North Carolina State University

21st Annual
Undergraduate Research Symposium

April 10, 2012

10:30 a.m.-1:30 p.m.
McKimmon Center
Thanks & Acknowledgments

2st Annual Undergraduate Research Symposium
April 10, 2012

The annual Undergraduate Research Symposium continues to highlight presentations on some of the finest work and thinking at NC State University. The objectives of the Symposium are to demonstrate the importance of research in the undergraduate experience, to recognize the contributions made by our undergraduates to research, and to stimulate research involvement by young people. The Symposium has been endorsed by the Chancellor, the Faculty Senate, and the Council of Academic Deans. Undergraduate students engaged in scholarly research with faculty in all disciplines have been invited to participate.

Students present their contributions in poster formats during one of two sessions. Each presentation is placed under one of the colleges listed below. Teams of judges in each category select outstanding contributions for special recognition. The students making these outstanding contributions to research are further honored at the annual Sigma Xi social and reception followed by the new member initiation ceremony and awards recognitions will be held on Tuesday April 17, 2012, 5:00 p.m. in the College of Veterinary Medicine Atrium. Details about the symposium can be found at http://www.ncsu.edu/ugrs/.

Categories

- Agriculture and Life Sciences/Vet Med
- Design
- Education
- Engineering
- Humanities and Social Sciences
- Poole Management
- Natural Resources
- Physical and Mathematical Sciences
- Textiles

Financial support for this year’s symposium has been provided by

- Division of Undergraduate Academic Programs
- North Carolina Biotechnology Center’s Event Sponsorship Grant
- NC State University Provost's Office
- NC State University Vice Chancellor for Research and Graduate Studies
- Office of Undergraduate Research
- Sigma Xi: The Scientific Research Society

Special thanks to Anthony Tran, a graduate of the College of Design, for the abstract booklet cover design, and Kim Cox and Katie Lynch for serving as the Web Masters for the creation and layout of the symposium.

The Undergraduate Research office appreciates the efforts of the committee members and especially the time and expertise of the symposium judges.
Table of Contents

Poster Presentations

Session 1 1

Session 2 12

Abstracts

College of Agriculture and Life Sciences 22
College of Design 60
College of Education 61
College of Engineering 62
College of Humanities and Social Sciences 74
College of Management 79
College of Natural Resources 80
College of Physical and Mathematical Sciences 82
College of Textiles 90

Index of Presenters

In alphabetical order by lead presenter 92

Symposium Report 111
# Poster Presentations
## Session 1
### 10:30 AM - 11:45 AM

<table>
<thead>
<tr>
<th>Poster #</th>
<th>Student Presenters</th>
<th>Project Title</th>
<th>Mentors and/or Co-Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Ashlee Marie Plummer Chemistry</td>
<td>Modification of inhibitor binding in the distal cavity by L100 site mutations in dehaloperoxidase-hemoglobin</td>
<td>Stefan Franzen Chemistry</td>
</tr>
<tr>
<td>A2</td>
<td>Teal Russell Biochemistry</td>
<td>Endothelial cell micropatterning for engineering vascularized tissue constructs</td>
<td>Balaji Rao Chemical &amp; Biomolecular Eng</td>
</tr>
<tr>
<td>A3</td>
<td>Ansel Lou Blumers Physics</td>
<td>Surface roughness of nanoscale epitaxial Graphene films on SiC, in comparison with Graphite and SiC surfaces</td>
<td>Jack Rowe Physics</td>
</tr>
<tr>
<td>A4</td>
<td>De'Ja Sade Alexander Biology, Jennifer Wheeley Biological Sciences-Human Biology Concentration, Brittany Lang Human Biology</td>
<td>Qualitative Assessment of Medical Students? Definition of Childhood Obesity</td>
<td>Suzie Goodell Food, Bioprocessing &amp; Nutrition Sciences, Alice Raad Food, Bioprocessing, and Nutrition Sciences, Natalie Cooke Food Science</td>
</tr>
<tr>
<td>A5</td>
<td>Matthew David Gromlich Plant Biology</td>
<td>Establishing a STEM Educational Program at the Boys Club of Wake County and Evaluating its Effectiveness to Increase Students? Interest in and Attitude Towards STEM Careers and Courses</td>
<td>Chad Jordan Plant Biology</td>
</tr>
<tr>
<td>A6</td>
<td>Catherine Teressa Thriveni Biology, Franklin Beeninga Biological Sciences, Krina Patel Human Biology, Kylie Broderick International Studies</td>
<td>Language Processing and Motor Function Impairment in Neurological Disorders: A Focus on Huntington's Disease and Schizophrenia</td>
<td>Miriam Ferzli Biology</td>
</tr>
<tr>
<td>A8</td>
<td>Alexa Kathryn Martin Biology</td>
<td>A Qualitative Assessment of the Preference of Fruits and Vegetables among Preschoolers</td>
<td>Suzie Goodell Food, Bioprocessing &amp; Nutrition Sciences</td>
</tr>
<tr>
<td>A9</td>
<td>Heidi Elizabeth Klumpe Chemical Engineering</td>
<td>An alternative to antibiotics: engineering the CRISPR system to trigger autoimmunity in pathogenic bacteria</td>
<td>Chase Beisel Chemical &amp; Biomolecular Eng</td>
</tr>
</tbody>
</table>
Kirsty Jane Ward, Biochemistry; Dhaval Patel, Biology; Courtney Maguire, Microbiology; Noukon Chanthammavong, Biology; Shaneice Mitchell, Biochemistry

Nanotechnology Applications in Medicine: Drug Delivery to Diagnostics to Tissue Engineering

Christina Tang, Chemical & Biomolecular Eng

Medha Surampudy, Political Science

Comparative Approaches to Transitional Justice in the Former Yugoslavia

Traciel Reid, Public & International Affairs

Morgan Leigh Collins, Animal Science

The effect of different feeding practices on blood glucose concentrations in horses.

Shannon Pratt-Phillips, Animal Science

Molli Katharine Hayworth, Biology and Psychology

Effects of Propolis on Honeybee Immunity

David Tarpy, Entomology

Kelsey Alexandra Lohman, Animal Science

Using Past Histories, Milk Testing, and Hormone Testing to Predict Mare Foaling Dates

Scott Whisnant, Animal Science

Ashley Loray Jones, Plant Biology

Sensitized Genetic Backgrounds Reveal a Role of PERIANTHIA in Ovule Formation and AGAMOUS Repression

Bob Franks, Genetics

Bradley Glynn Poston, Human Biology

Source of calcium increase produced by histamine in human adipose-derived stem cells

Robert Grossfeld, Biology; Elizabeth Loboa, Biomedical Engineering

Jennifer Nicole Hamilton, Animal Science

Analysis of Long-Term Culture of Pig Gonocytes

Robert Petters, Animal Science

Cara J Adrian, Biology

Ethical Issues Concerning the Uses of Genetic Technology

H. C. Liu, Animal Science

Diana C Joseph, Biology; Lauren Hatchett, Spanish Language and Literature; Deniz Kerim, biological sciences; Kathleen Bell, biological engineering; Emily Bissett, Nutrition Science, International Studies; Alyssa D’Addezio, biological sciences; Dana Applegate, biological sciences; Taylor Barto, biological and agricultural engineering; Obed Agyei, Biology

Recommendations to Achieve Global Water and Sanitation

Matthew Polizzotto, Soil Science

Hannah Elizabeth Gardner, Zoology; Christian Tilley, Human Biology; Samantha Goodwin; Alexis Barnes, Human Biology; Jennifer Okpala; Stephanie Mayor; Jennine Lection, Animal Science; Bridget Conley, Microbiology; Katherine Boyette; Mary Klinck, Agriculture

Zoonosis: the fear, recognition, and reaction to BSE

Kenneth Esbenshade, CALS-Dean's Office and Staff
Business; Zachary Spencer Poultry Science; Vanessa Wolf Animal Science; Eileen McAnarney Human Biology; Madison Roche Biology

A22 Jason Michael Hite Applied Mathematics Subspace Methods for Gaussian Process Surrogate Construction Hany Abdel-Khalik Nuclear Engineering

A23 Ellen L Cho Interdisciplinary Studies The Present and Future Prospects of the Chilean Education System Joseph Palis Interdisciplinary Studies

A24 Edward Philips Tomlinson Chemical Engineering Thermally Activated Optically Functional Surface Features Michael Dickey Chemical & Biomolecular Eng

A25 Michael Thomas Wyngarden Biology Binding Properties and Function of M. undulatus Estrogen Receptors with Chlordane and the Effects of Amino Acid Mutation on Binding Beth Hawkins Biology

A26 Kendra Sutton Food Science and Nutrition Haiti Fruit Bar Project Brian Farkas Food, Bioprocessing & Nutrition Sciences

A27 Jelani Tyson Food Science; Chuong Le Bioprocessing; An Truong Food Bioprocessing and Nutrition

A28 Dustin A Leininger Physics A QCM Study of the Tribological Properties of Nanodiamonds Jackie Krim Physics

A29 Mark Koneczal Wetherington Physics Characterization of P3HT Films Grown by Thermal Evaporation in High Vacuum Daniel Dougherty Physics

A30 Stephanie George Wilson Psychology An Evaluation of a Parent Tutoring Reading Fluency Program John Begeny Psychology

A31 Keiko Marie Wadsworth Microbiology Environmental Carcinogen-induced Retinal Degeneration in a Population-based Mouse Model David Threadgill Genetics

A32 Andrew Wayne Radford Biology Bioenergy Production Using Trees at Wastewater Treatment Facilities Elizabeth Nichols Environmental Technology

A33 Miranda Lynn Ganci Plant and Soil Science Assessing the Affect of the Plant Pathogen, Pythium irregularare, and Vermicompost on Arbuscular Mycorrhizal Fungi in Strawberry Roots Michelle Schroeder-Moreno Crop Science

A34 Katherine Caroline Barefoot Polymer and Color Chemistry Intelligent Design of 3D Scaffolds for Tissue Engineering Julie Willoughby Textiles

A35 Emily Ford Communication Investigating Verbal Workplace Communication Behaviors Joann Keyton Communication

B2 Lindsey Marie Pandorf Human Biology Developing Training Tools to Evaluate Mealtime Emotional Climate of Teachers in a Preschool Setting Suzie Goodell Food, Bioprocessing & Nutrition Sciences, Satoko Chika Food Science;
| B3 | Chinwe Coretta Anumudu  
Biochemistry | ROLE OF POSITIVE CHARGE ON SUBSTRATE BINDING TO DEHALOPEROXIDASE ENZYME FOUND IN ARMPHITRITE ORNATA | Stefan Franzen Chemistry |
| B4 | David Michael Higgins  
Plant Biology, Genetics | Shoot apical meristem formation is controlled by physical protein-protein interactions of SEUSS and members of the BELL-LIKE HOMEO DOMAIN family. | Bob Franks Genetics |
| B5 | Kristin E Hartgrove  
Horticultural Science; Plant Biology | Micromorphological Characterization of Leaf Structure of Three Cercis (Redbud) Botanical Varieties and an Ultra-pubescent Mutant by Scanning Electron Microscopy | Dennis Werner Horticultural Science |
| B6 | Ian Robert Thompson  
Environmental Technology and Management  
Kryie Hooton  
Environmental Technology and Management;  
Sarah Leichter  
Biological Sciences | The Importance of the Amazon Rainforest, Coral Reefs, and Honey Bees as Indicators of Environmental Degradation. | Miriam Ferzli Biology |
| B7 | Supriya Sadagopan  
Samantha Xu  
Biochemistry;  
Sunny Bhathela  
Biochemistry;  
Rebecca Purvis  
Human Biology | Disruptions of Endocrine Signaling and Potential Therapeutic Treatments using Tissue Engineering and Prevention through Environmental Toxin Identification | Miriam Ferzli Biology |
| B8 | Mary Hunt Lewis  
Plant Biology | Population shifts in *Aspergillus flavus* | Ignazio Carbone Plant Pathology |
| B9 | Anne M Watson  
Physics | Characterization of the Morphology and Performance of Differentially Cast Organic Thin-Film Transistors | Harald Ade Physics |
| B10 | Richard McAlister Deans  
Chemistry | Facile Synthesis of a Close Analogue of Vitamin B12 | Jonathan Lindsey Chemistry |
| B11 | Katie Elaine Robertson  
Zoology | The ontogeny of stress coping behavior in the zebrafish, *Danio rerio* | John Godwin Biology  
Ryan Wong Biology |
| B12 | Manix Lukungu Eluhi  
Biomedical Engineering | Tungsten-based Carbon Microelectrodes: A New Generation of Neurochemical Sensors? | Gregory McCarty Biomedical Engineering |
| B13 | Anna Noel Carolyn McKain  
Animal Science | Assessment of Vector Competence for Tick Species of North Carolina | Ricardo Maggi CVM-Comp Animal |
| B14 | Joseph Anthony Moo-Young  
Chemical Engineering; Textile Engineering | Molecular Dynamics Simulations of Carbon Nanotube-Polythiophene Interactions | Melissa Pasquinelli Textiles |
| B15 | Kristin Harr Cochran  
Chemistry | Direct Analysis of Textile Fibers and Dyes Using MALDESI Mass Spectrometry | David Muddiman Chemistry |
| B16 | Joshua James Wheeler  
Biochemistry  
Thomas George  
Biological Sciences-Human Biology | Research and Technology in Gene Therapy | H. C. Liu Animal Science |
Mary Austin Animal Science; Jared Davis Zoology

B17 Holly Christine Sweeney Mathematics
Do Heatwaves Impact Ground Level Ozone Levels? Bill Hunt Statistics

B18 Mary Ashleigh Craver Biology
Nutrition and Dining at North Carolina State University and Beyond Sarah Ash Food, Bioprocessing & Nutrition Sciences

B19 Cameron Tyler Parsons Food Bioprocessing and Nutrition Science; Tim Carver Food Science; Robert Price Food Science; Chaunyetta Barkley Food Science
Improved Shelf Life of Chocolate Milk Brian Farkas Food, Bioprocessing & Nutrition Sciences

B20 Danielle A Lindquist Zoology
Tetracycline Residues in Porcine Stomach Ronald Baynes Department of Population Health and Pathobiology

B21 Steven Mark Maddox International Studies-International Relations Concentration
An analytical look at the immigration policy of Spain Carol Lewald Interdisciplinary Studies

B22 Kristy M Casper Animal Science
Bartonella Detection after Storage Ricardo Maggi CVM-Comp Animal

B23 Stephanie Michelle Leyrer Biological Sciences
Neonatal Bisphenol A exposure alters sexually dimorphic gene expression in the postnatal rat hypothalamus Heather Patisaul Biology

B24 Esther Meerim Lee Chemical and Biomolecular Engineering
Nanofibers of Water-Soluble Polymers via Foam Electrospinning Saad Khan Chemical and Biomolecular Engineering

B25 Travis W Morton Physics
Computational study of polyaminocarboxylate interactions with La(III) ions Elena Jakubikova Chemistry

B26 Jeanine Rafiq Soufan Political Science
Becoming Mainstream: The LGBT Movement Traciel Reid Public & International Affairs

B27 Ginger Danielle Hobgood Animal Science
Exploring issues and making recommendations regarding the use of veterinary pharmaceuticals in animal production agriculture John Havlin Soil Science

B28 Luis Miguel Valencia Interdisciplinary Studies
Mi Casa NO Es Su Casa: Colombian natural resources and the effects of Neoliberalism on Indigenous an Afro-Colombian communities. Carol Lewald Interdisciplinary Studies

B29 Caleb A Marshall Physics
Influential Beta-Decay Rates In The Rare Earth Peak: An r-Process Sensitivity Study Gail McLaughlin Physics Matthew Mumpower Physics

B30 Alexander Michael Doane Food Bioprocessing and Nutrition Science; Kenneth Miller Bioprocessing Science; Dylan Page Bioprocessing Science; Rachel Geiger Bioprocessing Science; Aaron Anders Bioprocessing
The Validation of Methods to Micro-Aerate the Fermentation of Red Ale Wort Brian Farkas Food, Bioprocessing & Nutrition Sciences
B31  Jillian Breidge Gilmartin  
Meteorology & Marine Science

Influence Of the Madden Julian Oscillation On Nutrient Availability In the Galapagos Region

Dan Kamykowski  
Marine Earth And Atmospheric Sciences

B32  Alyssa E Stubbs  
Geology

Computer Tomography Investigations into Cranial Pneumacticity in a Fossil Diving Bird

Daniel Ksepka  
Marine, Earth & Atmospheric Sci

B33  Logan Robert Maxwell  
Chemical Engineering

Production of Eutectic Gallium Indium Micro-Droplets

Michael Dickey  
Chemical & Biomolecular Eng

B34  Andre Kurepa Waschka  
Applied Mathematics/Economics

Optimizing the BCS Tournament Format

Robert Hammond  
Economics

C1  Rochana Jayakumar  
Biomedical Engineering

Background-Substracted Fast-Scan Cyclic Voltammetry to Detect Reactive Oxygen Species

Leslie Sombers  
Chemistry

C2  Mariam Rashid  
Biology

Assessing Preschool Teachers' Definition of a Positive Mealtime Environment

Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences

Satoko Chika  
Food Science

C3  Jordan Reynolds Keith  
Chemical Engineering

Kinetic and Thermochemical Analysis of Pericyclic Transition States in Glucopyranose Isomerization

Phillip Westmoreland  
Chemical and Biomolecular Engineering

Vikram Seshadri  
Chemical & Biomolecular Engineering

C4  Jennifer Hice Iyengar  
Parks, Recr & Tourism Mgmt

Enabling dignified livelihoods through People-First Tourism

Duarte Morais  
Parks, Recreation & Tourism Mgt

Gene Brothers  
Parks Recreation and Tourism Management

C5  Rebecca O Breese  
Biology

There's More to Genes than Meets the Eye

H. C. Liu  
Animal Science

Ameya Sadguru Kulkarni  
Genetics

Amanda Perez  
Biological Sciences

Juan Perez  
Biological Sciences

C6  Jordan Daniel Taylor  
Biology

Marine Organisms and Ecosystems: The Balance of Interspecies Relationships and Biodiversity

Miriam Ferzli  
Biology

Sophie Leigh Austin  
Biology

The Impact of Concussions on Contact Sports and Their Athletes

Michael Goshe  
Biochemistry

Kirstin Morris  
Nutrition Science

Karim Chanem  
Biological Sciences: Human & Religious Studies

Heather Kashner  
Biochemistry

Jennifer Tier  
Human Biology

A’neka Montford  
Human Biology

Brandon Williams  
Biochemistry

C9  Mark Edward Herring  
Biology

Preschool Education in Agriculture/Nutrition Sciences: The Barriers in the Development and Implementation of Early Childhood Nutrition Intervention Curriculum

Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences
<table>
<thead>
<tr>
<th>C10</th>
<th>Akshitha Vijayakumar</th>
<th>Biochemistry</th>
<th>A Putative tmRNA of Mycobacteriophage Astraea</th>
<th>Eric Miller Microbiology; Devon Viscount Microbiology; Susan Carson Plant Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clay Graber Biology; Austin Graves Biological Sciences; Heather Hill Biochemistry; Megan Fruchte Biological Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C11</td>
<td>Philip Stuart Britt Nuclear Engineering</td>
<td></td>
<td>Multiphase Turbulent Flow Visualization in a Nuclear Reactor Channel</td>
<td>Igor Bolotnov Nuclear Engineering</td>
</tr>
<tr>
<td>C12</td>
<td>Kevin Favreau Biology Bailey Green Biology; Jenna Beck Biological Sciences: Integrated Physiology &amp; Neurobiology; Christopher Carr Biology</td>
<td>BIO 483: Multiple Theories of Multiple Sclerosis: Autoimmunity vs. Oligodendrogliopathy</td>
<td>Robert Grossfeld Biology</td>
<td></td>
</tr>
<tr>
<td>C13</td>
<td>Christine Anne Zabel Biology Marissa Herchler; Kayla Dennis; Maxwell Pote; Brittany Bellis; Katherine Cassady</td>
<td>Lionfish: Kudzu of the Caribbean</td>
<td>James Brown Microbiology</td>
<td></td>
</tr>
<tr>
<td>C14</td>
<td>Jordan Lindsey Ferguson Biological Sciences</td>
<td>Hedgehog Signaling Controls Intestinal Rotation and Epithelial Cell Development in Xenopus laevis</td>
<td>Nanette Nascone-Yoder CVM-Molecular Biomedical Sciences</td>
<td></td>
</tr>
<tr>
<td>C15</td>
<td>Morgan Elizabeth Carter Biochemistry Kimberly Amick Microbiology; William Kohlway IV Microbiology</td>
<td>Drivers of genome evolution: homing endonuclease genes in mycobacteriophages</td>
<td>Eric Miller Microbiology; Susan Carson Plant Biology</td>
<td></td>
</tr>
<tr>
<td>C16</td>
<td>Miles Patrick Smaxwell Psychology</td>
<td>JavaTutor: The Influence of Learning Environment and Engagement Level on Conceptual Change</td>
<td>Eric Wiebe Depart Of Math Science And Technology Education</td>
<td></td>
</tr>
<tr>
<td>C17</td>
<td>Emily Gibson Seberger Biological Sciences</td>
<td>Genetics in Human Affairs: An Audience Response System (ARS) strategy to improve grades in the classroom</td>
<td>Marian Gardner Genetics</td>
<td></td>
</tr>
<tr>
<td>C18</td>
<td>Lyndsay Johnson Barnes Chemical Engineering</td>
<td>A computational study of electronic excitations in Fe(II)-polypyridines in the visible light region.</td>
<td>Elena Jakubikova Chemistry</td>
<td></td>
</tr>
<tr>
<td>C19</td>
<td>James Taylor York Statistics Carey Jackson Statistics; Aaron Lamb Statistics</td>
<td>Assessment of Air Quality Trends Near Roadways</td>
<td>Bill Hunt Statistics</td>
<td></td>
</tr>
<tr>
<td>C20</td>
<td>Audreyanna Salinas Biological Sciences: Molecular, Cellular, Developmental Biology</td>
<td>Exploring the Binding Affinities of Genestin to Estrogen Receptors by the Use of Site Mutagenesis</td>
<td>Beth Overman Biology</td>
<td></td>
</tr>
<tr>
<td>C21</td>
<td>Levon P Keusseyan Nuclear Engineering</td>
<td>D-T Fusion Neutron Source Shielding and Application Design</td>
<td>Steven Shannon Nuclear Engineering; Mohamed Bourham Nuclear Engineering</td>
<td></td>
</tr>
<tr>
<td>C22</td>
<td>Dean Stanley Pixton Fitts Dept Indus &amp; Syst Engr</td>
<td>Improving Patient Flow through a Cancer Hospital?'s Infusion Clinic</td>
<td>Brian Denton E.P.Fitts-Industrl &amp; Sys Engr</td>
<td></td>
</tr>
</tbody>
</table>
C23  Amanda Marie English  Statistics
  James Wrenn  Statistics;
  Bomin Kim  Statistics;
  William James  Statistics
  Analyzing the Release of Toxic Chemicals Over Time: Is it the Economy or the Environment?  Bill Hunt  Statistics

C24  Kyle David Dean  Electrical & Computer Engr
  FPGA-Driven Buck Converter for Low-Voltage Solar Panel Emulation  Subhashish Bhattacharyya  Elec & Comp Engineering

C25  Casey Elizabeth Collins  Bioarchaeology
  Can Resilience Theory Explain Changes in Consumerism?  Nora Haenn  Interdisciplinary Studies

C26  Alaina Lynn Blevins  Biology
  Biology Lab TA teaching project  Lisa Parks  Biology

C27  Julie Ann Wasko  Food Science
  Nick Fragedakis  Food Science;
  Anita Shek  Food Science;
  Amanda Burgess  Food Science
  Alternative Use for Sweet Potato Processing By-Products  Brian Farkas  Food, Bioprocessing & Nutrition Sciences

C28  Geoffrey Benjamin Maxwell  Biochemistry
  Procaspase-7 Purification and Crystallization  Clay Clark  Biochemistry

C29  Colleen Nicole Crozier  Poultry Science
  The effects of nematode infection on eosinophil major basic protein and mast cell tryptase levels in the equine colon  Bruce Hammerberg  Department of Population Health and Pathobiology

C30  Rahma K Elkamhawy  Food Bioprocessing and Nutriti
  Is Toothpaste killing more than it's supposed to? : Environmental Impacts of Toothpaste  Tuere Bowles  Education

C31  Christina Alice Grace McChesney  Biology
  Evan Kelly  Microbiology;
  Brooke Wolff  Biological Sciences;
  Gabrielle Brautman  Biological Sciences;
  Olivia Phillips  Biological Sciences
  Survival and Mobility of an Intein within an Essential Protein of Mycobacteriophage Astraea  Susan Carson  Plant Biology
  Devon Viscount  Microbiology;
  Eric Miller  Microbiology

C32  Lisa Ann D’Costa  Chemical Engineering
  Self-propelling particles for enhanced absorption of oil spills  Orlin Velev  Chemical and Biomolecular Engineering
  Rachita Sharma  Chemical & Biomolecular Eng

C33  Nishika Shina Patel  Biochemistry
  Neuropeptide Y and Leptin Receptor mRNA Expression in Brain Tissue of a Teleost Fish, the Hybrid Striped Bass  Russell Borski  Biology

C34  Michael G Browne  Biomedical Engineering
  Biomechanical Analysis of both a Globally Inspired and a Variable Movement Clubfoot Brace using a Surrogate Biomodel  Andrew DiMeo, Sr.  Biomedical Engineering

C35  Deanna Michelle Sedlak  Animal Science
  Comparison of Protocols for Ovulation Synchronization (Ov-Synch) and Timed Artificial Insemination (TAI) of Goats  Charlotte Farin  Animal Science

D1  Michael Fredrick Schwartz  Plant Biology/Biology
  SEU and BUM1 affect shoot apical meristem termination and vegetative to floral transition in Arabidopsis thaliana  Bob Franks  Genetics
D2  Jessica Christine Piner Zoology  A Qualitative Assessment of the Motivators and Facilitators for Teachers and Administrators for Nutrition Education in Preschool Classrooms  Suzie Goodell Food, Bioprocessing & Nutrition Sciences  Virginia Carraway-Stage Food, Bioprocessing, and Nutrition Sciences

D3  Andrew Charles Tibbits Chemical Engineering  Engineering of Biopolymer Particles for Foam Stabilization  Orlin Velev Chemical and Biomolecular Engineering

D4  Joshua David Quinn Biology  Wesley Yang Biochemistry; Colleen Fleming Biology; John Encarnacion Biology; Wesley Sayre Biology  Ethical Issues Regarding Genetically Modified Organisms  David Threadgill Genetics

D5  Oindree Banerjee Physics  Observational Constraints on the Origin of Light Neutron-Capture Elements in Metal-Poor Stars  Carla Frohlich Physics

D6  Cashlyn Elizabeth Coburn Biology  Ian Chapman Biological Sciences-Human Biology; Blake Hess Biological Sciences-Human Biology; Sarah Finegan Biological Sciences  A Comparative Study of Specific Neurological Diseases: Alzheimer's, Parkinson's and Schizophrenia  Miriam Ferzli Biology

D7  Julia Michelle Washburn Biology  Jessica Proctor Zoology; Karinna Alvarez Trujillo Biology; Hira Faisal Biology  Advancements in Medical Technology and Anesthesiology: Treatments for Skin Cancer, Rabies and Spinal Muscular Atrophy  Miriam Ferzli Biology

D8  Christopher William Schaefer Parks, Recr & Tourism Mgmt  Psychological Attachment and the Influences of Constraints and Motivations: A Study on the Students of North Carolina State University  Jonathan Casper Parks, Recreation & Tourism Mgt

D9  Franchesca Camille Jones Psychology  The Thoughts of Adolescents on Messages in Hip Hop Music  Pamela Martin Psychology

D10  Melissa Erin Vinson Polymer and Color Chemistry  Forensic Analysis of Disperse Dyes on Polyester  Keith Beck Textile Engineering Chemistry and Science

D11  Lauren Margaret Cole Biology  Bernice Gyamfi Nutrition Sciences; Daljinder Bhangoo Biological Sciences; Jacey Byers Nutrition Sciences; Tiffany Matthews Biological Sciences; Jesha Arfeen Biological Sciences; Peyton Huneycutt Biological Sciences; Eric Pierce Biological Sciences; Emily Sayavong Biological Sciences  The Effects of Maternal Obesity During Pregnancy on Offspring Health  Scott Whisnant Animal Science

D12  Joel E Anderson Computer Science  Graph-Theoretic Algorithms for Optimal Sensor Placement and Malicious Attack Detection in Large Power Grids  Aranya Chakrabortty Elec & Comp Engineering
<table>
<thead>
<tr>
<th>#:</th>
<th>Student Name</th>
<th>Major/Department</th>
<th>Title</th>
<th>Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>D13</td>
<td>Alexis Jean Householder</td>
<td>Chemistry</td>
<td>Synthesis of 1,5-Disubstituted-2-Aminoimidazole/Triazole Conjugates and Their Biological Activity</td>
<td>Christian Melander</td>
</tr>
<tr>
<td>D14</td>
<td>Brooke Elizabeth Reimer</td>
<td>Human Biology &amp; Nutrition Science</td>
<td>Attitudes, knowledge, and beliefs of health care providers regarding the use of donor human milk in the NICU</td>
<td>April Fogleman</td>
</tr>
<tr>
<td>D15</td>
<td>Megan Elizabeth Williamson</td>
<td>Animal Science</td>
<td>Genetics in Medicine: Implications for Healthcare</td>
<td>H. C. Liu</td>
</tr>
<tr>
<td></td>
<td>Alex Herring</td>
<td>Biological Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Samantha Lane</td>
<td>Biology/Poultry Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mallory Cochran</td>
<td>Human Biology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D16</td>
<td>Grace Eunhye Lee</td>
<td>Biology</td>
<td>Iodothyronine deiodinase type II and possible significance in sex change in the Bluehead wrasse (Thalassoma bifasciatum)</td>
<td>John Godwin</td>
</tr>
<tr>
<td>D17</td>
<td>Gayatri Pongur Snigdha</td>
<td>Chemical Engineering</td>
<td>Hybrid Renewable-Energy System for Battery Extension Targeting Mobile Applications.</td>
<td>Stephen Walsh</td>
</tr>
<tr>
<td>D18</td>
<td>Heather Christine Brown</td>
<td>Animal Science</td>
<td>Effects of Diet and Feeding Schedule on Equine Glucose Metabolism</td>
<td>Shannon Pratt-Phillips</td>
</tr>
<tr>
<td>D19</td>
<td>Heather Ann Marie Roberts</td>
<td>Food Bioprocessing and Nutrition</td>
<td>Validation of CO2 Control Systems used in Fermentation</td>
<td>Brian Farkas</td>
</tr>
<tr>
<td></td>
<td>Jeffrey Pineda</td>
<td>Science</td>
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<td>D20</td>
<td>Hitesh R Patel</td>
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<td>The Role of Arabidopsis Response Regulator 7 (ARR7) in Geminivirus Infection</td>
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<td>Hadeer Usama Metwally</td>
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<td>Background-subtracted fast-scan cyclic voltammetry to detect reactive nitrogen species</td>
<td>Leslie Sombers</td>
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<td>D22</td>
<td>Ryan Hampton Mcnamara</td>
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<td>New Milk Flavor Could Open Old Doors</td>
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<td>Robert Grossfeld</td>
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<td>Stacy Ingram</td>
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<td>Alexander Melvin</td>
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<td>Pooja K Sarin</td>
<td>Biomedical Engineering</td>
<td>Hyperthermophilic Enzyme Immobilization on Nanofibrous Supports</td>
<td>Saad Khan</td>
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<td>D25</td>
<td>Imad Khan</td>
<td>Biology</td>
<td>The Effect of Clofibrate on Renal Fatty Acid Oxidation in Neonatal Pigs</td>
<td>Lin Xi</td>
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<td>D26</td>
<td>Hannah Deering Kellam, Biology</td>
<td>New Method of Teaching Introductory Biology Lab</td>
<td>Lisa Parks, Biology</td>
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<td>D27</td>
<td>Allison Ruth Rhodes, Biology</td>
<td>A Research Model for Childhood Obesity: The Effects of Overfeeding on Commercial Piglets</td>
<td>Chad Stahl, Animal Science; Bryna Seabolt, Animal Science</td>
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<td>D28</td>
<td>Laura Denise Barlow, Psychology</td>
<td>The Effect of Parent Implementation Integrity on Students' Reading Fluency Outcomes</td>
<td>John Begeny, Psychology; Rachel Mitchell, Psychology</td>
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<td>D30</td>
<td>Megan Alyse Morse, Genetics</td>
<td>Correlation between Genotype and Mouse Limb Length</td>
<td>David Threadgill, Genetics</td>
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<td>D31</td>
<td>Natalie Nadia Kandinata, Biochemistry</td>
<td>DNA Genotyping Using Agarose Gel Electrophoresis</td>
<td>Jose Ascencio-Ibanez, Biochemistry</td>
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<td>D32</td>
<td>Victoria Elizabeth Crisci, Biology</td>
<td>Identification of cell-type specific peptide ligands for human preadipocytes</td>
<td>Paul Hamilton, Microbiology</td>
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<td>D33</td>
<td>Thea Esme Roper, Chemical Engineering</td>
<td>Human Adipose-Derived Stem Cells Exhibit Changes in the Conformation and Lineage Specification of Primary Cilia in Response to Chemical and Mechanical Stimuli</td>
<td>Elizabeth Loboa, Biomedical Engineering; Josephine Bodle, Biomedical Engineering</td>
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<tr>
<td>D34</td>
<td>Alicia M Braxton, Zoology</td>
<td>The evaluation of MMP-2 and -9 in urine samples from canine cancer patients</td>
<td>Christopher Mariani, CVM-Comp Animal</td>
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## Poster Presentations
### Session 2
12:15 PM - 1:30 PM

