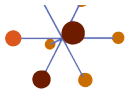
**Mentor: Julie Dunsmore, Jordan Booker**

**Ryan L. Powles*****High Throughput Microarray Study of the Effect of Heme-mediated Regulation of Per2 Stability for Gene Expression.***

Results from our group show that proteasome-mediated degradation of the human core circadian transcription factor period 2 (hPer2) results from heme, a metabolite that exhibits rhythmic oscillations and is crucial for maintaining cellular homeostasis. In vivo studies show heme levels directly control hPer2 stability and by extension influence the period length and phase-shifting properties of the biological clock in synchronized cells. Using microarray-based gene expression analysis of Aml-12 mouse liver cells to study the effects of hPer2 reduction either by hemin-treatment or by silencing using siPer2, we identify novel pathways regulated by hPer2 using Pathway Analysis based on Gene Ontology (GO) classifications and the biomedical literature. Multiple transport and metabolic genes are found to be differentially modulated by heme-mediated hPer2 degradation and siPer2 treatment. Many of these genes are overexpressed in cancer cells (i.e., Mgea5 and Krt20) or belong to the cell cycle and death signaling pathways (i.e., Tgfb2 and PDK1). Results reveal multiple cell-wide pathways that act together in controlling normal cell physiology and, when de-regulated, lead to proliferative disorders.

**Mentor: Carla V. Finkielstein, Roderick Jensen**





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## ABSTRACTS

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### **Eric H. Reasor**

#### *The Influence of Fall Fertilization Programs on the Traffic Tolerance and Recovery and Sprigged Bermudagrass Varieties*

Bermudagrass (*Cynodon* spp.) is a popular athletic field turfgrass in the transition zone due to its rapid growth rate and high density. However, the ability of a newly sprigged bermudagrass field to withstand traffic in the first season of establishment can be challenging due to the onset of winter dormancy in mid-fall of a typical American football schedule. This research evaluated first season traffic tolerance of three vegetatively-established bermudagrasses (Patriot, Riviera, and an experimental ecotype called Wayland) to varying levels of fall Nitrogen fertilization. Plots of 9.3 m<sup>2</sup> were established at the Turfgrass Research Center on 16 June 2010. All plots received N at a level of 49 kg ha<sup>-1</sup> per month for June and July and were mowed three times weekly at 2.5 cm. A traffic simulator was applied weekly to one half of the bermudagrass plots to simulate the traffic of three football games per week for August 30 through November 7. Monthly N fertilization treatments were applied perpendicular to traffic and non-trafficked treatments. The fertilization treatments were 49 kg ha<sup>-1</sup> monthly from June through August, June through September, and June through October. Patriot bermudagrass established fastest and was the most traffic tolerant, followed by Riviera. Nitrogen fertilization treatments that continued into the months of September and October extended bermudagrass color and improved turf density of all cultivars until killing frost in mid-October.

**Mentor: Michael Goatley, Jr., Shawn Askew, David McCall, Whitnee Askew**

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### **Heather F. Reeves**

#### *Increased consumption of fat and simple carbohydrates results in obese prepubertal pigs of similar body weight*

A translational swine model of childhood obesity was used to determine the interaction between dietary energy source, body adiposity, and oral glucose tolerance (OGT). Prepubertal female pigs weaned at 21 d of age were fed control (C), refined sugar (S), fat (F), and sugar-fat (HE) diets in a 2x2 factorial arrangement for 16 wk. Calories from fat were 8.9% for C, 5.6% for S, 35.5% for F and 32.3% for HE. Calories from sugar were 36.0% for

S and 30.7% for HE. Adding fat or sugar increased ( $P < 0.003$ ) calorie intake indicating impaired ability to regulate energy consumption. Daily fat accretion and percent body fat were higher ( $P < 0.03$ ) in all treatments compared to C, and in HE compared to S. Ultrasound backfat depth was associated ( $P < 0.001$ ) positively with percent body fat ( $r^2 = 0.909$ ) and negatively with percent body protein ( $r^2 = -0.912$ ). Fat and sugar intake raised ( $P < 0.02$ ) plasma cholesterol levels. Glucose area under the curve (AUC) in response to OGT at 14 wk was higher ( $P < 0.03$ ) in F (+15%) and HE (+32%) pigs compared to C. Glucose AUC from S-fed pigs was not different ( $P = 0.2$ ) from C- or F-fed pigs. Adding sugar, fat, or their combination to diets increased ( $P < 0.008$ ) glucose AUC. Inclusion of fat in the diet reduced ( $P < 0.001$ ) insulin AUC during OGT, while sugar had no effect. Inclusion of fat and refined sugar in pig diets increases body adiposity and impairs glucose homeostasis.

**Mentor: Jeffery Escobar**

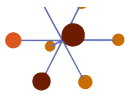
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### **Jordan C. Richard**

#### *Climate-growth relationships for a long-lived riverine fish species across southeastern USA*

Understanding the relationships between organism growth and climate variability is of increasing research interest. We evaluated climate-growth relationships for a long-lived fish species (the freshwater drum, *Aplodinotus grunniens*) in 8 riverine and 4 reservoir environments across the southeastern USA. Fish otoliths were used to estimate incremental annual growth rates of each fish and tree-ring techniques were used to standardize annual growth for age prior to correlation with various climate metrics. To date, we have measured inter-annual growth increments from a total of 126 individual fish, ranging in age from 4-32 years. We are currently correlating age-standardized annual growth indices to various annual climate variables including temperature, growing degree days, precipitation, global climate indices (e.g., El-Nino) and a variety of hydrologic metrics. In particular, we are interested in evaluating whether climate-growth relationships shift in predictable ways across hydrologic habitat types. These results are important for understanding how climate variability and climate





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## ABSTRACTS

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change might affect the functional biology and reproductive fitness of long-lived riverine fishes.

