2018 Boland Undergraduate Research Symposium

Showcasing Student Research & Creative Activities

Tuesday, March 27, 2018

Millennium Centre, Johnson City
8:00 a.m. - 5:00 p.m.

Sponsored by:

ETSU Honors College
ETSU Office of Research & Sponsored Programs
Dr. Jay Boland Honors Endowment
ETSU Ronald E. McNair Program
The ETSU Honors College welcomes you to the 2018 Boland Undergraduate Research Symposium

The Symposium is dedicated to the memory of Dr. Jay Boland, Director of the ETSU University Honors Scholars Program from 2002-2006. The ETSU Undergraduate Student Research Symposium is an event in which ETSU undergraduate students can present their research in an informal, non-competitive environment. The Symposium includes oral presentations in various discipline-themed sessions. Performance artists (music; reading; theater) are particularly encouraged to participate. Visual artists may display their work in the Millennium Centre lobby. ETSU Undergraduate students are encouraged to participate in the Symposium by presenting their research for work-in-progress projects or completed projects. By participating in this event, students will be able to exchange ideas with peers and gain valuable feedback. The Symposium has experienced a steadily increasing number of participants and increasing diversity of disciplines represented. The first Symposium had only 25 participants but has since grown to over 90 participants, with noteworthy discipline expansion into the performing arts and an enhanced role for display artists.

Presentation Sessions

- Arts and Humanities
- Social Sciences, Education, and Business
- Science and Technology
- Student Artworks

ETSU Steering Committee

- Students: Ginny Allen, Heidi Armstrong, Mitchel Ball, Laura Carr, Alex Day, Dustin Gilmer, Elizabeth Hale, David Hamilton, Amber Howard, Rachel Johnson, Holden Kales, Kristina Lim, Ragan McNair, Ashley Sexton, Aamir Shaikh, Zak Simpson, Erin Teaster
- Faculty & Staff: Jennifer Adler, Assistant Director, Roan Scholars Leadership Program
- Bonnie Bailey, Secretary, Honors College
- Deanna Bryant, Office Coordinator, Honors College
- Patrick Cronin, Director of Arts Outreach
- Dr. Dinah Deford, Academic Coordinator, McNair Program
- Daniel Hedden, Director, Presidential Honors Community Service Scholars Program, Honors College
- Dr. Michelle Hurley, Assistant Director, McNair Program
- Dr. Richard Ignace, Director, Undergraduate Research, Honors College
- Claire Jones, Information Research Technician, Honors College
- Susan Kellogg, Marketing Manager, Honors College
- Dr. Karen Kornweibel, Director, University & Midway Programs, Honors College
- Dr. Scott Koterbay, Director, Fine & Performing Arts Program, Honors College
- Karla Leybold, Recruitment & Assessment Manager, Honors College
- Dr. Judy Slagle, Dean, Honors College
- Dr. Mick Whitelaw, Director, Honors-In-Discipline Program, Honors College
- Dr. Richard Ignace, Assistant Director, McNair Program
- Dr. Michelle Hurley, Assistant Director, McNair Program
- Dr. Richard Ignace, Director, Undergraduate Research, Honors College
- Claire Jones, Information Research Technician, Honors College
- Susan Kellogg, Marketing Manager, Honors College
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- Dr. Scott Koterbay, Director, Fine & Performing Arts Program, Honors College
- Karla Leybold, Recruitment & Assessment Manager, Honors College
- Dr. Judy Slagle, Dean, Honors College
- Dr. Mick Whitelaw, Director, Honors-In-Discipline Program, Honors College

ORSPA assists members of the ETSU community in securing and managing external funding for their research, creative, instructional, and service activities. ORSPA is responsible for ensuring that ETSU proposals, sponsored agreements and other research related agreements conform to sponsor guidelines and are compliant with all federal, state, and ETSU policies and regulations.

Education and training in areas including finding funding opportunities, grant writing, proposal development, and general sponsored programs administration is available to faculty, staff, and students through workshops, guest lectureships, and one-on-one consultation.

Ronald E. McNair Post-Baccalaureate Achievement Program

Named in honor of Ronald E. McNair, an African-American astronaut killed in the Challenger Space Shuttle explosion in 1986, this program is one of the United States Department of Education’s special initiatives known as TRIO that serve and assist disadvantaged students in their educational endeavors.

The goal of the McNair program is to increase the attainment of graduate degrees, particularly PhDs by students from underrepresented segments of society such as students who are from low-income and first generation backgrounds or students who are ethnic minorities and underrepresented in graduate programs. This program prepares participants for doctoral studies through involvement in research and other scholarly activities.
### 2018 Boland Undergraduate Symposium Event Overview

**MILLENIUM CENTRE LOBBY**

- **7:55 am** - Welcome - Dr. Richard Ignace, Director, Undergraduate Research & Creative Activities
- **8:00 am - 5:00 pm** - Student Art Display
  - Richard Brown (Graphic Design) - Untitled - Wayne Dyer, advisor
  - Amber Howard (Studio Art) - Hold Me Down - Vanessa Mayoraz, advisor
  - Jonathan Jennings (Graphic Design) - Untitled 2018, David Dixon, advisor
  - Ben Riley and Benjamin Siffring (Digital Media-Game Design) - Procedural Environment & Gore-Based Combat System in a 3D Game Engine - Todd Emma, advisor
  - Carrie Williams (Graphic Design) - The Negative Contributions of Factory Farming - Scott Contreras-Koterbay, advisor

**ETSU BLUEGRASS BAND** - Noon - 12:45 pm

**LUNCH** - Noon - 12:45 pm - Room 220

**PERFORMANCE** - 12:45 pm - 1:30 pm - Room 130

- A series of short performance skits.