<table>
<thead>
<tr>
<th>Poster #</th>
<th>Student Presenters</th>
<th>Project Title</th>
<th>Mentors and/or Co-Authors</th>
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<tbody>
<tr>
<td>A1</td>
<td>Erika Anne Davis</td>
<td>Fiddler crab interspecific competition influences species? sediment choice in North Carolina salt marsh</td>
<td>Stephen Fegley Biology</td>
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<tr>
<td>A2</td>
<td>Shinhae Yoon</td>
<td>Understanding the role of blood flow in Registration of Hematopoietic development</td>
<td>Suk-won Jin Cardiovascular</td>
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<tr>
<td>A3</td>
<td>John W Galloway</td>
<td>NCSU Solar Site Evaluation</td>
<td>Robert Bruck Plant Pathology</td>
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<tr>
<td>A4</td>
<td>Amanda M Wilkins</td>
<td>Gibberellic Acid and Liquid Smoke Influence Seed Germination of Verbena bonariensis</td>
<td>Dennis Werner Horticultural Science</td>
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<tr>
<td>A5</td>
<td>Jennifer Renee Wheeley De'Ja Alexander; Brittany Lang</td>
<td>Qualitative Assessment of Third and Fourth Year Medical School Students Knowledge of Childhood Obesity Gained from Clinical Rotations</td>
<td>Suzie Goodell Food, Bioprocessing &amp; Nutrition Sciences; Alice Raad Food, Bioprocessing, and Nutrition Sciences; Natalie Cooke Food Science;</td>
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<tr>
<td>A6</td>
<td>Ronnie Labib Shammas</td>
<td>Effects of a Collaborative Active Learning Format for Introductory Biology on Student Performance and Higher Order Thinking</td>
<td>Miriam Ferzli Biology</td>
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<tr>
<td>A7</td>
<td>Christopher Robert Freeze John Obare; Jacob Brennan; Arsheen Allam</td>
<td>Improving Adhesion Forces of Chromium deposited onto Silicon Dioxide and Silicon Nitride Substrates</td>
<td>Anatoli Melechko Material Science Engineering Konstantin Glukh</td>
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<td>A8</td>
<td>Chigozirim Okey-Nwamara</td>
<td>Barriers in Implementing a Positive Mealtime Environment in a Preschool Classroom</td>
<td>Suzie Goodell Food, Bioprocessing &amp; Nutrition Sciences Satoko Chika Food Science</td>
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<tr>
<td>A9</td>
<td>Justin David Buie</td>
<td>Cortical Damage Impacts Ependymal Cell Homeostasis within the Mouse Neural Stem Cell Niche</td>
<td>Troy Ghashghaei CVM-Molecular Biomedical Scien</td>
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<td>A10</td>
<td>Meredith Lane Davis</td>
<td>Development of an Anatomy Laboratory Manual as a Study Aid for an Animal Science Course</td>
<td>Shweta Trivedi Animal Science</td>
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<tr>
<td>A11</td>
<td>Kayla Nicole Claassen</td>
<td>Essential Oil Concentration and Grain Type Affect Broiler Ileal Traits at Market Age</td>
<td>Edgar Oviedo</td>
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<td>Amber D Taylor</td>
<td>Aniline catalyzed hydrazone formation for the derivatization of N-linked glycans</td>
<td>David Muddiman</td>
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<td>Steven Walker</td>
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<td>Jennifer Karen Felder</td>
<td>Real Time Algorithms for Power System Parameter Estimation</td>
<td>Aranya Chakrabortty</td>
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<td>A14</td>
<td>Elisabeth A Braswell</td>
<td>Cabbage leaf curl virus but not Beet curly top virus Induce Senescence in Arabidopsis thaliana</td>
<td>Jose Ascencio-Ibanez</td>
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<td>A15</td>
<td>Cassandra Lynn Ferring</td>
<td>The Effect of Sire Breed on Birth Weight, Pre-Weaning Average Daily Gain, and Weaning Weight of Angus and Angus Cross Calves</td>
<td>Joe Cassady</td>
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<td>A16</td>
<td>Sameera Hassan</td>
<td>Global Drinking Water and Sanitation Challenges Demand Communal and Multifaceted Solutions</td>
<td>Matthew Polizzotto</td>
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<td>Cameron Parnell</td>
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<td>Analiesel Hannes</td>
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<td>Tatiana Suvorova</td>
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<td>John Buchenberger</td>
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<td>Amira Said</td>
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<td>A17</td>
<td>Lauren Susanne Little</td>
<td>Osseointegration Paired with Whole Body Vibration</td>
<td>Ola Harrysson</td>
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<td>A18</td>
<td>Taylor Alexander</td>
<td>Gene Level Pain Expression in Feline Associated Degenerative Joint Disease</td>
<td>Melissa Ashwell</td>
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<td>James Rudolph Rowland</td>
<td>Lissajous Figures as a Model for Neutrino Oscillations</td>
<td>Chueng Ji</td>
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<td>A20</td>
<td>Emily Katherine Marquez</td>
<td>Using Gene Strips to Aid Understanding of Topics Related to DNA and RNA Sequences in Introductory Genetics</td>
<td>Ted Emigh</td>
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<td>Justin Chew</td>
<td>Electrocapillary Withdrawal of EGaIn from Microfluidic Channels</td>
<td>Michael Dickey</td>
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<td>Elizabeth W Hyde</td>
<td>Meeting the Welfare Needs of Captive Black Bears: The Effectiveness of Food Enrichment</td>
<td>Jenny Campbell</td>
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<td>Rochelle Denise Strednak</td>
<td>Novel Polyunsaturated Omega-3 Oil Genes from Wild Soybean</td>
<td>Thomas Carter</td>
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<td>Sarah Louise Turner</td>
<td>The Effects of Chronic and Acute Maternal Stress on Postnatal Health</td>
<td>Scott Whisnant</td>
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<td>Valerie Asadian</td>
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| A25 | Dayne A Plemmons  
Chemical Engineering | Synthesis and Characterization of Environmentally-Benign Biopolymer Nanoparticles | Orlin Velev  
Chemical and Biomolecular Engineering |
| A26 | Katrina Elaine Connor  
Food Bioprocessing and Nutrition  
Chemistry | Natural Colorants as Alternatives to FD&C Yellow 5 in Pasteurized Pickle Products | Suzanne Johanningsmeier  
Food Science |
| A27 | Ermiyas Bizuwork  
Chemical Engineering | Dielectric Elastomer with Tunable Shape Anisotropy | Richard Spontak  
Chemical and Biomolecular Engineering |
| A28 | Nikolai Leonid Sigmon  
Chemical Engineering | Thermal Protective Properties of ALD Coated Fibers | Gregory Parsons  
Chemical and Biomolecular Engineering |
| A29 | Daniel Evan Piephoff  
Chemical Engineering | Size-Induced Nanoscale Segregation of Midblock-Selective Cosolvents in Microphase-Ordered Triblock Copolymers | Richard Spontak  
Chemical and Biomolecular Engineering |
| B1 | Katlin Rae Allsbrook  
Genetics | Cytochrome P450 2D6 Genetic Testing at LabCorp: Impact of CYP450 2D6 Metabolizer Phenotype | Edward Williams  
Laboratory Corporation of America |
| B2 | Molly Anastasia Matty  
Genetics | Development and application of an assay to determine relative telomere length in Mus musculus as compared to a single copy gene, epidermal growth factor receptor, using real time quantitative PCR | David Threadgill  
Genetics |
| B3 | Brittany Anne Lang  
Physical Education  
Jennifer Wheelely  
Biological Sciences-Human Biology Concentration; De'Ja Alexander  
Biological Sciences  
Concentration  
Concentration  | Qualitative Assessment of Medical School Coursework Received by Third and Fourth Year Medical Students for the Treatment and Prevention of Childhood Obesity | Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences  
Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences  
Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences |
| B4 | Ariel Ruth Fugate  
Interdisciplinary Studies | Perceptions of Community Food Systems | Sarah Bowen  
Sociology & Anthropology |
| B5 | Alyssa Bryn Worf  
Food Bioprocessing and Nutrition  
Chemistry | Fruit and Vegetable Familiarity Among Preschoolers | Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences |
| B6 | Michelle Carolyn Anderson  
Biology | Barriers to Implementing Nutrition Education in Head Start Preschool Classrooms | Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences  
Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences  
Virginia Carraway-Stage  
Food, Bioprocessing, and Nutrition Sciences |
B7  Rachel Elizabeth Garris
Biochemistry
Reproducing results utilizing previous inoculation methods to determine if Bacteria is a factor in Disease in A1 and G2 species of Creeping Bentgrass
James Knopp
Biochemistry

B8  Emma Rose Friberg
Biology
Modified Neurosphere Differentiation to Assay Neurotoxicants
David Threadgill
Genetics

B9  Breanna Lauren Pasko
Biology
The contribution of macrophage dynamin-mediated endocytosis to Borrelia burgdorferi sonicate- and culture supernatant-elicited Type 1 IFN response
Jennifer Miller
Microbiology

B10 Courtney Michelle Vaughn
Biology
Caelia Park
Biochemistry;
Ryan McMillan
Biochemistry;
Danell Tetreau
Zoology;
Jeannie Paik
Biochemistry;
Peter Le
Biochemistry;
Gabrielle Kattan
Human Biology;
Nicole Bolick
Human Biology;
Morgan Carter
Biochemistry;
Hadeer Metwally
Biochemistry;
Nidhi Gandhi
Biochemistry;
Megan Davis
Biology;
Lavanya Rao
Biochemistry;
Grace Jones
Biology
Mercury: Fact and Fiction
James Knopp
Biochemistry

B11 Adriano Alexandro Bellotti
Biomedical Engineering
Tori Jefferson
Ecology & Evolutionary Biology;
Richard Sater
Biochemistry;
Avinash Pyreddy
Biology;
Ravi Dixit
Microbiology;
Kayla Hurst
Zoology
A translational frameshift in the tail assembly chaperone of mycobacteriophage Astraea
Eric Miller
Microbiology
Devon Viscout
Microbiology;
Susan Carson
Plant Biology;

B12 Taylor Rose Lansing
Biology
Ecosystem fragmentation leads to utilization of a suboptimal prey type in endemic livebearing fishes of the Bahamas
Randall Langerhans
Biology

B13 Travis T Lekich
Chemistry
Harnessing the Power of the Sun Through Metal to Metal Charge Transfer
Walter Weare
Chemistry

B14 Heather Leigh Shipman
Environmental Technology
Hydrologic and Scaling Study of an Inactive Hog Farm
Elizabeth Nichols
Environmental Technology

B15 Daniel Lawson Norris
Animal Science
Historical Prevalence of Infectious Veterinary Disease In Wartime
William Kimler
History

B16 Eric F Seders
Biology
Oral Health Education and Hygiene Practices in Elementary-Aged Children
Miriam Ferzli
Biology

B17 Giovanna Elizabeth Hernandez
Biological Sciences; Genetics
Regulation of Gene Expression in Drosophila Midline Development
Patricia Estes
Genetics
B18  Ashley Jeanne Kirby  
Zoology  
Veterinary Treatments on Museum Reptiles and Amphibians  
Shweta Trivedi  
Animal Science

B19  Catherine Grace McVey  
Animal Science  
Equine QFBR: A Computational Approach to Equine Temperament Analysis  
Daniel Egger  
Duke Center for Quantitative Modeling

B20  Rebecca S Wood  
Food Bioprocessing and Nutrition  
Pamela Haith  
Food Science;  
David Benton  
Food Science;  
Alexander Choman  
Food Science;  
Shannon Williams  
Food Science  
Comparison of Extraction Methods for Natural Yellow Color from Sweet Potato Leaves  
Brian Farkas  
Food, Bioprocessing & Nutrition Sciences

B21  Madiha S Malik  
Graphic Design  
Glorifying the Holy Script: The Past and Present of Islamic Calligraphy and Typography  
Martha Scotford  
Graphic Design

B22  Travis John Dunbar  
Chemistry  
Stability of 1-dodecyne-Capped Gold Nanoparticles in Solution  
Christopher Gorman  
Chemistry

B23  Charlotte Emily Rastas  
Biology  
Sequencing and Evolutionary Analyses of SEPALLATA-1 Genes in the Dogwood Family  
Quiyun (Jenny) Xiang  
Plant Biology

B24  Necho Durelle Williams  
Zoology and Agricultural Business Management  
The precedence of Trademarks, Services marks, Small Businesses and the relationship to current state of the Economy.  
Theodore Feitshans  
Agri & Resource Economics

B25  Brian Christopher Parham  
International Cultural Studies  
Community Investment and Conservation in Ecuador  
Carol Lewald  
Interdisciplinary Studies

B26  Arjun Puri  
Biomedical Engineering  
Effect of Low Magnitude, High Frequency Vibrations on Rotator Cuff Tendon  
Paul Weinhold  
Biomedical Engineering

B27  Samantha Lenore Walker  
Zoology  
The Effects of Nosema on Honey Bee (Apis mellifera) queens.  
David Tarpy  
Entomology

B28  Rachel Lynne Turner  
Biology  
Characterization of a recombinant Metallosphaera sedula lipase (Msed_1072) for algae biofuel production  
Amy Grunden  
Microbiology;  
Rushyannah Killens  
Microbiology

B29  Colin Travis Smith  
Mechanical & Aerospace Engr  
Modeling the Effects of Microgravity on Overall Proximal Tibia Bone Stiffness  
Anthony Lau  
Biomedical Engineering;  
Ted Bateman  
Joint Dept. Biomedical Engineering;

C1  Jodie Louise Joseph  
Animal Science  
Understanding the Pre-Veterinary Track Population Enrolled in a Professional Development Course  
Shweta Trivedi  
Animal Science

C2  Sarah Michelle Guess  
Biomedical Engineering and Anthropology  
Implementation of an Electronic Medical Record Keeping System via iPad in Santa Cruz La Laguna, Sololá, Guatemala  
James Wallace  
Sociology and Anthropology

C3  Candice Lynn Gurkin  
Biochemistry  
The Preliminary Steps in Production of Biofuel from the Penicillium Jariarum  
Jose Ascencio-Ibanez  
Biochemistry
Microalgae Tetraselmis chuii: Maintaining a Culture, Extraction of RNA and Creation of cDNA

**C4**

**Obed Kwame Agyei**  
Biology

Effects of site-directed mutagenesis on the binding affinity of tamoxifen to the estrogen receptors of a teleost fish, Micropogonias undulatus.

Beth Hawkins  
Biology

**C5**

**Alison N. Mitchell**  
Biology

Teacher Perceptions on Inquiry-Based Nutritional Educational Program in Low Income Preschools

Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences

Virginia Carraway-Stage  
Food, Bioprocessing, and Nutrition Sciences

**C6**

**Hillary Beth Spangler**  
Food Bioprocessing and Nutrition

Comparing Children's Fruit and Vegetable Preferences: Using a Pictorial Tool Versus a Tasting Assessment

Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences

**C7**

**Asia Jacqueline Murphy**  
Wildlife Sciences

Turning Up the Heat: Effects of Artificial Temperature Increase on Post-Dispersal Seed Predation

Lauren Nichols  
Biology

**C8**

**Amy Elizabeth Lamb**  
Animal Science

The Effects of Toxic Endophyte Positive Fescue Seed on Purine Derivatives in Angus Steers

Joan Eisemann  
Animal Science

**C9**

**Joseph Aaron Cheek**  
Plant and Soil Sciences: Agronomic Science  
**samantha cohen** biology;  
**Caitlin Davis** Horticultural Science;  
**Tony Mayer** Plant Biology;  
**Emily Robertson** Biochemistry;  
**christine kerrigan** biology (human biology);  
**Andrew Scruggs** Horticulture Science;  
**Kaitlyn Casulli** Food Science;  
**Nicholas Lannon** Agricultural and Environmental Technologies & International Studies

World Food Security in 2050: Can we meet food, feed, and fuel needs?

John Havlin  
Soil Science

**C10**

**Jodi Coons Soto**  
Microbiology

Berberine traps the influenza A hemagglutinin in the Golgi Apparatus

Scott Laster  
Microbiology

**C11**

**Courtland Hamilton Matthews**  
International Studies

Maritime Piracy in Southeast Asia and East Africa

D. Murray  
Chass-Dean’s Office

**C12**

**Chelsea Robyn Ratzlaff**  
Nuclear Engineering

Role of Shaped Electrodes on Secondary Electron Emission in Glow Discharges

Mohamed Bourham  
Nuclear Engineering

**C13**

**Justin Jeffrey Whitaker Brooks**  
Nuclear Engineering  
**Joshua Earp** Nuclear

Eliminating Transuranic Material Utilizing HE-MOX

Dmitriy Anistratov  
Nuclear Engineering
C14  Kyle A Hemker  
Nuclear Engineering  
Mark Hunt  Nuclear Engineering;  
Tengjia Peng  Nuclear Engineering;  
Matthew Worth  Nuclear Engineering;  
Amber Purvis  Nuclear Engineer;  
Philip Britt  Nuclear Engineering  
Transmuting TRU Material with Subcritical Annular Core Driven by a Fast Neutron Source  
Dmitriy Anistratov  Nuclear Engineering

C15  Brittany Nicole Glatz  
Chemical Engineering  
Increasing the Catalytic Activity of Immobilized Enzymes  
Saad Khan  Chemical and Biomolecular Engineering  
Christina Tang  Chemical & Biomolecular Eng

C16  Brandon Colby Carlisle  
Biology  
Relative Quantification of N-linked Glycans on a Reverse Phase Chromatography Platform Coupled Online to Mass Spectrometry: Practical and Experimental Advantages Over HILIC Separation  
David Muddiman  Chemistry  
Steven Walker  Chemistry

C17  Scott Robert Akerman  
Physics  
Effect of type II supernovae on the weak s-process in low-metallicity rotating stars.  
Carla Frohlich  Physics

C18  Elsie Bjarnason  
Chemical Engineering  
Manipulation of the Shape and Properties of a Liquid Metal  
Michael Dickey  Chemical & Biomolecular Eng

C19  Kira Ashton Pruitt  
Biology  
Inducing Early Flowering in Tobacco using a PVX Viral Expression System  
Ralph Dewey  Crop Science

C20  Lauren Elizabeth Cates  
Biology  
Lionfish: Kudzu of the Caribbean  
James Brown  Microbiology

C21  Elijah Ezekiel Gordon  
Philosophy and Religious Studi  
Study of Zinc Chloride aqueous solutions using UV-Vis Spectroscopic Techniques  
James Martin  Chemistry  
Bradley Losey  Chemistry

C22  Claire Ingrid Svendsen  
Food Bioprocessing and Nutrit  
Alane Ficalora  Food Science;  
Joseph Seman  Food Science;  
Meredith Johnson  Food Science;  
Chemical Comparison of North Carolina and California Cabernet Sauvignon  
Brian Farkas  Food, Bioprocessing & Nutrition Sciences
Kendra Stallings  
*Food Science*

James H Blew  
*Chemistry*

C23
A Computational Study of Interfacial Electron Transfer in Fe(II)-polypyridine Sensitized TiO2 Surfaces

Elena Jakubikova  
*Chemistry*

Elizabeth Ashley Pragar  
*Biological Sciences*

C24
Analyzing Copy Number Aberrations of Tumor Suppressor Genes and Oncogenes In Feline Sarcoma

Rachael Thomas  
*CVM-Molecular Biomedical Sciences*

Emily Rose Carr  
*Biology*

C25
Effects of Environmental Enrichment Toys on Nursery Pigs

William Flowers  
*Animal Science*

Ahmad Rabi Amini  
*Chemical Engineering*

C26
The Gelation Mechanics of Silk Fibroin

Richard Spontak  
*Chemical and Biomolecular Engineering*

Stephen Evans White  
*Chemical Engineering*

C27
Introducing Tunable Shape-Memory Effects into Thermoplastic Elastomers

Richard Spontak  
*Chemical and Biomolecular Engineering*

Meghan Elizabeth Wilt  
*Textile Engineering, Chemical Engineering*

C28
Lignin as a Material Platform for Bio-Derived Macromolecules and Fibers

Julie Willoughby  
*Textiles*

D1
Caleb Dale Pearce  
*Biological Science*

Fungicide Resistance of U.S. Phytophthora infestans Pathogens

Jean Ristaino  
*Plant Pathology*

Hannah Renee Reese  
*Chemical Engineering*

D2
The use of a hydrophilically modified charcoal as a pretreatment of transgenic plant extract for the separation of antibodies

Ruben Carbonell  
*BTEC-Biomanufacturing Training Education Center*

Kevin Trevor Martell  
*Psychology*

D3
The Effects of Self-Consciousness on Job Performance in a Customer Service Setting

Bart Craig  
*Psychology*

Kaitlyn Eileen Casulli  
*Food Science*

D4
Effect of High Pressure Processing on Viscosity and Immunoglobulin G Content in Bovine Colostrum

Brian Farkas  
*Food, Bioprocessing & Nutrition Sciences*

Amanda Clarissa Antono  
*Biological Sciences and Nutrition Sciences*

D5
Parenting Picky Eaters: Strategies to Get Preschool Children to Eat Previously Rejected Foods

Suzie Goodell  
*Food, Bioprocessing & Nutrition Sciences*

Mary Patricia Bulfin  
*Biology*

D6
Identification of the Gene Responsible for the Chicken L Allantigen by Whole Genome Association Mapping and Assessment of Potential Implications on Poultry Immunological Response

Chris Ashwell  
*Poultry Science*

Michele Lee Price  
*Biology*

D7
Everyone Says You Are What You Eat

Suzie Goodell  
*Food, Bioprocessing & Nutrition Sciences*
<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
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<th>Name</th>
<th>Department</th>
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<tbody>
<tr>
<td>Jessica Loyd</td>
<td>Animal Science;</td>
<td>Predicting Observed Soil Moisture Using Statistical Modeling</td>
<td>Nicholas Snow</td>
<td>Biological Sciences &amp; Spanish Language;</td>
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<td>Nicholas Snow</td>
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<td>Morgan Pope</td>
<td>Human Biology</td>
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<tr>
<td>D8</td>
<td>Joseph Tokeshi Taylor</td>
<td>Etiolegy of Amyotrophic Lateral Sclerosis</td>
<td>Robert Grossfeld</td>
<td>Biology</td>
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<tr>
<td>D9</td>
<td>Travis Wayne Radford</td>
<td>nickel-Catalyzed Cross-Coupling of Pyridine Derivatives with</td>
<td></td>
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<tr>
<td>D10</td>
<td>Summer Dawn Mims</td>
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<tr>
<td>D11</td>
<td>Aravind Somasundaram</td>
<td>Prenatal Factors In The Development of Pediatric Brain Tumors</td>
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<tr>
<td>D12</td>
<td>Catherine A Longo</td>
<td>The effect of small interfering proteins on Drosophila melanogaster</td>
<td></td>
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<tr>
<td>D13</td>
<td>Justin L. Hills</td>
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<tr>
<td>D14</td>
<td>Eva Marie Frantz</td>
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<td>Yeou Shya Chiou</td>
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<td>Shikha Singh</td>
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<td>Tayla W Cunningham</td>
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<td>Mary Terese Burkey</td>
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<td>Kelsey Leigh McDonald</td>
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</tbody>
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| D20 | Erika Ruth Koerner  
*International Studies* | Europe’s Zivilmacht State: Germany’s current political identity within Europe and the effects of German-style policy making in the European Union | Carol Lewald  
*Interdisciplinary Studies* |
| D21 | Richard Byron Beddingfield  
*Electrical & Computer Engr* | Parallel Active Filter for Load Generated Harmonic Distortion Removal | Subhashish Bhattacharya  
*Elec & Comp Engineering* |
| D22 | Danielle A Lindquist  
*Zoology* | Visitor Impressions: How Zoogoers Assess Animal Welfare | Jenny Campbell  
*Biology* |
| D23 | Michael Clifton Collins  
*Physics* | Helium Diffusion, Solubility, and Permeability Measurements of nEDM Experiment Construction Materials | David Haase  
*Physics* |
| D24 | Mark Stradley Dyson  
*Biochemistry* | B-Catenin: Target for Cancer Treatment | Balaji Rao  
*Chemical & Biomolecular Eng* |
| D25 | Brinda Monian  
*Chemical Engineering* | Use of Supercharged GFP to Deliver Binding Proteins into Mammalian Cells | Balaji Rao  
*Chemical & Biomolecular Eng* |
| D26 | Amanda Lee Cox  
*Chemical Engineering* | Elastomeric Photovoltaics Derived from Microphase-Separated Block Ionomers | Richard Spontak  
*Chemical and Biomolecular Engineering* |
| D27 | Brandi LaShea Shaw  
*Chemical Engineering* | Origami Folding of Polymer Sheets by Local Light Absorption | Michael Dickey  
*Chemical & Biomolecular Eng*  
Jan Genzer  
*Chemical and Biomolecular Engineering* |
| D28 | Matthew Bijan Movassaghi  
*Animal Science* | Molecular Characterization and Comparison of Multidrug Resistant (MDR) Salmonella isolated from Humans and Swine in North Carolina | Siddhartha Thakur  
*CVM-Food Animal Eq* |
Abstracts
Arranged in Alphabetical Order by Author within the College of the Mentor

College of Agriculture and Life Sciences

Session 1, A19
Ethical Issues Concerning the Uses of Genetic Technology

Cara J Adrian Biology
Mentors and/or Co-Authors: H. C. Liu Animal Science

New technological advancements have expanded the possibilities for the genetic field. These advances include genetic engineering, testing, and cloning. Recent research, however, has given rise to a menagerie of ethical debates including stigmatization, political controversy, and economic uncertainty. Based on the potential outcomes this new technology has presented, it is prudent to examine how these ethical issues will impact the future. Thus, the basis of this project was to investigate the controversies and ethical dilemmas surrounding the utilization of genetic technology (Note: the purpose of this project was not to provide answers to these controversies, but rather to explore various viewpoints). Questions investigated included “what effect will genetic technology have on the price of insurance,” “will genetic stereotyping exist in the post-genomic era,” and “what are the consequences of allowing the cloning of humans?” To address such questions, existing academic research and reviews were consulted. Thorough examination of these texts have reinforced that the settlement of these ethical issues depend on various political, social, economic, and religious factors. Although it can be predicted what kind of arguments could arise surrounding these matters, it is impossible to know in what direction such debates will go until genetic technology is further developed and its use more widespread.

Session 2, C4
Effects of site-directed mutagenesis on the binding affinity of tamoxifen to the estrogen receptors of a teleost fish, Micropogonias undulatus.

Obed Kwame Agyei Biology
Mentors and/or Co-Authors: Beth Hawkins Biology

The actions of estrogen are important to many physiological processes, including growth and maintenance of the reproductive system. Estrogens mediate their effects by binding to estrogen receptors (ERs) in target cells and inducing gene transcription. Drugs that specifically activate or inactivate the ER in a tissue-specific manner have proven to be effective tools against estrogen-related diseases. However, much is still not known about the structural relationship between ER proteins and their ligands. Tamoxifen is a breast cancer drug that binds to and blocks ER signaling in breast cancer cells, but not in other cell types, such as the ovary. Lack of signaling downstream of ER activation with tamoxifen is partly attributed to changes in the conformation of a signaling loop on the surface of the receptor. I will use the fish model system of three ERs (ERα, ERβ, ERβb), which contain diagnostic amino acid changes near the ligand binding pocket to further elucidate the importance of the ER structure to tamoxifen binding. Specifically, I will perform reciprocal mutagenesis of the conserved asparagine 411 of the fish ERα amino acid serine. I hypothesize that this will alter the binding affinities of the ERα receptor to more closely resemble those of ERs and mammalian ERs. This study will shed light on the importance of a region of the ER ligand domain outside of the binding pocket.

Session 1, A4
Qualitative Assessment of Medical Students? Definition of Childhood Obesity

De'Ja Sade Alexander Biology
Jennifer Wheeler Biological Sciences-Human Biology
Concentration;
Brittany Lang Human Biology
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences
Alice Raad Food, Bioprocessing, and Nutrition Sciences; Natalie Cooke Food Science;

Seventeen percent of children ages 2-18 are currently obese. Healthcare providers have an important role in diagnosing, preventing, and treating childhood obesity. To determine the way in which medical students describe the term childhood obesity, the research team conducted 78 interviews with third and fourth year medical students at schools across the United States. Audio-recordings of the interviews were transcribed verbatim and researchers analyzed the data to determine dominant emergent themes. Researchers found that students used stereotypes (e.g. “fat child eating fast food”) or personal experiences to describe childhood obesity. Additionally, students used a variety of methods to define childhood obesity: growth charts, Body Mass Index, and/or a diagnosis tailored to the individual child. To improve health professionals’ understanding of childhood obesity, future work should include development of standardized education for medical students on appropriate ways to define and describe childhood obesity.

Session 2, B1
Cytochrome P450 2D6 Genetic Testing at LabCorp: Impact of CYP450 2D6 Metabolizer Phenotype

Katlin Rae Allsbrook Genetics
Mentors and/or Co-Authors: Edward Williams Laboratory Corporation of America

Cytochrome P450 (CYP) is a major category of drug-metabolizing enzymes. Pharmacogenetic testing for different CYP variants can classify an individual’s metabolizer phenotype. The four possible metabolizer phenotypes are extensive, intermediate, ultra-rapid, and poor. The 2011 Food and Drug Administration (FDA) guidelines outline how to determine the CYP2D6 metabolizer phenotypes based on genotyping performed on the Roche Amplichip platform. This project compared the genotype/metabolizer phenotypes of 3995 specimens ordered for three CYP2D6 tests (generic CYP2D6 test, CYP2D6 Tamoxifen specific and CYP2D6 opioid specific tests) using the FDA guidelines with the guidelines for determining metabolizer phenotypes as suggested by a research article published by the University of North Carolina at Chapel Hill. An analysis of the data indicated that there was a significant decrease in the number of extensive metabolizers and a significant increase in the number of intermediate metabolizers when all three types of
Barriers to Implementing Nutrition Education in Head Start Preschool Classrooms

Michelle Carolyn Anderson  Biology
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences
Virginia Carraway-Stage  Food, Bioprocessing, and Nutrition Sciences

In the US, 17% of children are considered overweight or obese, despite efforts to include nutrition in the preschool curriculum. Children attending Head Start often experience higher rates of obesity. Reported barriers for teaching nutrition education in other academic settings include lack of curricular materials and teachers without enough nutrition training. The purpose of this research was to interview Head Start teachers (n=15), Center Directors (n=4) and Health/Nutrition Coordinators (n=11) to determine the barriers observed when implementing nutrition education in Head Start preschool classrooms. Interviews were analyzed to identify themes. Staff in these centers experienced many barriers, which made it more difficult to effectively teach nutrition education in the classroom. The most common barriers included confusion and limitations related to Head Start policies (federal and local), lack of nutrition resources inside classrooms (updated references and new lesson ideas), and inadequate teacher training in nutrition education. Many reported skipping or limiting formal nutrition education in the classroom in order to allow more time for other subjects such as math, reading, and writing. To effectively improve the nutrition education, it is important to understand barriers to nutrition education in the classroom as experienced by teachers and administration. The results obtained in this study serve as baseline data to explain classroom barriers, which may better enable nutrition educators to develop educational resources and training experiences to improve the content, frequency and overall quality of nutrition education in the Head Start preschool classroom.