**Mentor: Andrew Rypel**

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### **Amber L. Rosser**

*The Effects that beta-guanidinopropionic acid has on the phosphagen system and how that affects muscle metabolism and pH.*

The 'RN allele' possessed by some pigs encodes for a mutated AMP-activated protein kinase (AMPK). AMPK is considered the fuel gauge of the cell, essentially acting to increase energy producing biochemical pathways in the cell and down-regulating those pathways responsible for consuming energy. Thus, under conditions where energy utilization by muscle tissue is quite pronounced, AMPK binds AMP and becomes activated by phosphorylation. Once activated, AMPK alters glucose uptake, glycolysis and oxidative phosphorylation, along with a myriad of other pathways critical for producing energy. In the case of this "gain in function" mutation in RN pigs, mutated AMPK is always attempting to generate extra energy (ATP) in the muscle because the AMP binding portion of the enzyme is altered in such a manner that it 'thinks' it is bound to AMP. As a result, RN pig muscle has greater phosphocreatine (PCr) than those lacking the mutation. Given that PCr is used to buffer ATP levels during the onset of non-steady state energy metabolism, it follows that the adenine nucleotide pool may remain high enough to allow for continued glycolysis prior to muscle fatigue. In this case, the extended glycolysis would increase the H<sup>+</sup> concentration through two means, additional glycolytic flux and increased ATP hydrolysis. Therefore, our objective is to define and model the biochemistry responsible for the extended muscle energy metabolism observed in pigs possessing the AMPK mutation. Specifically, we aim to determine how changes in the phosphagen system of RN pigs affect muscle metabolism and pH. The *hypothesis* for the proposed research is that pigs possessing the RN mutation have the capacity to buffer the total adenine nucleotide pool (ATP, ADP, AMP) for greater periods of time during anaerobic metabolism and this results in a lower ultimate muscle pH at fatigue.

**Mentor: David Gerrard**

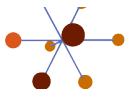
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### **Jaime K. Rutter**

*Pigments can be used as fecal markers in cattle*

The type and amount of forage consumed affects the efficiency of grazing systems and needs quantification. One method utilizes plant wax markers to estimate intake and diet selection. This method requires linking fecal samples to individual animals, which is challenging on pasture. Our study goal was to determine if feeding pigments could uniquely identify fecal samples. Six colors were tested: FD&C Blue 1, Blue 2, Red 40, Yellow 5, and Yellow 6, and titanium dioxide (white). Each color was mixed with calf feed at 2 levels: 11 and 22 g/kg. Two steers were assigned to each color-level combination. Steers were fed their diets from day 0 to 7. Fecal samples were collected on days -5, -2, 2, 3, 6, 9, 10 and 13. Color was evaluated objectively (colorimetry) and subjectively (visual assessment by 2 observers). Objective measures were lightness (L\*), redness to greenness (a\*), and yellowness to blueness (b\*). Fecal color attributes changed over time (P < 0.01), with color delineation after 2 days of feeding. Blue 1 and white had higher, and Blue 2, lower L\* values than the rest of the treatments (P < 0.001). Blue 1 and Red 40 had lower a\* values (P < 0.001), and Yellow 5 had lower b\* values (P < 0.001), than the other treatments. Over time, Blue 1 was both more visible (P < 0.001) and intense (P < 0.01), to the observers, while Blue 2 only was more intense (P < 0.05). In conclusion, Blue 1 and Blue 2 were best to link individuals to their fecal sample when fed for at least 2 days.

**Mentor: Ronald Lewis**

**ABSTRACTS****Amir-Arsalan Safaai-Jazi*****The Role of Est1 Interacting Proteins in Fission Yeast Germination***

Telomeres serve a vital function in preserving the genomic integrity of eukaryotic cells by protecting the vital coding sequences of genes on chromosomes through the addition of repeated sequences of non-coding telomeric DNA. *Schizosaccharomyces pombe*, commonly known as fission yeast, is a valuable model organism in the study of telomere structure and maintenance because of its many shared characteristics with human cells. Telomerase, a specialized reverse transcription enzyme, is responsible for the production and maintenance of telomeres. The telomerase holoenzyme complex is composed of the catalytic subunit protein Trt1, the protein Est1 and the RNA subunit template TER11. Upon a homozygous deletion of the telomere binding protein Taz1, telomere length has been cited to be up to ten fold longer in length<sup>2</sup>. The Est1 subunit is required for in vivo telomerase activity. In addition to its in vivo telomerase function a novel role for Est1 in germination has surfaced. After sporulation of a taz1-d/d *S. pombe* strain with est1D spores will not germinate<sup>2</sup>. To elucidate Est1's role in germination, we performed a two-hybrid screen in which we identified five genes that are upregulated during meiosis, but do not function during meiosis. We reasoned that these proteins could function after meiosis during spore germination in the same pathway as Est1. To test this we disrupted the five candidate genes in a taz1-d/d *S. pombe* strain to determine if spore germination is affected.