**AUDITORIUM 137A Morning Session**

<table>
<thead>
<tr>
<th>Student/Presentation Title</th>
<th>Department</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>Ciara Russell: The Depiction of Bacchus in the Renaissance</td>
<td>Art History</td>
<td>Vida Hull</td>
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<tr>
<td>Emily Ford: While Everyone Else is Sleeping: Challenges of Team-Based Qualitative Research</td>
<td>Communication Studies</td>
<td>Kelly Dorgan</td>
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<tr>
<td>Braden Trent: Cultural Competency in the Army: Training for Peace with Tomorrow's Societies</td>
<td>Communication Studies</td>
<td>Laughton Messmer</td>
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<td>Timothy Payne: Appalachian English in Lee Smith's &quot;Saving Grace&quot;</td>
<td>English</td>
<td>Martha Michieka</td>
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<td>Amber Rookstool: Portrayal of Women in Hanan al-Shaykh's Fairy Tales</td>
<td>English</td>
<td>Martha Michieka</td>
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<td>Laura Carr: Cleopatra: Perceptions and Reality</td>
<td>History</td>
<td>Joel Van Amberg</td>
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**AUDITORIUM 137B Morning Session**

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<thead>
<tr>
<th>Student/Presentation Title</th>
<th>Department</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>Shelby Maiden: The Commodity Club: Commodity Fetishism in Modern Art and Tattoos</td>
<td>Graphic Design</td>
<td>Andrew Scott Ross</td>
</tr>
<tr>
<td>Abeer Chaudhary: Finely Tuned: A Study of Music Performance-Related Injuries, Traditional Medical Therapy, and Alternative Treatments</td>
<td>Health Science</td>
<td>Mary Dave Blackman</td>
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<tr>
<td>Chelsi Crockett: Scroll in Color: How Colors in Instagram Pictures Illicit Emotions in Users</td>
<td>Media &amp; Communication</td>
<td>Susan Waters</td>
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<tr>
<td>Time</td>
<td>Student/Presentation Title</td>
<td>Department</td>
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| 8:05 am | Ryan Lynch  
*High Returns & Low Volatility: The Case for Mid-Cap Stocks* | Accounting and Finance          | William Trainor |
| 8:30 am | Annie Malcolm  
*Profile of Volatile Fatty Acids (VFA) in the Feces of Normal and Overweight College Students* | Nutrition                        | William A. Clark |
| 8:45 am | Brian Dempsey  
*Small Mammal Mortality Caused by Roadside Containers on a Heavily Trafficked Forest Service Road in the Cherokee National Forest* | Biology                           | Thomas Laughlin |
| 9:25 am | Anthony Adams, Emily Hearl, and David Hopland  
*Baltimore Police Department’s Crime Data* | Computational Applied Mathematics | Christina Lewis |
| 9:40 am - 9:55 am | **Break** | | |
| 9:55 am | J.P. Mitra  
*Optimizing Construction Estimation: A Case Study of the ETSU Football Stadium and Fine Arts Center* | Construction Engineering Technology | Jeremy Ross |
| 10:20 am | Olivia Rowell  
*ETSU Dental Hygiene Students’ Interest in and Perceived Preparedness for Nontraditional or Expanded Roles after Graduation* | Dental Hygiene | Deborah Dotson |
| 10:45 am | Eva Price  
*Subjective Visual Vertical and Otolith Compensation: Evaluating Off-Axis Rotation Stimulus in Healthy Controls* | Exercise Science | Courtney Hall |
| 11:10 am | Grayson White  
*The Effects of Simulated Spaceflight Conditions on the Mucin Lining of the Mouse Uterine Tube* | Health Sciences | Allan Forsman |
| 11:25 am | Sydney Keith  
*Experimental Protocol for the Production of Bacterial-Expressed CTRP3* | Health Sciences | Jonathan Peterson |
| 11:40 am | Austin Miller  
*Synthesis of Oxadiazole Derivatives as non-β-lactam β-lactamase inhibitors* | Chemistry | Abbas Shilabin |
| 8:05 am | Kimberly Dinsmore  
*Factor and Cluster Analysis of the Learning Orientation Questionnaire* | Nursing | Loyd Glenn |
| 8:30 am | Kristina Lim  
*Protective Anti-Inflammatory Role of Extracellular Ubiquitin in Myocardial Ischemia/Reperfusion Injury* | Biology and Chemistry          | Krishna Singh |
| 8:55 am | Macon Magna  
*A Study of the H-alpha Emission Line Shape in Beta Lyrae* | Physics | Richard Deehan |
| 9:20 am | Zakery Simpson  
*The Enduring Effects of Adolescent Alcohol Exposure on Glutamate Levels in the Prefrontal Cortex* | Physics | Gerald Deehan |
| 9:35 am | Denise Harness  
*A Comparison of Unsupervised Methods for DNA Microarray Leukemia Data* | Mathematics | Jeff Knisley |
| 10:15 am | Kayla Davis  
*Experiencing Illness in the Western Biomedical World: A Push for More Comprehensive Health Care in America* | Anthropology | Melissa Schrift |
| 10:40 am | Brittnay Stubbs  
*Psychosocial Well-Being and Efforts to Quit Smoking in Pregnant Women of Appalachia* | Nutrition | Andrea Clements |
| 11:05 am | Caroline Denning  
*An Actor’s Approach to the Role of Trisha in “Five Women Wearing the Same Dress,” Written by Alan Ball* | Theatre | Bobby Funk |
### Room 130 Morning Session

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<tr>
<th>Time</th>
<th>Student/Presentation Title</th>
<th>Department</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>8:05 am</td>
<td>Jessica Chambers</td>
<td>Psychology</td>
<td>Diana Morelen</td>
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<td></td>
<td><em>Internalizing Symptoms Associated with Emotional Abuse: An Examination of Religious Social Support as a Moderating Variable</em></td>
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<td>8:30 am</td>
<td>Emily Clark</td>
<td>Psychology</td>
<td>Stacey Williams</td>
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<td><em>PTSD Symptoms and Military-Specific Stigma in United States Veterans</em></td>
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<tr>
<td>8:55 am</td>
<td>Elizabeth Wiederholt</td>
<td>Psychology</td>
<td>Jill Stinson</td>
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<td></td>
<td><em>Sex Offenders, the Tennessee Public Registry, and Suicidality</em></td>
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<td>9:20 am</td>
<td>Autumn Glass</td>
<td>Psychology and Sociology</td>
<td>Ginette Blackhart</td>
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<td></td>
<td><em>The Impact of Maladaptive Social Media Use on Mental Well-Being</em></td>
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<tr>
<td>9:40 am</td>
<td>Break</td>
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<tr>
<td>10:00 am</td>
<td>Elizabeth Hale</td>
<td>Psychology</td>
<td>Myra Elder</td>
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<td></td>
<td><em>The Relationship of Military Service Branch to Rates of Post-traumatic Stress Disorder and Substance Use Disorder Among Appalachian Veterans</em></td>
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<td>10:15 am</td>
<td>Hal Hughes</td>
<td>Communication Studies</td>
<td>Kelly Dorgan</td>
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<td><em>Capturing the Rise and Ruin of the Researcher: Uses of the Research Notebook</em></td>
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<td>10:30 am</td>
<td>Mykala Reynolds</td>
<td>Communication Studies</td>
<td>Kelly Dorgan</td>
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<td><em>Qualitative Research: Giving Stories the Justice They Are Due</em></td>
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<td>10:45 am</td>
<td>Angel Lunceford and Alicia Basini</td>
<td>Microbiology</td>
<td>James Fox</td>
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<td></td>
<td><em>The Importance of Baseline Analysis for Establishing Replicable, Evidence-Based Behavior Analytic Interventions: Implications for Researchers and Practitioners</em></td>
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<td>11:00 am</td>
<td>Rebekah Pearson</td>
<td>Sport Management</td>
<td>Natalie Smith</td>
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<td><em>A Shift from Baseball? What Influences the Perception of the National Pastime?</em></td>
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<td>11:15 am</td>
<td>Rebekah Cisney</td>
<td>Communication Studies</td>
<td>Amber Kinser</td>
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<td><em>Coffee Shops and Third Space: Communicative Practices In-Between</em></td>
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### Auditorium 137A Afternoon Session