Session 2, D5
Parenting Picky Eaters: Strategies to Get Preschool Children to Eat Previously Rejected Foods
Amanda Clarissa Antono  Biological Sciences and Nutrition Sciences
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences
Joylyn Daniel  Food, bioprocessing, and Nutrition Sciences

Food neophobia affects a child’s willingness to try new foods and can translate to children avoiding certain foods. In order to address this issue of food rejection in children, researchers conducted 16 focus groups to determine the strategies that parents use to get their children to eat such previously rejected foods (PRF). These focus groups targeted African American and Hispanic parents from Head Start centers in the greater Houston, TX, Yakima, WA, and Tacoma, WA areas. While many strategies were discussed, the results show that the majority of parents willingly decided not to purchase or serve foods that their children did not want to eat. Additional strategies arose when parents tried to serve PRF that they had already prepared. Such strategies included adding other ingredients to the foods (i.e. ranch dressing, cheese), and serving the PRF in an alternative style (i.e. steaming instead of serving raw). Future research can analyze the best methods to help parents get their children to eat PRF. Results from this research study will be used to create an intervention to help parents get their preschool children to eat PRF.

Session 1, C8
The Impact of Concussions on Contact Sports and Their Athletes
Sophie Leigh Austin  Biology
Kirstin Morris  Nutrition Science;
Karim Ghanem  Biology Concentration: Human & Religious Studies;
Heather Kashner  Biochemistry;
Jennifer Tier  Human Biology;
Ar’neka Montford  Human Biology;
Brandon Williams  Biochemistry
Mentors and/or Co-Authors: Michael Goshe  Biochemistry

Athletes can receive concussions in almost any sport at any level. In recent decades, a raised awareness of concussions and their effects on the body have led to a higher rate of diagnosis. The literary research of this topic covered several aspects: defining a concussion, the biochemical changes in the brain following concussions, second impact syndrome, long term effects and emotional responses to concussions, diagnostic methods, and concussion policies of sports organizations. Although different sources have varying definitions and grades of a concussion, most agree it is a mild traumatic brain injury resulting from an impact that causes the brain to hit the skull. After a concussion, the brain experiences a chemical cascade, which requires recovery time to prevent second impact syndrome. There are possible long-term effects of concussions, including possible links to neurofibrillar tangles, which are associated with Alzheimer’s disease. Concussions have also been shown to increase rates of depression and anxiety. The NFL and other sports organizations have increased their regulations regarding concussed athletes, which involve education of team members and utilizing more medical personnel, such as a neurologist, in their training. Diagnosing is often difficult since much of the testing involves the injured athlete responding to questions, so diagnostic tests have been created and improved to establish a baseline that is compared to the athlete’s responses after an injury. Although there has recently been an increase in awareness and knowledge regarding concussions, many aspects about the condition remain unknown.

Session 1, A10
Non-Nutritive Oral Behaviors of Holstein Dairy Cows: A Free-stall v. Pasture Study
Jennifer Brooke Beane  Animal Science
Mentors and/or Co-Authors: Dan Weary  Animal Welfare Program

As the dairy industry is trending towards intensive housing systems, restricted feeding and indoor housing is becoming common practice for calves, heifers, and cows. Thirty-two Holstein dairy heifers distributed in four groups, with eight animals assigned to each group by stage of gestation and
animal age. Each group received two treatments of free-stall and pasture in a cross-over experimental design carried out at the University of British Columbia Dairy Education and Research Center in Agassiz, British Colombia, Canada. Non-nutritive oral behaviors, tongue rolling and oral biting were observed during this study. In free-stall housed heifers, non-nutritive oral biting occurred in 25 heifers (78%) and tongue rolling occurred in 13 heifers (40%). In pasture housed heifers, non-nutritive oral biting occurred in 4 heifers (12.5%) and tongue rolling occurred in 4 heifers (12.5%). Tongue rolling was not observed until sixty minutes after feed delivery. Overall, more tongue rolling and bar biting occurred while the heifers were housed indoors in free-stalls versus pasture. These results suggest that heifers housed in free-stalls exhibit more frustration and bored behaviors than those housed on pasture. More enrichment should be provided in free-stalls to decrease the occurrence of non-nutritive oral behaviors.

Session 2, B11
A translational frameshift in the tail assembly chaperone of mycobacteriophage Astraea
Adriano Alejandro Bellotti Biomedical Engineering
Tori Jefferson Ecology & Evolutionary Biology;
Richard Sater Biochemistry;
Avinash Pyreddy Biology;
Ravi Dixit Microbiology;
Kayla Hurst Zoology
Mentors and/or Co-Authors: Eric Miller Microbiology
Devon Viscount Microbiology;
Susan Carson Plant Biology

Bacteriophages are viruses that infect bacteria. Students in the Phage Hunters course at North Carolina State University isolated bacteriophages using Mycobacterium smegmatis as a host. Last semester, we isolated and characterized the mycobacteriophage Astraea. Based on electron microscopy, we found Astraea to be of the myoviridae morphotype. Myoviridae have contractile tails that inject genomic DNA into host cells. We purified the double-stranded DNA genome of Astraea and sent it to DHMRI for sequencing. This semester, we annotated two putative genes predicted to encode tail assembly chaperones, which are proteins that aid in the assembly of the major tail subunit of the phage. We hypothesize that these genes contain an evolutionarily conserved mechanism of frameshifting between genes to code for one product. This mechanism in other known phages occurs in the ribosome during translation when a slippery sequence is encountered on the mRNA. The slippery sequence is a stretch of nucleotides in the format XXXYYYZ that causes the ribosome to "slip" to a -1 reading frame. We predict the presence of this frameshift because of a slippery sequence (GGGAAAA) found in the correct frame of the first gene, similarities to genes in related mycobacteriophages, and the prevalence of slippery sequences in tail assembly chaperone genes. This process demonstrates the capacity for multiple coding options (short, terminated or long, readthrough proteins) in one region of the genome.

Session 2, A14
Cabbage leaf curl virus but not Beet curly top virus Induce Senescence in Arabidopsis thaliana
Elisabeth A Braswell Biochemistry
Mentors and/or Co-Authors: Jose Ascencio-Ibanez Biochemistry

Geminiviruses represent a serious agricultural problem worldwide, particularly in tropical and subtropical countries. These viruses cause a lot of loss in crops due to its ability to affect plant development. Cabbage leaf curl virus (CaLCuV) is a bipartite begomovirus transmitted by whiteflies that infects Arabidopsis thaliana, a model plant. Unlike many other viruses, geminiviruses replicate in the nuclei of infected cells however they behave similar to other viruses (RNA viruses) when it comes to symptom development. A recent work by Keech et al (2011) showed that tubulin genes fused to GFP can be an excellent tool to visualize changes in cell scaffolds during time. We are studying the different effects Cabbage leaf curl virus (CaLCuV) and Beet curly top virus (BCTV) have on senescence markers in Arabidopsis thaliana. This study compared both viruses in two ways. First by monitoring gene expression of all tubulin genes in infected leaves of A. thaliana Col-0 and second, by looking at two tubulin genes fused to the green fluorescent protein that incorporate to the microtubule network. Results show differences in the way the tubulin genes and other senescence markers are affected during geminivirus infection.

Session 1, D34
The evaluation of MMP-2 and -9 in urine samples from canine cancer patients
Alicia M Braxton Zoology
Mentors and/or Co-Authors: Christopher Mariani CVM-Comp Animal

Matrix metalloproteinases-2 and -9 (MMPs) are zinc-
dependent endopeptidases that degrade components of the extracellular matrix. They are expressed by many different cancers, and facilitate the local invasion and metastasis of these tumors. We hypothesized that MMPs would be expressed in the urine of dogs with cancer. We collected urine samples from canine patients seen at the NCSU College of Veterinary Medicine that had a diagnosis of cancer. Samples were stored at -80°C until analysis, which was performed with gelatin zymography. We found that 28% of dogs surveyed with cancer expressed MMP-2 while 58% expressed MMP-9. We conclude that MMP-2 and -9 are expressed in the urine of dogs with cancer. Comparison studies to determine the expression of MMPs in clinically healthy dogs and dogs with other disease processes are ongoing. The ultimate goal of this research is to determine if urine expression of these compounds might be used as a diagnostic tool for identifying dogs with cancer or screening for the relapse of tumors after therapy in dogs.

Session 1, C5
There’s More to Genes than Meets the Eye
Rebecca O Breese Biology
Pei-Chun Chu Biochemistry;
Paige Jacobs Zoology;
Laura Buckner Biological Science

Mentors and/or Co-Authors: H. C. Liu Animal Science

Epigenetics refers to the modification of DNA expression without changing the base pair sequence. To do this, the cell can modify histone proteins, which help the DNA condense, or the actual DNA molecules. Methyl groups and acetyl groups are added and removed from these structures to regulate the gene expression. These changes can be influenced by many factors. During fetal development, the mother’s behaviors can impact the epigenetics of the organism. After birth, the organism’s lifestyle choices and environment can change its epigenetics.

Session 1, D18
Effects of Diet and Feeding Schedule on Equine Glucose Metabolism
Heather Christine Brown Animal Science

Mentors and/or Co-Authors: Shannon Pratt-Phillips Animal Science

The horse’s metabolism has evolved to support a diet of mostly fermentable forage carbohydrates as the main source of nutrients and energy. Today’s domesticated performance horses are often stalled and fed commercial feeds composed of cereal grains high in starch. Additionally these horses are usually fed twice a day as opposed to slowly grazing throughout the day. Previous research has shown that insulin resistance is often caused by diets with large amounts of non-structural carbohydrates (NSC). The purpose of this research is to investigate the metabolic response of blood glucose levels to changes in equine diet constituents and feeding times. This study consisted of the following four treatment groups: 1. High NSC fed twice a day 2. High NSC fed three times a day 3. Low NSC fed twice a day and 4. Low NSC fed three times a day. Blood samples were taken prior to feeding and for the next five hours post feeding. The EDTA-plasma was used for spectroscopy readings to calculate the glucose concentrations in the blood. The data were analyzed using a four by four Latin square design. Results showed that there was a significant effect of time (p<0.0001) but no significant difference between the four treatments (p>0.05). There was no significant difference between treatments for peak glucose concentrations, time to reach peak concentration, or the area under the glucose curve. There was a trend (p=0.094) for lower glucose levels when feeding three times a day as opposed to two regardless of the meal type.

Session 2, A9
Cortical Damage Impacts Ependymal Cell Homeostasis within the Mouse Neural Stem Cell Niche
Justin David Buie Biology

Mentors and/or Co-Authors: Troy Ghoshghaei CVM-Molecular Biomedical Science

During embryonic development, neurogenesis occurs ubiquitously throughout the central nervous system (CNS). However, neurogenesis is limited to select regions of the postnatal and adult brain. An established corridor of adult neurogenesis in the mouse CNS includes the subependymal zone (SEZ) of the lateral ventricles, which forms a stem cell niche. Prior research has shown that the ependymal component of the niche is stimulated to divide in response to neural damage, and directly participates in generation of new neurons that migrate to the site of injury. The precise nature of such responses and their underlying mechanisms remain largely unknown. Our lab recently discovered that a forkhead transcription factor, Foxj1, is required for the differentiation of ependymal cells during early postnatal development. Moreover, we have evidence that the endogenous Foxj1 promoter in the wildtype ependymal cells becomes highly inactive during adult periods. These findings led to the hypothesis that Foxj1 expression in the ependymal component of the niche may increase in response to injury. Using genetic mosaicism in mice I examined the fate of Foxj1 expressing ependymal cells following induced injury. My preliminary findings suggest an increase in Foxj1 expressing cells in and around the SEZ two weeks post injury. This increase in Foxj1 expressing cells may be due to proliferation of preexisting Foxj1 expressing cells, or induction of the Foxj1 promoter in cells without Foxj1 expression prior to injury. These findings provide an exciting platform for future assessment of the role of Foxj1 in the damaged/degenerating adult brain.

Session 2, D6
Identification of the Gene Responsible for the Chicken L Alloantigen by Whole Genome Association Mapping and Assessment of Potential Implications on Poultry Immunological Response
Mary Patricia Bulfin Biology

Mentors and/or Co-Authors: Chris Ashwell Poultry Science

Parasitic disease, such as cecal coccidiosis caused by the parasite Eimeria tenella, remains a significant concern within the commercial poultry industry due to increasing resistance to anticoccidial supplemental treatment. Improving the chicken’s inherit immunological response to coccidial infection is a potential method for combating resistance to and can be determined by considering alloantigen genes. Chicken erythrocyte alloantigen system L has two haplotypes, L1 and L2, and is associated with multiple factors involved in immunological response in the chicken. A resource population was produced by mating a heterozygous male chicken (L1L2) with four heterozygous females (L1L1), the F2 progeny were characterized for their L type. DNA was extracted and birds were sexed by PCR. DNA pools were prepared representing
each L haplotype from each family for SNP typing. The 4 parents and pools from each of the 4 families were genotyped using a 42,000 single nucleotide polymorphisms (SNPs) assay on a custom illumina bead array SNP panel. A single marker association analysis was performed using JMP genomics as a case/control population and P values were adjusted for multiple testing using false discovery rate (FDR). Significant association was observed with L alloantigen type and a distal region of chromosome 4. Investigation of this L alloantigen locus on chromosome 4 indicates that there are multiple candidate genes present whose protein products are localized on the cell surface. Further study is required to determine the causative variation responsible for the L alloantigen system.

Session 2, C25
Effects of Environmental Enrichment Toys on Nursery Pigs
Emily Rose Carr Biology
Mentors and/or Co-Authors: William Flowers Animal Science

An innate behavior of pigs is the establishment of a hierarchy of social dominance or peck order. This begins at birth, but isn’t expressed vigorously until pigs are weaned and placed in pens. Weaning occurs at 3 weeks of age and pigs fight daily with their pen mates. It is common for pigs to physically injure one another; this period of aggressive behavior is detrimental to their health and wellbeing. The objective of this study was to examine the effect of introducing rubber balls into pens of weaned pigs on the incidence of aggressive behaviors and injuries. 6 pens containing 8-12 pigs were used. After weaning at 3 weeks of age, each pen was randomly assigned to receive 0, 1, 2, 3, 4, or 5 balls (n=1 pen per number of balls). The pen with 0 balls was considered the control. Once per week over a 5 week span, the pigs were weighed and lesions were recorded and scored based on their severity on a scale of 1-3, 1 being least and 3 being most severe. Additionally, 6-10 minutes of video per pen was recorded weekly to monitor behaviors. Our hypothesis was that the introduction of toy balls will decrease aggressive behaviors and reduce the number and/or severity of lesions that occur. We hoped to find a correlation between number of toys and behavioral and lesion changes. The goal of the study was to improve production and create a healthier, more enjoyable environment for nursery pigs.

Session 1, C15
Drivers of genome evolution: homing endonuclease genes in mycobacteriophages
Morgan Elizabeth Carter Biochemistry
Kimberly Amick Microbiology
William Kohlway IV Microbiology
Mentors and/or Co-Authors: Eric Miller Microbiology
Susan Carson Plant Biology

Mycobacteriophages, viruses that infect Mycobacterium spp., are sorted into clusters based on genome similarity. Phages within the F1 subcluster share a lower degree of sequence similarity in the 3’ portion of their genome than in the 5’ portion, unlike those in other clusters that share a high degree of similarity across their entire genomes. F1 phage genomes have a high degree of sequence heterogeneity in the 3’ half, which notably contains putative homing endonuclease genes (HEGs). HEGs code for enzymes that cleave dsDNA and direct the transfer (“homing”) of genes from one genome into another. This transfer often contributes to the evolution of genomes. We hypothesize that HEGs predominate in the variable region of the phage genome, where they are less likely to affect the functionality of necessary genes and where their self-directed insertion transfers new genes that contribute further to the 3’ sequence mosaicism. HEGs found in F1 phages belong to either the HNH or GIY-YIG homing endonuclease families, which are identified by conserved amino acid motifs. The presence of a conserved motif in a putative HEG suggests that the gene product could be an active endonuclease. We are investigating four different mycobacteriophage HEGs - three HNH and one GIY-YIG. We examined these HEGs for conserved motifs to verify putative functionality. Phage pairs that might demonstrate HEG mobility were identified for co-infection experiments: Mutaforma13 x Shauna1 and Mozy x RockyHorror. By plating the lysate from the co-infections, we will be able to test for HEG movement using PCR screening.

Session 1, B22
Bartonella Detection after Storage
Kristy M Casper Animal Science
Mentors and/or Co-Authors: Ricardo Maggi CVM-Comp Animal Science

*Bartonella* is a zoonotic bacterium that can be transmitted by many vectors, including fleas, ticks, body lice, sand flies and via animal bites, scratches, and potentially ingestion. *Bartonella* infection in people has been historically associated with Cat Scratch Disease, endocarditis, bacillary angiomatosis and Trench Fever. Nevertheless, more complex and chronic disorders such as neurological disorders have been recently reported. The objective of this project was to determine if human blood samples containing *Bartonella* species could be stored for up-to 8 weeks at 4-8°C before tested for the presence of this bacteria could take place. A set of DNA samples (n=59) were extracted from spiked human blood with and without *Bartonella henselae*. Samples were previously stored at 4°C for up to two months and were tested using PCR (Polymerase Chain Reaction). *Bartonella* DNA was amplified using conventional *Bartonella* genus PCR primers targeting the 16S-23S intergenic spacer region (ITS). All products were analyzed by 2% agarose gel electrophoresis. PCR products obtained from samples were sequenced to identify the species and ITS strain type. Results showed that 58 of the 59 samples were accurate to their expected outcome. *Bartonella* spiked samples were positive and negative control samples were negative from weeks 1-9. Detection of *Bartonella* in samples after storage is important for when samples may not be tested right away after collection.

Session 2, D4
Effect of High Pressure Processing on Viscosity and Immunoglobulin G Content in Bovine Colostrum
Kaitlyn Eileen Casulli Food Science
Mentors and/or Co-Authors: Brian Farkas Food, Bioprocessing & Nutrition Sciences
Keith Poulsen Pathobiological Science
Derek Foster CVM-Food Animal Eq

Feeding of high quality, pathogen free colostrum is essential for the health of dairy calves; however, bovine colostrum is often contaminated through improper handling which necessitates its pasteurization. Thermal treatments (62.5°C,
30 min) reduce bacterial contamination, but these increase the viscosity of the colostrum as well as reduce the concentration of biochemically active nutrients, such as immunoglobulins. It was hypothesized that high pressure processing could be applied to bovine colostrum to prevent changes in viscosity and nutrient levels. First-milking samples collected from cows (Holstein) at the College of Veterinary Medicine at North Carolina State University were pressure processed (Autoclave Engineers, CIP2-22-60) at 300 MPa and 400 MPa for 0 to 45 min. while maintaining a temperature of 0°C. Shear stress and viscosity for each pressure processed sample was determined (StressTech, Controlled Stress Rheometer) over shear rates (0.1 to 200 1/s) encompassing those found during calf feeding and at bovine body temperature (37.8°C). IgG content was determined (Bovine IgG RID Test Kit, Triple J Farms) in singlet for each triplicate pressure processed sample. Viscosity values remained constant (0.01 Pa s) over the range of times tested at 300 MPa while values generally increased (0.01 to 0.03 Pa s) with increasing time at 400 MPa with the highest viscosity being acceptable for feeding. IgG values all remained above the minimum threshold (5000 mg/dl) for all treatments except 30 and 45 min at 400 MPa.

Session 2, C20
Lionfish: Kudzu of the Caribbean
Lauren Elizabeth Cates Biology
Marissa Herchler ;
Kayla Dennis ;
Patrick McCarthy ;
Jenna Montminy ;
Paige Harrelson ;
Kylie Gilsson ;
Carolina Caro ;
Hannah Howard ;
Noelle Dalhouse ;
Rocco Coluci
Mentors and/or Co-Authors: James Brown Microbiology

The Caribbean, Bahamas, Gulf of Mexico, and the entire eastern seaboard from Rhode Island to Venezuela have been invaded by the voracious and venomous lionfish (Pterois miles and P. volitans). This south-Pacific fish, popular amongst marine aquarists because of it's beauty and hardiness, escaped or was released into the waters of Florida, from where they have spread like Kudzu. They are efficient predators, very hardy, have few predators, and multiply quickly. They threaten ecosystems and economies with their voracious appetites. In some regions, including the North Carolina coast, they outnumber all native grouper species (with which lionfish compete) except Scamp (Mycteroperca phenax). We will describe the effects of this invasion, and what is being done to control it and minimize the impact of these dangerous aliens, including our own efforts to raise awareness.

Session 2, C9
World Food Security in 2050: Can we meet food, feed, and fuel needs?
Joseph Aaron Cheek Plant and Soil Sciences: Agronomic Science
samantha cohen biology;
Caitlin Davis Horticultural Science;
Tony Mayer Plant Biology;
Emily Robertson Biochemistry;
christine kerrigan biology (human biology);
Andrew Scruggs Horticulture Science;
Kaitlyn Casulli Food Science;
Nicholas Lannon Agricultural and Environmental Technologies & International Studies
Mentors and/or Co-Authors: John Havlin Soil Science

Future food, fiber, fuel, and water requirements of a growing global population will place increasing stresses on our agricultural production systems. While all ecosystems are impacted by human intervention and management, meeting future global demands for resources will challenge societies to cooperatively manage and protect ecosystems. Over the next 40 years global demand for food and other products will increase by 50% or more. Future demand and supply is driven by several factors including increasing population pressure, availability and productivity of agricultural land, increasing non-food use of crops, and increasing proportion of meat in the diet. Each factor will be evaluated relative to its impact on meeting food demand.

Session 2, A11
Essential Oil Concentration and Grain Type Affect Broiler Ileal Traits at Market Age
Kayla Nicole Claassen Biochemistry, Bioprocessing
Mentors and/or Co-Authors: Edgar Oviedo Poultry Science

A commercial essential oil (EO) blend with benzoic acid (Crina Poultry Plus) improves broiler performance in both wheat- and corn-based diets, but the mode of action is not yet understood. One trial was conducted to evaluate the effects of the concentration of this EO (0, 150, or 300ppm) in corn (C) or wheat (W) based diets on ileal morphology, comparative mucus levels, and enterocyte migration. 720 Ross 708 male broilers were randomly identified and placed in 72 floor pens, with 12 replicate pens per treatment. At 45 days of age, one broiler per pen was weighed and injected intraperitoneally with 5-bromo-2’-deoxyuridine (10mg/kg), then injected with thymidine (500mg/kg) after 3 hours. 24 hours later, each bird was weighed and sacrificed. An ileal segment was collected for comparative mucus quantification using a colorimetric assay. Ileal segments were harvested for immunohistological staining to determine villus height (VH), apical villus width (AW), villus base width (BW), crypt depth (CD), crypt width (CW), thickness of mucosa epithelium (McT), and enterocyte migration (M), averaging 15 villi per bird. Results indicated EO decreased mucus production, with no significant effect on McT. Enterocytes from W-fed birds migrated further along the villus. C-diets increased VH, CD, and McT compared to W-diets. EO in W-diets increased CD and AW, decreased VH, and decreased VH:CD ratio. In conclusion, the EO affected intestinal histomorphology, especially when added to W-based diets.

Session 1, D6
A Comparative Study of Specific Neurological Diseases: Alzheimer’s, Parkinson’s and Schizophrenia
Cashlyn Elizabeth Coburn Biology
Ian Chapman Biological Sciences-Human Biology; Blake Hess Biological Sciences-Human Biology; Sarah Finegan Biological Sciences
Mentors and/or Co-Authors: Miriam Ferzli Biology

Neural signaling is an essential process that plays a role in cognition, movement, and development. Neural signaling breakdown may cause dysfunctions/disorders that can result
in dementia, hallucinations, and even death. Alzheimer's disease, Parkinson's disease and schizophrenia are all neurological disorders caused by an excess or deficiency of a certain neurotransmitter. Neurotransmitters are an integral part of neural signaling and communication between neurons. Alzheimer's disease has been linked to a decrease of acetylcholine concentrations, Parkinson's disease is a result of a dopamine deficiency in the basal ganglia, and schizophrenia is believed to be caused by excess dopamine production. Based on a recent literature review, we compared the causes, symptoms, and possible treatments of these disorders. We hypothesized that these disorders have common origins and progressions, while differing in their symptoms and therapeutic options. We concluded that specialized therapeutic options are needed to aid patients affected with these diseases, even though Alzheimer's, Parkinson's, and schizophrenia are similar in both their origins and progression. Further research will help us discover the underlying similarities between the diseases' progression and genomic patterns, in order to help us create individualized therapies for each.

Session 1, D11
The Effects of Maternal Obesity During Pregnancy on Offspring Health
Lauren Margaret Cole Biology
Bernice Gyamfi Nutrition Sciences;
Daljinder Bhangoo Biological Sciences;
Jacey Byers Nutrition Sciences;
Tiffany Matthews Biological Sciences;
Isha Arfeen Biological Sciences;
Peyton Huneycutt Biological Sciences;
Emily Sayavong Biological Sciences
Mentors and/or Co-Authors: Scott Whisnant Animal Science

Maternal obesity has many health implications that affect not only the pregnant woman but also her offspring. This research aimed to investigate the many effects of maternal obesity during pregnancy on offspring health. Maternal obesity during pregnancy is associated with a significant increase in neonatal mortality risk. Research suggests that obese mothers are more likely to give birth to children with birth weights below the 10th percentile. Furthermore, effects of maternal obesity during pregnancy carry on well into postnatal development, as maternal obesity is an indicator of high BMI in offspring and increased likelihood of developing diabetes. Congenital abnormalities and increased adiposity are more likely to occur in children born to obese mothers. Children born to obese mothers are more likely to develop diabetes, hypertension, and cardiovascular disease later in life. Research indicates this could be reduced by treatments designed to decrease obesity such as gastric surgery. This research provides significant evidence that the intrauterine environment plays a role in determining postnatal health and that health intervention strategies targeted to pregnant women could have a major impact on the health of future generations.

Session 1, A13
The effect of different feeding practices on blood glucose concentrations in horses.
Morgan Leigh Collins Animal Science
Mentors and/or Co-Authors: Shannon Pratt-Phillips Animal Science

By slowing the rate at which horses' consume their feed, rises in blood glucose concentrations may also be slowed which may decrease the effects on insulin sensitivity. We investigated several common methods to slow horses' feed consumption rates, as well as including testing the effectiveness of a novel feed tub. The research examined how these different methods to slow feeding affected glucose responses. After a baseline blood sample was collected, horses were given a pelleted horse feed in one of the randomly selected four different feed tubs. The amount of time it took for each horse to consume their feed was recorded and blood samples were collected at various intervals. The glucose concentrations were then analyzed which showed that the various treatments did not have a significant effect on glucose concentrations. Glucagon and insulin work to keep glucose normal, so in healthy horses glucose should remain fairly constant. There was also variability between horses which could have masked the treatment differences in the statistics.

Session 2, A26
Natural Colorants as Alternatives to FD&C Yellow 5 in Pasteurized Pickle Products
Katrina Elaine Connor Food Bioprocessing and Nutrition
Mentors and/or Co-Authors: Suzanne Johanningsmeier Food Science

FD&C Yellow 5 is a synthetic lemon yellow dye commonly used in pasteurized, pickled vegetable products in the US. Health concerns associated with this dye may lead the pickle industry to find an alternative, natural food colorant. Natural colorants, including annatto, turmeric (curcumin), water dispersible beta-carotene, and caramel color were tested for the ability to replace Yellow 5 in pasteurized pickle products. Pickle products (pH ~ 3.8) were prepared with a range of natural yellow colors, pasteurized, and stored at room temperature under fluorescent lighting. Color was measured spectrophotometrically for the pickle cover brine, and pickle color was measured using a Hunter colorimeter. L*a*b* values and hue were determined and compared to pickles containing Yellow 5. Sensory analysis (n=100 consumers) was conducted to determine the consumer acceptability of the naturally colored products. We found that although the brines looked yellow to the eye, they were different in their spectrophotometric profiles. Pickles prepared with annatto, beta-carotene, and turmeric resulted in significant differences in overall appearance. Beta-carotene was not well absorbed by the cucumber slices and none of the natural colors tested were as bright as Yellow 5. Though the pickles were different in color, those prepared with turmeric were liked significantly more for both color and overall taste than pickles containing Yellow 5 (P <0.05). Our research showed that consumers are willing to accept natural colorants as a replacement for Yellow 5 in pickle products. Therefore, further research to improve the stability of turmeric in these types of products is warranted.

Session 1, B18
Nutrition and Dining at North Carolina State University and Beyond
Mary Ashleigh Craver Biology
Mentors and/or Co-Authors: Sarah Ash Food, Bioprocessing & Nutrition Sciences

North Carolina State University Dining provides online nutrition information for foods served on campus. In addition to the macronutrients, Weight Watcher Point values are
available as well as other recent changes. When selecting foods on campus, many students do not use these resources or even know how to access them. In order to understand how University Dining provides nutritional information, personal interviews were conducted with the dietician at NC State and a member of the Dining Committee. After discovering why specific nutrition information is provided, student surveys were completed by 361 students in sections of Introduction to Human Nutrition. These surveys asked students if they looked at nutrition information, the content important to them, and how they accessed information. In order to provide recommendations to University Dining, other colleges were investigated online, to learn how other dining programs worked, what nutrition information they provided, and how that information was accessed. The interviews revealed that University Dining continually shows interest in not only making foods healthier but also providing more nutrition information when requested from students. The surveys found that the majority of students do look at nutrition information when eating on campus; however, they are often concerned with nutrition facts that are not provided. Moreover, most students wanted to access nutritional information in a different form than a website. Overall, the students and other dining programs provided suggestions for University Dining that could be used to address student requests and make nutritional information more accessible in the future.

Session 1, D32
Identification of cell-type specific peptide ligands for human preadipocytes
Victoria Elizabeth Crisci Biology
Mentors and/or Co-Authors: Paul Hamilton Microbiology
Fat tissue is a viable source of preadipocytes; current research is focused on useful and novel applications of these adult stem cells in both clinical and basic research. Preadipocyte-specific peptides could be linked scaffold material to create a tissue regeneration matrix. Therefore, identification of these peptides is vital in novel regenerative research. In addition, identification of cell-specific peptides that bind with strong affinity to preadipocyte ligands provides many novel avenues for cell-type specific identification as well as cell isolation and selection. This project employed phage display technology to search for cell-specific peptide ligands that could bind precisely to human-derived preadipocytes.

Random combinatorial peptide libraries were generated in a phage display system and used in identifying cell-specific binding sequences. During the affinity selection process on cells, each round of selection resulted in an enrichment of phage that display peptides that bind to the target preadipocytes, the binding of isolated clones was tested using a phage-based ELISA. ELISA results indicated a peptide sequence that bound to human-derived preadipocytes derived from the experimentally-created random combinatorial peptide library. However, further cross reactivity testing and target cell specificity analyses are needed to determine if the binding is specific to preadipocytes.