**Mentor: Virginia Zakian**

**Lawrence K. Satterfield*****Dendritic Amphiphiles against Staphylococcus aureus and Methicillin-Resistant S. aureus (MRSA)***

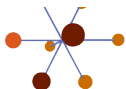
Lipid-based antimicrobial compounds have shown potential as an alternative to more conventional antibiotics as the incidence of antibiotic resistance in many clinically significant pathogens, has continued to increase. Dendritic amphiphiles (DAs), developed in the Gandour lab have broad spectrum antimicrobial activity in vitro. This research explored methods to determine the

mechanism of action of DAs against *Staphylococcus aureus* and clinical isolates of methicillin-resistant *S. aureus* (MRSA). The rationale of our approach was based on the hypothesis that the target of DA action is the cell membrane. To assess whether DA exposure leads to membrane leakage, cells were exposed to DAs at concentrations fourfold higher than their MIC. Membrane integrity was measured using the LIVE/DEAD® BacLight™ bacterial viability assay. Leakage of 260nm absorbing material was also measured as evidence of leakage of cell contents. In the leakage assay, the absorbance values for cells treated with both DAs and low concentration CTAB did not increase significantly over time and were lower than those of cells treated with high concentrations of CTAB. In the LIVE/DEAD® bacterial viability assay similar results were observed, as the cells treated with DAs or low concentration CTAB remained green while those treated with higher concentration CTAB appeared red with no green cells. These preliminary results indicate that the DAs may be acting on the cell membranes without causing dramatic cell lysis.

**Mentor: Richard Gandour, Joseph Falkinham**

**Caitlin S. Shaw, Brad Copenhaver, Mary Elmer, Robert Gafney*****Vulnerability in Rural Virginia***

Households and local governments were all affected by the 2008 economic downturn. As the economy recovers from the Great Recession, there are increasing calls for fiscal austerity at federal and state levels. As the federal and state governments address their own budget shortfalls, transfers to local governments and households living in these localities are likely to suffer. Some of the poorest households in the most vulnerable areas are likely to feel the adverse impacts of this austerity, and governments in these areas must be prepared for the worse. In an effort to understand who in Virginia is most affected by this crisis, we need to understand where federal and state transfers to localities and individuals are distributed and in what amount. This information gives insight on which counties and regions of Virginia are most vulnerable to fiscal belt-tightening. Our hypothesis is that the most vulnerable households are clustered in vulnerable communities and these communities tend to be the most rural areas of

**ABSTRACTS**

Virginia. To understand where transfers are distributed among Virginia communities and households we analyzed two sources of data. We began with the Bureau of Economic Analysis' Regional Economic account data, which measure transfers to households. These include health, social, unemployment, etc. We used data from Virginia localities to measure the degree to which the local government depends on federal and state transfers for revenues. This provides information on go

**Mentor: Jeff Alwang**

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**Lauren M. Sheehan**

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*In ovo feeding of Carnosine*

For my spring/summer research project, I will be examining the effects of nutrient supplements on the expression of intestinal amino acid and peptide transporters in embryonic chicks (layers and broilers). A preliminary study will be done to analyze the expression of amino acid and PepT1 transporters in organ cultures at different embryonic days. My main research project, based on my initial study, will be supplying amino acids and peptides to the organ cultures. There are numerous amino acid transporters located in the brush border membrane of the small intestine that transport neutral, acidic and basic amino acids. Between embryonic day 18 (e18) and day of hatch, the chick begins its consumption of the amniotic fluid which contains essential dietary nutrients.

Prior research has determined that supplying additional nutrients to the embryonic chick by injecting nutrients into the amniotic fluid, the process called in ovo feeding, does enhance intestinal development and posthatch growth. For the first part of my research, I will isolate the small intestine from embryonic chicks (e18 to day of hatch) and culture these tissues in vitro. I will then determine the optimal culture conditions for maintaining survival of the tissue sections. Second, my main research project will be supplying specific nutrients (amino acids and peptides) to culture medium to examine their effects on the expression of PepT1 and several amino acid transporters. A protocol consisting of RNA extraction, cDNA synthesis and RT-PCR will be followed. My hypothesis is that additional nutrients supplied to intestinal segments will act as substrates for the

amino acids and/or PepT1 transporter thus significantly increasing gene expression levels.

**Mentor: Eric Wong**

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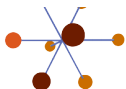
**Jamee F. Short**

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*A Film Analysis: Applying Concepts of the Cognitive Dissonance Theory to American History X*

Cognitive Dissonance Theory, developed by Leon Festinger, is known as the distressing mental state brought on by inconsistency between a person's two beliefs or a belief and an action. Through the theory, there is a desire for individuals to seek consistency among their cognitions. In the 1998 film, American History X, the main character, Derek, a Nazi skinhead, experiences numerous situations in which he is faced with discomfort that causes him to question the values he once defended so strongly. Cognitive dissonance theory is arranged into four groups: selective exposure, post decision dissonance, minimal justification, and hypocrisy induction. I will analyze three scenes from the film which highlight three of the four groups. Through detailed analysis of Derek's specific scenes in which he experienced hardships, it will help to explain how the theory helped him to overcome his pain and in turn, become a reformed individual.