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<thead>
<tr>
<th>Time</th>
<th>Student/Presentation Title</th>
<th>Department</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>1:30 pm</td>
<td>Samuel Sevigny</td>
<td>Communication Studies</td>
<td>Wesley Buerkle</td>
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<td></td>
<td><em>The Implications of Student-Faculty Interaction and Mentorship in Higher Education</em></td>
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<tr>
<td>1:55 pm</td>
<td>Anna Pfeiffer</td>
<td>English</td>
<td>Daniel Westover</td>
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<td></td>
<td><em>The Medicine of Middle Earth: An Examination of the Parallels Between World War Medicine and Tolkien’s “The Lord of the Rings”</em></td>
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<tr>
<td>2:20 pm</td>
<td>Rebekah Voiles (Tusculum College)</td>
<td>English</td>
<td>Clay Matthews</td>
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<td><em>Greed and Parrots: Examining the Emergence of Pirate Tropes in “Treasure Island”</em></td>
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<tr>
<td>2:35 pm</td>
<td>Emily Williams</td>
<td>English</td>
<td>Mark Baumgartner</td>
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<td><em>Fairy-Tale Convention and Post-Modernism in Aimee Bender’s “O’ff”: A Critical Introduction</em></td>
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<tr>
<td>2:50 pm</td>
<td>Zoe Hester</td>
<td>English</td>
<td>Michael Cody</td>
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<td><em>Story-telling through Movement: An Analysis of the Connections between Literature and Dance</em></td>
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<td>3:30 pm</td>
<td>Caitlin Tripp</td>
<td>History</td>
<td>Henry Antkiewicz</td>
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<td><em>The American Impact on the Evolution of the Japanese Women’s Rights Movement</em></td>
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<tr>
<td>3:55 pm</td>
<td>Allison Smith, Emily Ford, Gavin Skelton and Anthony Walls</td>
<td>Human Services</td>
<td>Joyce Duncan</td>
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<td></td>
<td><em>The Power of Performing Arts</em></td>
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<tr>
<td>4:10 pm</td>
<td>Rebecca Erin Hockman</td>
<td>Journalism</td>
<td>Susan Waters</td>
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<td></td>
<td><em>Media’s Perception of Veterans</em></td>
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<td>4:35 pm</td>
<td>Sarah Caroline King</td>
<td>Music Performance</td>
<td>Alison Deadman</td>
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<td><em>What You Hear is What You Hear: Preparing an Arrangement of Steve Reich’s “Nagoya Marimbas” for Flute Choir</em></td>
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### Auditorium 137B Afternoon Session
#### Social Sciences

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<tr>
<th>Time</th>
<th>Student/Presentation Title</th>
<th>Department</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>1:30 pm</td>
<td>Sydney Ross</td>
<td>Anthropology</td>
<td>Melissa Schrift</td>
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<td></td>
<td><em>The Social Justice System of Cuba</em></td>
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<tr>
<td>1:45 pm</td>
<td>Megan Gauck</td>
<td>Anthropology and Biology</td>
<td>Lindsey King</td>
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<td><em>Killed a Bird Today: The Evolution and Hybridization of the Yoruba Tricksters</em></td>
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<tr>
<td>2:10 pm</td>
<td>Alexandra Drumwright</td>
<td>Communication Studies</td>
<td>Wesley Buerkle</td>
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<td><em>A Traditionally Modern “Princess”: Gender Stereotypes in Disney’s “Moana”</em></td>
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<td>2:35 pm</td>
<td>Ragen McNair</td>
<td>Criminal Justice</td>
<td>Erica Hutton</td>
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<td><em>(Tusculum College)</em></td>
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<td><em>Siblicide: Patterns and Typologies of Offenders.</em></td>
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<td>2:50 pm</td>
<td>Holden Guy</td>
<td>Political Science</td>
<td>Hadii Manudu</td>
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<td><em>Diffusion of 100% Tobacco-Free Policies in Higher Education Institutions in Tennessee</em></td>
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<td>3:05 pm</td>
<td>Kaelyn Bishop</td>
<td>Psychology</td>
<td>Andrea Clements</td>
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<td></td>
<td><em>Perception and Acceptability of Violent Acts in Video Games, Movies, and News Media</em></td>
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<td>3:20 pm</td>
<td>Rose Stephens</td>
<td>Psychology</td>
<td>Andrea Clements</td>
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<td></td>
<td><em>The Prevalence of Adverse Childhood Experiences Among Women with Postpartum Psychotic Symptoms</em></td>
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### Room 120 Afternoon Session
#### Science & Technology