Session 1, C29
The effects of nematode infection on eosinophil major basic protein and mast cell tryptase levels in the equine colon
Colleen Nicole Crozier Poultry Science
Jessica Pritchett Animal Science;
Christon Wiles Zoology

Mentors and/or Co-Authors: Bruce Hammerberg
Department of Population Health and Pathobiology

Larval stages of the cyathostome nematodes found in the submucosa of the large intestine of horses can be the cause of acute inflammation in the colon, liquid and protein loss into the gut lumen, and entry of enterotoxins into gut tissues (Steinbach 2006). The inflammation associated with these nematodes in the submucosa involves mast cells and eosinophils that is similar to the intestinal inflammatory response of humans suffering from food allergies. Humans suffering from food hypersensitivity have elevated levels of mast cell derived tryptase and eosinophil major basic protein (EMBP) from degranulating eosinophils in their feces as measured by immunoassays and associated with inflammation in the colon (Peterson 2007, Van Odijk 2006). We hypothesize that levels of mast cell derived tryptase and EMBP can serve as markers of inflammation associated with nematode infections of the colon of horses. Enzyme linked immunosorbant assays (ELISA) were performed on fecal extracts to measure the amounts of EMBP and mast cell tryptase using labeled antibodies specific for these enzymes. Fecal samples were collected over a one year period at one to two month intervals and at daily intervals on two occasions immediately following treatment with anthelmintic drugs. Fecal parasite ova counts were also performed on these samples. Horses were kept year round on pastures with known levels of cyathostoma infective larvae. The findings show a seasonal fluctuation in EMBP levels possibly associated with the stages of nematode life cycle and infection level.

Session 2, D17
The mutagenesis of the rpsl gene of Campylobacter rectus (ATCC 33238) to confer streptomycin resistance
Tayla W Cunningham Human Biology
Mentors and/or Co-Authors: Deborah Threadgill Microbiology
Erin Harrell Microbiology

Campylobacter rectus (C. rectus) is a gram-negative, anaerobic rod and has been shown to be associated with adult periodontitis; a chronic inflammatory disease in which destruction of the supporting oral structures (i.e. the gums) can lead to tooth loss. Some of the possible virulence factors of this bacterium are its method of motility (flagella) and the possible production of cytokotins. Additionally, the S-layer surrounding the outer membrane of this bacterium can induce cytokine release in host cells. Though C. rectus is said to be an etiological agent of periodontal disease, it is currently not classified as a pathogenic bacteria and very little is known about its virulence mechanisms. The genome of C. rectus contains some genes that may be involved in natural transformation. This process allows a bacterium to be highly flexible and acquire additional virulence genes. Helicobacter pylori (H. pylori) and C. rectus have a homologous gene, rpsL.

In H. pylori, when a specific point mutation is carried out in this gene, and that extracellular DNA is taken up through natural transformation, it confers streptomycin resistance. By inducing this same point mutation in the rpsL gene of C. rectus (33238), it is possible to demonstrate the natural competency of C. rectus through acquisition of streptomycin resistance. I amplified, cloned, and successfully carried out a 129 A to G point mutation in the rpsL gene using site-directed mutagenesis. Currently, we are attempting to naturally transform the mutated rpsL gene back into the genome of C. rectus (33238), but have been unsuccessful, thus far.
**Session 2, A1**

Fiddler crab interspecific competition influences species’ sediment choice in North Carolina salt marsh

Erika Anne Davis Biological Sciences

*Mentors and/or Co-Authors: Stephen Fegley Biology*

Population ecology examines how competition alters species’ niches, including distribution and resource use. Fiddler crabs *Uca pugnax* and *U. pugilator* are ecosystem engineers in the salt marsh because their burrowing oxygenates sediment and increases marsh cordgrass, *Spartina alterniflora*, production. While *U. pugnax* feeds and burrows primarily in fine sediments and *U. pugilator* prefers coarser sediment, in marshes with well-mixed sediments there is an increased likelihood of habitat and resource overlap between these species. We hypothesized that interspecific competition may influence *Uca spp.* burrowing and feeding behavior and determine species distribution within the marsh. To test this hypothesis we conducted two-factor (sediment grain size and species presence/absence) laboratory experiments at the University of North Carolina Institute of Marine Sciences from July 31st – September 23rd, 2011. Using a replacement design, we recorded each species’ initial sediment choice, behavior, and burrow location when two crabs of one species were present and one crab of each species was present. To determine if interspecific competition is density-dependent, we repeated the experiment using ten crabs per treatment. In low-density replicates, *U. pugnax* preferred burrowing in finer sediment when *U. pugilator* were absent and showed no preference when they were present. *U. pugilator* showed no preference in either the absence or presence of the other species, which reflects field observations. Our results suggest that interspecific competition may be more influential in *U. pugnax*’s sediment choice and burrowing activity. We intend to further investigate these interactions by gathering more burrow data at the high-density level and behavioral observations.

**Session 2, A10**

Development of an Anatomy Laboratory Manual as a Study Aid for an Animal Science Course

Meredith Lane Davis Animal Science

*Mentors and/or Co-Authors: Shweta Trivedi Animal Science*

Undergraduate students enrolled in ANS 206 (Anatomy of Domestic Animals) had online access to notes on the Moodle learning management system and were responsible for bringing notes to class. It became increasingly evident that a majority of students failed to bring the required notes which led to inability to record supplemental information presented during class. The objective of this project is to determine the value of a laboratory manual as a study aid and its impact on student performance. At the end of the fall semester, students were asked to complete a survey concerning study aids. Over 95% of the students indicated that they believed a laboratory manual would be helpful for ANS 206. The laboratory manual was designed to include lecture notes, study guides, dissection guides and diagrams in color. This manual was ultimately published by Kendall Hunt Publishing Company and was a mandatory requirement for the course in the spring semester of 2012. Student performance on the laboratory practicals, online quizzes and in class quizzes was compared between the two semesters. Results showed that a greater number of students earned As and Bs on the first laboratory practical during the Spring of 2012 compared to students who took the course in the Fall of 2011. In addition, the average online quiz score of the students taking the course in the spring semester was also higher than the previous semester. Minor editorial changes are being incorporated into the laboratory manual to further improve its quality and effectiveness as a study aid.

**Session 1, B30**

The Validation of Methods to Micro-Aerate the Fermentation of Red Ale Wort

Alexander Michael Doane Food Bioprocessing and Nutrit

Kenneth Miller Bioprocessing Science;

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Rachel Geiger Bioprocessing Science;

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Currently, the brewing industry lacks methods to control the aeration of wort during fermentation. Traditionally, wort is not aerated because aeration without sufficient control can result in the development of off-flavors in the final product. It was hypothesized that control of this process can be achieved using micro-aeration to inject minute amounts of air into wort during the first 24 hours of beer fermentation. To develop and validate such methods, multiple batches of Irish red ale were manufactured using two small-scale batch fermenters at controlled aeration set points to evaluate variation and composition between batches when fermented by Nottingham Saccharomyces cerevisiae. Batch characteristics can be assessed based upon high performance liquid chromatography (HPLC) data from industry specific fermentation columns. This project is currently in the experimental phase of development and results are currently pending. The design and validation of micro-aeration methods could have a significant impact on the brewing industry. Controlling aeration in wort has the potential to reduce variation between batches, and to shorten the fermentation time while maintaining product quality with relatively low maintenance costs. Future experiments could compare the final quality of aerated wort to traditional methods by analyzing batch growth kinetics and chemical composition to historical specifications.

**Session 1, C12**

BIO 483: Multiple Theories of Multiple Sclerosis: Autoimmunity vs. Oligodendrogliopathy

Kevin Favreau Biology

Bailey Green Biology

Jenna Beck Biological Sciences: Integrated Physiology & Neurobiology;

Christopher Carr Biology

*Mentors and/or Co-Authors: Robert Grossfeld Biology*

Multiple Sclerosis (MS) is a demyelinating disease of the central nervous system (CNS) that affects two million people worldwide. This disease is very difficult to diagnose and has no known cure, but various disease-modifying treatments are available. It is widely considered that during MS progression, the body’s own immune system attacks the myelin sheath, which is essential for transmission of electrical signals by nerve cells. According to the Autoimmunity Hypothesis, naïve T-cells are activated within the lymph nodes, inducing differentiation and migration to the CNS. Infiltration of the blood-brain barrier occurs after T-cell migration, which leads to neuronal demyelination and inflammation due to these
myelin-reactive cells. Upon further research, a novel hypothesis has been created that advocates for the initial stages of MS progression being oligodendrocyte apoptosis and dystrophy as opposed to immune system activation. Utilizing post-mortem histopathological examinations from MS patients, four major lesion types were categorized. Type III and IV lesions (characterized by oligodendrogial apoptosis and dystrophy, respectively) have never been described in relation to the autoimmune hypothesis or to Experimental Autoimmune Encephalomyelitis (EAE), the primary animal model for MS. The Oligodendrogliopathy Hypothesis states that inflammation is not the cause of MS (as with the autoimmunity hypothesis), but rather a result of oligodendrocyte apoptosis. Further examinations of this novel approach to MS pathogenesis can lead to more precise lesion characterization and an increased understanding of the mechanism underlying this complex disease.

**Session 1, C14**

**Hedgehog Signaling Controls Intestinal Rotation and Epithelial Cell Development in Xenopus laevis**

Jordan Lindsey Ferguson Biological Sciences

**Mentors and/or Co-Authors:** Nanette Nascone-Yoder CVM-Molecular Biomedical Scien

During the development of the digestive tract, the intestine must rotate in a specific direction in order to create proper anatomy. Intestinal malrotation affects 1 in 500 births, and predisposes affected babies to life-threatening complications. It has been shown that disruption of hedgehog signaling can cause intestinal malrotation in mouse models. However, the specific mechanism by which Hedgehog affects intestinal rotation is still unknown. The morphogenesis of the intestinal epithelium occurs coincident with intestinal rotation. I hypothesized that Hedgehog is a controlling gene in epithelial cell arrangement, shape and viability during intestinal rotation and elongation. In order to assess the role of Hedgehog in epithelial cell development, developing *Xenopus laevis* embryos were exposed to either cyclopamine, a chemical which inhibits Hedgehog signaling, or purmorphamine, which activates inappropriate Hedgehog signaling, to generate models of intestinal malrotation. Immunohistochemistry staining was then used to visualize the development of abnormally rotating guts at a molecular and cellular level. Cyclopamine and purmorphamine both affect the formation of the intestinal cell space, as well as outer cell shape, and adhesion. Cyclopamine caused an enlarged cell cavity with an abnormally wide gut tube, while those embryos treated with purmorphamine had a narrow gut tube with a loss of central cells. These results suggest that Hedgehog signaling controls intestinal rotation by regulating the size of the internal cell space, and the shape and adhesion of outer intestinal cells. Therefore, one of the root causes of intestinal malrotation and elongation may be changes in cell shape, adhesion, and central cell development, possibly caused by abnormal Hedgehog signaling.

**Session 2, A15**

**The Effect of Sire Breed on Birth Weight, Pre-Weaning Average Daily Gain, and Weaning Weight of Angus and Angus Cross Calves**

Cassandra Lynn Ferring Animal Science

**Mentors and/or Co-Authors:** Joe Cassady Animal Science

The objective of this study was to assess the effects of breed of sire on birth weight, pre-weaning average daily gain, and weaning weight. Angus (n = 58), Hereford (n = 37), and Braunvieh (n = 37) sires were randomly mated to commercial Angus cows (n = 182). Hereford and Braunvieh sired calves will express 100% heterosis. Data were available for 365 calves born from 2003-2010 at the Tidewater Research Station in Plymouth, NC. The model included fixed effects of breed of sire, age of dam, sex of calf, and calving season. Gestation length was included as a covariate. The GLM Procedure of SAS was used. Age of dam and sex of calf affected birth weight, pre-weaning average daily gain, and weaning weight (P < 0.01). Calf birth year affected pre-weaning average daily gain and weaning weight. Gestation length affected birth weight (P < 0.01) and tended to affect pre-weaning average daily gain and weaning weight. Sire breed affected birth weight (P < 0.01). Angus, Hereford, and Braunvieh sired calves had average birth weights of 34, 37, and 37 kg, respectively. Birth weight, pre-weaning average daily gain, and weaning weight increased as age of dam increased up to 5 years of age. In summary, breed of sire influenced birth weight but did not affect pre-weaning average daily gain and weaning weight. These results are surprising in that heterosis did not result in heavier calves at weaning.

**Session 2, B8**

**Modified Neurosphere Differentiation to Assay Neurotoxicants**

Emma Rose Friberg Biology

**Mentors and/or Co-Authors:** David Threadgill Genetics

Parkinson’s disease is a neurodegenerative disorder of the central nervous system that results from the death of dopamine-producing neurons. Once dopaminergic nerve are
destroyed, never cells in the brain cannot properly send messages to control muscle movement, which leads to a loss of muscle function. Recent studies have shown an increase in the risk of developing Parkinson’s-like diseases in individuals exposed to the widely used industrial solvent, trichloroethylene (TCE). To develop an in vitro model for studying the effects of TCE on dopaminergic neurons, we reprogrammed mouse embryonic fibroblasts into induced pluripotent stem (iPS) cells. The iPS cells were used to develop a modified neurosphere differentiation protocol suitable for multi-well cell culture slides that will be needed to test the effects of TCE and its metabolites, dichloroacetic acid (DCA), trichloroacetic acid (TCA) and trichloroethanol (TCOH). Over an 11 day protocol, iPS cells formed both monolayer and embryoid body (EB) cells that were differentiated by subjecting each to N2B27 and/or EB media on Poly-D-lysine and Laminin treated slides. We found that to efficiently generate neurons from neurospheres in multi-well slides, 1.00 x 10^4 cells were required to be plated in each 0.8 cm^2 well of a multi-well slide. This modification greatly improved the ability to grow long-lived neurons in vitro, which will be essential for testing the effects of TCE and its metabolites. Future experiments will evaluate the identity of neurons differentiated from iPS cells by staining for the presence of tyrosine hydroxylase (TH), which specifically identifies dopaminergic neurons that are thought to be directly affected by TCE.

Session 2, A3
NCSU Solar Site Evaluation
John W Galloway Forestry
Mentors and/or Co-Authors: Robert Bruck Plant Pathology

Two primary students and eight teams of two students systematically surveyed solar site conditions for buildings on NC State University Centennial, North, and Centennial Biomedical campuses. Given the short timeframe, student teams followed a pragmatic approach, relying primarily on internet and NC State virtual resources for the first phase of the project. Site visits were performed for buildings, which provided a specific learning opportunity and/or to have additional data collection to establish a building as suitable for a future solar installation. The data collection criteria included: shading, orientation, roof area available, impediments, visibility, energy efficiency, age of roof, roof type, and ease of rooftop access for installation. Students also spoke with decision makers at the University and Industry level to ascertain what criteria was most important to people from every perspective. 25 buildings are currently being reccomended for several categories including small scale research systems, large scale utility systems, solar thermal and parking deck installations.

Session 1, A33
Assessing the Affect of the Plant Pathogen, Pythium irregularare, and Vermicompost on Arboruscular Mycorrhizal Fungi in Strawberry Roots
Miranda Lynn Ganee Plant and Soil Science
Mentors and/or Co-Authors: Michelle Schroeder-Moreno Crop Science

Plant pathogens cause economic damage to producers and the addition of beneficial soil amendments, such as vermicompost and Arboruscular Mycorrhizal Fungi (AMF), into a production setting may decrease disease pressure on plants. AMF is a fungus which can exist in a mutually beneficial relationship with plants. The structures of AMF include hyphae, arbuscules, and vesicles. Vermicompost is formed from worm castings. *Pythium irregularare* is a plant pathogen which causes root rot. An experiment was designed to assess how *Pythium irregularare* affects AMF colonization and the allocation of AMF structures within strawberry roots, in the presence or absence of vermicompost. The experiment was conducted in the NCSU Phytootron over a twelve week period. In week one, strawberry plugs were planted with either AMF, vermicompost, a combination of both treatments, or without treatment. After four weeks, the plants were transferred to six inch pots, and half of the plants were inoculated with *Pythium* infected rye grain. Root samples were collected during the fourth, sixth, eighth, and twelfth week of the experiment. The roots were cleaned, cleared, and stained in order to assess the AMF colonization and allocation of AMF structures within the roots at each sample period. The data was analyzed and the treatments of vermicompost and *Pythium* had a significant affect on AMF during week 8 only. In week 8, the data showed that the vermicompost treatment significantly decreased AMF colonization and the allocation of vesicles and hyphae, while the *Pythium* treatment significantly increased AMF colonization and the allocation of arbuscules.

Session 1, A21
Zoonosis: the fear, recognition, and reaction to BSE
Hannah Elizabeth Gardner Zoology
Christian Tilley Human Biology;
Samantha Goodwin;
Alexis Barnes Human Biology;
Jennifer Okpala;
Stephanie Mayor;
Jennine Lection Animal Science;
Bridget Conley Microbiology;
Katherine Boyette;
Mary Klinck Agriculture Business;
Zachary Spencer Poultry Science;
Vanessa Wolf Animal Science;
Eileen McNamary Human Biology;
Madison Roche Biology
Mentors and/or Co-Authors: Kenneth Eshenshade CALS-Dean’s Office and Staff

In recent decades, transmissible spongiform encephalopathies (TSE) have come to the attention of scientists and the public, creating a deep concern for potential health risks. TSEs have been reported worldwide in several species of animals, including cattle and humans. The causative agent of the disease is a prion that spreads by the conversion of native protein into the infectious prion by manipulation of protein folding. Research into prions of lower Eukaryotic organisms has been insightful in the understanding of prions and their different structures, strains, and barriers between species. The infectious agent enters the host from ingestion of contaminated material and spreads to the immune system in secondary lymphoid tissue. A unique strain of Creutzfeldt - Jakob disease (CJD), infecting younger patients, emerged in 1995 after the European outbreak of bovine spongiform encephalopathy (BSE). An investigation of a connection between BSE and CJD was promptly established; both diseases were caused by the same prion strain. There is currently some anti-prion therapeutics, being explored by as treatment options. Currently BSE infected organisms cannot be reliably detected without an autopsy, prompting most countries to focus on prevention. Prevention methods include removal of specified risk materials in human and ruminant food, enhancing BSE surveillance systems, and reinforcing educational and outreach efforts. While the import laws of the
US and many other countries have decreased since the height of the BSE scare, the US still has many restrictions for importing ruminants and ruminant products from other countries.

Session 2, B7
Reproducing results utilizing previous inoculation methods to determine if Bacteria is a factor in Disease in A1 and G2 species of Creeping Bentgrass
Rachel Elizabeth Garris Biochemistry
Mentors and/or Co-Authors: James Knopp Biochemistry

In the realm of turfgrass disease management, fungal pathogens have been most devastating over the years. Bacterial Wilt is a term documented in the literature for one bacteria species, Xanthomonas translucens. In the late 1970’s, a significant disease outbreak occurred on ‘Toronto’ creeping bentgrass documenting the first bacterial disease in turf. Since then, X. translucens has been more problematic on annual bluegrass. Etiolation, the rapid elongation of turf leaves and sheaths, has been observed prior on bacterial disease; however, research to confirm bacteria as the causal agent of etiolation has not been completed. In 2009, Giordano et al. isolated Acidovorax avenae from etiolated and necrotic creeping bentgrass; however, attempts to reproduce these symptoms in the greenhouse only resulted in slight tip-dieback. In 2010 and 2011, many samples were submitted to the turf disease clinic with suspected bacterial disease, some were etiolated and some were just necrotic. Upon examination of infected turf, bacterial streaming was observed in cut tissue and no other common fungal pathogens were present. Bacteria were isolated on nutrient agar using the t-streak method. PCR amplification and sequencing of the internal transcribed spacer region was used to identify bacteria strains. A. avenae amplification and sequencing of the internal transcribed spacer region was used to identify bacteria strains. A. avenae was isolated from symptomatic samples, but a number of spacer region was used to identify bacteria strains. A. avenae amplification and sequencing of the internal transcribed spacer region was used to identify bacteria strains. A. avenae was isolated from symptomatic samples, but a number of

Session 1, A5
Establishing a STEM Educational Program at the Boys Club of Wake County and Evaluating its Effectiveness to Increase Students’ Interest in and Attitude Towards STEM Careers and Courses
Matthew David Gromlich Plant Biology
Mentors and/or Co-Authors: Chad Jordan Plant Biology

I have been working with students at the Boys & Girls Clubs of Wake County for over two years now. In my time, I have noticed that these students often do not have the best foundation in math or science courses. This lack of foundation has caused a general dislike for math and science courses in general and, ultimately, means that students do not pursue STEM (Science, Technology, Engineering, and Mathematics) subjects and careers. The purpose of this course was to introduce students to STEM subjects and careers in a fun and active way. A variety of impacts were measured including students’ attitudes towards mathematical and scientific concepts, students’ knowledge of mathematical and scientific subject material, mathematical and scientific application to real-world problems, and interest in future STEM careers. Through pre-assessments and post-assessments, student surveys, and an end-of-the-year science fair, students demonstrated a higher aptitude for scientific and mathematical concepts. They also showed an increased interest in a variety of mathematical and scientific concepts. Finally, an increased confidence in scientific and mathematical understanding was observed by each and every student in the class.

Session 2, C3
The Preliminary Steps in Production of Biofuel from the Microalgae Tetraselmis chui. Maintaining a Culture, Extraction of RNA and Creation of cDNA
Candice Lynn Gurkin Biochemistry
Mentors and/or Co-Authors: Jose Ascencio-Ibanez Biochemistry

The purpose of this experiment is to gain knowledge about the microalgae Tetraselmis chui. T.chui is an algae that shows potential but has not been used for biodiesel production. The focus of our research was largely comprised of researching the algae and determining where to obtain it, what medium to grow it in, and how to maintain a stable culture. We found a reliable source for the xenic culture of the algae, media and conditions for grow. Unfortunately, it seems an axenic culture is not possible at the moment so we used the xenic culture to establish bi weekly sub-cultures. We purified RNA from the xenic culture and then produced cDNA that will be tested with a known proliferating cell nuclear antigen (PCNA) set of primers to verify that our cDNA it actually belongs to T. chui. Once we know that the cDNA contains T. chui transcripts, we will attempt the production of a cDNA library for sequencing.

Session 1, A18
Analysis of Long-Term Culture of Pig Gonocytes
Jennifer Nicole Hamilton Animal Science
Mentors and/or Co-Authors: Robert Petters Animal Science

Seminiferous tubules were purified from 1-week-old piglets and then cultured under varying conditions. The goal was to culture the gonocytes (germ cells) in optimal conditions for division and development. Previous research in Dr. Petters’ lab has demonstrated that gonocytes become detached and float (floaters) during continued culture, but will re-adhere when plated on a fresh plate. First we looked at serum concentration over 5 weeks in culture. Tubules were cultured in either 1% or 10% fetal bovine serum. The next experiment was to look at culture conditions for grow. Unfortunately, it seems an axenic culture is not possible at the moment so we used the xenic culture to establish bi weekly sub-cultures. We purified RNA from the xenic culture and then produced cDNA that will be tested with a known proliferating cell nuclear antigen (PCNA) set of primers to verify that our cDNA it actually belongs to T. chui. Once we know that the cDNA contains T. chui transcripts, we will attempt the production of a cDNA library for sequencing.

Session 1, D29

Animal Science

Biochemistry

Plant Biology

Plant Biology

Biochemistry

Animal Science

Plant Biology
Proteomic Analysis of the Human Respiratory Ciliary Membrane using Streptavidin Affinity Purification and Liquid Chromatography-Tandem Mass Spectrometry

Justyne Starr Hammond  Biochemistry, Human Biology
Mentors and/or Co-Authors: Michael Goshe  Biochemistry

Justyne Hammond, Lawrence Ostrowski, Kevin Blackburn, and Michael B. Goshe

Cilia are hair-like macromolecular organelles projecting from epithelial cell surfaces that line the respiratory tract. Through coordinated beating, cilia clear the airway of mucus and debris. Cilia are comprised of a conserved axonemal structure encased within the ciliary membrane. While the primary role of cilia is clearance of debris, it is possible that airway cilia have other roles including perception of mucus flow, bacteria, or viruses. These other sensory-type functions would likely be mediated through membrane associated proteins. Unfortunately, little is known regarding the protein composition of the ciliary membrane. While the ciliary membrane is likely to share common components with the epithelial cell membrane, it is also expected to contain unique proteins. To gain insight into the ciliary membrane composition, a proteomic analysis of the membrane was conducted. Following chemical biotinylation of surface membrane proteins in a airway epithelial cell culture, intact cilia were isolated, the ciliary membrane was solubilized with detergent, and the axoneme was removed by centrifugation. Biotinylated membrane proteins were bound to streptavidin beads and washed to remove nonspecifically bound proteins. Bound membrane proteins were trypsinned in situ and analyzed by LC/MS/MS using an Orbitrap Elite mass spectrometer. A number of ciliary membrane proteins were identified, including annexins A1 and A3, putative annexin A2-like protein, brain acid soluble protein 1, Ras GTPase activating-like protein, sodium-dependent phosphate transport protein 2B, transgelin-2, and potassium transporting ATPase a-chain B.

Session 2, A16
Global Drinking Water and Sanitation Challenges Demand Communal and Multifaceted Solutions

Sameera Hassan  Biology
Cameron Parnell  Animal Science;
Analiesel Hannes  Microbiology;
Tatiana Suvorova  Microbiology;
John Buchenberger  Human Biology;
Amira Said  Biology
Mentors and/or Co-Authors: Matthew Polizzotto  Soil Science

Over 884 million people in the world use unimproved sources of drinking water and 2.6 billion use unimproved sources of sanitation. Together, this lack of access to safe water and sanitation causes millions to become sick, miss school or work, or even die. Over seventy percent of people affected by poor water and sanitation live in rural communities, raising a call to action with them to reach the Millennium Development Goals set by the U.N. which include reducing the global population that live without sustainable access to safe drinking water and basic sanitation. Many people in rural areas consume water that is contaminated by ineffective waste disposal and practices including open defecation and poorly designed pit latrines. These harmful practices not only cause contamination of local well water, but may also have impacts miles away, causing multiple communities to be affected by the poor water and sanitation practices of one community. By educating the leaders that make decisions on water and sanitation, we can better serve rural communities with more successful projects that waste less money. Through community partnerships and multifaceted approaches, we can decrease the urban-rural water and sanitation disparities and achieve the Millennium Development Goals. We suggest multiple water and sanitation strategies that will work best to alleviate the current needs of rural populations. However, it is imperative to remember that there is no “silver bullet” solution and water and sanitation needs should be addressed on individual bases to produce the most sustainable results.

Session 1, A14
Effects of Propolis on Honeybee Immunity

Molli Katharine Hayworth  Biology and Psychology
Mentors and/or Co-Authors: David Tarpy  Entomology

Honeybee health has recently been threatened including an unexplainable loss of bees within colonies across the country. The harvesting of antimicrobial compounds (resins) from the environment and their incorporation into the social nest architecture as propolis is a relatively unexplored defense for typical C. canadensis, the ultra-pubescent mutant displayed extensive wax residues on the adaxial surface, higher stomate density, as well as trichomes located on both the ab- and adaxial leaf surfaces. Given these results, there does appear to be a connection between stomate and trichome presence and density (as well as wax layer thickness) and the superior drought and heat tolerances exhibited by the texensis and mexicana varieties. Possible connections to improved pest resistance, and potential use for breeding purposes, were also explored.
honeybees against pathogens. The purpose of this experiment was to assess the antimicrobial activity of honeybees raised in different propolis environments and explore whether propolis environments increase the ability of honeybees to handle physiologic stressors. A 20 bee cup study (with variations of Nevada, North Dakota and no propolis) was performed. In each cup, there was a combination of two different feeding treatments (Lipoplysaccharides-LPS and sterile water). After 3 days, the bees were collected, and RNA was extracted for real-time PCR analysis to determine the levels of different immune genes present. Differences between cages will be discussed and conclusions will be drawn from these analyses.

Session 2, B17
Regulation of Gene Expression in Drosophila Midline Development
Giovanna Elizabeth Hernandez Biological Sciences; Genetics
Mentors and/or Co-Authors: Patricia Estes Genetics

Studying how genes are expressed and regulated provides insight into how organisms develop. Specifically, understanding how the central nervous system (CNS) develops could provide clues to the biological basis of degenerative diseases such as Parkinson’s and Alzheimer’s. Our studies focus on how neurons and glia form in the Drosophila CNS. The Snail family gene, escargot (esg) is known to be essential for development in several Drosophila tissues, in particular the trachea, wing, eye and neurons. To understand how esg is activated in various tissues, genomic regions flanking the esg gene were fused to GFP and injected into Drosophila embryos to generate transgenic lines. These esg::GFP lines were then screened for GFP expression in embryos and larvae. Of all fifteen transgenic lines screened, only EsG-C2 was expressed in the midline cells. Because the midline consists of six different cell types by the end of embryogenesis, we wanted to identify which cell types expressed the esg::GFP reporter gene. To do this, EsG-C2 transgenic embryos were collected and labeled with GFP and several additional midline markers using antibody staining. The results indicate that during embryogenesis, EsG-C2 is expressed almost exclusively in the midline glia and progeny of the median neuroblast. These results will be used to determine how genes are activated in the median neuroblast and its progeny, a lineage that gives rise to multiple neural subtypes, including GABAergic interneurons and octopaminergic motoneurons.

Session 1, C9
Preschool Education in Agriculture/Nutrition Sciences: The Barriers in the Development and Implementation of Early Childhood Nutrition Intervention Curriculum
Mark Edward Herring Biology
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences

Preference for fruits and vegetables improves with increased exposure to novel foods, and a preschool nutrition curriculum can provide this educational exposure. Barriers like obstruction to lesson implementation and inconsistent school policies can undermine the effectiveness of an interventional curriculum in regards to encouraging children to eat more fruits and vegetables. The purpose of this study was to assess preliminary findings related to the barriers in the development and implementation of PEAS (Preschool Education in Agriculture/Nutrition Science), a hands-on preschool nutrition education curriculum. Over a period of 24 weeks, college student volunteers implemented lessons in local Head Start classrooms on a weekly basis. Students (n=6) provided feedback on their experiences after implementing each lesson. Preliminary analyses were conducted on 55 lessons in 11 of the 15 developed units. Student feedback rated 85% of the lessons as “easy” for preschoolers to understand and 75% of the lessons as “easy” to implement. Lesson implementation faced barriers in the classroom with regards to school policies prohibiting use of activity sheets and food preparation in classrooms. Modifications were made to lessons to improve alignment with educational Head Start center policies. The PEAS curriculum may be a tool preschool teachers can use to educate their students and encourage more consumption of fruits and vegetables.

Session 1, B4
Shoot apical meristem formation is controlled by physical protein-protein interactions of SEUSS and members of the BELL-LIKE HOMEODOMAIN family.
David Michael Higgins Plant Biology, Genetics
Mentors and/or Co-Authors: Bob Franks Genetics

Plant development requires the action of multiprotein transcriptional regulatory complexes that bring about the differentiation of organs from meristematic regions. One key site of cell growth and differentiation is the shoot apical meristem, the cluster of cells at the apex of the plant from which all foliage above the cotyledons is derived. Genes found to be regulating this meristem include SHOOT MERISTEMLESS (STM), the SEUSS-LIKE gene family (including SEU and SLK2), and the BELL-LIKE HOMEODOMAIN gene family (including BLH8, BLH9, and ATH1). Higher order mutant combinations of these genes cause dramatic phenotypes, including the loss of shoot apical meristem formation as seen in seu slk2 double or blh8 blh9 ath1 triple knockout mutant plants. The purpose of this study is to determine if the STM and SLK2 proteins physically interact with STM or members of the BLH family. Data on protein interactions was collected using two systems, a bimolecular fluorescence complementation (BiFC) assay as well as a yeast-2-hybrid assay. Preliminary results indicate that BLH8 can physically interact with SEU or with SLK2. These data suggest that the loss of the shoot apical meristem in the seu slk2 double knockout mutant may result from the inability of STM/BLH heterodimers to form or function properly. Future directions of this project include genetic analysis as well as additional examination of protein-protein interactions to refine our model.