**Mentor: Beth Waggenpack**

**ABSTRACTS****Catherine A. Sims*****Insecticide Resistance of *Anopheles gambiae* and *Culex quinquefasciatus* to Permethrin and Dichlorodiphenyltrichloroethane (DDT) in Southern Ghana***

Insecticides play a major role in controlling the spread of malaria, however this means of protection is being threatened by the development of resistance to commonly used insecticides. Pyrethroids are often times used in vector control projects due to lower-toxicity to humans, high insecticidal potency at low dosages and rapid knockdown (KD) effects. *Anopheles gambiae* is a major vector of malaria in West Africa and has shown pyrethroid resistance in several countries. The other species tested, *Cx. quinquefasciatus*, is not a vector of malaria but acts as a nuisance to local populations. In this study *An. gambiae* and *Cx. quinquefasciatus* larvae were collected from five separate locations in the Central and Western regions of Ghana: Amamoma, Duakor, North OLA, Okyereko and Sekondi. The first three locations are found in Cape Coast. Adult mosquitoes were exposed to permethrin (0.75%) and DDT (4%) according to WHO protocol. Knockdown, mortality and resistance were all recorded over a 24-hour period. Seven experiments were conducted under WHO protocol resulting in 4.65% average mortality for *An. gambiae* and 80.53% for *Cx. quinquefasciatus*. Recording and understanding resistance is essential to vector control and preventing the spread of disease.

**Mentor: Daniel Wubah, B.A. Mensah**

**Karandeep Singh*****Hepatic Tissue Engineering***

A critical challenge in hepatic tissue engineering is the design of polymeric scaffolds that can maintain liver cell phenotype. Our focus is to design biopolymer based scaffolds to assemble three-dimensional liver models. Such scaffolds must not only enhance cellular adhesion but must also elicit liver-specific functions over an extended period of time. Towards this goal, the Rajagopalan group has designed detachable polyelectrolyte multilayers based upon chitosan and hyaluronic acid. The liver models we assemble are comprised of primary hepatocytes, an intermediate polyelectrolyte multilayer, liver sinusoidal

endothelial cells and Kupffer cells. The physical properties of the polyelectrolyte multilayers are optimized for hepatic cells. Liver-specific properties such as albumin secretion, and urea production are being measured.

**Mentor: Padma Rajagopalan**

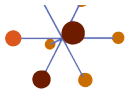
**Kathryn M. Slaughter*****Whorl position and shape may not reliably predict cattle behavior***

Cattle with aggressive temperaments produce dangerous working conditions. Position and shape of facial whorls have been reported to be predictive of behavior. High positions and non-round shapes were associated with more aggressive behavior. Our objective was to test if such a relationship held true within a calm working environment. In each of 3 years, 40 Angus-cross heifers were handled monthly over 3 consecutive months. Once in the chute, heifer behavior was scored 1 (docile) to 6 (aggressive) by 3 observers. Facial photos were taken for whorl scoring, and a blood sample was collected for cortisol analysis. Whorl location was described as above (high), between (middle) or below (low) the eyes, and whorl shape as round or non-round. Serum cortisol was determined by radioimmunoassay. Among heifers, 4% had high position and 19% had non-round whorls. Whorl shape ( $P = 0.03$ ), but not position ( $P = 0.1$ ), was indicative of behavior score. However, heifers with

round ( $2.2 \pm 0.1$  score), rather than non-round ( $1.9 \pm 0.1$  score), whorls were the more aggressive. Similarly, whorl shape ( $P = 0.02$ ), but not position ( $P = 0.4$ ), defined differences in serum cortisol. Heifers with round whorls had higher cortisol concentrations ( $48.1 \pm 2.2$  ng/mL) than those with non-round whorls ( $42.9 \pm 2.1$  ng/mL). Relationships between whorl measures did not coincide with published reports, suggesting this approach may not reliably describe temperament across varied work environments.

**Mentor: Ron Lewis**





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## ABSTRACTS

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### **Clarissa Stiles**

#### *Couples as a User Group in Mutually Reflective Technologies*

We set out to find out who couples are, what it means to design for couples as a user group, and what effects technology can have on couplehood. The main motivation for this work is that couple-design has not had been explored seriously enough. We want not only to portray an accurate picture of who couples are, but to transmit their needs in a manner that can help inform good design. Through our review of the literature, we have found the majority of the technologies designed for couples fell under the categories we identified as “abstracted presence” and “intimacy”. As a result, we were able to identify a new design space, “mutual reflection”, which warrants exploration. We employed Designed-Based Research methods and used a low-fidelity prototype journal that was distributed to ten couples to explore the new design space. The next iteration of our design will be informed by interviews from the ten couples that have been analyzed using Grounded Theory. We hope to present a picture of couples as we understand them in the context of mutually reflective technologies.

**Mentor: Steve Harrison**

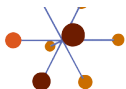
### **Mary Swanton, Amanda Craft, Carissa Ervine, Valerie Phelps**

#### *Children's Effortful Control in Preschool Settings*

Effortful control involves children’s ability to suppress one behavior in order to display a more appropriate behavior (Kochanska, Murray & Harla, 2000). Higher levels of effortful control have been related to better developmental outcomes (Kochanska & Knaack, 2003). Past research has examined how maternal behavior, such as high levels of power assertion, may not support optimal child effortful control (Kochanska et al., 2000). However, childcare teachers become important to child socialization as children spend increased levels of time in childcare settings. Therefore, we examined how the structure provided in a childcare setting was associated with children’s effortful control. Children were observed completing a crayon delay task in a room close to their classroom. Experimenters gave children a brand new box of crayons and asked them to wait to color. Children were told not to touch the crayons, and the delay lasted for four minutes. Effortful control was scored from the children’s latency to first touch the crayons and amount of time spent touching the crayons during the delay period. The level of structure was observed at each of the childcare centers. Each center was rated for the level of structure based on the amount of rules and directions in the classroom and how strictly they were enforced. We are in the process of coding our data, and we expect to find that children in centers with increased levels of structure will display lower levels of effortful control.