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<th>Time</th>
<th>Student/Presentation Title</th>
<th>Department</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>1:30 pm</td>
<td>Ashley Cameron</td>
<td>Chemistry</td>
<td>Michael Kruppa</td>
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<td><em>Identification of Farnesol in Extracellular Vesicles of Candida albicans</em></td>
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<tr>
<td>1:55 pm</td>
<td>Anastasia Kuvayskays</td>
<td>Chemistry</td>
<td>Aleksey Vasiliev</td>
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<td><em>Modification of Silica Surface</em></td>
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<tr>
<td>2:10 pm</td>
<td>Patrick South</td>
<td>Chemistry</td>
<td>Abbas Shilabin</td>
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<td><em>Discovery of a Novel Inhibitory Compound Produced by Soil Bacterium Rhodococcus MTM9W5.2</em></td>
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<td>2:35 pm</td>
<td>Tristan Onek</td>
<td>Computer and Information Science</td>
<td>Brian Bennett</td>
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<td><em>Developing an Open Source Financial Data Collector for Trade Algorithm and Artificial Intelligence Testing</em></td>
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<td>2:50 pm</td>
<td>Walter Dominic Espejo</td>
<td>Chemistry and Biology</td>
<td>Hua Mei</td>
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<td><em>Developing and Validating Cancer-Specific Carbon Quantum Dots</em></td>
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<td>3:15 pm - 3:30 pm</td>
<td>Break</td>
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<tr>
<td>3:30 pm</td>
<td>Luke Hiester</td>
<td>Computing</td>
<td>Jay Jarman</td>
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<td><em>File Fragment Classification with Neural Networks</em></td>
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<tr>
<td>3:55 pm</td>
<td>Noah Carter</td>
<td>Computing</td>
<td>Asad Hoque</td>
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<td><em>Building Data Visualization Applications to Facilitate Vehicular Networking Research</em></td>
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<td>4:20 pm</td>
<td>Sarah Zimmer</td>
<td>Biology</td>
<td>Ranjan Chakraborty</td>
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<td></td>
<td><em>Identification of the HmuPSTUV Operon and its role in Heme Utilization in Rhizobia Leguminosarum ATCC 14479</em></td>
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</table>
1:30 pm Brianna McCoy  
**Health Science**  
Analysis of Prerequisite Anatomy Requirements  
Advisor: Beatrice Owens

1:45 pm Joe Oliver  
**Health Science**  
Inhibition of Focal Adhesion Kinase Promotes Olfactory Stem Cell Self-Renewal and Neuroregeneration Via Ciliary Neurotrophic Factor  
Advisor: Jis Cuihong

2:00 pm Devin Narwani  
**Health Science**  
Can Alcaligenes Be a New Treatment for Staphylococcus Species?  
Advisor: Sean Fox

2:25 pm Lindsey Wright  
**Mathematics**  
Classifying Textual Fast Food Restaurant Reviews Quantitatively using Text Mining and Supervised Machine Learning Algorithms  
Advisor: Michele Joyner

3:15 pm Dustin Gilmer  
**Physics**  
Factors that Influence Success in Research Funding Quantitative Study  
Advisor: Richard Ignace

3:45 pm Evin McQuistion  
**Theatre**  
A Director’s Approach to Annie Baker's “The Aliens”  
Advisor: Bobby Funk

4:10 pm Drake Parrott  
**Interdisciplinary Studies**  
Experiments in Creation  
Advisor: Cara Harker

4:25 pm Olivia Ellis  
**Graphic Design**  
The Exploitation of Microaggressions  
Advisor: David Dixon

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**2018 Boland Undergraduate Symposium**

**Presentation Abstracts**

**Student/Year/Location/Time**  
**Major:** Advisor  
**Presentation Title**

**ANTHONY ADAMS, Senior**  
*Computational Applied Mathematics: Nicole Lewis*  
**AUD 137B/9:25 am**  
**Baltimore Police Department’s Crime Data**  
We analyzed the Baltimore Police Department’s Crime Data for the American Statistical Association competition. The Crime data included the Calls to 911, Locations of Crimes, CCTV Locations, and the number of Officers in each District. We did comparisons on trends of 911 calls and where crimes are taking place along with how each has changed and how it could change in the future.

**Kaelyn Bishop, Junior**  
*Psychology: Andrea Clements*  
**AUD 137B/3:05 pm**  
**Perception and Acceptability of Violent Acts in Video Games, Movies, and News Media**  
Violent video games are often cited as being a factor that increases antisocial behavior. If other media is perceived as being more violent, would the blame still be placed on video games? This study investigates the perceived violence of the same act presented through different media: video games, news, and movies. It also looks at which violent acts are considered acceptable for different ESRB ratings, namely teen and mature.

**Alicia Blasini, Junior, (co-presenter)**  
*Microbiology: James Fox*  
**ROOM 130/10:45 am**  
**The Importance of Baseline Analysis for Establishing Replicable, Evidence-Based Behavior Analytic Interventions: Implications for Researchers and Practitioners**  
Single subject studies analyze individual behavior identifying how interventions change behavior. Critical to this analysis are repeated baseline measures to identify behavior function and evaluate intervention effects. Forty studies treating child behavior problems between 1997 and 2015 were analyzed. Average student age was 8 years. Most studies used simple frequency counts (47%) of behavior. Baseline observation averaged 42 minutes and 7.4 observations. Most studies (81%) reported no systematic analysis of baseline stability, making it difficult to establish evidence-based effective interventions.

**Richard Brown, Senior**  
*Graphic Design: Wayne Dyer*  
**MILLENNIUM LOBBY**  
**Untitled**  
This piece was created in studio photography class for a “one light” project. It explores the balance of the human form.

**Ashley Cameron, Senior**  
*Chemistry: Michael Kruppa*  
**ROOM 120/1:30 pm**  
**Identification of Farnesol in Extracellular Vesicles of Candida Albicans**  
Candidiasis is one of the top causes of nosocomial infections in the United States most commonly caused by Candida albicans. Farnesol is a lipid soluble molecule previously found in cell-free media of C. albicans and was determined to be a quorum-sensing molecule of this yeast. Extracellular vesicles were isolated using ultrafiltration and concentrated EV samples were assessed using 1H NMR. Peaks matching those of pure trans,trans-farnesol show that farnesol is likely transported via extracellular vesicles.
Coffee Shops and Third Space: Communicative Practices In-Between

Coffee Shops and Third Space: Communicative Practices In-Between

Although Cleopatra is best known for her reported beauty, her influence went well beyond her outward appearance in Egyptian and Roman society. People often forget that she was a powerful Egyptian leader and had important involvement in events leading up to the emergence of the Roman Empire. This presentation will address the perceptions of Cleopatra and compare that with the reality of this historical figure and the mechanisms that she used to maintain power and influence in a male-dominated society.

Building Data Visualization Applications to Facilitate Vehicular Networking Research

A web app was developed which allows any internet-connected device to remotely monitor a roadway intersection via HTTP. A mapping simulation was enhanced to allow researchers to retroactively track the location and the ad-hoc connectivity of vehicle clusters. A performance analysis was conducted on the utilized network partitioning algorithm. This work was completed under and for the utility of ETSU’s Vehicular Networking Lab. It can serve as a basis for further research in the field of wireless automobile connectivity.