Session 2, D13
What Happens in Utero Does Not Stay in Utero: The Effects of Maternal Depression and Stress on Fetal Development
Justin L. Hills Biology
Jin Yin; Byrd Nichols Biological Sciences
Mentors and/or Co-Authors: Scott Whisnant Animal Science

The body of scientific literature exploring the influence of prenatal environments on postnatal development continues to grow. Maternal depression has been found to impair the cognitive, social, and emotional development of the child while maternal stresses, both daily and traumatic, are often
Homeostatic balance in the body relies on the complex interactions between organ systems. Under ideal conditions, the body can function at peak levels both mentally and physically allowing for maximum cardiovascular function, immune response, muscular performance, and neuroendocrine signaling. As each system is essential for healthy bodily functions, researchers are investigating the enhancement and dysfunctional responses in the body. Using clinical trials and animal modeling techniques, researchers can investigate healthy skeletal muscle (SKM) growth and neural signaling (NS), while addressing pathogenesis of coronary heart/artery disease (CHD or CAD) and Crohn’s disease (CD). Studies in SKM determined that proteins, nutritional supplements, and hormones have varying implications on SKM performance depending on a broad range of variables. CD, a form of immunodeficiency affecting the digestive system, includes many symptoms that affect or are associated with deficiencies or homeostatic disruptions in other systems. Research studies in CAD investigate multiple treatment options. Researchers also examine the effects of low insulin sensitivity and detectable troponin levels, which can increase the probability of CAD or heart damage. Studies on the autonomic nervous system have measured the effects of neurological regulation and dysregulation on cardiac function and the endocrine system. Understanding the interconnectedness of body systems can ameliorate possible confounding health problems. It may lead to a greater focus on holistic treatment approaches that de-emphasize treatment of one organ system at a time. Further research in this area may be significant in providing greater understanding for a whole-body approach to treatment of diseases.

Session 1, A7
The Interconnectedness of the Human Body:
Cardiovascular, Muscular, Nervous, and Immune Systems
Joseph Michael Hutchinson Biology
Raaveel Sayed Biological Sciences-Human Biology;
Jennifer Nguyen Human Biology;
Joseph D’Alessandro Biology
Mentors and/or Co-Authors: Miriam Ferzli Biology

Homeostatic balance in the body relies on the complex relationships between organ systems. Under ideal conditions, the body can function at peak levels both mentally and physically allowing for maximum cardiovascular function, immune response, muscular performance, and neuroendocrine signaling. As each system is essential for healthy bodily functions, researchers are investigating the enhancement and dysfunctional responses in the body. Using clinical trials and animal modeling techniques, researchers can investigate healthy skeletal muscle (SKM) growth and neural signaling (NS), while addressing pathogenesis of coronary heart/artery disease (CHD or CAD) and Crohn’s disease (CD). Studies in SKM determined that proteins, nutritional supplements, and hormones have varying implications on SKM performance depending on a broad range of variables. CD, a form of immunodeficiency affecting the digestive system, includes many symptoms that affect or are associated with deficiencies or homeostatic disruptions in other systems. Research studies in CAD investigate multiple treatment options. Researchers also examine the effects of low insulin sensitivity and detectable troponin levels, which can increase the probability of CAD or heart damage. Studies on the autonomic nervous system have measured the effects of neurological regulation and dysregulation on cardiac function and the endocrine system. Understanding the interconnectedness of body systems can ameliorate possible confounding health problems. It may lead to a greater focus on holistic treatment approaches that de-emphasize treatment of one organ system at a time. Further research in this area may be significant in providing greater understanding for a whole-body approach to treatment of diseases.
Repression
Ashley Loray Jones Plant Biology
Mentors and/or Co-Authors: Bob Franks Genetics

PERIANTHIA (PAN) is a gene involved in determining floral organ number, as well as floral meristem termination. It is also an activator of the homeotic gene AGAMOUS (AG). PAN is likely downstream of SEUSS (SEU) and AINTEGUMENTA (ANT), two key regulators of ovule development. Although PAN is expressed in the placental tissue that gives rise to ovules, the pan single mutants do not condition alterations of ovule development. In an effort to identify synergistic interactions, pan ant and pan seu double mutants were cleared for ovule counts. Both the pan seu and the pan ant double mutants had severely decreased ovule numbers as well as severe bending and splitting of the gynoecium when compared to the wildtype and single mutants. In addition to the decreased number of ovules, pan seu also had homeotic transformations and the addition of another whorl within the gynoecium, similar to another floral meristem. These results indicate that PAN is involved in ovule formation and could possibly be a repressor of AG within the flowers. This implies that PAN plays a previously unidentified role in ovule development.

Session 1, A20
Recommendations to Achieve Global Water and Sanitation
Diana C Joseph Biology
Lauren Hatchett Spanish Language and Literature; Deniz Kerim biological sciences; Kathleen Bell biological engineering; Emily Bissett Nutrition Science, International Studies; Alyssa D’Addieco biological sciences; Dana Applegate biological sciences; Taylor Barto biological and agricultural engineering; Obed Agyei Biology
Mentors and/or Co-Authors: Matthew Polizotto Soil Science

Globally, millions of people live without access to clean drinking water and basic sanitation on a daily basis. In 2000, this issue was adopted as part of the Millennium Development Goals to improve health and environmental sustainability. Although the specific goal is to halve the proportion of people who lack basic sanitation and clean water, this goal has a great number of challenges. In order to increase access to safe water and sanitation, solutions must consider variables such as money, connecting and educating the local community, reaching the target coverage in regards to determining the sufficient amount of new technology for a community, the environment, sustainability, and financial as well as natural resources. Ongoing research is being conducted to better understand and develop beneficial and cost-effective technologies to improve global water and sanitation. However, even if the technology can be implemented, it is not a sustainable solution for developing communities if they do not have the resources or knowledge to maintain the technology long term. Therefore, the effectiveness of the technology is just as important as the amount being produced. Sustainable solutions toward poor water quality and sanitation are vital to ensuring progress and are described as having health benefits, easy maintenance, reliability, and awareness of social and environmental needs.

Session 2, C1
Understanding the Pre-Veterinary Track Population Enrolled in a Professional Development Course
Jodie Louise Joseph Animal Science
Mentors and/or Co-Authors: Shweta Trivedi Animal Science

The objective of this project was to gain an understanding of the pre-veterinary track students at North Carolina State University so that the Veterinary Professional Advising Center (VetPAC) can best serve its students and achieve the highest success rates. All 52 students enrolled in ANS 281: Pre-Veterinary Professional Development Course were surveyed on their animal-related experiences, veterinary experiences, confidence in applying to veterinary school, interest areas, and back-up plans. The percentages of student responses for interest areas were 31% total response rate for small animal veterinarian and another 20% for exotic/wildlife veterinarian. 60% of the students have less than 50 hours of small, large, exotic, or research animal experience. The biggest deficiencies are in research and exotic. Veterinary experience hours yielded similar results, 72% of the class had less than 50 hours of veterinary experience in the above categories, with a majority lacking research and exotic veterinary experience. This could be attributed to age distribution (55% of the students have sophomore standing) or perhaps something else. Less than 50% of the sophomores did not have backup plans. In addition, students took the Learning and Study Strategies Inventory (LASSI), an accredited study skills test that assesses students’ skill, will, and self-regulation based on a 10-scale, 80-question survey. Recognizing these interests and strengths in diverse aspects of veterinary medicine is key in comprehending the choices that the Pre-Veterinary track students make while planning their undergraduate curriculum, internships and extra-curricular experiences.

Session 1, D31
DNA Genotyping Using Agarose Gel Electrophoresis
Natalie Nadia Kandinata Biochemistry
Mentors and/or Co-Authors: Jose Ascencio-Ibanez Biochemistry

We were interested in understanding DNA genotyping methods. Researching information on genotyping, we found the sequence for 13 sets of primers used by the FBI. We order the primers and set up PCR reactions using total DNA from human blood and were able to generate simple profiles and distinguish between individuals. The 13 genetic markers from FBI Laboratory’s CODIS (Combined DNA Index System) and Amelogenin are used along with STR loci for analysis. After trying various agarose gel concentration, results showed that 1.5% Agarose gels produced the clearest bands. Although not all of the 13 genetic markers and Amelogenin showed bands at all the expected places on the gel, we had proven that agarose gels can be used in a modest laboratory setting to perform DNA genotyping techniques.

Session 1, D26
New Method of Teaching Introductory Biology Lab
The objective of this study was to evaluate the effects of clofibrate on both mitochondrial and peroxisomal fatty acid oxidation in kidneys of neonatal pigs. Piglets received 5 mL of vehicle (2% Tween 80, control) or vehicle containing clofibrate (75 mg/kg body weight, treatment). In vitro fatty acid oxidation rate of C18:1 was greater in mitochondria than in peroxisomes (P < 0.001). In addition, the oxidation rate of C18:1 was greater in mitochondria than in peroxisomes (P < 0.001). Consistent with the stimulation of fatty acid oxidation, the activities and mRNA enrichments of the key enzymes, carnitine palmitoyltransferase in mitochondria and fatty acyl-CoA oxidase in peroxisomes were increased. Although the mRNA enrichment of 3-hydroxy-3-methylglutaryl-coenzyme A synthase for ketogenesis was increased also, the β-hydroxybutyrate measured in the kidney did not increase with clofibrate treatment. These findings indicate that clofibrate stimulates fatty acid oxidation but not ketogenesis in the kidneys of neonatal pigs.

The North Carolina Museum of Natural Sciences is home to over 800 vertebrates including reptiles, amphibians, small mammals, birds, and fish. Each animal must be examined regularly to ensure its health as well as the health of the public to maintain the success of the museum. When veterinarian, Dr. Dan Dombrowski arrived at the museum, he organized a record keeping system to include a file on each animal’s husbandry information and veterinary records. The system provides a great resource for research projects. The goal of this research project was to learn more about museum veterinary medicine by documenting the number and types of treatments that have been done on reptiles and amphibians. All available files, over 500 for reptiles and amphibians were reviewed. The type of treatment as well as its frequency per animal was recorded. The hypothesis was that Itraconazole baths to treat or prevent chytridymycosis will be the most used treatment in amphibians and that Fenbendazole, a dewormer will be the most used treatment in reptiles. In conclusion, the treatments used by museum Veterinary Services have been effective in maintaining healthy live special species collection. The results indicated that the baths and dewomers were among the most frequent treatments used. Future research should compare these practices to other veterinary practices used in similar facilities that house or treat reptiles. Future veterinary interns will be able to access these results from this project’s database to follow up effectiveness of specific practices of treatments.

Hannah Deering Kellam Biology

Mentors and/or Co-Authors: Lisa Parks Biology

This semester I have been teaching a lab section for an Introductory Cellular and Molecular Biology course. My objective going into this teaching project was to implement a new style of teaching. This course originally has been taught by breaking students into six groups of four, with each group performing the lab activities independently. This semester, I have encouraged students at each table to confer with other groups about both the process of data collection and the results of each experiment. This way, the students are showing each other the proper lab techniques, instead of having the instructor reprimand improper use of equipment. Likewise, I have taken on a “peer to peer” teaching style as opposed to an authoritative style. I have found that, by teaching these students in the same manner I would teach a classmate a difficult topic, they feel more comfortable asking for help. My students email me outside of class, ask pertinent questions during lab, and even come into lab early to receive extra help on some of the more difficult subjects. I think that this peer to peer style of teaching has helped my students learn the material by creating a less intimidating student-teacher relationship.

Session 1, D25

The Effect of Clofibrate on Renal Fatty Acid Oxidation in Neonatal Pigs

Imad Khan Biology

Mentors and/or Co-Authors: Lin Xi Animal Science

The objective of this study was to evaluate the effects of clofibrate on both mitochondrial and peroxisomal fatty acid oxidation in kidney tissues. Ten newborn pigs from 5 litters were randomly assigned to two groups and fed either 5 mL of the vehicle (2% Tween 80, control) or vehicle containing clofibrate (75 mg/kg body weight, treatment). Piglets received oral gavage daily for three days. In vitro fatty acid oxidation then was measured in the kidney homogenates with or without mitochondria inhibitors (antimycin A and rotenone) using 14C-labeled C18:1 and C22:1 as substrates. Clofibrate significantly stimulated C18:1 and C22:1 oxidation in both mitochondria and peroxisomes, but the stimulation was higher in mitochondria than in peroxisomes (P < 0.001). In addition, the mRNA enrichment of 3-hydroxy-3-methylglutaryl-coenzyme A synthase for ketogenesis was increased also, the α-ketofatty acid measured in the kidney did not increase with clofibrate treatment. These findings indicate that clofibrate stimulates fatty acid oxidation but not ketogenesis in the kidneys of neonatal pigs.

Session 1, B1

The Asian Needle Ant

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Many invasive ants, through genetic bottleneck effects and shared recognition profiles, exhibit reduced intercolony aggression to form supercolonies, negatively impacting the native flora and fauna of the invaded geographical area. Although the Asian needle ant was recently identified as an invasive species to the United States, scientists have conducted little research on this primitive species. Elucidating the colony structure of Asian needle ants is important to understanding this species’ invasion process and explaining mechanisms for eliminating local ant species. This study is composed of two principle components to determine whether Asian needle ant form supercolonies across their invaded range. Part one consists of dyadic behavioral assays to determine intercolony aggressive behavior between individuals from four different locations across an invaded landscape. Part two of the study involves Gas Chromatograph (GC) analysis of the cuticular lipids of ants from each location to compare cuticular recognition profiles between individuals from different locations across this invaded range. On the scale observed in this study, Asian needle ants from each location are discrete colonies and not supercolonial. Behavioral assays show that ants from different locations are more aggressive towards each other than towards ants from their own colony. Additionally, the GC analysis indicates ants from different locations have different cuticular lipid profiles. Here, we provide the first evidence of the discrete colony structure of Asia needle ants across an invaded range. Even though the points of data were too far apart to determine supercoloniality at a landscape scale, future testing is important to determine treatment and identification of the invasion process.
Effects of Genetic Mutations on Anatomy, Heritable, and Infectious Diseases

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Amanda Perez Biological Sciences; Juan Perez Biological Sciences

Mentors and/or Co-Authors: Miriam Ferzli Biology

Research in the field of genetics investigates heredity, variation of inherited characteristics and the transfer of genetic disorders from parents to offspring. A large proportion of the world population is impacted by disorders due to genetic mutations, and hence, considerable resources are invested into this field. The impact of these mutations is evident, as they affect many gene loci responsible for a variety of traits. “The Human Genome Project” and other advances in research, technology and animal modeling have allowed researchers to examine the cause of mutations in several genetic disorders. For example, two studies using hydroxyurea and penicillin, conducted on sickle cell disease (SCD) patients have led to promising results in demonstrating the importance of fetal hemoglobin (HbF) for immunity against the disease. Further research in HbF could lead to a cure for patients suffering from SCD. Also, the study of the genome of malarial parasites has shown promise in finding an effective treatment for vector borne diseases. Lastly, the advances in oral health science and dental genetics have led to findings of genetic disorders like dental agenesis (hypodontia), supernumerary teeth disorder, dental malformations and other odontogenetic problems. The traits, causative genes and transcription factors of these malformations have been identified and efforts to minimize the risks have been made. Our main objective is to highlight various genetic disorders by focusing on their causes and identify the possible prospective research in this field.

Session 2, C8
The Effects of Toxic Endophyte Positive Fescue Seed on Purine Derivatives in Angus Steers

Amy Elizabeth Lamb Animal Science

Mentors and/or Co-Authors: Joan Eismann Animal Science

We studied the effect of toxic endophyte positive fescue seed and fescue toxicity on the levels of purine derivatives (allantoin and uric acid) and creatinine in bovine urine. We hypothesized that fescue toxicity in cattle could influence the amount of microbial fermentation taking place in the rumen and therefore alter the concentration of purine derivatives while not altering creatinine. We conducted an experiment using eight Angus steers in which four of the steers were fed endophyte positive fescue seed and the other four were fed endophyte negative fescue seed as a control in period one. In the second period, the treatments were reversed. A complete 48 hour collection of urine from the steers was completed including additional spot samples. The samples and standards were then analyzed for concentrations of allantoin, uric acid, and creatinine using High Performance Liquid Chromatography (HPLC). The total collection samples were used to identify any trends in purine derivatives that developed in response to the different treatments. During analysis, creatinine levels were used to account for differences in body weight and urine volume while quantifying the concentration of purine derivatives in the spot samples. Our results suggest possible inconsistencies in the methodology used to calculate the ratio of purine derivatives to creatinine and/or that fescue toxicity causes a decrease in microbial fermentation in the rumen. Further research will need to be completed in order to gain a total understanding of the effect fescue toxicity has on purine derivatives and creatinine levels.

Session 2, B3
Qualitative Assessment of Medical School Coursework Received by Third and Fourth Year Medical Students for the Treatment and Prevention of Childhood Obesity

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All physicians’ should be given nutritional information within their coursework in order to prevent and treat childhood obesity. In this qualitative assessment, researchers investigated third and fourth year medical students’ overall knowledge of the etiology of childhood obesity and their viewpoints on the quality of their education regarding their readiness to prevent and treat childhood obesity. Researchers conducted phone interviews with 78 allopathic and osteopathic third and fourth year medical students across the nation. Researchers found that the medical students felt their coursework did not adequately prepare them to prevent and treat childhood obesity. The majority of students stated that there was too much information to learn in their first two years of medical school; therefore, there was not enough time to provide additional information regarding nutrition and childhood obesity. Others said that the information that was provided to them was minimal or typically focused on adults rather than children. Some students thought that providing additional lectures outside the classroom may be beneficial. With additional nutrition information, medical students may feel that they will be more confident in counseling obese children.

Session 2, B12
Ecosystem fragmentation leads to utilization of a suboptimal prey type in endemic livebearing fishes of the Bahamas

Taylor Rose Lansing Biology

Mentors and/or Co-Authors: Randall Langerhans Biology

A common and serious outcome of human-induced habitat degradation and fragmentation is loss of top predators. Such predator release can permit resilient prey organisms to increase in density as they experience dramatically altered ecological conditions. A fundamental prediction of optimal foraging theory is increased utilization of suboptimal prey types with greater competition for food resources, as might often occur for resilient prey taxa in these human-altered environments. In the Bahamas, anthropogenic fragmentation of wetlands via road construction is widespread, and disrupts hydrological connectivity between fragmented and adjacent marine areas, resulting in the loss of marine piscivorous predators. Here we examine the effects of ecosystem fragmentation on utilization of a suboptimal prey item, molluscs, across multiple islands for each of three divergent lineages of endemic, livebearing fishes of the genus Gambusia. We estimated conspecific density as a surrogate for the intensity of intraspecific resource competition, and employed two methods to estimate prevalence of mollusc feeding: (1) a novel, non-invasive method using x-ray radiographs, and (2) direct stomach-content analysis. Both the
density of Gambusia, and the frequency and incidence of molluscivory, increased subsequent to habitat fragmentation. This shift may have a number of important ecological and evolutionary consequences, and highlights a potentially pervasive effect of habitat modification on the foraging niches of native organisms.

Session 1, D16
Iodothyronine deiodinase type II and possible significance in sex change in the Bluehead wrasse (Thalassoma bifasciatus)

Grace Eunhye Lee Biology
Mentors and/or Co-Authors: John Godwin Biology

In fishes, like many other vertebrates, thyroid hormones play a significant role in a wide range of physiological processes including development, basal metabolism, and homeostasis. Iodothyronine deiodinase type II (Dio2) enzyme regulates thyroid hormone levels by converting T4 to the more active T3. In this study, we examined Dio2 expression in the Bluehead wrasse (Thalassoma bifasciatus), a female-to-male sex changing fish. When a terminal phase male is not present, the largest female will undergo sex change and become the new terminal phase male. Initial phase males and females are phenotypically similar with a yellow head and body and a white underside. Some initial phase males can also have white bars that break up the midlateral stripe forming a series of blackish and grayish blotches. The terminal phase males are much larger in size with a blue head followed by two dark vertical stripes separated by a white bar. Dio2 may play a role in Bluehead wrasse sex change mechanisms by altering thyroid hormone levels and metabolic rates. We performed non-radioactive in situ hybridization to reveal if and where Dio2 expression occurs in the brain and counted reads from high-throughput RNA-Seq data to obtain an estimate of potential differences in expression between terminal phase males and females. Although the read counts from high-throughput RNA-Seq reads only reported rough estimates, the results did show a potential difference in expression between terminal phase male and female Bluehead wrasse gonads and the brain. Overall, this study is an initial step to further detailed studies examining the possible relationship between Dio2 enzyme rates and sex change in the Bluehead wrasse.

Session 1, B8
Population shifts in Aspergillus flavus

Mary Hunt Lewis Plant Biology
Mentors and/or Co-Authors: Ignazio Carbone Plant Pathology

Aspergillus flavus is an ascomycete fungus that produces carcinogenic aflatoxins (AFs). Currently, two non-aflatoxigenic strains of A. flavus are being used as biocontrols on agronomically important crops such as peanut and corn. These strains are non-aflatoxigenic due to either a nonsense mutation within the AF gene cluster (AF36) or a completely missing AF gene cluster (Afla-guard). A. flavus was once thought to reproduce only asexually and parasexually, but evidence now shows that sexual reproduction is possible. Sex may compromise the efficacy of these biocontrol strains because these strains could mate with indigenous toxigenic strains, and through recombination, produce progeny with a regained toxigenic phenotype. In our experiment, the biocontrol strains AF36 and Afla-guard, both of which are MAT1-1, and the toxigenic strain NRRL 3357 (MAT1-1) were applied to a cornfield. A. flavus was sampled from soil before biocontrol application and one year after. PCR amplification grouped isolates into three mating-type groups: MAT1-1, MAT1-2, and MAT1-1/MAT1-2. The heterokaryotic mating type (MAT1-1/MAT1-2) made up 54% of the isolates sampled prior to biocontrol treatments, but was found in only 9% of the isolates after biocontrols were applied. This suggests that heterokaryosis can be maintained in subsequent generations. Further characterization of heterokaryons and their frequency in A. flavus populations may be important in understanding how these fungi adapt to changing environmental conditions.

Session 1, B23
Neonatal Bisphenol A exposure alters sexually dimorphic gene expression in the postnatal rat hypothalamus

Stephanie Michelle Leyerer Biological Sciences
Mentors and/or Co-Authors: Heather Patiasault Biology

Bisphenol A (BPA), a component of polycarbonate plastics and epoxy resins, is a well recognized endocrine disrupting compound. In rats, neonatal life is a critical window for sexual dimorphic hypothalamic organization, thus endocrine disrupting compound exposure during this period may interfere with this process. We hope to show that, in early postnatal life, sex differences in estrogen receptor (ER) alpha, ER beta, and kisspeptin (Kiss1) gene expression in the anterior and mediobasal hypothalamus can be pronounced at birth but transient, and region specific. Our hypothesis is that neonatal BPA exposure would alter the sex specific expression of these genes. Long Evans rats will be neonatally exposed to vehicle, 10mg/kg estradiol benzoate, 50mg/kg BPA or 50mg/kg BPA by subcutaneous injection daily over the first three days of life. Brains will be collected on postnatal days (PND) 4 and 10 (6-9 animals/group).

Session 1, B20
Tetracycline Residues in Porcine Stomach

Danielle A Lindquist Zoology
Mentors and/or Co-Authors: Ronald Baynes Department of Population Health and Pathobiology

Tetracycline is a broad spectrum antibiotic used to treat infections in swine. The maximum residue levels of tetracycline in pork stomach tissue in Europe, Russia and the United States are 10, 200 and 2,000 ppb respectively. This difference in accepted safety levels may be the reason why stomach tissues that the United States exports continue to be residue violators in overseas markets. In this study, 30 pigs at two different stages of production (weanling and finisher) were treated with tetracycline following the label instructions. Blood samples were collected at 0, 72, 78, 96, 102 h after exposure. The medication was stopped at 120 h and blood samples were again collected at 126, 144, 168, 192 and 216 h after exposure. Five animals were slaughtered at withdraw day 0, 1, 2, 4 and 8 post dosing and stomachs were collected. All blood and tissue samples were analyzed by HPLC. Tetracycline levels in plasma were below level of detection after withdraw day 4. The stomach tissues had residues reaching an average of 671.72, 330.31, 297.77, 136.36 and 268.08 ppb on withdraw days 0, 1, 2, 4 and 8 respectively. This study shows that tetracycline residues are still detected in the stomach tissues, even after the withdrawal time of four days in the US. These residue levels could explain why stomach tissue tested in Russia and Europe show up as positive for tetracycline, even though the meat passed...
Session 2, D22
Visitor Impressions: How Zoogoers Assess Animal Welfare
Danielle A Lindquist Zoology
Mentors and/or Co-Authors: Jenny Campbell Biology

Zoos are required by government and industry to maintain high animal welfare standards while meeting their education and entertainment mission. While zoo staff are educated about the welfare needs of the animals in their care, less clear is the visitors’ perception. We designed a survey to determine what visitors think is the most important role of zoos - education, entertainment, or conservation - and how well zoos perform these roles. We also asked them to choose factors that best indicate good animal welfare and to rate NC Zoo. Survey groups were: NC Zoo Society members (n=276), NC State students (n=103), and zoo visitors (n=500). Zoo Society members, students, and visitors ranked education most important at 61%, 56% and 58%, respectively. Zoo Society members ranked how well the NC Zoo educates at a 4.47/5.0 out of 5, while students and visitors ranked education at 3.98/5.0 and 3.98/5.0, respectively. The perceived effort required to improve animal welfare did not differ across the groups, however, the welfare ratings overall for the NC Zoo were much higher in the Zoo Society compared to the other groups. Surveyors ranked quality of space as the best indicator of optimal welfare. This research suggests differences in perception among people who visit and support the efforts of the North Carolina Zoo.

Session 1, A15
Using Past Histories, Milk Testing, and Hormone Testing to Predict Mare Foaling Dates
Kelsey Alexandra Lohman Animal Science
Mentors and/or Co-Authors: Scott Whisnant Animal Science

A mare’s long gestation length, and other factors, makes predicting when a mare is going to foal very difficult. This study aims to find any correlations between physical and hormonal changes. Seven mares were followed through their pregnancy and checked twice daily once they began producing milk. The checks consisted of looking at the mare’s physical changes (mammary gland size, tail head softness, vulva elongation, and the presence of wax on her teats), the changes to her milk (color, tackiness, clarity, and calcium concentration), and her progesterone and estrogen blood hormone levels. Physical and milk changes were assessed and given a numerical score at 7am and 3:30pm. Blood was drawn at 3:30pm then later tested by an ELISA test for progesterone and estrogen levels. The hormones are what connect and cause the physical changes; therefore they are the most accurate way of predicting when parturition will occur. As the progesterone goes up, estrogen goes down until right before birth when the progesterone drops drastically and estrogen rises. Progesterone levels are the most indicative since the pregnancy is maintained through progesterone. If an on farm test (similar to the foal IgG SNAP Test) can be produced to do a quick blood test for progesterone, then it could be much easier to know when the mare will foal so a veterinarian can be on call or present in case of emergencies. This would be very beneficial in high risk pregnancies where there is a strong likelihood of a veterinarian being needed.

Session 2, D12
The effect of small interfering proteins on Drosophila malanogaster development
Catherine A Longo Chemical Engineering
Mentors and/or Co-Authors: James Mahaffey Genetics

The goal of this project is to develop small interfering proteins (SIPs) that can be used to affect protein function in vivo. In Dr. Rao’s lab (CBE, NCSU) they have created the SIPs by randomly mutating surface residues on 7 scaffold proteins which were then displayed using yeast surface display. Once the site we would like to target was determined, magnetic beads coated in the target were used to separate the SIPs that bind to the target. The SIPs being studied are targeted to the PDZ and DIX domains of the Dishevelled protein. Using flow cytometry the SIPs were screened for affinity to the target. Once identified, I cloned the DNA encoding the SIPs into the Drosophila transformation vector, pUASTattB, and injected these into Drosophila embryos to obtain transgenic lines. Once transgenic lines were available, I crossed them with flies carrying various Gal4 driver constructs. The GAL4 drivers cause expression of the SIP in specific tissues and at specific times during Drosophila development. The effect of the SIP should be seen in the progeny of this cross. The cuticles of larvae expressing the SIP are examined for phenotypes consistent with the reduction of disheveled function. In addition, SIPs that include the c-myc tag have been created and injected into flies. An antibody stain will then be used to determine whether or not the SIPs are being expressed.

Session 2, A20
Using Gene Strips to Aid Understanding of Topics Related to DNA and RNA Sequences in Introductory Genetics
Emily Katherine Marquez Biology
Mentors and/or Co-Authors: Ted Emigh Genetics

The introductory genetics course is a survey course that briefly covers many basic topics. The course helps to prepare students for upper level genetics courses, but upper level instructors noticed that students leaving introductory genetics still did not have a solid grasp of antiparallel strands for DNA, 5’ and 3’ ends, and sense and antisense. The purpose of this project was to enhance students’ understanding of the listed topics by utilizing hands-on exercises using gene strips. Antibody strips were previously successful for teaching students eukaryotic regulation, so the gene strips were modeled after them. Exercises were given throughout the course as relevant topics were taught. Students were instructed to write given sequences on gene strips and rearrange the strips to complete the exercises. The initial exercise was given in problem session with one example worked out by the instructor. Students were given extra credit points to increase participation. Following completion of the exercise, a survey was given to gauge its effectiveness. A total of 161 students completed the exercise, and 150 completed the survey. Of the 150 who completed the survey, eight had not completed the exercise. Among the 142 students who completed the exercise and the survey, 75 (53%) felt it helped them understand the concepts of sense and antisense, 115 (81%) felt it helped them understand the concept of 5’ and 3’ ends, and 79 (56%) felt it helped them understand the concept of leading and lagging strands of DNA.
Vegetables among Preschoolers
Alexa Kathryne Martin Biology
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences

Many children do not consume adequate amounts of fruits and vegetables. Preference for fruits and vegetables is largely shaped during the preschool years. While there is evidence regarding preference of fruits and vegetables in preschool children, there have been few studies regarding the reasons behind fruit and vegetables preferences in the preschool population. The purpose of this research is to assess the reasons children provide as to why they like or dislike certain fruits and vegetables. Forty-two preschool children aged 3-5 enrolled in local Head Start centers were included in the study. A series of photographs featuring a variety of fruits and vegetables was used to ensure that the children were able to identify the food and to provide a reason for why they liked or disliked the food. Many themes were discovered among the answers provided by the children. The most frequent themes included positive preferences in general, texture, reference to eating the food, and physical characteristic/appearance of the fruit or vegetable. Understanding why children have specific preferences for different fruits and vegetables can be valuable in developing nutrition education programs in preschools which aim to improve nutrition-related knowledge and attitudes among preschool students.

Session 2, B2
Development and application of an assay to determine relative telomere length in Mus musculus as compared to a single copy gene, epidermal growth factor receptor, using real time quantitative PCR
Molly Anastasia Matty Genetics
Mentors and/or Co-Authors: David Threadgill Genetics

Telomere sequences are the same in all mammals: a simple TTAGGG repeating sequence on the end of each DNA strand. Telomeres have been the topic of many studies, primarily discussing their role in cancer and aging. In order to further elucidate the purpose of telomeres, it is first necessary to determine the relative quantity of telomeric repeats in different cell lines, in this case the 64 cell lines of the Collaborative Cross. This research investigates the development of an assay quantifying telomeric and sing copy gene regions of MC-38 colon cancer DNA of Black 6 Mus musculus via quantitative real-time PCR. As a less labor-intensive alternative to FISH and southern blot analysis, RT-qPCR provides us with a ratio of telomere copy number to a single copy gene, or T/S ratio. Optimization of this assay has been found for a small region of the single copy gene, epidermal growth factor receptor, found on the 11th chromosome compared to a non-dimerizing region of telomeric repeats, described previously. This single copy gene sequence is 85% similar to humans, while the telomeric sequence is 100% conserved in humans. By application of this assay to the 8 parental and 56 filial lines of the Collaborative Cross, we can further our understanding of the inheritance patterns of telomeres and potentially their role in aging patterns and susceptibility to cancer.

Session 1, C28
Procaspase-7 Purification and Crystallization
Geoffrey Benjamin Maxwell Biochemistry
Mentors and/or Co-Authors: Clay Clark Biochemistry

Apoptosis, or controlled cell death, occurs in eumetazoans to maintain cellular homeostasis. Apoptosis occurs through a proteolytic cascade composed of two groups of caspases, the initiators and effectors. The initiator caspases (8,9 and 10) activate the effector caspase-3, and to a lesser extent caspases -6 and 7 which leads to the proteolysis of structural and protective components of the cell thereby executing apoptosis.

As the terminal protease in the apoptotic cascade, procaspase-3 is a potentially important therapeutic target in the treatment of cancer, where its activation could ablate tumor formation. It has been shown that an abundance of inactive procaspases-3 is present in cancer cells, therefore targeting it directly could reinitiate cell death. Previous data from our lab show that procaspase-3 has two forms, the inactive favored form, or an active, unflavored form. Designing small molecule activators to bind to allosteric sites of procaspase-3 could shift the population of species to favor the active form. To this end we have developed small molecule activators of procaspase-3. The focus of the current research is to purify and crystallize procaspase-7, a homologous effector caspase to procaspase-3 because the latter is unable to be crystallized using current methods. In order to understand the mechanism of action of each small molecule activator it is necessary to have a crystal structure to exemplify our findings to procaspase-3. The data presented here show the purification and crystallization conditions of procaspase-7 in the absence of drug.