**Mentor: Cynthia Smith**





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## ABSTRACTS

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### Ashley R. Taylor

#### *Using Accelerometers to Quantitatively Assess Infant General Movements for Early Detection and Intervention of Cerebral Palsy*

According to the National Institute of Health, nearly 800,000 persons suffer from Cerebral Palsy in the United States alone. There is currently no cure for Cerebral Palsy; however, many helpful therapies may be utilized to lessen the traumatic impact of this disease when it is identified early enough in a child's life. Current diagnostic techniques are qualitative, expensive, and subjective, and sometimes not accurate until a child reaches 4-5 years of age. By using micro-electromechanical accelerometers, the general movements of infants can be quantified. Analyzing these quantified movements can accurately predict many neurological dysfunctions, including Cerebral Palsy. Small accelerometers will be placed on the limbs of infants, in order to assess the specific frequencies and phase displacement of an infant's general movements. Signal processing with high-speed data acquisition allows observation of high-frequency motions, possibly undetected by the human eye. This research is focused on the development of sensors for use in a clinical setting to diagnose Cerebral Palsy in infants. While this sensor development is not a cure for Cerebral Palsy, it is potentially a step towards early diagnosis, which could ultimately lead to better lives for persons with Cerebral Palsy.

**Mentor: Al Wicks and Andre Muelenaer**

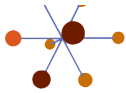
### Karishma V. Tolani

#### *High throughput screening fluorescence polarization binding assay for search of inhibitors of siderophore A from *Aspergillus fumigatus**

*Aspergillus fumigatus* (*A. fumigatus*) is a human pathogenic saprotrophic fungus that is typically found in soil and decaying organic matter and that affects immunocompromised individuals, such as patients in intensive care units, organ transplant recipients, and AIDS victims. Siderophore A (Akarish9fSidA) is a flavin-dependent monooxygenase that catalyzes hydroxylation of ornithine in *A. fumigatus* biosynthesis and is an essential component in viability and pathogenesis of the fungus, and, therefore, is a validated drug target against *A. fumigatus* infections. In this study, we use fluorescence polarization binding assay in high throughput screening to look for potential inhibitors of AfSidA. Previously, in our group we developed a chromophore with ADP and TAMRA moieties. This chromophore was shown to bind in the active site of the enzyme somewhere between NADPH and substrate binding subsites with the  $K_d$  value of  $2.1 \pm 0.2 \mu\text{M}$ , and proved to be a great tool in the studies of N-hydroxylating monooxygenases. Here, we will present the results of screening of the library consisting of 2200 small molecule compounds. The inhibition profiles of identified positive hits will be compared with current AfSidA potent inhibitors reported in the literature.

1. Qi, J., Oppenheimer, M., and Sobrado, P. (2011) Fluorescence polarization binding assay for *Aspergillus fumigatus* virulence factor UDP-galactopyranose mutase, *Enzyme Res.* 2011.

**Mentor: Pablo Sobrado**



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**ABSTRACTS**

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**Aimee M. Tolbert**

*Exploring relationships between parental involvement and child fears*

Previous research has shown that overcontrolling parenting strategies are related to a child's fear levels (Ollendick & Horsch, 2007). The purpose of this study was to further understand the relationship between maternal over involvement, mother's own phobic anxiety, child's fear level and specific phobias. It was predicted that within a sample of children with specific phobias, mothers displaying more invasive involvement, higher levels of their own phobic anxiety and higher fear levels in the children would all contribute to the severity of a child's specific phobia. The child's specific phobia was assessed using the Anxiety Disorder Interview Schedule (ADIS). Over involvement was coded in an interaction task with the child and questionnaires were used to measure child's fear level and mother's phobic anxiety, respectively. Using simultaneous regression, the overall model was significant ( $R^2 = .108$ ,  $p = .014$ ). More specifically, mother overinvolvement significantly predicted child's specific phobia severity score ( $\beta = .207$ ,  $p = .039$ ). While there were trends in the expected direction, child's overall fear level ( $\beta = .184$ ,  $p = .066$ ) and mother's own phobic anxiety ( $\beta = .166$ ,  $p = .097$ ) were not significant predictors. The clinical implications of these findings and future directions will be discussed.

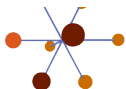
**Mentor: Thomas Ollendick, Marie Fraire**

**Kartikeya Tyagi**

*Developing Sand Injection Prototype for Studying Sand Ingestion in Jet Engines*

The purpose of this undergraduate research project was to design a prototype for injecting sand microparticles in a test section with air flow to investigate sand ingestion in jet engines. The research was conducted by Kartikeya Tyagi and Missy Hughes. Sand ingestion poses huge problems in jet engines as it can cause serious damage to the components of the engine. To study the effects, sand microparticles of size less than 40 microns are to be used. The problem was that the microparticles formed lumps in the existing sand injection device due to particle interactions. A uniform sand injection was not being achieved. Thus the aim of the project was to design a device that solved this problem so that sand ingestion can be studied effectively. The design process from ME 2024 course (Introduction to Design and Economics) was used to come up with an effective design. We conducted literature search to understand the behavior of sand microparticles and found that some form of mechanical agitation is required to prevent the particles from lumping. From our understanding, we came up with the needs and specifications. We then came up with possible design concepts and evaluated the best design against the specifications. After that a prototype was built to investigate whether the design is feasible. We found that the final design mixed air and particles uniformly and lumping was minimized to a great extent with some design problems like size, remote use and reusability.