An Examination of Religious Social Support as a Moderating Variable: Internalizing Symptoms Associated with Emotional Abuse

This study aims to investigate if religious social support in childhood will moderate the impact of negative outcomes associated with emotional abuse. Further, this study will examine whether and how gender and ethnicity impact this relationship. The sample includes undergraduate students attending East Tennessee State University (ETSU). Participants completed an online survey that asked about childhood experiences (e.g., emotional abuse, emotional socialization, religious social support) as well as current mental health (e.g., anxiety, depression).

An Actor’s Approach to the Role of Trisha in “Five Women Wearing the Same Dress”

Written by Alan Ball

Since Instagram began in the U.S., no studies on color and Instagram have been conducted. My desire is to see how/if these two subjects correlate. More specifically, how/if specific color undertones, such as red, green, etc. will elicit a different response in the Instagram user when viewing the various colored content.
Kimberly Dinsmore, Senior
Nursing: Loyd Glenn
Factor and Cluster Analysis of the Learning Orientation Questionnaire
The purpose was to determine the factor structure of the 25-item Learning Orientation Questionnaire used to customize teaching programs. By manual evaluation of inter-item correlations and automated varimax rotation in the R language, four factors were extracted: progress of learning, desire to learn, determination of intended goals, and learning achievement, accounting for 49 percent of the total variance. Previous findings were partially confirmed and our results show that questionnaire could be reduced in size while maintaining a strong measurement quality.

Alexandra Drumwright, Senior
Communication Studies: Wesley Buerkle
A Traditionally Modern "Princess": Gender Stereotypes in Disney’s Moana
Movies— even those designed for young children— consistently portray and reinforce idealized social norms, attitudes, and behaviors according to the roles that dominant social culture deems appropriate (Rome). This thesis will investigate whether Disney’s newest “princess” Moana continues the production company’s tendency to portray male and females in stereotypical gender roles, or if it takes a step in a positive feminist direction. This research will look at the Disney movie, Moana, through a variety of feminist perspective lenses.

Olivia Ellis, Senior
Graphic Design: David Dixon
The Exploitation of Micro-aggressions
The Exploitation of Micro-aggressions documents my personal experiences as an African American, the history of Blaxploitation, and the current racial climate in the United States. This is also a documentation of my BFA Senior Exhibition of the same title.

Walter Dominic Espejo, Senior
Chemistry/Biology: Hua Mei
Developing and Validating Cancer-Specific Carbon Quantum Dots
A carbon dot is a small, fluorescent carbon nanoparticle that generally ranges from 3-10 nanometers. Developing and validating carbon quantum dots with specific photo-bleaching resistance; however, carbon quantum dots have a lower quantum yield and better biocompatibility. In this research, carbon quantum dots were synthesized using ammonium citrate as the carbon source and folic acid as the targeting agent. These carbon dots were validated through characterization methods such as IR, UV-vis, and proton NMR spectroscopies.

Emily Ford, Senior
Communication Studies: Kelly Dorgan
While Everyone Else is Sleeping: Challenges of Team-Based Qualitative Research
In this presentation, I draw on a reflective approach in reviewing three challenges potentially faced by researchers when conducting team-based qualitative research. First, I address the obstacles that can possibly arise from the interpersonal dynamics of the research team. Second, I speak about the impact time constraints have on a research team. Third, I discuss the challenges of being the first author on a qualitative research project. Last, I identify lessons I have learned from my qualitative research experience.

Emily Ford, Senior, (co-presenter)
Human Services: Joyce Duncan
The Power of Performing Arts
The undergraduate research featured a study of POP Arts, an all-inclusive program for students with and without disabilities. POP Arts emphasizes implementation of theatrical skills to improve behavioral, physical, and mental capabilities. Throughout the study, the researchers observed skill development through the eyes of volunteers and parents of participants in the program. Findings indicated that parents and volunteers noted enormous differences in socialization and skill acquisition and emphasized the importance of adding or continuing arts programs in the school system.

Megan Gauck, Senior
Anthropology and Biology: Lindsey King
Killed a Bird Today: The Evolution and Hybridization of the Yoruba Tricksters
The trickster archetype appears cross culturally, recognizable by their cunning exploits and gray morality. Ajapa and Eshu both possess these characteristics, though they fulfill different functions in the Yoruba belief system. Upon the introduction of Regla de Ocha (or Santeria) to Cuba following the transatlantic slave trade, a new figure emerges, known for his tricks and adaptability. This study investigates the unique role Eleggua plays in Cuban life and how he represents a hybridized form of his African trickster predecessors.

Dustin Gilmer, Senior
Physics: Richard Ignace
Factors that Influence Success in Research Funding Quantitative Study
Productivity in the field of research is often difficult to quantify, but is important to answer due to the amount of funds that enter the field. To answer this question quantitative data such as hours spent and funding returned, as well as publication data can be used to find some measure of productivity.

Holden Guy, Junior
Political Science: Hadji Marmudu
Diffusion of 100% Tobacco-Free Policies in Higher Education Institutions in Tennessee
As 99 percent of smokers start by age 26, higher educational institutions (HEIs) must take roles in reducing tobacco use among students with school tobacco policies (STPs). This study has five phases: a literature review, 10 focus group discussions, development of an STP rating system, assessment of the 71 STPs at non-profit HEIs in Tennessee, and publishing results. Variance is found among the 49 STPs of Tennessee public institutions. Eleven limit few tobacco products, and six limit smoking only near buildings.
This study examines multiple Veterans Affairs Medical Centers to compare Post-traumatic Stress Disorder (PTSD) and Substance Use Disorder (SUD) in veterans from Central Appalachia. We expect to find a relationship between branch of service and the co-occurrence of PTSD and SUD. Past research has provided data on PTSD and SUD, but little information on the rates of co-morbidity is known. Other variables, such as age, race, sex, and combat status will be measured, controlling for impact on rates of diagnoses.

Denise Harness, Senior
Mathematics: Jeff Knisley
ROOM 120/9:35 am

A Comparison of Unsupervised Methods for DNA Microarray Leukemia Data

Advancements in DNA microarray data have created the need for sophisticated machine learning algorithms and feature selection methods. Unsupervised classification identifies activated genes in a Leukemia patient. Partial correlations between the features are used to create a precision matrix. This technique reduces the number of genes to a fraction of the original 7,000. Then a graphical network of these connections is created. The results of this are compared against other feature engineering approaches to assess its accuracy on the Leukemia data.