Session 1, C31
Survival and Mobility of an Intein within an Essential Protein of Mycobacteriophage Astraea
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As students in the North Carolina State University “Phage Hunters” course, we isolated Astraea, a mycobacteriophage of the myoviridae morphotype. The Astraea genome was sequenced and classified in the C1 subcluster. We predicted two putative inteins near the 3' end of the genome. An intein is a segment within a protein that is self-cleaved from the protein and the resulting polypeptides are rejoined. Both inteins were found to contain homing endonuclease genes (HEGs). A HEG is an enzyme capable of transferring genetic material from one phage genome to another; this can be potentially damaging as it disrupts gene function. One of the two inteins occurs within a gene predicted to encode terminase and is the focus of this work. Terminase is an essential protein responsible for packaging DNA into the capsid. The Astraea intein aligns with the mycobacteriophage Catera intein which has been shown biochemically to be a functional class three intein. We hypothesize that these inteins allow for the HEGs within them to be present without interfering with protein function, while the HEGs provide mobility of the intein between coinfected bacteriophages. This arrangement demonstrates a complex level of coding capacity in a single region of the genome.
Session 2, D19
The Effectiveness of Learning Objectives
Kelsey Leigh McDonald Human Biology
Mentors and/or Co-Authors: Sarah Ash Food, Bioprocessing & Nutrition Sciences

This study investigated the effectiveness of learning objectives as a student study aid. The instructor of a large introductory nutrition class uses the learning objectives associated with each module to form her test questions; therefore if students use the learning objectives to study they should get higher test grades than those who do not. An in-class survey examined whether, in fact, student performance was correlated with the use of learning objectives and how the learning objectives were used (e.g., did students write out the answers or just highlight relevant material). As a result of the analysis, an instructional sheet entitled “Making Effective Use of the Learning Objectives” was created. The survey was then re-administered to determine if the grades and students’ use of the learning objectives improved.

Session 1, B13
Assessment of Vector Competence for Tick Species of North Carolina
Anna Noel Carolyn McKin Animal Science
Mentors and/or Co-Authors: Ricardo Maggi CVM-Comp Animal

In recent years, the prevalence of tick population in North Carolina has been increased steadily due to advert climatic shift. Ticks are known vectors for zoonotic pathogens such as B. burgdorferi, Bartonella, and Rickettsia species. Several tick species (I. scapularis (n=351), I. affinis (n=157), A. americanum (n= 272), and D. variabilis (n=205) were collected throughout North Carolina and screened for Ehrlichia, Anaplasma, Bartonella and Borrelia genus DNA by PCR. Bartonella DNA (0.57%) and Borrelia (B. burgdorferi sensu stricto) DNA (0.6%) was amplified from I. scapularis, whereas 64% of I. affinis ticks were positive for Borrelia spp DNA (includes B. bissetti in 48%, B. burgdorferi ss in 51% respectively). However none ofIxodes affinis ticks amplified Bartonella DNA. A. americanum ticks harbor Ehrlichia/Anaplasma DNA (24%) and Rickettsia spp DNA (50%), however none of them were positive for Borrelia and Bartonella DNA. None of the D. variabilis ticks were PCR positive for other genus of bacteria. Based on our preliminary study, we conclude that the low prevalence of Borrelia burgdorferi sensu stricto in I. scapularis from North Carolina suggests that this tick species may not be a competent vector for transmission. Further studies are warranted to evaluate the role of I. affinis as competent vector. The intriguing finding in our study is possibly that A. americanum ticks act as a potential vector for Ehrlichia/Anaplasma and Rickettsia species.

Session 1, D22
New Milk Flavor Could Open Old Doors
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Twanna Boyd Food Science;
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Mentors and/or Co-Authors: Brian Farkas Food, Bioprocessing & Nutrition Sciences

Development of flavored milk products complying with the new regulations of less than 22 grams of sugar and under 150 calories per 8 fluid ounces, would enhance the nutritional value of flavored milk currently served in the K-12 school system. This type of development could help satisfy public opinion related to the current problems associated with obesity and heart disease in the United States. School boards are considering removal of flavored milk from the school menu altogether due to the popular belief that sugar added to the product during processing is contributing to obesity in school age children. The North Carolina dairy industry is currently working on a solution that would allow them to continue to deliver flavored milk to schools, thereby maintaining an important revenue stream. Can a new flavored milk product spark an interest for dairy plants to manufacture products for schools? Our hypothesis is that a new flavor can compete with chocolate, under the new regulations, giving dairy plants more incentive to produce for schools. Banana and caramel flavored milks will be produced in the dairy plant at NCSU. They will be artificially sweetened with Splenda. Preliminary experiments were used to identify the flavor and type of sweetener to use. These two potential products will be analyzed by a sensory test conducted on the NCSU campus. A new flavored milk product which complies with the new nutritional guidelines will allow the dairy industry to continue producing flavored milk for schools.

Session 2, C5
Teacher Perceptions on Inquiry-Based Nutritional Educational Program in Low Income Preschools
Allison N. Mitchell Biology
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A hands-on, inquiry-based nutrition education program encourages active learning and is essential when attempting to impact positive change in relation to fruit and vegetable consumption among preschoolers. Research has shown an increase in knowledge and interest in healthy foods as well as increased intake of targeted healthy foods upon implementation of cooking-based programs. Children who participate in these food-based programs have shown to also have an increased preference for healthy foods as compared to older children. PEAS (Preschool Education in Agricultural and Nutrition Sciences) is a hands-on, food-based curriculum for preschool children. Weekly units were designed around a model of science inquiry engaging preschoolers in hands-on activities related to nutrition, math, science, art, music, and reading. NCSU students taught PEAS lessons at a local Head Start center and conducted individual interviews with preschool teachers (n=9 classrooms) after completion of each lesson. In this study, researchers found that despite barriers such as, center educational policies, teachers reported a willingness to teach 94.5% of the lessons again and would recommend 96.4% of the lessons to other teachers. This is important, because long-term successful implementation of the PEAS curriculum is largely dependent on the teachers leading the lessons. Future research should assess teachers’ educational levels and how it can impact of nutrition education in the classroom.

Session 1, D30
Correlation between Genotype and Mouse Limb Length
Megan Alyse Morse Genetics
Among the animals used in research, mice are among the most widely used organism due to the remarkable genetic similarity between mice and humans; making them the experimental choice in research (Hart). Within mice there are many genetic developmental markers that play an essential role in the development of limbs. Mice limbs develop in a series of 15 developmental stages that have been defined as the time from the first appearance of the limb bud to the completion of the limb outgrowth (Wanek). Genes that are commonly associated with limb development are; FGF10, TBX4/5, FGF10 is associated with the formation of a limb, while the apical ectodermal ridge, AER, gene is responsible for the outgrowth of the limb. TBX4/5 is responsible for proximal/distal formation (Grubb). The experiment analyzed 150 mouse specimens. The mice were packaged into 8” x 11” plastic packages; 4-6 mice per package dependent on specimen size. The packs of mice were then exposed to x-ray radiation, through means of a Faxatron x-ray unit. The radiograph was analyzed by completing a series of ten measurements through a measurement program, ImageJ. Measurements were taken in the following order, right to left; femur, tibia, hind foot, humerus, and ulna. The data suggests similar measurements between the length of the right and left limbs. This signifies symmetrical development. However, there is some variation; the future of the research will be to explore the cause of the variation in the measurements.

Session 2, D28
Molecular Characterization and Comparison of Multidrug Resistant (MDR) Salmonella isolated from Humans and Swine in North Carolina
Matthew Bijan Movassaghi Animal Science
Mentors and/or Co-Authors: Siddhartha Thakur CVM-Food Animal Eq

The aim of this study was to: 1) determine and compare the antimicrobial resistance profile of temporally and spatially related Salmonella isolates from humans and pigs; 2) characterize the Salmonella isolates at the molecular level to identify the genes responsible for coding antimicrobial resistance; and 3) genotype the Salmonella isolates using Pulsed Field Gel Electrophoresis (PFGE) to identify and compare their fingerprints. A total of 400 Salmonella isolates from humans (n=200) and pigs (n=200) in North Carolina were characterized for their antimicrobial resistance profile to a panel of 15 antimicrobials which are important in both human and veterinary medicine. We further selected 48 multi-drug resistant (MDR) Salmonella isolates (humans n=24; pigs n=24) that were characterized based on serotype and MDR patterns to identify the presence of resistance genes by polymerase chain reaction (PCR). Salmonella Typhimurium phage type DT 104 exhibited a distinct pentaresistant profile characterized by resistance to ampicillin, chloramphenicol, streptomycin, sulfisoxazole, and tetracycline in 34% (n=68) of human isolates and 47% (n=94) of pig isolates. We detected multidrug resistance (resistance to ≥ 3 antimicrobials) in 52% (n=104) of the human isolates and 24.5% (n=49) of the pig isolates. The pentaresistant isolates tested positive for the blvreB, cmlA, aadA1, aadA2, and tetG resistance coding determinants. The PFGE patterns of the human isolates were different from the pig isolates and there was no evidence that the pig isolates were genotypically linked with human Salmonella Typhimurium DT 104 in our study.
Tim Carver
Chaunyetta Barkley
Cameron Tyler Parsons
Improved Shelf Life of Chocolate Milk

video camera. These video tapes will be used to train student
5.26% sucrose) via HTST pasteurization at 72°C for 15
kGy will be used to produce chocolate milk (3.25% fat and
NCSU will be plated to assess vegetative bacteria and spore
bacteria and spores in a product. Cocoa from the dairy at
radiation is capable of decreasing the number of vegetative
introduction of bacterial contaminants with the addition of
we created “gold standard” and training audio/video
tapes. We collected these “data” at the Bright Horizons
preschools by recording the teacher-student interaction via a
video camera. These video tapes will be used to train student
volunteers to observe the emotional climate in a classroom.

Session 1, B19
Improved Shelf Life of Chocolate Milk
Cameron Tyler Parsons Food Bioprocessing and Nutriti
Tom Carver Food Science;
Robert Price Food Science;
Chaunyetta Barkley Food Science
Mentors and/or Co-Authors: Brian Farkas Food, Bioprocessing & Nutrition Sciences

It is a well-established problem in the dairy industry that
chocolate milk spoils at a faster rate than unflavored milk.
While much research has been conducted to explain why this
may be, the problem has persisted for the better part of a
century. One possible cause for this phenomenon is the
introduction of bacterial contaminants with the addition of
cocoa to milk. This hypothesis was examined by assessing the
natural microflora of cocoa and investigating ionizing
radiation as one potential solution to the problem. Ionizing
radiation is capable of decreasing the number of vegetative
bacteria and spores in a product. Cocoa from the dairy at
NCSU will be plated to assess vegetative bacteria and spore loads. Batches of cocoa, irradiated at levels of 10, 15, and 20 kGy will be used to produce chocolate milk (3.25% fat and 5.26% sucrose) via HTST pasteurization at 72°C for 15 seconds and the bacterial population monitored for three weeks to assess bacterial growth in relation to chocolate milk produced with untreated cocoa. The irradiated cocoa will also be plated and assessed. The tests are ongoing and data is still being compiled. If an appreciable shelf-life increase is observed in the irradiated samples, dairy producers will have a means of increasing the shelf life of their product that can be carried out by their suppliers before the cocoa reaches them. If no difference is found, that will lend credence to some alternate theories as to the causation of the spoilage of chocolate milk.

Session 2, B9
The contribution of macrophage dynamin-mediated endocytosis to Borrelia burgdorferi sonicate- and culture supernatant-elicited Type I IFN response
Breanna Lauren Pasko Biology
Mentors and/or Co-Authors: Jennifer Miller Microbiology

Borrelia burgdorferi (Bb) is a gram-negative, spirochete bacterium that has been isolated as the causative agent of Lyme disease. Bb is transmitted to mammalian hosts via tick bite and without immediate antibiotic treatment can lead to arthritis and other clinical signs in infected individuals. Type I IFN, originally discovered as an anti-viral cytokine, is produced by both innate and adaptive immune cells in response to bacterial infection. We recently discovered that Bb infection triggers innate immune cell Type I IFN production that drives the development of severe Lyme arthritis. We previously determined that several diverse bacterial ligands, including unknown components present in Bb sonicate and culture supernatants, trigger a macrophage Type I IFN response. Our current studies utilized the dynamin inhibitor Dynasore to test the hypothesis that components present in Bb sonicate and culture supernatants require internalization by bone marrow derived macrophages to trigger a Type I IFN response. Initial dose-response experiments were designed to select a non-cytotoxic Dynasore concentration that would inhibit macrophage internalization of the IFN-stimulatory ligand Pam3Cys (our positive control). Mouse bone-marrow derived macrophages were then pre-treated with the optimal dose of Dynasore to assess the contribution of dynamin-mediated endocytosis to Bb sonicate- and culture supernatant-mediated Type I IFN induction. These studies which represent an initial step towards the characterization of unknown Bb IFN-stimulatory ligands, will expand our knowledge of how Bb is recognized and internalized by macrophages. This information could lead to the development of novel immune-targeted therapeutic agents for the treatment of Lyme disease.

Session 1, C33
Neuropeptide Y and Leptin Receptor mRNA Expression in Brain Tissue of a Teleost Fish, the Hybrid Striped Bass
Nishika Shina Patel Biochemistry
Mentors and/or Co-Authors: Russell Borski Biology

The purpose of this study was to evaluate the nutritional regulation of neuropeptide Y (NPY) and the leptin receptor (OBR) in fish. Hybrid Striped Bass (Morone chrysops x M. saxatilis) were used due to their ability to grow quickly and tolerate changes in feeding patterns. Groups of fed, fasted, and fasted/re-fed fish were sampled to determine mRNA expression levels in OBR and NPY in the brain where appetite is regulated. The fish were harvested on-site for hypothalamus and telencephalon tissue. Our previous research has shown that leptin will increase with feeding, and that leptin injection causes a decrease in appetite. This study showed the mRNA levels of OBR and NPY in telencephalon tissue, and levels of OBR in hypothalamus tissue were transiently elevated by fasting over 1-2 weeks. The rise in NPY gene expression during fasting may reflect the hormone’s actions in stimulating appetite. The increase in OBR gene expression is thought to correspond to depressed ligand (leptin) levels, as leptin mRNA levels from the liver, which is the primary source of circulating hormone in HSB, decreases during fasting based on our previous work. Leptin is thought to inhibit NPY expression in the brain by OBR co-expressed in NPY producing neurons. This study supports a role for NPY in regulating appetite in response to fasting by increasing NPY transcription. Increased leptin sensitivity, represented by up-regulation of OBR during fasting, may reduce appetite when feeding resumes and an increase in circulating leptin levels is observed.

Session 1, D20
The Role of Arabidopsis Response Regulator 7 (ARR7) in
Geminivirus Infection
Hitesh R Patel Biochemistry
Mentors and/or Co-Authors: Jose Ascencio-Ibanez Biochemistry

Geminivirus are single stranded DNA viruses that replicate in the nuclei of infected cells. The goal of this project is to study gene expression of a particular response regulator of Arabidopsis thaliana (ARR7) upon cucumber leaf curl virus (CaLCuV) infection. ARR7 is our gene of interest because it is down-regulated during geminivirus infection, as opposed to being up regulated by RNA virus infection in Arabidopsis. Microarray gene expression analysis was conducted for 102 commonly upregulated genes during RNA infection, 68 of them were found affected by the geminivirus. ARR7 is one of only three genes that are down regulated. We are studying ARR7 response in three ways. ARR7::GFP plant selection was made after 3 generations of homozygous stable lines through herbicides treatment. We will use these plants to monitor ARR7 expression during infection. Also, ARR7 over expressing plants were tested for infection with two geminiviruses (BCTV and CaLCuV). Results showed tolerance to the infection. Quantitative PCR of CaLCuV infected Arabidopsis was performed to confirm down regulation of ARR7.

Session 2, D1
Fungicide Resistance of U.S. Phytophthora infestans Pathogens
Caleb Dale Pearce Biological Science
Mentors and/or Co-Authors: Jean Ristaino Plant Pathology

Phytophthora infestans causes potato late blight, an important and costly disease of potato and tomato crops. We have begun screening recent genotypes of P. infestans for sensitivity to fungicides. Nineteen isolates of P. infestans from locations in the US were screened for sensitivity to mefenoxam, fluopicolide, cyazofamid, or etridiazole on rye V-8 media and allowed to incubate at 18°C in the dark for two weeks. The percentage growth compared to a nonamended control was determined and plotted against the log of the fungicide concentration to determine the mean EC50. Current calculated EC50 values for isolates tested against fluopicolide have placed US-22 as most sensitive at 0.14 mg/L and US-8 as least sensitive at 0.43 mg/L. The range and mean EC50 values for each fungicide will be further discussed as well as the relative sensitivity of the common US genotypes of P. infestans to each fungicide.

Session 1, A17
Source of calcium increase produced by histamine in human adipose-derived stem cells
Bradley Glynn Poston Human Biology
Mentors and/or Co-Authors: Robert Grossfeld Biology
Elizabeth Loba Biomedical Engineering

This study aimed at finding the source of calcium (Ca2+) for increases in cytoplasmic Ca2+ activated by histamine in adult human adipose-derived stem cells (hADSC). In other cell types, the type 1 histamine receptor is known to signal through a Phospholipase C-Inositol Trisphosphate pathway to release Ca2+ from intracellular organelles. These experiments tested whether the response of hADSC in culture increases in cytoplasmic Ca2+. In normal saline, histamine treatment gave a robust increase in cytoplasmic calcium. The response was reduced but not completely eliminated in calcium-free saline; this was reversible upon repeat treatment in normal saline. After pre-incubation with BHQ, the response to histamine was greatly reduced. Therefore, influx of calcium and release from internal stores both appeared to contribute to the increase in cytoplasmic calcium produced by histamine.

Session 1, D2
A Qualitative Assessment of the Motivators and Facilitators for Teachers and Administrators for Nutrition Education in Preschool Classrooms
Jessica Christine Piner Zoology
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences
Virginia Carraway-Stage Food, Bioprocessing, and Nutrition Sciences

Despite the recent plateau in childhood obesity, the prevalence of overweight preschool children has doubled in the past 30 years. Children from low-income families who attend a Head Start (HS) program are significantly more likely to be overweight than the general preschool children population. Prior research has indicated that preschool centers have the ability to have an impact on childhood obesity prevention through the implementation of nutrition education programs. The purpose of this study was to conduct in-depth individual interviews with HS teachers (n=15) and Health/Nutrition Coordinators (n=11) and Center Directors (n=4) to identify factors that motivate and facilitate the implementation of nutrition education in the preschool classroom. Teachers were motivated to teach nutrition in their classroom due to personal obligation, childhood obesity concerns, and because it was a HS requirement. Teachers reported facilitators to teach nutrition included access to hands-on, visual resources and an all-inclusive curricular resource. Administrators identified motivators to teaching nutrition in the classroom as childhood obesity concerns, using the child as agent of healthy change in the family, and because it was a HS requirement. Administrator reported facilitators included easy to use resources, training in nutrition education, and parent/community involvement. This study serves as baseline data to explain factors that might help nutrition educators develop educational resources and training experiences possibly improving the quality of nutrition education provided in the Head Start preschool classroom.

Session 2, C24
Analyzing Copy Number Aberrations of Tumor Suppressor Genes and Oncogenes In Feline Sarcoma
Elizabeth Ashley Pragar Biological Sciences
Mentors and/or Co-Authors: Rachael Thomas CVM-Molecular Biomedical Science

Many cancers display chromosomal abnormalities, which may alter normal gene expression and affect tumor behavior. Studying the chromosomal status of cancers may help to optimize treatment plans since certain therapies target specific abnormalities, but this approach has not been widely applied to feline cancer. We used fluorescence in situ hybridization (FISH) analysis to study the chromosomal status of three...
tumor suppressor genes (TP53, CDKN2A, PTEN) and two oncogenes (KIT, MET) in samples from a feline sarcoma case taken before and after treatment. DNA was isolated from BAC (bacterial artificial chromosome) clones representing these genes, labeled with a fluorescent tag and hybridized to chromosomes from a healthy cat to serve as a control. This confirmed that each probe generated signals on the correct chromosomes in the correct number. These probes were then hybridized to both feline sarcoma specimens, and the observed number and location of probe signals for each gene was compared to that seen in the control. Both specimens showed numerical and structural abnormalities of each gene; however the post-treatment sample showed more cell-to-cell variation in FISH probe signals, especially for the CDKN2A and TP53 genes. Analysis of additional cases will show whether these abnormalities are common features of feline sarcomas and may help with diagnosis and predicting outcome.

Session 2, D7

Everyone Says You Are What You Eat
Michele Lee Price  
Biology
Jessica Loyd  
Animal Science;
Nicholas Snow  
Biological Sciences & Spanish Language;
Morgan Pope  
Human Biology

Mentors and/or Co-Authors: Suzie Goodell  
Food, Bioprocessing & Nutrition Sciences
Natalie Cooke  
Food Science

Is there any validity to the common cliché “you are what you eat”? Prior research investigated the relationship between socioeconomic status and geographic region on culture and food; however, little was found on the relationship of cultural influence on individuals’ food choices in the college setting after moving to the United States or living with parents who formerly lived in another country. The purpose of this study was to qualitatively determine the relationship between culture and food in first or second generation immigrants to the United States. Using food timelines created by the participants and a standardized guide, researchers interviewed twelve volunteers and analyzed the data for themes. Researchers found that geographic region, inherited traditions, strong familial ties, and current life situations influenced food choices and traditions. These findings confirm the results of previous literature and have implications for dietary recommendations and localized food options, as well as cultural diversity education throughout the university.

Session 2, C19

Inducing Early Flowering in Tobacco using a PVX Viral Expression System
Kira Ashton Pruitt  
Biology

Mentors and/or Co-Authors: Ralph Dewey  
Crop Science

This project aims to incorporate the Flowering Locus T (FT) gene from Arabidopsis into a Potato Virus X (PVX) vector to induce early flowering in tobacco cultivars. The ability to induce early flowering represents a powerful tool that could greatly accelerate the breeding process by shortening the generation time of the plant. The FT gene has already been successfully incorporated as a stable transgene into the tobacco plant genome for this purpose; however, a viral vector system offers several advantages: it allows researchers to induce early flowering into any tobacco cultivar without having to initially introduce the stable transgene in advance; this methodology utilizes a transgenic virus, so the virus is transferred to each individual plant and only targeted plants will be infected, thus, this system doesn’t require maintenance or screening for the FT gene in each generation; this methodology means that the trait isn’t passed from parent to offspring so the plants are non-transgenic, which offers a strong benefit due to the current controversy over transgenic plants; and the gene doesn’t need to be crossed out of the final cultivar since the seeds won’t carry the virus. After successful propagation of the virus throughout the plant, the infected leaf tissue can be frozen for storage and used at a later time to inoculate other plants with the FT virus, making the system a quick, effective means to achieve flowering and collect seeds at any time with little preparation.

Session 1, D4

Ethical Issues Regarding Genetically Modified Organisms
Joshua David Quinn  
Biology
Wesley Yang  
Biochemistry;
Colleen Fleming  
Biological Sciences;
John Encarnacion  
Biology;
Wesley Sayre  
Biology

Mentors and/or Co-Authors: David Threadgill  
Genetics

The emergence of genetically modified organisms (GMOs) in modern culture is one that has been received with much skepticism within a somewhat limited community. One of the main issues concerning the topic of GMOs, specifically those in the field of food production, is the fact that a substantial amount of the population is unaware that genetically modified organisms are even in use. Another expansive issue is the ethical concern regarding the employment of genetic modification in crop science and food production. There are many who state that GMO use is a positive advancement as it allows for many benefits concerning food production, such as higher crop yields. There are also those who oppose GMO use, stating that the long term effects of consuming GMO products are still unknown and possibly harmful. Between these two polarizations there are many arguments and examples regarding GMO use as a positive innovation for society as well as opinions stating the opposite.

Session 2, D9

Etiology of Amyotrophic Lateral Sclerosis
Travis Wayne Radford  
Biology
Steven Clark  
Biological Sciences;
Andrew Nagler  
Biological Sciences;
Andrew Blank  
Biological Sciences;
Poorva Apte  
Biological Sciences

Mentors and/or Co-Authors: Robert Grossfeld  
Biology

Amyotrophic lateral sclerosis, or ALS, is one of the most commonly diagnosed neuromuscular diseases in the world. ALS is a progressive degeneration of motor neurons in the spinal cord and brain, resulting in gradual loss of voluntary motor control and eventual death by respiratory failure. There is no known cause. About 5-10% of cases occur within families, while the other 90-95% of cases are sporadic. Several genes have been associated with ALS, but the relationship between these genes, in terms of causing ALS, has not been determined. The immune system seems to play a role, with reactive astrocytes, activated microglia, dendritic cells, and CD-8 T lymphocytes present in higher concentrations in the spinal cords of patients with ALS compared to normal individuals. Rodents and zebrafish are
used to research ALS, but there is not yet a perfect animal model since so many factors seem to be implicated in causing the disease. We are investigating the possible interaction between the human immune system and dietary neurotoxins as contributors to the development of ALS and related neurodegenerative diseases.

Session 1, C2
Assessing Preschool Teachers' Definition of a Positive Mealtime Environment
Mariam Rashid Biology
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences Satoko Chika Food Science

According to the guidelines by the American Dietetic Association, teachers should know how to create a positive mealtime environment; however, the definition of a 'positive mealtime environment' is not given. A positive mealtime environment is necessary, because the environment a child is in can affect their eating habits. Preschool teachers of 3-5 year olds from the West Coast of the United States were interviewed about their perceived definition of a positive mealtime environment. Our results indicated that teachers defined a positive mealtime environment as a place where children build healthy eating habits and learn various types of social and motor skills. Teachers also defined a positive mealtime environment as an fun, interacting environment where everyone is engaged and encouraged to try new foods. The information gathered from this data will be used to create educational materials that will help teachers make it easier to create a positive mealtime environment.

Session 2, B23
Sequencing and Evolutionary Analyses of SEPALLATA-1 Genes in the Dogwood Family
Charlotte Emily Rastas Biology
Mentors and/or Co-Authors: Qiuyun (Jenny) Xiang Plant Biology

The SEPALLATA-1 gene is a MADS-BOX E-class gene that has been identified in Arabidopsis thaliana and is reported to have a potential role in petal-like morphology of non-petal organs in some plants. To assess the role of the SEP-1 gene in the expression of petaloid bracts in dogwood (Cornus), I isolated a partial sequence of the gene from six dogwood species using Polymerase Chain Reactions followed by DNA sequencing technology. The gene identity of the obtained sequences was determined by a Blast search of the GenBank protein database. Phylogenetic analyses of SEP-1 sequences was conducted to determine the evolutionary relationships of the gene among Cornus species and other flowering plants. Results of the analyses showed that the Cornus SEP-1 genes are exclusively closer to one another than they are to the SEP-1 of other plants. They are also more closely related to the SEP-1 genes of the same phylogenetic clade compared to other clades. The two Cornus species with petaloid bracts are most closely related to one another, as are the three species with rudimentary bracts. C. Canadensis shows the greatest rate of molecular evolution in the gene. When compared to the SEP-1 gene of Arabidopsis, cDNA showed that the beginning portion of the gene is more conserved between Arabidopsis and Cornus when compared to the end, which is less conserved. These results provide a basis for my future experiments in gene cloning and gene expression to assess the role of SEP-1 in bract petaloidy in Cornus.

Session 1, D14
Attitudes, knowledge, and beliefs of health care providers regarding the use of donor human milk in the NICU
Brooke Elizabeth Reimer Human Biology & Nutrition Science
Mentors and/or Co-Authors: April Fogleman Food Science

The purpose of our research is to survey the staff at neonatal intensive care units (NICUs) to gain an understanding of its workers’ perspectives on breastfeeding practices. We are looking at the barriers preventing hospitals, NICU staff, and patients from using human donor milk when mother’s own milk is unavailable. In writing our survey, we collaborated with graduate researchers at the University of North Carolina at Chapel Hill’s School of Public Health who are researching a similar topic that targets neonatologists in North Carolina. We hypothesize that at hospitals where policies are already in place to promote the Baby Friendly (BF) Hospital Initiative, there will be more evidence of education, familiarity, comfort, and support of the use of human donor milk in the NICU. At hospitals where BF policies have not been put into place or carried out in practice, there will be less evidence of these four qualities in the NICU. The survey we have written will be emailed to the NICU staff members at four North Carolina hospitals (WakeMed Raleigh, WakeMed Cary, Rex Hospital, and UNC Chapel Hill Medical Center) and Stanford University in California. The survey is designed to gain an understanding of staff perspectives by asking staff opinions, common breastfeeding practices, and familiarity and comfort with human donor milk and milk banking. The survey should be completed in about 6-7 minutes per participant. We are still receiving responses to the survey and are in the process of analyzing their significance.

Session 1, D27
A Research Model for Childhood Obesity: The Effects of Overfeeding on Commercial Pigs
Allison Ruth Rhodes Biology
Mentors and/or Co-Authors: Chad Stahl Animal Science Bryna Seabolt Animal Science;

The purpose of the study was to use Sus scrofa domesticus, or commercial pigs, as a research model for childhood obesity. Specifically, the study aimed to demonstrate the effects of overeating during the early stages of life and its effects on body composition, bone composition and organ weight. The piglets were divided into two groups, one being fed a normal diet and the other being fed approximately 50% more of that diet. Daily body weights were recorded throughout the study. At the conclusion of the study, the piglets were euthanized and measurements of their major organs and bones were taken. The data indicates that the overfed pigs did weigh more (p<.01) than the normal-fed pigs and also averaged larger organ (p<.01) and bone sizes (p<.05) than the normal-fed pigs. While this study is useful to examine the effects of overfeeding during infancy on neonatal growth and bone development, it would be of great interest to allow the animals to grow into sexual maturity and even adulthood to determine if overfeeding during infancy predisposes pigs to obesity later in life, with or without feeding diets high in saturated fat and sugar. This older pig model would also be useful in determining insulin resistance and glucose tolerance in obese
versus lean animals.

Session 1, D19
Validation of CO2 Control Systems used in Fermentation
Heather Ann Marie Roberts Food Bioprocessing and Nutrition
Jeffrey Pineda Bioprocessing Science;
Campbell Stubbs IV Bioprocessing Science;
William Hughes Bioprocessing Science
Mentors and/or Co-Authors: Brian Farkas Food, Bioprocessing & Nutrition Sciences

The yeast cell line, Saccharomyces cerevisiae, has an established history in biomanufacturing; however, many processes are still unknown. One of those unknowns is control of CO2, which is a compounded problem as CO2 is present in the inlet air for aerobic fermentations and as a metabolite of anaerobic and aerobic yeast fermentations. Studies have observed that levels of CO2 below 20% can be beneficial whereas levels above 40% begin to display inhibitory effects. A validation plan and methodology were proposed for monitoring and control of CO2; partial pressure within BiOENGiNEERiNG R’ALF-Plus 3.7L benchtop bioreactors. The use of BiOENGiNEERiNG gas mixing stations for control over inlet gas composition paired with BiOENGiNEERiNG dissolved oxygen probes and an Alpha Omega Instruments Corporation off gas analyzer were used to control composition of dissolved CO2 present in liquid media. Yeast by-products will be quantified using High Performance Liquid Chromatography (Waters HPLC system; Phenomenex 0.0 x 7.80 mm fermentation column) to measure the response; yeast have to controlled conditions, as well as monitoring cell growth during batch fermentations using a Nexcelom Bioscience Cellometer. The use of validation runs will ensure that the control of CO2 has reproducible results. Performance validation will ensure the capabilities of producing repeatable biomass yield and beneficial secondary metabolites through control and regulation of CO2 partial pressure. Benefits of controlling CO2 partial pressure during fermentations stem from the addition of one more level of control. Being capable of assuring a high degree of control during bioprocessing is necessary for ensuring safe, reliable products.