**Mentor: Srinath V. Ekkad**



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**ABSTRACTS**

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**Elish M. Votruba***Dead Things*

The purpose of writing this piece was to study the impact surrounding the death of a loved one. I focused the piece on a mother and her two small children who are struggling through the recent and sudden death of the father. There is a bluebird dying in the backyard, and the children beg their mother to heal it. The mother instead waits for the children to fall asleep before throwing the bird away. The bluebird was symbolic for happiness and hope. The bird's struggle and inevitable death parallels the struggling of the mother. The ending shows how this woman, a dying bluebird herself, chose to protect her children's innocence just a little longer. By telling this lie, the children are left blissfully unaware of the pain and loss that they will inevitably have to endure throughout their lives. For them, they still have hope, although the mother knows better.

**Mentor: Robin Allnut**

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**Shelby E. Ward***"The Circus Animals' Desertion": A look at the failure of language and stability of heart*

Later on in William Butler Yeats' life, and very close to the end of his career he writes, "The Circus Animals' Desertion," which looks back on younger times in his life and earlier works he created. He is very aware of his age, his gift as an artist, and how they are related. In "The Circus Animals' Desertion," Yeats says that he is "a broken man" but the pieces are filled with this regretful and forced acceptance of his age, while simultaneously lamenting some of his earlier works which are shadowed now with disappointment in himself as an artist. One of the questions that this paper addresses is what does that failure of language do to a writer overtime to his life and his body of work? By looking at this poem in context with some of his earlier poems, it shows Yeats still has his heart, and even though it does not yearn so forcefully as it once had there is a sense that it still holds the ability for a type of potential in himself and in language.

**Mentor: Tom Gardner**

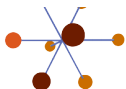
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**Stephanie M. Welch***Calibration of Real-Time Water Quality Monitoring Instruments*

The purpose of the LEWAS lab is to identify land use change effects on water quality and quantity real time and to conduct water sustainability research and education. In order for the LEWAS Lab to deliver accurate water quality data, precise calibration of its water quality and quantity monitoring instruments is necessary. The purpose of this poster will be to demonstrate the theory, maintenance, and calibration of the HydroLab MS5 water quality sonde and SonTek Argonaut SW Acoustic Doppler Current Profiler (ADCP). The MS-5 measures six parameters: pH, temperature, conductivity, dissolved oxygen (DO), turbidity, and oxidation reduction potential (ORP). The SonTek Argonaut SW uses acoustic Doppler technology to determine stream discharge. Accurate discharge

measurements are important for accurate mass flux measurements. A simple regression model was developed relating index velocity ( $V_i$ , m/s) from the ADCP and discharge measurements ( $Q$ , m<sup>3</sup>/s) from the velocity area method. This model was found to have a P value of 0.0003 for  $V_i$ , <0.0001 for  $Q$ , and a P total of <0.0001. An R<sup>2</sup> value of 0.915 was found. According to the linear regression performed on JMP Software, there is a high correlation between the index velocity and discharge.

**Mentor: Vinod Lohani, Mark Roger**



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**ABSTRACTS**

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**Hope H. Wentzel**

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***Potential for secondary production differences in redback salamander (*Plethodon cinereus*) populations inhabiting north- versus south-facing slopes***

In mountain ecosystems, thermal conditions can vary dramatically due to landscape aspect, and

differences in vegetative production. However, the effect of landscape aspect on consumer production is poorly understood, especially along Appalachian clines where salamander diversity is remarkably high. This research seeks to examine potential differences in secondary production (i.e., biomass accumulated by a population over time) between salamander populations on north- versus south-facing slopes in Jefferson National Forest, Virginia. We hypothesize that salamander production will be significantly higher on south-facing slopes due to enhanced thermal energy, however our sites are on the southern terminus of the species geographic range, thus the true ecological pattern could also be opposite from predicted. Work has begun on age estimations of redback salamanders using skeletochronology from previously collected/preserved specimens near our study sites. Preliminary analyses suggest thin-sections of vertebrae and femurs provide the best age estimations based on clarity and consistency of growth rings. This spring, we will initiate field studies to estimate age-specific redback salamander biomass and production on north-versus south-facing slopes. Our study has implications for predicting how salamander diversity and production will react to climate change at relevant spatial scales.

**Mentor: Andrew Rypel**

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**Jennifer R. Williams**

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***Binary Toxicity of In-Hive Pesticides to Honey Bees***

Pollinators are a critical component to the plant health and production of agricultural landscapes. Pesticide residue exposures to honey bees, *Apis mellifera* L., are implicated in the decline of these pollinators and their ecosystem services. Pesticide residue surveys in honey bee colonies across North America reveal multiple pesticides and their metabolites. However, knowledge of the toxicological consequences of these

pesticide residues, alone and in combination, to honey bee colonies and their decline is limited. Herein, we provide a toxicological profile of common in-hive pesticides found in honey bee colonies, the toxicological interaction of these in-hive pesticide mixtures to honey bees, and the metabolic activities of honey bees towards these in-hive pesticides. This information will serve as a prerequisite for the characterization of pesticide residue consequences to honey bee colonies, the improvement of honey bee colony health, and the reduction of honey bee colony losses in Virginia.