Emily Hearl, Senior, (co-presenter)
Computational Applied Mathematics: Nicole Lewis
AUD 137B/9:25 am

Baltimore Police Department’s Crime Data

We analyzed the Baltimore Police Department’s Crime Data for the American Statistical Association competition. The Crime data included the Calls to 911, Locations of Crimes, CCTV Locations, and the number of Officers in each District. We did comparisons on trends of 911 calls and where crimes are taking place along with how each has changed and how it could change in the future.

Zoe Hester, Senior
English, Foreign Language: Michael Cody
AUD 137A/2:50 pm

Story-telling through Movement:
An Analysis of the Connections between Literature and Dance

Movement and story-telling are the links between past and present; both dance and literature have the same artistic and primal origins. We began to dance to express and communicate, to worship and feel. We tell stories for the same reasons: to learn from the past and to be able to communicate in the present. This work explores the many connections between literature and dance through examinations of six dance forms: Native American, Bharatanatyam, West African, Ballet, Modern, and Post-Modern dance.

Luke Hiester, Senior
Computing: Jay Jarman
ROOM 120/3:30 pm

File Fragment Classification with Neural Networks

This study explored a novel approach for applying neural network models to file fragment classification, the task of identifying the type of a small isolated segment from a digital file, with application areas including digital forensics and network security. The results show that this approach has good potential, but further work is needed in model tuning. The contributions of this study include the application of neural network types previously unused in this domain and a novel representation for model input.

Rebecca Erin Hockman, Senior
Journalism: Susan Waters
AUD 137A/4:10 pm

Media’s Perception of Veterans
I am performing a quantitative study on the East Tennessee State University’s population of veterans and their families by using an IRB-approved survey. The survey asks them how they feel they are affected by the portrayal of veterans in the media regarding obtaining a job, social standing in society, and general perception. In addition, my research received a $500 grant that will be used for gift cards to be given to randomly selected participants of the survey.

David Hopland, Sophomore, (co-presenter)
Computational Applied Mathematics: Nicole Lewis
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Amber Howard, Senior
Studio Art: Vanessa Mayoraz
MILLENNIUM LOBBY
Hold Me Down
My work explores the interplay of flesh and spirit and finding a balance between both. Hold Me Down refers to my acceptance of a physical, primal need in a sexual encounter that juxtaposes a similar need in scripture, “Wives be submissive to their husbands.”

Hal Hughes, Senior
Communication Studies: Kelly Dorgan
ROOM 130/10:15 am
Capturing the Rise and Ruin of the Researcher: Uses of the Research Notebook

This presentation examines the functions of the research notebook by a novice qualitative researcher. Drawing on a reflexive approach, I outline the benefits and best practice methods when using a research notebook. Discussed benefits include: 1) personalizing style; 2) reflecting on the researcher’s emotional states; and 3) documenting the research process.

Matthew Jennings, Senior
French: Theresa McGarry
AUD 137A/10:00 am

Nevertheless, She Persisted:
Gender Indexicality in the Speech of Elizabeth Warren, 2007-2017

This project is a replication of a study done analyzing the relationship between the linguistically feminine and masculine elements of Hillary Clinton’s speech over the course of 21 years which found that Clinton’s language became decreasingly feminine or increasingly masculine as her involvement in the political world grew. By analyzing the speech of Senator Elizabeth Warren, this project aims to see if her speech displays similar linguistic trends despite a much shorter political career.

Jonathan Jennings, Senior
Graphic Design: David Dixon
MILLENIUM LOBBY
Unlabeled 2018

This work presents the idea of labels referring to gender identity, sexual orientation and the attempt to see these facets of one’s self without pinning an exact label on an individual.
Experimental Protocol for the Production of Bacterial-Expressed CTRP3

Previous studies have shown that mammalian-expressed CTRP3 functions by lowering blood glucose levels in transgenic mice. However, mammalian-expressed CTRP3 is expensive and can only produce up to 1mg/L of recombinant protein. However, bacterial-expressed CTRP3 is relatively inexpensive and can theoretically produce 70mg of recombinant protein per L of bacteria. The issue being addressed in this experiment is to see if a functional bacterial-expressed CTRP3 can be produced effectively and economically by using a bacterial expression protocol.

Sarah Caroline King, Senior
Music Performance: Alison Deadman
What You Hear is What You Hear:
Preparing an Arrangement of Steve Reich’s “Nagoya Marimbas” for Flute Choir
Visual artist Frank Stella (b. 1936) said about his work, “What you see is what you see.” A member of the visual art movement known as Minimalism, he is famed for his repeating black-stripe paintings. There are noticeable parallels between the concept of these visual works and Steve Reich’s (b. 1936) Minimalist music, particularly Nagoya Marimbas (1994). This presentation will explore the repetitive rhythmic components of Minimalist music and the challenges of arranging a percussion piece for a flute ensemble.

Anastasia Kuvayskaya, Senior
Chemistry: Aleksandr Basilev
Modification of Silica Surface
Novel functionalized organic/inorganic hybrid materials were successfully synthesized by surface modification of mesoporous silica gel. Two surface reactions were used for immobilization of 4-vinylphenylboronic acid: hydrosilylation and hydrothiolation of the алкene group. The hydrothiolation reaction demonstrated better effectiveness and resulted in higher density of surface boronic acid groups. The obtained materials were highly porous with high surface area. They can be used for the preparation of various catalysts, adsorbents and composite materials.

Kristina Lim, Senior
Biology and Chemistry: Krishna Singh
Protective Anti-Inflammatory Role of Extracellular Ubiquitin in Myocardial Ischemia/Reperfusion Injury
Heart disease is the leading cause of death in the United States. Myocardial ischemia/reperfusion injury refers to the myocyte death that results from the cessation and subsequent restoration of blood flow to the heart. Ubiquitin (UB) is a highly conserved protein. β-adrenergic receptor (β-AR) stimulation in myocytes increases extracellular levels of UB, and extracellular UB decreases β-AR-stimulated myocyte apoptosis and cardiac fibrosis. This study explored the potential therapeutic role of extracellular UB in myocardial ischemia/reperfusion injury using a mouse model.