Session 1, B11
The ontogeny of stress coping behavior in the zebrafish, Danio rerio
Katie Elaine Robertson Zoology
Mentors and/or Co-Authors: John Godwin Biology
Ryan Wong Biology

Many organisms experience stress and exhibit anxiety-like behaviors. The mechanisms used to cope with stress, however, can vary between individuals. It was hypothesized that coping behavior is shaped over time and early development is especially important. This study was designed to characterize the ontogeny of stress coping styles in the zebrafish, Danio rerio. We utilized wild-caught zebrafish that were selectively bred into two lines that exhibit either proactive or reactive behavioral stress responses (e.g. “bold” and “shy” fish). To assess the onset of differences in coping styles we quantified behavioral stress displays of individuals using open field tests at several time points throughout the fish’s lifecycle. We used a repeated measures within subjects design (n=56 per line). To control for any habituation, another set of individuals (n = 56 per line) was only tested once at the same ages. There was no significant change in the amount of time spent frozen over weeks 1, 2 and 3 post-fertilization. Bold and shy fish also did not differ in time frozen during those weeks. During weeks 7 and 13, however, both strains spent significantly more time frozen than they did in the first three weeks of both the repeated measures and one-time tests. Further, in weeks 7 and 13, the shy fish spent significantly more time frozen than their bold counterparts. Knowledge gained about age-dependent changes in behavioral stress response will guide characterization of neural gene expression and may potentially provide insights into the developmental bases of anxiety disorders.

Session 1, B7
Disruptions of Endocrine Signaling and Potential Therapeutic Treatments using Tissue Engineering and Prevention through Environmental Toxin Identification
Supriya Sadagopan Biochemistry
Samantha Xu Biochemistry;
Sunny Bhathela Biochemistry;
Rebecca Purvis Human Biology
Mentors and/or Co-Authors: Miriam Ferzli Biology

Normal endocrine signaling is imperative for homeostatic control in humans. Minor imbalances can result in a diseased state. Due to the different roles of the endocrine system, researchers are exploring the diverse effects of malfunctioning endocrine receptors. Signaling problems within endocrine receptors can lead to endocrine, neurological, and metabolic cellular conditions. In one study, researchers found that a disruption in pancreatic signaling lead to insulin resistance when exposed to oxidative stress. This resistance caused an increase in the occurrence of diabetes. Researchers studying schizophrenia, a condition that results from an overstimulation of the dopamine receptors, are testing various drugs to determine their effects on this disorder. Other studies show that an imbalance in estrogen receptor signaling could affect collagen levels, skin elasticity, and thickness, which is important in understanding cellulte formation in women. These are only a few examples of the importance of properly functioning endocrine receptors. As scientists attempt to understand how to address these conditions, studies in tissue culturing and environmental toxicology identification are showing promise. Preliminary findings in the field of molecular chemistry have shown that carbon nanotubes may provide scaffolding for tissue engineering to replace damaged collagen. Carbon nanotubes can also be used in the environment to detect known endocrine disrupting toxins. As the clear necessity for healthy endocrine signaling is evident for health, further research will provide greater insight into their mechanism and manipulation for treatment of disease.

Session 1, C20
Exploring the Binding Affinities of Genistein to Estrogen Receptors by the Use of Site Mutagenesis
Audreyanna Salinas Biological Sciences: Molecular, Cellular, Developmental Biology
Mentors and/or Co-Authors: Beth Overman Biology

Estrogen receptors (ER) are a group of nuclear receptors located intracellularly in the cytosol. Estrogen receptors bind with estrogens which regulates growth, development, and homeostasis. The aim of this study is to look at the binding affinities of genistein to two types of Atlantic
Croacker (ac) fish ERs: acERu and acERβ, as well as a mutated acERu construct. The mutation was accomplished by PCR site directed mutagenesis in which the amino acid isoleucine (I) was mutated to the corresponding methionine (M). IPTG was used to induce the expression of acER from bacteria. Liquid scintillation was used to count the amount of binding that occurred between the control, estradiol (E2), and genistein to the acERs. Genistein had the highest binding affinity with acERβ (which is consistent with other current literature) and the lowest binding affinity with the acERu. Interestingly enough, genistein's binding affinity for the mutated receptor (I to M) was significantly lower than that of the acERβ but higher for the acERu. This data provides evidence for isoleucine, being necessary for proper binding of genistein to acERs, and is novel evidence of the amino acid’s contributions to the binding affinity of genistein to these acERs. These findings provide insight into genistein's effects on growth and development. Further research will elucidate the role of isoleucine in acERs binding to genistein.

Session 1, D1
SEU and BUM1 affect shoot apical meristem termination and vegetative to floral transition in Arabidopsis thaliana

Michael Fredrick Schwartz Plant Biology/Biology

Mentors and/or Co-Authors: Bob Franks Genetics

The shoot apical meristem (SAM) is a set of pluripotent cells that gives rise to above ground organs including leaves and flowers. The SAM normally progresses through different developmental phases; first a vegetative phase during which rosette leaves are produced and subsequently a reproductive phase. We are interested in two genes, SEUSS (SEU) and BUMBERSHOOT1 (BUM1), that are required for the maintenance of SAM growth and for the timely transition to the reproductive phase. seu single mutants have deformed flowers, a slight delay in the transition to flowering, and reduced plant height. While seu single mutants do not alter SAM development dramatically, mutations in the SEUSS paralogue, SEUSSLIKE2 (SLK2) show an enhancement of seu by the near complete loss of SAM formation in the seu slk2 double mutants. This suggests that the SEU family of proteins plays a critical role in SAM formation. bum1 mutants have defects in SAM maintenance, produce aerial rosettes, and display a reduced ability to complete the vegetative-floral transition. To examine the genetic relationship between seu and bum1 we generated seu bum1 double mutants. Examination of seu bum1 seedlings indicates that seu mutants dramatically enhance the phenotype of the bum1 mutants, with respect to premature SAM termination, and delayed transition to the reproductive phase. In order to further characterize these double mutants we will use rosette leaf counts to estimate the timing of the floral transition and will examine and compare floral organ tissue morphology between genotypes. Our results suggest a model in which SEU and BUM encode partially overlapping redundant activities that are important for proper SAM development.

Session 1, C17
Genetics in Human Affairs: An Audience Response System (ARS) strategy to improve grades in the classroom

Emily Gibson Seberger Biological Sciences

Mentors and/or Co-Authors: Marian Gardner Genetics

Across the United States, Audience Response Systems (ARS) are being used daily on college campuses. One of the main types of ARS used throughout North Carolina State University’s campus is Turning Technologies Response Card XR clickers. Many professors use clickers daily for taking attendance or for asking specific questions on material covered in class. Additionally, they are used to assess a student’s existing knowledge on material. But what if the clicker questions focused specifically on problem areas for students? Over the course of the Fall 2011 Semester in the Genetics in Human Affairs (GN 301) class at North Carolina State University, I tested the idea to see if targeting specific problem areas would improve grades in the classroom. Two weeks before a test, clicker questions were asked focusing on the main ideas of the lectures. Problem areas were identified based on the highest percentages for the two class sections. Worksheets geared toward problem topics were made available to the students a week before the test. Additionally, review sessions were held before the tests to go over the worksheets to attempt to better prepare the students for their upcoming test. Based on the information gathered in the Fall Semester, the same technique will be used in the Spring Semester for GN 301 to encourage students to prepare earlier for tests and to go over problem areas displayed by the clicker technology. Overall, the results were not conclusive that the review sessions were a success in the fall; however the worksheets proved to be helpful for students.

Session 2, B16
Oral Health Education and Hygiene Practices in Elementary-Aged Children

Miriam Ferzli Biology

Tooth decay in children in the United States is more common than any other chronic childhood disease. Development of proper oral hygiene – the practice of keeping the mouth clean and free of harmful bacteria – at a young age is vital to lifelong health. I investigated the oral hygiene habits of elementary-age schoolchildren, 8 to 10 years old. To obtain feedback, I administered a survey asking a range of questions pertaining to each student’s daily oral hygiene practices, and evaluated each student based on their responses. Following the survey, I presented a lesson on oral hygiene, which included demonstrations on brushing and flossing. Through the survey, I found that the majority of students’ scores on the survey fell into the range of needing major improvements in their oral hygiene practices. I also observed that the areas of need for improvement were widely diverse. However, the two areas with the greatest need for improvement were in frequency of flossing and frequency of consuming sugary snack items.

Session 1, C35
Comparison of Protocols for Ovulation Synchronization (Ov-Synch) and Timed Artificial Insemination (TAI) of Goats

Deanna Michelle Sedlak Animal Science

Mentors and/or Co-Authors: Charlotte Farin Animal Science

The study objective was to evaluate 3 ov-synch protocols for breeding goats using TAI. Does (N=85) were randomly assigned to estrus synchronization with AI (control; n=22); ov-synch with TAI at 72h (NC.Synch-TAI72; n=21); ov-synch with TAI at 48h (NC.Synch-TAI48; n=22), or Controlled Intravaginal Drug Release with TAI at 48h (CIDR; n=20). Controls received two shots 15mg PGF2a 9 days apart and were bred by AI based on estrus onset. NC.Synch-TAI72
Learning Environment with Upside-down Pedagogies) would for teaching known as SCALE-UP (Student-Centered Active Learning) that can take place in a course. A study was conducted to determine whether a non-traditional format and active learning that can take place in a course. Large lecture settings limit the amount of collaborative work and active learning that can take place in a course. To gauge student critical thinking skills were compared for students in lab exams and a final. Additionally, collaborative learning and critical thinking analyses is needed on future and current data to form a satisfactory conclusion; but initial results suggest improved higher order thinking skills and increased student enthusiasm within the SCALE-UP lecture.

Effects of a Collaborative Active Learning Format for Introductory Biology on Student Performance and Higher Order Thinking
Ronnie Labib Shammas Biology

Mentors and/or Co-Authors: Miriam Ferzli Biology

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Session 2, A6
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Ronnie Labib Shammas Biology

Mentors and/or Co-Authors: Miriam Ferzli Biology

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Session 2, B29
Modeling the Effects of Microgravity on Overall Proximal Tibia Bone Stiffness
Colin Travis Smith Mechanical & Aerospace Engr

Mentors and/or Co-Authors: Anthony Lau Biomedical Engineering; Ted Bateman Joint Dept. Biomedical Engineering;

Studies and experience in spaceflight has shown that the absence of gravity in the skeleton will cause severe declines in total bone mass. Astronauts manning long duration spaceflights experience substantial bone loss, which include microstructural changes in cortical and trabecular bone leading to decrease in bone effective stiffness. The objective of this study is to investigate how spaceflight affects the bone strength in mice through finite element modeling. Three groups of mice were used in this study each with n=15: Mice flown on STS-135, a baseline, and control group. Tibias were excised from each mouse, in the case of the Spaceflight group, immediately upon landing. The bones were scanned in a micro CT scanner at 10 um isometric resolution. For analysis on these models the 3D Image data was exported into a finite element mesh. After which compression was simulated on a 1.0mm thick section of the proximal tibia to determine the effective stiffness of the bone structure at this location. The bone was compressed to 5% of total height and the resultant force output was measured, which provides the effective stiffness of the bone specimen. The results showed a statistically significant decrease in bone strength between the mice aboard the spacecraft and the other two groups. The results from the model showed that the spaceflight group had around a 30% decrease in bone strength compared to the ground control group (P<0.001), while the percent difference between ground control and baseline is twenty percent.

Session 2, D23
BIO 483: Parkinson's Disease
Aravind Somasundaram Biology
Stacy Ingram Biology;
Nikki Brandon Biology;
Alexander Melvin Biology

Mentors and/or Co-Authors: Robert Grossfeld Biology

Parkinson’s Disease (PD) is a neurodegenerative disorder characterized by the progressive loss of dopaminergic neurons in the substantia nigra pars compacta, consequently leading to clinical and pathological abnormalities. Classic clinical symptoms include gait disturbance, resting tremor, and rigidity muscles. Despite intensive research, the specific mechanism of PD remains elusive. Popular treatment options include L-Dopa administration and Deep Brain Stimulation. Protection from inflammation could help alleviate the progression of the disease. Our goal is to identify potential targets for preventing the disease.

Session 2, D11
Prenatal Factors In The Development of Pediatric Brain Tumors
Aravind Somasundaram Biology

Mentors and/or Co-Authors: Heather Patiasaul Biology

Malignant brain tumors are the leading cause of cancer death among children, and the second most common type of pediatric cancer with a 5-year survival rate of 67%. Despite exhaustive research on brain tumors, the exact mechanisms regarding their origins remain elusive, with only 5% of tumors linked to hereditary disorders. Adverse exposures in the prenatal environment have been linked to various diseases including cardiovascular disease, diabetes and obesity. Thus, recent brain tumor research has focused on carcinogens and their potential injurious effects in the prenatal environment, resulting in tumorigenesis. N-nitroso compounds (NOC), are found in tobacco and certain food products, and are hypothesized to play a role in the formation of brain tumors. The fetal brain is extremely sensitive because it is actively...
carcinogens, like NOC, can chemically alter and induce cell formation before adulthood, could potentially lead to greater childhood brain tumors. Future laboratory studies specifically focusing on fetal NOC exposure and subsequent brain tumor formation before adulthood, could potentially lead to greater understanding regarding the mechanisms by which carcinogens, like NOC, can chemically alter and induce cell proliferation. The aim of this presentation is to present novel scientific research from studies that focus on NOC in food and tobacco and their potential role in the development of childhood tumors in the central nervous system.

Session 2, C10
Berberine traps the influenza A hemagglutinin in the Golgi Apparatus
Jodi Coons Soto Microbiology
Mentors and/or Co-Authors: Scott Laster Microbiology

Influenza A is a single stranded RNA virus that causes respiratory disease in mammals. We have found that the alkaloid berberine inhibits influenza A growth in vitro. The goal of my research was to define the mechanism by which berberine exerts its anti-influenza A effect. Previous experiments in the lab have shown that berberine causes viral hemagglutinin to be mislocated in the infected cell. Rather than the surface staining that is expected, these studies revealed a punctate pattern of intracellular staining. We hypothesized that berberine is acting to prevent maturation of the hemagglutinin, trapping it in the endoplasmic reticulum (ER) or the Golgi apparatus on its way to the cell surface. To test this hypothesis immunofluorescence microscopy was used to determine whether ER or Golgi compartments displayed similar patterns of punctate staining. These experiments revealed similar staining patterns for the Golgi apparatus and the viral HA protein in berberine treated cells. Conversely, markers for ER, nucleus, and mitochondria did not reveal similar staining patterns to HA staining in treated cells. We conclude that berberine is preventing virus replication by trapping the viral HA protein in the Golgi apparatus. In future studies we will ask whether the effect of berberine on the transport of HA through the Golgi is specific for the viral HA protein or is also seen with other viral and cellular proteins. Collectively, these results will impact our decision of whether to recommend berberine for use as a treatment for influenza A infections in humans.

Session 2, C6
Comparing Children's Fruit and Vegetable Preferences: Using a Pictorial Tool Versus a Tasting Assessment
Hillary Beth Spangler Food Bioprocessing and Nutriti
Mentors and/or Co-Authors: Suzie Goodell Food, Bioprocessing & Nutrition Sciences

A 'taste and rate' (T&R) is the ideal method for assessing child fruit and vegetable preferences; however, this method is costly and difficult outside of a laboratory setting. A pictorial method may be a more feasible alternative for assessing child fruit and vegetable preferences. The purpose of this study was to determine the correlation between children's fruit and vegetable preferences assessed by an electronic, pictorial tool and preferences assessed by a T&R assessment. Participants were children, 3-5 years old, (n=26) enrolled in local Head Start Centers. A high quality pictorial tool with 20 photographs of fruits (n=10) and vegetables (n=10) (whole and transformed forms) was compared against the T&R assessment. The T&R assessed 13 different fruits (n=5) and vegetables (n=8). Cronbach’s alpha reliability of the pictorial tool was 0.736. Spearman’s rho analysis of the pictorial tool and the T&R yielded statistically significant (p<0.05) results for broccoli and green bean, indicating assessing preference with a photograph may not be a valid preference measure for these vegetables. The fruits and vegetables that yielded non-significant results indicate that preference can likely be assessed using photographs. Developing a tool that can accurately and reliably assess child fruit and vegetable preferences would allow assessment of nutrition education programs focused on positively impacting child fruit and vegetable preferences in similar settings. Future research should involve predictive validity methodology.

Session 1, A26
Haiti Fruit Bar Project
Kendra Sutton Food Science and Nutrition
Jelani Tyson Food Science;
Chuong Le Bioprocessing; An Truong Food Bioprocessing and Nutriti
Mentors and/or Co-Authors: Brian Farkas Food, Bioprocessing & Nutrition Sciences

Haiti is the poorest country in the Western hemisphere. Poverty and malnutrition are widespread. Poor nutrition begins at conception and without an improvement Haitians cannot improve their quality of life. In order to combat the nutritional problems, a meal replacement bar was developed. The bar was formulated with ingredients native to Haiti thus allowing it to be produced using Haitian ingredients and labor. The bar needed to contain quality sources of the

Soybean \( (G. max) \) seeds contain about 20% oil with 8% of the total oil being linolenic acid in most cultivars. Oils high in linolenic acid have industrial uses such as lubricating oils and linoleum flooring. Introgressing contrasting genes and alleles from the wild ancestor of domesticated soybean, \( G. soja \) Sieb. & Zucc. (previously \( G. ussuriensis \) Regal & Maack), into soybean for the high-linolenic acid trait has the potential to increase the genetic base of soybean for the trait and increase linolenic acid content beyond those found in either parent. We made crosses between N7103 (\( G. max \)) and PI 366122 (\( G. soja \)), screened the progeny for agronomic appearance and then assayed for linolenic acid seed content, developed Near-Isogenic Lines (NILs) from the selected progeny, and identified individual lines with high linolenic acid seed content. Linolenic acid content was determined by fatty acid methyl esters (FAME) analysis. We hope to release lines with particularly high linolenic acid content as germplasm for future applications in soybean breeding. The NILs will be used in a genetic study to sequence and identify the genes and alleles responsible for the high-linolenic acid trait that has been introduced into soybean from \( G. soja \).

Session 2, A23
Novel Polyunsaturated Omega-3 Oil Genes from Wild Soybean
Rochelle Denise Strednak Plant Biology
Mentors and/or Co-Authors: Thomas Carter Crop Science

Soybean \( (Glycine max \) (L.) Merr.) seeds contain about 20% oil with 8% of the total oil being linolenic acid in most cultivars. Oils high in linolenic acid have industrial uses such as lubricating oils and linoleum flooring. Introgressing contrasting genes and alleles from the wild ancestor of domesticated soybean, \( G. soja \) Sieb. & Zucc. (previously \( G. ussuriensis \) Regal & Maack), into soybean for the high-linolenic acid trait has the potential to increase the genetic base of soybean for the trait and increase linolenic acid content beyond those found in either parent. We made crosses between N7103 (\( G. max \)) and PI 366122 (\( G. soja \)), screened the progeny for agronomic appearance and then assayed for linolenic acid seed content, developed Near-Isogenic Lines (NILs) from the selected progeny, and identified individual lines with high linolenic acid seed content. Linolenic acid content was determined by fatty acid methyl esters (FAME) analysis. We hope to release lines with particularly high linolenic acid content as germplasm for future applications in soybean breeding. The NILs will be used in a genetic study to sequence and identify the genes and alleles responsible for the high-linolenic acid trait that has been introduced into soybean from \( G. soja \).
Macronutrients, such as lipids, carbohydrates, protein, as well as some vitamins and minerals. Lipids were provided by avocados, carbohydrates from sweet potatoes, protein from red kidney beans, and vitamins and minerals from mangoes and bananas. The aim was to create a shelf stable and palatable product using a water activity lower than 0.7. The raw ingredients were peeled, pureed, and sheeted into a thin one-half inch layer. The puree was baked at 300°F for 15 minutes and sliced into individual serving sized bars. During development, the final bar was analyzed for caloric content, nutrients, water activity, firmness, color, and microbial load. The caloric and nutrient contents were determined using a nutritional database. The water activity of the final product was determined by a water activity meter. Firmness was determined using the three point technique, color was analyzed using a Minolta colorimeter, and the microbial load was determined by aerobic plate count. This product will provide a much needed nutritional supplement to combat the hunger that is rampant in Haiti while potentially creating jobs.

**Session 2, C22**

**Chemical Comparison of North Carolina and California Cabernet Sauvignon**

Claire Ingrid Svendsen  
Food Bioprocessing and Nutrition Sciences

Joseph Seman  
Food Science

Meredith Johnson  
Food Science

Kendra Stallings  
Food Science

**Mentors and/or Co-Authors:** Brian Farkas  
Food, Bioprocessing & Nutrition Sciences

North Carolina has a growing wine industry and is currently ranked 9th in wine and grape production in the country. Currently California is responsible for 90% of wine production in the country. The goal of this research is to identify differences in the primary aroma compounds found in Cabernet Sauvignon wine from Yadkin Valley, North Carolina and Napa Valley, California. This research is valuable to the young North Carolina wine industry because it could give North Carolina wineries ideas to improve the aroma qualities of their wine. Cabernet Sauvignon was selected for the comparison because it is cultured in both regions and has the most economic impact on the growers of red wine grapes in North Carolina. Gas Chromatography – Olfactometry (GC-O) and Two-Dimensional Gas Chromatography with Mass Spectrometry (2D GC-MS) were performed to identify and compare the chemical compounds. After analyzing GC-O data it was found that several esters and alcohols were similar in wines from both regions. 2D GC-MS will be performed to identify and quantify differences between samples. A preliminary sensory analysis/taste test was performed using 20 point wine judging scale developed by UC Davis; the results ranked Napa Valley A first, followed by Napa Valley B, Yadkin Valley A, then Yadkin Valley B. This research project possesses a unique perspective in that it is comparing a prominent region of wine-making, California, to an upcoming viticulture region. Data from this study may be used to improve North Carolina wine marketability and overall quality.

**Session 1, C7**

**Marine Organisms and Ecosystems: The Balance of Interspecies Relationships and Biodiversity**

Jordan Daniel Taylor  
Biology

Kenzi Stemp  
Biology

Taylor Shropshire  
Biological Oceanography

**Mentors and/or Co-Authors:** Miriam Ferzli  
Biology

Organisms in marine ecosystems evolve in accordance with biotic and abiotic pressures. Interactions between organisms and their environments can affect populations as well as whole ecosystems. There is a vast amount of research that examines different marine ecosystems, community relationships and biodiversity. For example, the parasite-host interactions in coral reefs control fish populations and can affect the entire coral reef ecosystem. In globally unique ecosystems, such as the Sargasso Sea, interactions between organisms and their environments define the ecosystem. Researchers carried out a strategic analysis of ecological populations to gather a survey of each ecosystem. They also performed case studies of specific organisms to analyze predator/prey interactions. Additionally, exhibitory organisms such as the cuttlefish display camouflage strategies in response to predation. Scientists performed observational studies to determine how cuttlefish react to various substrates they encounter in marine environments. These studies serve as controls on biodiversity, and observe unique adaptations to specific prey adaptation. Marine aquatic environments allow organisms to adapt to evolutionary pressures and population control, as well as ecosystem interactions and relationships. Further research will continue to describe the fragility and complexity of these ecosystems and the relationships of the organisms that live there.

**Session 1, B6**

**The Importance of the Amazon Rainforest, Coral Reefs, and Honey Bees as Indicators of Environmental Degradation.**

Ian Robert Thompson  
Environmental Technology and Management

Kylie Hooton  
Environmental Technology and Management

Sarah Leichter  
Biological Sciences

**Mentors and/or Co-Authors:** Miriam Ferzli  
Biology

Certain organisms or ecosystems require highly specific niches or interactions, respectively, and may serve as indicators for assessing environmental conditions. Honey bees require interactions between different hives, and when one colony shows symptoms of colony collapse disorder (CCD), it is likely that adjacent colonies will become infected. Many studies were conducted comparing healthy colonies to colonies affected by CCD. The research showed that there is some sort of infectious agent that causes CCD, but there is much discrepancy on what exactly this infectious agent is. The Amazon rainforest has the highest biodiversity in the world, but factors including climate change and deforestation are significantly impacting this fragile ecosystem. Models were used to predict the amount of environmental degradation in the Amazon Rainforest and how to best approach conservation. Models show that the rainforest has many factors that will result in great amounts of loss, and protected areas are a key in conservation. In another example of environmental effects on ecosystems, organisms that occupy coral reefs have specific living conditions dependent on pH and temperature, which are affected by global climate change. Studies were conducted to see how climate change affects coral reefs. Increasing temperature causes coral bleaching, caused by the loss of dinoflagellate symbiont within the coral hosts. All of these findings support the notion that small changes can have huge impacts at the level of the organism, community, and ecosystem. Further research is needed to understand how to prevent continued environmental degradation.
Session 1, A6
Language Processing and Motor Function Impairment in Neurological Disorders: A Focus on Huntington's Disease and Schizophrenia

Catherine Teresa Thriveni Biology
Franklin Beeninga Biological Sciences;
Krina Patel Human Biology;
Kylie Broderick International Studies

Mentors and/or Co-Authors: Miriam Ferzli Biology

The brain serves as the central control system for all behavioral, emotional, and physical responses in the body. When brain function is disrupted by diseases such as Huntington's disease (HD) and schizophrenia, normal cognitive abilities such as language processing and motor functions become impaired. For example, in schizophrenia, speech interpretation and production is hindered. This corresponds directly to the functioning of Broca's area, and could perhaps affect the dorsal pathway connecting it to the temporal area, proven to be involved in syntactical processing. Further EEG and intracranial recordings could help pinpoint exactly where these diseases affect language processing and production. There are methods for managing neural disorders such as the use of medications, therapy, and maintenance of an overall healthy lifestyle. However, certain aspects of a healthy lifestyle, such as exercise, could potentially treat symptoms in HD but worsen symptoms in schizophrenia. Researchers have used novel brain imaging techniques to determine that an excess of the neurotransmitter dopamine causes psychotic symptoms. Exercise has shown to heighten dopamine levels, which can worsen symptoms in schizophrenics. On the other hand, exercise can increase brain-derived neurotrophic factor (BDNF) concentrations within the body, which can help treat the symptoms of neuron degeneration in HD. In HD patients, BDNF levels are decreased and the pathogenesis of the disease is catalyzed. Due to the obvious complexity of these disorders and their disruptive impact on normal language processing and motor functions, further research is necessary to determine therapeutic treatments and understand homeostatic brain function.

Session 1,
Coincidence Spectrometry Detection of Nuclear Threat Sources Masked in Cargo

Diana Susan Tingen Nuclear Engineering
Bryan Krystek Nuclear Engineering;
Kristian Brindle Nuclear Engineering;
Jacob Smelley Nuclear Engineering

Mentors and/or Co-Authors: Robin Gardner Nuclear Engineering
John Mattingly Nuclear Engineering

Current radiation portal monitors (RPM) at ports of entry have high false positive rates, requiring the use of costly secondary inspections to demonstrate cargo safety. Using a combination of sodium iodide and plastic scintillation detectors, we have developed an RPM that uses coincidence spectroscopy to determine the presence of cobalt-60 with some shielding in a strong masking source of potassium. This is done by creating a coincidence spectroscopy system that shows the two gamma rays of Co-60 released in coincidence. Potassium emits only one gamma ray, which will not show up in coincidence spectroscopy. The experimental setup verification and the RPM design were done using the MCNP PoliMi code on the CEAR cluster to efficiently simulate large numbers of Co-60 gamma rays. Once the MCNP PoliMi model was verified, it was then scaled up to a full-size cargo container with a shielded Co-60 source embedded in a large bed of KCl fertilizer, simulating the use of these detectors in an RPM application. This allows generation of a sample RPM design simultaneously using sodium iodide and plastic scintillation detectors. This coincidence method successfully detected the presence of shielded cobalt gamma rays surrounded by large amounts of potassium. This was verified by comparing results to what would be seen if standard non-coincidence counting were used to what is seen when using coincidence counting. The efficiency and cost-effectiveness of this system make it a viable candidate for enhancing current secondary or possibly even primary inspection techniques.

Session 2, A18
Gene Level Pain Expression in Feline Associated Degenerative Joint Disease

Taylor Alexander Treadaway Genetics

Mentors and/or Co-Authors: Melissa Ashwell Animal Science

Degenerative joint disease is a crippling disorder that results in painful movement, and stiffness in the joints. This crippling condition is not very well understood in cats, which makes their treatment difficult. Therefore we sought to determine if feline sufferers of degenerative joint disease express pain at the genetic level in a significantly different manner from disease free cats by examining expression of genes thought to be associated with pain. My contribution to this project was to identify the most stable reference genes in both cats with and without the disease. The best reference genes are expressed at stable levels across all samples to give a stable platform for comparison. We gathered dorsal root ganglia from cats determined to have degenerative joint disease, and ganglia from control animals. From those samples we isolated total RNA that was converted to cDNA. Using the cDNA from both affected and unaffected cats, we ran real time PCR temperature gradients with primer pairs to determine their optimal annealing temperatures. We then examined expression of each gene in all the cDNA samples to determine which genes are the most stably expressed. To identify the most stably expressed reference genes, we used software programs designed to determine the best reference genes. Based on results from these two programs, we determined the three most stably expressed genes across all samples are RPL30, HMBS, and GUSB. With these results we can further analyze our feline samples to determine if genes found to encode for pain in prior rodent studies have significantly different gene expression levels in diseased versus healthy samples in the cat.

Session 2, B28
Characterization of a recombinant Metallosphaera sedula lipase (Msed_1072) for algae biofuel production

Rachel Lynne Turner Biology

Mentors and/or Co-Authors: Amy Grunden Microbiology
Rushyannah Killens Microbiology

With the push towards creating renewable biofuels, algae have emerged as a promising feedstock due to its ability to produce significant amounts of oil for fuel conversion in a relatively small amount of land. However, in order for algae to be a viable alternative, the biofuel conversion process must become more efficient. One way to increase efficiency of the
algal biofuel conversion is to use thermostable lipases, which cleave free fatty acids from the algal lipids. The research project described here was focused on the recombinant expression of the Metallosphaera sedula DSM5348 gene. Mied. 1072, which encodes for a thermostable lipase in an effort to biochemically characterize the lipase for its application in algal biofuel production. The target lipase gene was amplified using genomic DNA from Metallosphaera sedula as well as molecular biology techniques to generate an expression vector for recombinant protein production in the bacterium Escherichia coli. The vectors used for the recombinant protein expression coded for a his-tag either at the N or C terminus, which enabled protein purification via metal affinity chromatography. The presence of the his-tag can affect the way that the protein folds and therefore can ultimately influence the overall activity of the protein. After both the N and C terminus his tagged proteins were purified, temperature range, pH range, and substrate affinity assays were completed to determine the conditions under which the lipase has optimal activity.

Session 2, A24
The Effects of Chronic and Acute Maternal Stress on Postnatal Health
Sarah Louise Turner Human Biology
Mackenzie Stevens Animal Science;
Taylor DeMorat Biology;
Valerie Asadian Integrative Neurobiology and Physiology;
Melissa Zinter Human Biology;
Traci Barbour Human Biology;
Amanda Choi Human Biology
Mentors and/or Co-Authors: Scott Whisnant Animal Science

The purpose of this research is to analyze the effects of acute versus chronic stress in utero and the effect on post-natal development. Major points of interest with regards to acute stress include world tragedies and domestic violence. Studies indicate that most women who experience this type of short-term stress have fetuses that are more prone to shorter gestation, premature birth, low birth weight, and in some extreme cases fetal death. Low basal cortisol levels were studied post-natally in mother and offspring. It was determined that the offspring of mothers who had these low basal cortisol levels were more susceptible to having low levels as well, and thus more prone to developing post-traumatic stress disorder. On the other hand, chronic stress classifies as a prolonged period of external or internal tension specifically, influencing the physical or psychological state of the mother. The results from the research indicate that the fetus may develop increased risk of psychological disorders, structural changes of the brain and increased risk of pre-term birth and miscarriage. Specific hormones include oxytocin, which causes a change in the peripartum adaptations of the mother and cortisol, which creates a positive feedback loop causing pre-term birth. The particular strong effects seen from these studies indicate that stress experience in utero can have dire effects on the fetus.