**Mentor: Troy Anderson, Rick Fell**

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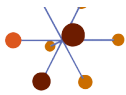
**Dana K. Williams**

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***The Free Clinic of the New River Valley and Equality in Access to Medical Care***

The inequalities in access to medical care in the U.S. are numerous and effect the entire population, either by influencing the costs of medical care or by putting some at risk for poorer health outcomes. In order to learn about these issues firsthand in a workplace environment, I volunteered at the Free Clinic of the New River Valley located in Christiansburg, Virginia. Through participatory observation, a patient survey, and an interview with the director of the clinic, I collected data which I compared to published literature on inequalities in access to medical care. My results showed several barriers to care including transportation, phone communication, language, and prescription costs. The clinic provides critically needed services to people of the area, but my results show that it does not have the capacity to care for all of those in need.

**Mentor: Anita Puckett**



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## ABSTRACTS

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### **John Yamine**

#### *Children's Effortful Control and Home Chaos Moderate the Relationship Between Maternal Negativity and Child Behavior Problems*

Are there factors that make some children follow a healthy developmental path despite their exposure to harsh parental negativity? To answer this, we investigated the role of child effortful control (EC) and household chaos, in moderating the relationship between maternal negativity (MN) and child behavioral/emotional (BE) problems. We hypothesized that child EC would moderate the association between MN and child BE problems, whereby a stronger link would be found for children with poorer EC. This moderating effect would be strongest in chaotic homes. We employed a multi-method approach with a sample of 154 mothers of children aged 3-7 years. MN was measured by observation of parent-child interactions. Home chaos as well as child EC and BE problems were based on mothers' report (Questionnaires: Chaos, CBQ and SDQ). Results from a hierarchical regression were consistent with the hypothesis for the EC factor score and its subscales. We found the strongest (standardized effect sizes: 0.4-0.6) associations between MN and child BE problems for children low in EC and also living in chaotic homes. Even in chaotic homes, the same link was modest if the child had high levels of EC. These results could not be attributed to SES. The findings support theories regarding child self-regulatory modulation of the potential effects of harsh parenting on BE problems. Furthermore, they suggest that these regulatory processes are particularly important when the home itself is chaotic.

**Mentor: Kirby Deater-Deckard, Nan Chen**

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### **Nicholas Schaum**

#### *The role of SNPs in miRNAs on aging*

Aging is the root cause of the majority of deaths in the developed world, and with an aging population, developing therapies to treat age related damage and disease is critical. The delay of onset of any major age related disease would have significant health, financial, and productivity benefits, and it is likely that treating the damages of aging directly would be much more efficient than treating

diseases individually. To that end, this project is designed to gain a better understanding of the mechanisms of aging in the hope that potential targets for treatment can be identified. Specifically, the affects of inherited variation in the form of SNPs on miRNA function in cases of exceptional longevity are investigated, as well as relating the associated changes to the molecular processes of aging. In preparation, updated lists of SNPs in and near pre-miRNAs have been created with dbSNP135 and mirBase18. Both computational and manual methods with the use of the UCSC Genome Browser were used. Several centenarian studies have been identified, and comparisons are underway.

**Mentor: Rick Jensen**

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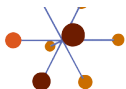
### **Inga Gehrke**

#### *Making investment decisions in health care with real options*

My research aimed at identifying a suitable model for the evaluation of investment decisions using real options theory and testing its applicability to a health care investment decision. Real options extends a common net present value analysis by incorporating uncertainty of future developments and assigning value to more flexible investments. After a literature research on available models and choosing to work with recombining binomial lattices, I conducted interviews with hospital decision makers to understand their investment options. With this input, I modeled a hypothetical investment in imaging technology and derived a decision. My study found that real options can be applied to technology decisions when formulating the investment in an option-setting, while its practicability for major strategic investments including non-monetary values is limited.

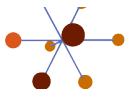
**Mentor: Chris Wernz**



**Index****Student Name, Majors, and Abstract Page #  
Sorted by Primary Mentor Department****Aerospace & Ocean Engineering**

22 Jacob Bean Aerospace Engineering

**Agricultural Economics**52 Caitlin S. Shaw Agricultural & Applied Economics  
\*Brad Copenhaver Applied Economic Management & Agriculture  
Political Science  
\*Mary Elmer Applied Economic Management & Agriculture  
\*Robert Gafney Applied Economic Management & Agriculture**Animal & Poultry Sciences**50 Heather F. Reeves Animal & Poultry Sciences  
51 Amber L. Rosser Animal & Poultry Sciences  
51 Jaime K. Rutter Animal & Poultry Sciences  
53 Lauren M. Sheehan Animal & Poultry Sciences  
54 Kathryn M. Slaughter Animal & Poultry Sciences  
44 Gabriel A. Mastromano Animal & Poultry Sciences**Apparel, Housing, & Resource Management**23 Morgan F. Bradley Apparel Design & Merchandising Management  
42 Julia E. Legard AHRM (APDM)  
48 Sarah M. Pelham Philosophy  
56 Amanda Tewksbury**Biochemistry**25 Sun J. Byun Biochemistry  
36 Andrew B. Hall Biological Sciences  
56 Karishma V. Tolani Chemistry B.S.**Biological Sciences**22 Kelly A. Barford Biochemistry  
24 Sabrina Brooks Biological Sciences  
24 Julia L. Button Biological Sciences  
26 Andrea Carlini Biological Sciences  
39 Elizabeth R. Hepner Biological Sciences  
\*Sarah Baldwin Biological Sciences  
\*Jeronimo Silva Wildlife Science  
40 Alyssa C. Hosey Biological Sciences  
43 Ashley C. Love Biological Sciences  
49 Ryan L. Powles Biological Sciences  
60 Nicholas D. Schaum Biological Sciences  
54 Catherine A. Sims Biological Sciences  
35 Kristin J. Haas Biological Sciences  
47 Timothy V. Nguyen Biological Sciences**Biological Systems Engineering**44 David R. Marshall Biology  
33 Kelly Ferguson Biological Systems Engineering  
46 David M. McCann Biological Systems Engineering  
45 Karan Mathur Biochemistry