Angel Lunceford, Senior
Microbiology: James Fox
The Importance of Baseline Analysis for Establishing Replicable, Evidence-Based Behavior Analytic Interventions: Implications for Researchers and Practitioners
Single subject studies analyze individual behavior identifying how interventions change behavior. Critical to this analysis are repeated baseline measures to identify behavior function and evaluate intervention effects. Forty studies treating child behavior problems between 1997 and 2015 were analyzed. Average student age was 8 years. Most studies used simple frequency counts (47%) of behavior. Baseline observation averaged 42 minutes and 7.4 observations. Most studies (81%) reported no systematic analysis of baseline stability, making it difficult to establish evidence-based effective interventions.

Sydney Keith, Senior
Health Sciences/Microbiology Concentration: Jonathan Peterson
High Returns & Low Volatility: The Case for Mid-Cap Stocks
This study examines excess returns and lower volatility generated by mid-cap firms. Larger returns of small-cap stocks is statistically insignificant. However, excess returns generated by mid-cap firms is statistically significant. This study hypothesizes the mid-cap anomaly results from the returns of growing firms within the segment, or that non-size-related factors have a significant impact on mid-cap firms. The results suggest the anomaly is not a result of either hypothesis. Therefore, the anomaly is not independent of non-size-related factors.

Macon Magno, Senior
Physics: Richard Ignace
A Study of the H-alpha Emission Line Shape in Beta Lyrae
Beta Lyrae is a binary star system containing two massive stars. The higher mass star (primary) is gaining mass from the lower mass star (secondary), and this process causes a disk to form around the primary star. Some studies suggest the disk contributes to the H-alpha emission, while others have shown that a jet exists in the system and could contribute to the H-alpha emission. We have considered various factors when modeling the H-alpha emission from Beta Lyrae.

Shelby Maiden, Senior
Graphic Design: Andrew Scott Ross
The Commodity Club: Commodity Fetishism in Modern Art and Tattoos
The current culture of commodity fetishism that surrounds both modern art and tattoos is disproportionately a part of the perpetuation of an artificial sense of society and community. It promotes the notion that by simply inking the deeper layers of their skin or by spending millions on a painting that somehow one becomes elevated and enters an elite space, or club, of people like them.

Annie Malcolm, Junior
Nutrition: William A. Clark
Profile of Volatile Fatty Acids (VFA) in the Feces of Normal and Overweight College Students
Five students of normal weight (N) and five who were overweight/obese (O) were recruited after IRB approval to provide a stool sample and fill out a food frequency questionnaire. Stool samples were analyzed for macronutrient composition and VFA fermentation profile. The data discovered suggests different fermentation in the colon between N and O participants that is potentially due to the macronutrient dietary profile, fiber intake, or bacterial species present in the colon.

Larry Keith Maultbay, Senior
Theatre: Melissa Shafer
Work-in-Progress: The Playwright’s Method
An in-depth exploration of the play writing process. The playwright of Closet Skeletons retraces the steps of writing his play, while also discussing and uncovering the connections between his dramatic influences in theatre and film. Work-in-Progress will also discuss the conclusion of the play writing process as well as how audience feedback from staged readings was used to better the next draft of Closet Skeletons.
Construction projects.

A Case Study of the ETSU Football Stadium and Fine Arts Center, respectively, as case studies for both post- and in-development estimation methods used by BurWil Construction Company and Denark Construction, Inc., for the ETSU estimation so variable even among expert estimators within the same company. This study will look at the accurately throughout the entire estimation process. Thus, it is important to know what makes construction programs.

Ragen McNair, Senior

Criminal Justice: Erica Hutton

Siblicide: Patterns and Typologies of Offenders

This study analyzes 100 cases of siblings that murder their siblings within the United States. From these cases criminality patterns are identified and typologies are developed. The purpose of this study is to examine those who murder their siblings and help develop common patterns for this type of crime that can later be used to assist in investigations.

Evin McQuistion, Senior

Theatre: Bobby Funk

A Director’s Approach to Annie Baker’s “The Aliens”

An overview of a director’s process through the phases of rehearsal and performance for Patchwork Player’s Spring 2016 production of The Aliens by Annie Baker. Includes research on the playwright and her other works as well as a journal of the rehearsal process of staging The Aliens.

Austin Miller, Senior

Chemistry: Abbas Shilabin

Synthesis of Oxadiazole Derivatives as non-β-lactam β-lactamase inhibitors

Bacterial resistance to β-lactam based drugs such as penicillin is a deep scientific concern for both hospital and community acquired bacterial infections. The search for new classes of drugs as antibiotics has become ever more important. Oxadiazole derivatives and, in particular, 1,2,4-oxadiazolidin-5-ones are promising candidates as non-β-lactam β-lactamase inhibitors. Unfortunately, current methods only provide access to oxadiazolidinones that are bulky and are unable to interact with β-lactamase due to steric concerns. The focus of this research is to present a method involving 1,3-dipolar cycloadditions of nitrones for the synthesis of oxadiazolidinones as well as a method for evaluating products inhibition of β-lactamase.

J.P. Mitra, Senior

Construction Engineering Technology: Jeremy Ross

Optimizing Construction Estimation: A Case Study of the ETSU Football Stadium and Fine Arts Center

Considering the competitiveness of the construction industry, it is important to predict costs for a project accurately throughout the entire estimation process. Thus, it is important to know what makes construction estimation so variable even among expert estimators within the same company. This study will look at the estimation methods used by BurWil Construction Company and Denark Construction, Inc., for the ETSU Football Stadium and Fine Arts Center, respectively, as case studies for both post- and in-development construction projects.

J.P. Mitra, Senior

ROOM 130/2:30 pm

English: Martha Michieka

Appalachian English in Lee Smith’s Saving Grace

The dialect spoken within Appalachia is a distinct dialect within American English, one well-known and stigmatized against in spoken language. Past writers have written in the dialect inaccurately, treating it as a joke, but in recent years authors have been working to better represent the dialect. Among them is Lee Smith. My thesis examines how Smith, in her novel Saving Grace, expresses the dialect faithfully, using it to better represent Appalachian people and as a storytelling tool.

Devin Narwani, Senior

Health Sciences: Sean Fox

Can Alcaligenes be a New Treatment for Staphylococcus species?