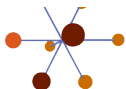


---

**Index**

---

25	Alexander Callo	Biology
<b>Chemical Engineering</b>		
54	Karandeep Singh	Biological Sciences
<b>Chemistry</b>		
36	Kevin P. Hannon	Chemistry
52	Lawrence K. Satterfield	Biology
22	Winston R. Becker	Engineering Science & Mechanics
21	Devon S. Baker	Materials Science & Engineering
<b>Civil &amp; Environmental Engineering</b>		
26	Chelsea Carey	Biological Sciences
34	Emily L. Gibson	Environmental Science
<b>Communication</b>		
53	Jamee F. Short	Communication
<b>Computer Science</b>		
55	Clarissa Stiles	Psychology
<b>Crop &amp; Soil Environmental Sciences</b>		
50	Eric H. Reasor	Crop & Soil Environmental Sciences
<b>Education</b>		
35	Justin O. Graves	Sociology
<b>Electrical &amp; Computer Engineering</b>		
32	Stephen D. Epstein	Engineering Science & Mechanics
<b>Engineering Education</b>		
58	Stephanie Welch	Civil & Environmental Engineering
<b>Engineering Science &amp; Mechanics</b>		
38	Evan G. Hemingway	Engineering Science & Mechanics
<b>English</b>		
58	Elisha M. Votruba	English
58	Shelby E. Ward	English
46	Thomas R. Minogue	English
37	Alyssa C. Hart	English
30	Rachel A. Dinkins	English
<b>Entomology</b>		
59	Jennifer R. Williams	Biological Sciences
<b>Fisheries &amp; Wildlife Conservation</b>		
26	Zoe R. Carroll	Wildlife Science
27	Stephanie Y. Chin	Biology
23	Morgan E. Brizendine	Fisheries Science
31	David V. Drewett	Wildlife Science
38	Laura B. Heironimus	Fisheries Sciences
50	Jordan Richard	Fisheries Science
59	Hope H. Wentzel	Animal & Poultry Science



---

**Index**

---

**Food Science & Technology**

47 Chase T. Noel Food Science &amp; Technology

**Foreign Languages & Literature**

42 Rachel M. Kirk Political Science

**Fralin Life Science Institute, Biochemistry**

42 Christian D. Laourdakis Biochemistry

**History**

20 Tyler D. Abt History

20 Nathan H. Abernethy History

20 Alexander E. Adkins History

24 Dylan H. Brooks History

28 Daniel M. Crowder History

40 Alison M. Hight History

**Human Development**34 Jane C. Giesken Human Development  
\*Raven N. Griffin Communication

37 Christian L. Hawthorne Psychology

40 Britanee D. Hodson Human Development

45 Emily B. McCall Human Development

55 Mary Swanton Human Development

\*Amanda Craft Human Development

\*Carissa Ervine Human Development

\*Valerie Phelps Human Development

**Human Nutrition Foods & Exercise**

22 Josh N. Bostic HNFE: Science Option

**Industrial & Systems Engineering**

36 Kyle A. Haring Biological Sciences

60 Inga Gehrke Industrial &amp; Systems Engineering

**Johns Hopkins. Center for the Study of American Government**

29 Joshua M. Deal History

**Mathematics, VBI**

30 Kristen A. Deger Mathematics

**Mechanical Engineering**

27 Meghan A. Canter Biological Sciences

32 Madison R. Farruggia Mechanical Engineering

38 David A. Henry Mechanical Engineering

\*Sebastien Corner Mechanical Engineering

46 Logan Miller Engineering Science &amp; Mechanics

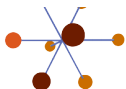
56 Ashley R. Taylor Mechanical Engineering

57 Kartikeya Tyagi Mechanical Engineering

**Political Science**

31 Victoria A. Dounoucos Political Science

34 Andrew F Gann, Jr. Political Science

**Index**

33	Robert A. Fekete	Political Science
41	Victoria S. James	International Studies
20	Ausan Y. Al-Eryani	Political Science
48	Charlotte L. Oliver	General Biology

**Molecular Biology**

52	Amir-Arsalan Safaai-Jazi	Biological Sciences
----	--------------------------	---------------------

**Psychology**

28	Derek A. Cornwell	Psychology
28	Allison B. Darling	Psychology
29	Victoria L. Deal	Psychology
30	William P. Diehl	Psychology
32	Rebekah F. Duke	Psychology
41	Kelly I. Kim	Psychology
43	Spencer C. Li	Biological Sciences
44	Zachary L. Mannes	Psychology
48	Caitlin Parker	Psychology
49	Erin S. Pennington	Psychology
57	Aimee M. Tolbert	Psychology
60	John Yamine	Psychology

**Religion & Culture**

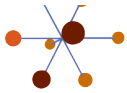
59	Dana K. Williams	Human Nutrition, Foods & Exercise
----	------------------	-----------------------------------

**Sociology**

21	Lamont Banks	Computer Science
	*Janani Ravi	English
	*Erica Wood	International Studies

**Urban Affairs & Planning**

39	Erica L. Hetzel	Environmental Policy & Planning
----	-----------------	---------------------------------

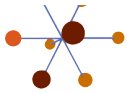


**Notes**

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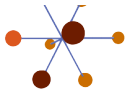




**Notes**

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