The Staphylococcus genus is a major cause of disease in humans. Our research previously demonstrated that Alcaligenes faecalis has inhibitory effects against Staphylococcus aureus. We therefore wanted to explore if A. faecalis inhibits other Staphylococcus species and if this effect is shared among Alcaligenes species. Our results indicate Alcaligenes faecalis and Alcaligenes viscolactis possess the ability to inhibit Staphylococcus aureus and all Staphylococcus species are inhibited in varying degrees. Understanding this mechanism may indicate new targets to combat Staphylococcus infections.

Joseph Oliver, Junior

Health Science: Jia Cuibong

Inhibition of Focal Adhesion Kinase Promotes Offactory Stem Cell Self-Renewal and Neuroregeneration Via Ciliary Neurotrophic Factor

Focal Adhesion Kinase (FAK) is one component of integrin signaling and regulates cell adhesion and proliferation. Previously, we identified FAK inhibition increased cell proliferation in adult mouse OE via ciliary neurotrophic factor (CNTF). Now we tested whether FAK inhibition increased neuroregeneration in the OE using BrdU pulse-chase method. FAK inhibitor significantly increased BrdU+ stem cells and olfactory neurons in the OE of CNTF wildtype but not knockout mice, indicating FAK inhibition promotes olfactory stem cell self-renewal and neuroregeneration via CNTF.

Tristan Onek, Sophomore

Computer and Information Science: Brian Bennett

Developing an Open Source Financial Data Collector for Trade Algorithm and Artificial Intelligence Testing

Successfully implementing stock trading algorithms using artificial intelligence requires a constant and reliable flow of data. Such data can be expensive or difficult to acquire. This study developed a zero-cost alternative model that mitigates the need to purchase big data from online vendors. A collection program locates and stores publicly available stock data on the Internet for free. Using this new model, trade testing strategies and their required data sets can become more accessible to potential new investors.

Drake Parrott, Senior

Interdisciplinary Studies: Cara Harker

Experiments in Creation

This will be a modern dance piece created with different methods of dance composition, including pre-determined choreography, improvisation, and aleatoric movement.

Timothy Payne, Senior

Audience: Brian Bennett

Appalachian English in Lee Smith’s Saving Grace

The dialect spoken within Appalachia is a distinct dialect within American English, one well-known and stigmatized against in spoken language. Past writers have written in the dialect inaccurately, treating it as a joke, but in recent years authors have been working to better represent the dialect. Among them is Lee Smith. My thesis examines how Smith, in her novel Saving Grace, expresses the dialect faithfully, using it to better represent Appalachian people and as a storytelling tool.
A unique and interesting game-play experience was developed by creating procedurally generated dungeons populated with dynamically generated content. Creation and implementation of a gore-based combat system, to include fractured skeletal meshes, creates a unique combat experience every time the game is played.

The undergraduate research featured a study of POP Arts, an all-inclusive program for students with and without disabilities. POP Arts emphasizes implementation of theatrical skills to improve behavioral, physical, and mental capabilities. Throughout the study, the researchers observed skill development through the eyes of volunteers and parents of participants in the program. Findings indicated that parents and volunteers noted enormous differences in socialization and skill acquisition and emphasized the importance of adding or continuing arts programs in the school system.

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Anthony Walls, Senior, (co-presenter)
Human Services: Joyce Duncan
The Power of Performing Arts
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Grayson White, Senior
Health Sciences-Microbiology: Allan Forsman
The Effects of Simulated Spaceflight Conditions on the Mucin Lining of the Mouse Uterine Tube
This research focuses on determining the effects of simulated spaceflight—simulated microgravity and radiation—on the thickness of the mucin lining of a mouse uterine tube. The study evaluates each three sections of uterine tube (isthmus, ampulla, and infundibulum) separately, and works to determine whether simulated microgravity, radiation, or a combination of the radiation and microgravity causes significant changes to the uterine tube.

Elizabeth Wiederholt, Senior
Psychology: Jill Stinson
Sex Offenders, the Tennessee Public Registry, and Suicidality
This paper explores the relationship between the Tennessee sex offender registry and suicidality. The research looks at the registry as a factor in suicidality among offenders by identifying cause of death of offenders on the Tennessee registry between 2011 and 2016. An Internet search engine was used to determine causes of death from a list of offenders from the TBI, which included 434 men and women who died while registered. Findings and implications for intervention and policy will be discussed.

Carrie Williams, Senior
Graphic Design: Scott Contreras-Koterbay
The Negative Contributions of Factory Farming
My thesis is an examination of the common practices of industrial farming which works in conjunction with a three-dimensional art piece depicting information about humane and sustainable farming.

Emily Williams, Senior
English: Mark Baumgartner
Fairy-Tale Convention and Post-Modernism in Aimee Bender’s “Off”: A Critical Introduction
Aimee Bender’s short fiction work, *Off*, informs my story, *Sacrament*. Bender’s work utilizes what Jo Carney, in *Aimee Bender’s Fiction and the Intertextual Ingestion of Fairy Tales*, identifies as conventional fairy tale form and motifs to explore post-modern ideas of disconnect, self-articulation, and emotional powerlessness. *Off* borrows from fairy tales as it employs narrative flatness, the “transformation dress” motif, and the violence and mutilation motif to extrapolate the protagonist’s disorientation. *Sacrament* aims to follow Bender’s lead.

Lindsey Wright, Senior
Mathematics: Michele Joyner
Classifying Textual Fast Food Restaurant Reviews Quantitatively using Text Mining and Supervised Machine Learning Algorithms
While companies seek to improve their business model through customer feedback readily available on social media, extracting such feedback is financially expensive and time consuming. Thus, our study extracts business intelligence by structuring opinionated textual data using text mining and classifying these reviews by the degree of customer satisfaction through predictive modeling. Specifically, we analyze Yelp reviews on fast food restaurants and attempt to predict the associated star rating in order to understand the important factors in customer satisfaction.

Sarah Zimmer, Senior
Biology: Ronjan Chakraborty
Identification of the HmuPSTUV Operon and Its Role in Heme Utilization in *Rhizobia Leguminosarum* ATCC 14479
Iron is an essential nutrient for the proper functioning of many bacterial physiological processes. A deficiency of iron in bacteria can cause inhibition of cell growth and changes in morphology. Under iron-restricted environments, microorganisms seek out different methods of acquiring iron. One such method is utilization of heme-bound iron. Our lab reported that *Rhizobia Leguminosarum* ATCC 14479 utilizes heme as an iron source. We are now characterizing the genes possibly involved in heme utilization.