Session 2, B10
Mercury: Fact and Fiction
Courtney Michelle Vaughn Biology
Caelia Park Biochemistry;
Ryan McMillan Biochemistry;
Danyell Tetreault Zoology;
Jeannie Paik Biochemistry;
Peter Le Biochemistry

Mentors and/or Co-Authors: Grace Jones Biology

Mercury, the “quicksilver” element, has been incorporated into medicinal, cultural, and industrial applications throughout history since its discovery. There are multiple sources of mercury for human exposure which include food, air, and dental fillings. Mercury has three different forms: elemental, inorganic mercury salts and organic mercury salts, which are characterized by distinct mechanisms and absorption rates in a human body. Elemental mercury is converted to inorganic mercury in the body. Organic mercury salts, the most toxic form to humans, are usually ingested or absorbed through the skin and are found to affect the kidneys, the central nervous system, and the thoracic region. Organic and elemental mercury are able to pass through the blood brain barrier, causing neuronal death, and pass through the placenta to a growing fetus. Inorganic mercury cannot pass through these barriers, but it has been shown to collect in the placental tissue. Tests of the blood, urine and hair can be used to detect exposure to mercury. In a non-exposed person, the blood mercury levels are usually between 0 and 0.2µg/L and the urine test mercury levels would be from 0 to 20µg/L. There is controversy concerning the proposed link between thimerosal, a vaccine preservative containing mercury, and autism, a disease affecting social behavior. Consequently, some children are not being vaccinated, resulting in outbreaks across the United States of harmful childhood diseases. Though the rates of mercury pollution have been decreasing, research efforts are being utilized in areas of safe disposal.

Session 1, C10
A Putative tmRNA of Mycobacteriophage Astraea
Akshitha Vijayakumar Biochemistry
Clay Gruber Biology;
Austin Graves Biological Sciences;
Heather Hill Biochemistry;
Megan Fruchte Biological Engineering
Mentors and/or Co-Authors: Eric Miller Microbiology
Devon Viscount Microbiology;
Susan Carson Plant Biology

As students in the first year Phage Hunters course, we isolated and characterized Astraea, a novel myoviridae phage of the C1 subcluster. We purified its double-stranded DNA genome and had it sequenced by the DHMRI. Phages often contain components relating to protein synthesis within their genome. Among these may be tRNAs, tmRNAs, and genes regulating transcription and translation. During annotation of the Astraea genome, we identified a putative transfer-messenger RNA (tmRNA). Further research into tmRNAs showed that they initiate a process known as trans-translation. This process rescues ribosomes stalled during translation, tagging the faulty protein and extracting it from the ribosome. The tmRNA places an oligopeptide tag at the C-terminus of the incomplete protein, marking it for protelysis. A number of proteins aid in this process and were identified in either the Astraea genome or the genome of its host, Mycobacterium smegmatis mc2-155. Comparison between the genome of Astraea and the genomes of other bacteriophages in the C1
subcluster showed that the sequence for the tag peptide matches those found in mycobacteriophages Bz1 and Catera. The tmRNA is also highly conserved among the other bacteriophages in the C1 subcluster. Our findings suggest that tmRNA may play a role in degrading faulty proteins and recycling amino acids during infection by Aстраea and related mycobacteriophages.

Session 1, A31
Environmental Carcinogen-induced Retinal Degeneration in a Population-based Mouse Model
Keiko Marie Wadsworth Microbiology
Mentors and/or Co-Authors: David Threadgill Genetics

Retinal degeneration is a heterogeneous disease and a leading cause of human blindness in the United States. The population-wide susceptibility to retinal degeneration is largely unknown but is thought to be induced by both genetic factors and environmental factors. Dietary contaminants, trichloroethylene (TCE) and inorganic arsenic (iAs), have been implicated in retinal degeneration pathogenesis, however due to a lack of population-based experimental models, the contribution of environmental exposures in the development of retinal injury remains unexplored. To examine susceptibility to environmentally-induced retinal degeneration, we utilized an F3 intercross mouse population model derived from a cross between FVB/N x NMRI x B6D2F1 - a multi-drug resistant p-glycoprotein knockout mouse, and CAST/EJ a wild-derived strain. F3 mice were divided into nine dose groups, and administered TCE and sodium arsenate via their drinking water and chow, respectively, at environmentally-relevant concentrations for 56 weeks. Ocular tissues of F3 mice exposed to dose-ratios of TCE and iAs were formalin-fixed paraffin-embedded and histological sectioning of eye tissue samples was performed. Sections were stained with hematoxylin and eosin and the neural and associated ganglion layers of the retina were quantified. Degeneration of the outer nuclear layer was sex-dependent, and hyperplasia of ganglion cell layers was observed in both arsenic alone and co-exposed groups. To examine retinal layer apoptosis, a marker of degeneration, we used the TUNEL assay followed by fluorescent microscopy. Co-exposed mice showed the highest measure of retinal layer apoptosis. This study revealed the involvement of environmental co-exposures in the development of retinal degeneration in a genetically heterogeneous mouse population.

Session 2, B27
The Effects of Nosema on Honey Bee (Apis mellifera) queens.
Samantha Lenore Walker Zoology
Mentors and/or Co-Authors: David Tarpy Entomology

Food systems worldwide rely heavily on the work of pollinators, the most important for commercial farming being the European honey bee (Apis mellifera). Within a colony of bees, the most important aspect is the health of the queen because queen determines the health of a colony. Though queens are susceptible to very few diseases and parasites, the gut parasite Nosema and several viruses are capable of affecting honey bee queens. This project looks at the investigates the role of these parasites on their impacts on disease susceptibility in queens. This study investigated behavioral changes in queens infected with Nosema, infected with both Nosema and viruses, or uninfected queens, as well as changes in worker behavior toward the queens. Queens were raised in the laboratory and kept in cages in an incubator. We will also measure disease prevalence in queens to see if Nosema facilitates viral infections within queens. The importance of these findings are discussed.

Session 1, D7
Advancements in Medical Technology and Anesthesiology: Treatments for Skin Cancer, Rabies and Spinal Muscular Atrophy
Julia Michelle Washburn Biology
Jessica Proctor Zoology
Karianna Alvarez Trujillo Biology
Hira Faisal Biology
Mentors and/or Co-Authors: Miriam Ferzli Biology

Medicine has made a lot of progress in the treatment of cancer, viral infections and neuromuscular degeneration. For example, research findings in the field of radiotherapy have led to more effective ways to control skin cancer. While rabies is less common than cancer, it is a good example of breakthroughs in vaccine development to control viral infections. In the study of spinal muscular atrophy (SMA), recent tissue culture studies have revealed findings that can be linked to more effective treatments. Anesthesia has been further developed and can be used in a wide range of procedures to provide pain relief, muscle relaxation, and even induce amnesia. Treatments for skin cancer, rabies, and SMA have become more convenient for patients due to the use of local and general anesthetic drugs. As we make headway in the 21st century, further funding for medical research is vital for continuing to develop effective medical treatment options and anesthetic drugs.

Session 1, C27
Alternative Use for Sweet Potato Processing By-Products
Julie Ann Wasko Food Science
Nick Fragedakis Food Science;
Anita Shek Food Science;
Amanda Burgess Food Science
Mentors and/or Co-Authors: Brian Farkas Food, Bioprocessing & Nutrition Sciences

Off-specification potatoes, roots and moldy potatoes are a significant waste stream created by the sweet potato processing industry. A new use could reduce waste and provide processors with an alternate revenue stream. Off-specification or mildly moldy sweet potatoes (MMSP) could act as an alternative carbohydrate source to white potatoes in potato dextrose (PD) broth, a bacterial growth media used to culture yeasts and mold. A sweet potato broth (SPB) was developed and tested against two commercial PD broths to determine if SPB could be competitive in the growth amount and rate of yeasts. Moisture, sugar and starch content of MMSP were found to be comparable to sweet potato literature values. Broth production was achieved by dehydrating steamed sweet potatoes and milling the dry product into powder. In a comparison of formulations for the SPB, MMSP dry matter was used at four concentrations, in treatments with and without added glucoamylase, which assists in starch breakdown. The formulations were tested against two commercial PD broths in a 72 hour experiment where Saccharomyces cerevisiae was grown, while being measured for optical density, as a representation of growth. The formulations, with competitive optical densities
Germination of Verbena bonariensis
Amanda M Wilkins Horticultural Science
Mentors and/or Co-Authors: Dennis Werner Horticultural Science

Verbena bonariensis L. is an herbaceous perennial commonly used in horticultural landscapes. Propagation of the species is limited to stem or root cuttings because of poor seed germination resulting from internal dormancy. However, prior research has demonstrated use of smoke-derived water is an effective treatment to overcome seed dormancy in some plant species adapted to fire-prone habitats. Therefore, six treatments (deionized water control, four weeks of stratification (moist-prechilling), 500 ppm gibberellic acid (GA3), 1:25 dilution of smoke water, 1:50 dilution of smoke water, and 500 ppm GA3 and 1:50 smoke water solutions combined) were utilized in three experiments to study the effect of smoke-derived water and GA3 treatment on seed germination of V. bonariensis. In each experiment, stratification, GA3, and both smoke solution treatments significantly increased percent germination compared to the control, but no consistent differences existed among these treatments. For two of the three experiments, the smoke solution and GA3 combined treatment resulted in significantly greater percent germination compared to either treatment alone. Results suggest V. bonariensis would be an excellent choice to demonstrate, in a short time frame, the positive impact of stratification, GA3 treatment, or smoke water treatment on seed germination. This could be used for a laboratory exercise in a classroom setting investigating mechanisms of overcoming seed dormancy in perennial plants.

Session 2, B24
The precedence of Trademarks, Services marks, Small Businesses and the relationship to current state of the Economy.
Necho Durelle Williams Zoology and Agricultural Business Management
Mentors and/or Co-Authors: Theodore Feitshans Agri & Resource Economics

Trademark and service marks are often critical to the success of businesses, in particular entrepreneurial startups. Further, small entrepreneurships drive the U.S. economy. The relationship between state and federal trademark law is examined. Recent developments are examined through analysis of judicial decisions, legislation, and regulations. Review of the economic, business, and popular literature explores challenges and opportunities for entrepreneurs. The purposes of this research are to examine what is the importance of small businesses related to economy, understanding how trademarks and service marks protect small businesses, how the two are related, and last but not least, to educate the general public on trademarks and service marks, their legal issues, and what is needed to own a trademark or service mark.

Session 1, D15
Genetics in Medicine: Implications for Healthcare
Megan Elizabeth Williamson Animal Science
Alex Herring Biological Sciences;

After 24 and 36 hours, will be tested against the commercial PD for the number of viable organisms using a cellometer. Results will aid in determining if MMSP deserves further research as a bacteria media carbohydrate.
The main objective of this research project was to look at how far genetics has come and see how it is affecting the healthcare industry, focusing on P4 medicines. The four parts of P4 medicines are Predictive, Preventive, Personalized, and Participatory. The hope is that over the next 20 years, medicine will be taken to a new level combining biotechnology and the human genome sequence, allowing for the management of people’s health before it turns into a disease. By being able to sequence the human genome, due to The Human Genome Project, one’s genetic sequence may soon become a big part of medical records. By analyzing these sequences there is hope that diseases will be predicted before the onset of symptoms allowing for early prevention and thus the optimum wellness of human beings. Medicines will become more personalized based off a person’s genetic sequence therefore making them more effective. This is currently done in the field of pharmacogenomics. Finally, patients will become more educated and better able to participate in medical choices, helping to eliminate the onset of many diseases. P4 medicines are a giant leap in the healthcare system and when the technology behind it is mastered, it will bring many benefits to the population that were not thought possible 20 some years prior.

Session 2, B20
Comparison of Extraction Methods for Natural Yellow Color from Sweet Potato Leaves
Rebecca S Wood Food Bioprocessing and Nutriti
Pamela Haith Food Science;
David Benton Food Science;
Alexander Choman Food Science;
Shannon Williams Food Science
Mentors and/or Co-Authors: Brian Farkas, Food, Bioprocessing & Nutrition Sciences

Tartrazine, also known as Yellow No. 5, is a synthetic azo dye used to color pickle brine and other food products. It is a popular colorant because of its solubility and stability in food systems. However, due to the increasing demand for natural food products, new natural alternative colorants to tartrazine are in demand as tartrazine has been shown to cause adverse effects for some consumers, including asthmatics and those who are aspirin intolerant. The goal of this project is to compare extraction methods of carotenoids, possibly lutein, from sweet potato leaves for efficiency and color. It is unique because the current research only focuses on extracting carotenoids for analytical purposes, which can render the carotenoids unfit for food use. Extraction methods to be compared include manual extraction with acetone and hexane, supercritical carbon dioxide extraction, and accelerated solvent extraction using water and acetone. Carotenoid output will be quantified using HPLC and spectroscopy will be used to determine color characteristics. The extraction is the first step in a larger project to extract, disperse, and stabilize yellow carotenoid compounds in low pH aqueous solutions such as pickle brine. If successful, yellow carotenoid compounds could replace tartrazine in pickles and other food products, providing a safe, natural alternative for food manufacturers. By finding the most efficient carotenoid extraction method for sweet potato leaves, producers can obtain the maximum profit from a product formerly considered a waste product, rendering this research significant to the food industry.

Session 2, B5
Fruit and Vegetable Familiarity Among Preschoolers
Alyssa Bryn Worf Food Bioprocessing and Nutriti
Mentors and/or Co-Authors: Suzie Goodell, Food, Bioprocessing & Nutrition Sciences

Childhood obesity is a concern in the United States, with children living below the poverty line at a greater risk for inadequate nutrition. Preschool is an important age for nutrition education, because they begin to have more independence in their food choices. Pictorial tools are an effective way to assess cognitive understanding of preschool-aged children. The purpose of this study is to assess preschool-aged children’s familiarity of different fruits and vegetables using a pictorial assessment tool. Children from local Head Start centers were recruited to participate in the study. Preschoolers were assessed individually using a pictorial assessment tool to determine if they could correctly identify the pictured fruit (n=25) or vegetable (n=32) in whole and transformed forms. Apple, banana, carrots, broccoli, strawberries and orange were identified correctly >80% of the time. Mashed and baked potato, eggplant, okra, olives, cauliflower, snow peas, squash, radish, kiwi, avocado, peach and asparagus were identified <15% of the time. Exposure to fruits and vegetables can increase preschoolers’ familiarity of these foods. Commonly eaten fruits and vegetables were identified more easily while the less common and exotic fruits and vegetables were less often recognized. This study serves to provide baseline data on preschoolers’ familiarity of fruits and vegetables for the development of nutrition education materials aimed at impacting fruit and vegetable consumption in this population.

Session 1, A25
Binding Properties and Function of M. undulatus Estrogen Receptors with Chlordane and the Effects of Amino Acid Mutation on Binding
Michael Thomas Wyngarden Biology
Mentors and/or Co-Authors: Beth Hawkins Biology

Estrogen is a steroid sex hormone that combines with intracellular estrogen receptors (ERs) to form a dimer that adjusts the expression of a variety of genes. The Atlantic croaker (M. undulatus) and all other teleost fish have three forms of estrogen receptors: ERα, ERβb, and ERβa. It is possible for ERs to bind with naturally occurring estrogenic compounds, synthetic estrogens, and non-estrogenic compounds. ERs share amino acid changes in the ligand binding domain that may influence ligand specificity and receptor function. The goal of the study is to examine binding properties of Atlantic croaker estrogen ERs (acERα and acERβa) with a nonestrogenic ligand, chlordane and determine how the differing amino acids located on acERα and acERβa are related to the particular ER binding ability to different substances. Bacterially expressed Atlantic croaker acERα’s and acERβa’s binding ability to chlordane was compared to estradiol (E2). On the M421 position, phenylalanine from acERβa was mutated to Methionine of acERα and binding specificities were compared to wild type acERα and acERβa binding. Pure Chlordane did bind to acERα and acERβa but with chlordane mixed with isoctane, binding to the receptors was not as effective. Chlordane does not bind as effectively to acERα and acERβa as...
estradiol. Methionine of acERα on the M421 position is related to increased binding of chlordane to ERs when compared to phenylalanine of acERβα. It is possible for non-estrogenic compounds such as chlordane and possibly other non-estrogenic compounds to bind to ERs which may alter naturally occurring biological activity.

Session 2, A2
Understanding the role of blood flow in Registration of Hematopoietic development
Shinhae Yoon Biology
Mentors and/or Co-Authors: Suk-won Jin Cardiovascular

Definitive hematopoietic stem cells (HSCs) that are capable of self-renewal and production of all mature blood lineages arise during embryogenesis. Both the timing of HSC induction and the gene programs regulating this process are well conserved across vertebrate species. Additionally, factors that affect HSC specification during embryogenesis often function similarly in HSC maintenance and/or recovery after marrow injury. The identification of factors that regulate HSC induction during embryogenesis is of significant therapeutic interest. Blood flow is a regulator of HSC identity. The method that this experiment uses is dextran injection and drug-induced modulation of heart rate. To increase blood flow, epinephrine treatment modulates heart rate and increases HPCs with in Zebra-fish CHT. The zebrafish has a number of unique characteristics that makes it a fantastic species for investigating vertebrate development and for modelling human disease. This study uses epinephrine RT/ Q-PCR processes as well. For results, hematopoietic progenitors within Zebra-fish CHT are regulated by blood flow; decreased flow leads to increased HPCs and increased flow results in decreased HPCs.
College of Design

Session 2, B21

Glorifying the Holy Script: The Past and Present of Islamic Calligraphy and Typography

Madiha S Malik Graphic Design

Mentors and/or Co-Authors: Martha Scotford Graphic Design

The art of Islamic calligraphy comes with years of practice, patience and knowledge of the language that derives from Arabic, known as the “mother of all languages.” The beauty of Islamic calligraphy is that it brings forth such a rich history, culture, and religion. A current question is whether the modern world of today is losing access to the authenticity of Islamic calligraphy as it might become a rare tradition. Speculative research on the history and traditions of Arabic calligraphy, as well as on the calligraphic letterforms in comparison to Arabic typographic letterforms, will allow for a better understanding of this question. When exploring the treasures of Islamic calligraphy, I was able to gather a comprehensive history of its evolution from origins in various areas of the Middle East. I became aware of the numerous styles of calligraphy that are not only exclusive to Arabic, but also to Persian, Urdu, and Turkish. Freydoun Naeymi-Rad is an Iranian calligrapher artist who studied the art of calligraphy with the great masters in Iran. He is presently in Raleigh, creating beautiful Persian calligraphy that reflects the poetry and religion of Iran. I was able to interview a Pakistani calligrapher from Virginia and attend a workshop in UNC Chapel Hill by another Iranian calligrapher, Dr. Mohammed Ali Bat-haee. Through interviewing these artistic individuals, I learned that the forms of handwritten calligraphy come straight from the heart, which is not as well expressed through the typography.
College of Education

Session 1, C30

Is Toothpaste killing more than it's supposed to? : Environmental Impacts of Toothpaste
Rahma K Elkamhawy Food Bioprocessing and Nutriti
Mentors and/or Co-Authors: Tuere Bowles Education

Toothpaste may seem beneficial in many ways; however the effects it has amount to much more than simply killing bacteria and preventing plaque. Toothpaste like many other detergents has chemicals that have imminent harm on the environment. Sending massive amounts of hormone disrupting chemicals into the environment can potentially harm the reproductive functions of fish, frogs, and many other creatures and, in some cases, even humans. This might not have instantaneous effects, but over decades the water in streams and lakes will be filled with these harmful chemicals which can lead to genetic mutations. Setting water purification systems to clean the waters from these chemicals can cost hundreds of millions of dollars. Therefore preventive measures should be taken before the problem becomes irreversible. There are actually many solutions to this problem. First, is that certain unnecessary compounds in toothpaste such as triclosan and fluoride can be removed. Another solution is to make highly technical water purification system to remove all harmful chemicals before they reach the waterways. Unfortunately, that solution will cost millions of dollars. Last solution, is to make a brand new toothpaste that would not harm the environment. This new all natural toothpaste would be made out of a plant called Miswak. This plant has very high antimicrobial characteristics that could be used as a substitute to regular toothpaste.

JavaTutor: The Influence of Learning Environment and Engagement Level on Conceptual Change
Miles Patrick Smaxwell Psychology
Mentors and/or Co-Authors: Eric Wiebe Depart Of Math Science And Technology Education

This study looked at computer-based learning environments. The learning environment of this study involved remote, computer-facilitated human tutoring of introductory-level, college computer science students on JavaScript through the application JavaTutor. The research focused on the JavaTutor environment’s efficacy to sustain an appropriate level of engagement in order to affect conceptual change (i.e., learning). In particular, the research aimed to find significant interactions between level of engagement and conceptual change. Prior research indicates that conceptual change requires deep processing and that deep processing typically coincides with high levels of engagement (Taasoobshirazi & Sinatra, 2011). Following Sinatra’s Cognitive Reconstruction of Knowledge Model (CRKM), conceptual change was measured through short-term learning gains and long-term retention items. Engagement was assessed through the User Engagement Scale (O’Brien & Toms, 2008; 2010) and NASA-TLX (Wiebe, Roberts, & Behrend, 2010) instruments. Positive correlations were found between some of the learning activities and measures of engagement. These findings will be discussed along with how this informs future development of the JavaTutor system and future research into the development of machine-based tutors with the ability to promote engaged learning.

Session 1, C16
Silk Fibroin (SF) is becoming increasingly desirable in the biomedical industry due to its biocompatibility, mechanical properties and resistance to enzyme degradation. Possible applications include drug delivery systems, mechanical actuators and tissue engineering scaffolds. Despite active interest in utilizing this polymer, commercialization has not progressed due largely to limitations caused by the premature gelation of SF in aqueous solution. To address this concern, a fundamental understanding of the gelation kinetics of SF is sought using rheological methods. Silk solutions were prepared by dissolving SF in Ca(NO3)2/MeOH at 65°C for 6-9 h, dialyzing the solution over a 24-h period, and then diluting the solution to a 3-4 wt% concentration. The solutions were tested using dynamic rheology to determine the gelation time after different dialysis times and at varying temperatures. An AR 2000 rheometer with a multiverse feature measured the ratio of the storage to loss moduli, generally referred to as tan d (where d is the phase angle), versus time until reaching a frequency-independent value, indicating the solution has gelled. By knowing the gelation time at various temperatures, an Arrhenius expression can be applied to determine the activation energy (E_a) at a given silk concentration. By mapping the gelation kinetics of SF over a range of process or storage conditions, a better understanding of the gelation mechanism can be obtained so that this biomacromolecule can be more efficiently used.

**Session 1, D12**

**Graph-Theoretic Algorithms for Optimal Sensor Placement and Malicious Attack Detection in Large Power Grids**

Joel E Anderson Computer Science

Mentors and/or Co-Authors: Aranya Chakrabortty Elec & Comp Engineering

The time-varying stochastic nature of power system operations require constant monitoring of its physical variables to avoid catastrophic failures. Modern measurement technologies such as Wide-Area Measurement Systems (WAMS) allow us to track these variables in real-time using very high-resolution dynamic data available from Phasor Measurement Units (PMUs). Due to cost constraints, however, system operators typically need the total number of PMUs to be installed in the system to be minimal, under which situation the optimal locations of these PMUs guarantee complete observability of the network. While algorithms for such minimal sensor placement are well-known in graph theory for an unconstrained measurement capacity of the PMUs, deriving them for PMUs with channel constraints still remains a challenge. Motivated by this problem, in Part-I of the project we develop a sub-optimal minimum cover algorithm for PMU placement under such measurement constraints, and illustrate their sensitivity to network size and complexity. In Part-II we develop a numerical method to track if any of the PMUs in the derived minimum cover set might be compromised by external malicious attacks. By placing the PMU data into a special matrix, we validate the measurement values within a specific tolerance using a symmetry-preserving algorithm, and tune it to balance accuracy of the solutions with computational costs. Both algorithms are illustrated via realistic power system examples, and implemented in our recently developed power system visualization software platform Watchdog.

**Session 2, D21**

**Parallel Active Filter for Load Generated Harmonic Distortion Removal**

Richard Byron Beddingfield Electrical & Computer Engr

Mentors and/or Co-Authors: Subhashish Bhattacharya Elec & Comp Engineering

With the increasing prevalence of non-linear loads in the electric power grid, it has become important to maintain power quality. Active power filters, especially parallel active filters, can be used to remove load generated harmonic distortion ensuring high power quality. This semester, with the help of my mentor Hesam Mirzaee, I have developed the parallel active filter further. In particular, I have focused on creating a stable hardware platform and a working open loop control system for active filter harmonic current extraction. First, I have built and tested a robust interface board that conditions all incoming analog signals for the digital signal processor (DSP) and outgoing pulse width modulation signals to the inverter. This board has been critical in improving system stability and precision. Second, I have developed the software of the dsp to test the harmonic extraction control loop of the active filter. This main control loop analyzes three-phase load currents in 60Hz synchronous rotating frame and extracts three-phase harmonic currents. The filter then supplies the harmonic currents to the load reducing the harmonics needed from the supply. I used a digital to analog converter (DAC) to view the signals that the dsp reads and verified the appropriate extraction. These signals are the reference for the control of the filter. With verification of this critical milestone, I can move forward in the filter development. I plan to complete and test the active filter controls and connect the active filter to our medium-voltage dc test-bed, serving as non-linear load.

**Session 2, C26**

**The Gelation Mechanics of Silk Fibroin**

Ahmad Rabi Amini Chemical Engineering

Mentors and/or Co-Authors: Richard Spontak Chemical and Biomolecular Engineering

Silk Fibroin (SF) is becoming increasingly desirable in the biomedical industry due to its biocompatibility, mechanical properties and resistance to enzyme degradation. Possible applications include drug delivery systems, mechanical actuators and tissue engineering scaffolds. Despite active interest in utilizing this polymer, commercialization has not progressed due largely to limitations caused by the premature gelation of SF in aqueous solution. To address this concern, a fundamental understanding of the gelation kinetics of SF is sought using rheological methods. Silk solutions were prepared by dissolving SF in Ca(NO3)2/MeOH at 65°C for 6-9 h, dialyzing the solution over a 24-h period, and then diluting the solution to a 3-4 wt% concentration. The solutions were tested using dynamic rheology to determine the gelation time after different dialysis times and at varying temperatures. An AR 2000 rheometer with a multiverse feature measured the ratio of the storage to loss moduli, generally referred to as tan d (where d is the phase angle), versus time until reaching a frequency-independent value, indicating the solution has gelled. By knowing the gelation time at various temperatures, an Arrhenius expression can be applied to determine the activation energy (E_a) at a given silk concentration. By mapping the gelation kinetics of SF over a range of process or storage conditions, a better understanding of the gelation mechanism can be obtained so that this biomacromolecule can be more efficiently used.
My research is concerned with the development of new supplemental computational tools and designing simplified visualization techniques. Bubble flows have also been studied in cases for turbulent flow applications in reactor channels. It is found that the channel for a prescribed void fraction and bubble diameter is capable of placing thousands of bubbles throughout the given specific void fraction, and resulted in a code that is randomly generated bubbles throughout the channel for a prescribed void fraction and bubble diameter.

This creates a supplementary computational tool for generating initial conditions for future simulations in more complicated cases on high-performance computers that can handle larger meshes and more complicated conditions.

Session 2, C18
Manipulation of the Shape and Properties of a Liquid Metal
Elsie Bjarnason Chemical Engineering

Mentors and/or Co-Authors: Michael Dickey Chemical & Biomolecular Eng

Traditional solid antennas have a specific shape and therefore a unique function. Antennae made from liquid metal are advantageous as their shape can be manipulated (e.g., elongated, bent, flexed), and they are better suited for use in a variety of environments. We use eutectic gallium indium (EGaIn, 75 wt.% Ga, 25 wt. % In, m.p.=15.5 °C) to form antenna by filling microchannels of different sizes and shapes. EGaIn is difficult to fill into complexly shaped microchannels due to the high surface tension of EGaIn. EGaIn also has a relatively low conductivity compared to traditional solid metals (e.g., Cu), which can lead to resistive losses. We are studying new methods to fill microchannels and micromolds by using vacuum filling. In addition, we hypothesize that the conductivity of EGaIn can be improved by using conductive additives. We improve the conductivity by mixing EGaIn with more conductive metals while maintaining the liquid phase and other desirable properties of EGaIn.

Session 1, C11
Multiphase Turbulent Flow Visualization in a Nuclear Reactor Channel
Philip Stuart Britt Nuclear Engineering

Mentors and/or Co-Authors: Igor Bolotnov Nuclear Engineering

My research is concerned with the development of new supplemental computational tools and designing simplified cases for turbulent flow applications in reactor channels. Visualization techniques bubbly flows has also been studied using Paraview software. The simplified flow case was developed in order to perform a separate effect study on bubble lift force. The lift force is a force that pushes the bubbles to the wall due to local velocity gradient, and the differences in the paths and effects are primarily dependent on the surface tension of the bubble itself, along with the relative velocity of the bubble. The geometry for this channel is considered to be two infinite parallel plates with a no slip condition on the plates, and an initial condition being a uniform flow velocity throughout the entire channel. Results will demonstrate the dependence of bubble movement on: (a) relative velocity; (b) surface tension; (c) liquid shear. Another part of this research was to develop a Fortran code that randomly generates bubbles throughout the channel for a given specific void fraction, and resulted in a code that is capable of placing thousands of bubbles throughout the channel for a prescribed void fraction and bubble diameter.

This project aims to invent a highly-enriched mixed-oxide (HE-MOX) fuel with reduced fertile material, providing the best burnup of the existing actinides. The goal is creating a fuel assembly and loading which can be inserted into a typical reactor that would result in a major actinide decrease within the fuel while maintaining safety margins. The assembly will be simulated in the environment of the McGuire plant to ensure proper safety standards are met. The HELIOS lattice-physics code was used to create a variety of HE-MOX assemblies to use in a core design and to check the burnup patterns of each assembly, ensuring burnup goals were met. The FORMOSA code package was then utilized to establish a loading pattern for the fuel assemblies and ensure reactor safety margins were met. HE-MOX fuel assemblies were successfully created at multiple enrichment levels using standard 17x17 assembly geometry. It has significant actinide burnup over the lifespan of the fuel, and has a safe, stable, and high power reactor power profile. The assemblies were mapped to a fuel loading pattern and will be tested to ensure the passing of all safety parameters.

Session 1, C34
Biomechanical Analysis of both a Globally Inspired and a Variable Movement Clubfoot Brace using a Surrogate Biomodel
Michael G Browne Biomedical Engineering

Mentors and/or Co-Authors: Andrew DiMeo, Sr. Biomedical Engineering

Clubfoot (congenital talipes equinovarus) is the most common musculoskeletal birth defect which occurs in otherwise normal children. This anomaly affects the tendons and ligaments in the lower extremity and foot, either bilaterally or unilaterally. Treatment is based on casting, however, clubfoot tends to relapse requiring post-correction bracing. Current bracing is performed during critical child development stages through age 5. This research study utilized the work shown by DiMeo et. al. stating that “surrogate biomodeling is an effective method to evaluate wide ranging bracing options.” Using gait analysis software and muscle-tendon unit length changes, a full biomechanical analysis was performed on a variable movement brace and a Steenbeck brace, a low-cost, low-tech brace developed and utilized in Uganda and other developing countries. Mimicking the degree of external rotation and dorsiflexion from the Steenbeck brace to the U.S. standard of care brace (Ponseti), only one data point showed statistical significance on a 0.05...
level when comparing the angles at the knee and hip at 1-inch incremental movements along the sagittal plane (2-inch articulation, knee joint, p=0.0106) suggesting that the braces have similar impacts on the angles of the knees and hips. Through adjustments to dorsiflexion and external rotation of the variable movement brace, knee and hip compensation angles were analyzed. Initial analysis has shown non-significant difference in knee angle through articulation with varying brace parameters. Hip angle compensation has mainly occurred in the sagittal plane causing maximum hip flexion. Future analysis of both braces will involve muscle-tendon unit forces and length changes.

Session 2, A21
Electrocapillary Withdrawal of EGaIn from Microfluidic Channels
Justin Chew Chemical Engineering
Mentors and/or Co-Authors: Michael Dickey Chemical & Biomolecular Eng

This paper describes a new method for controlling the removal of eutectic gallium indium (EGaIn) liquid metal from microfluidic channels. This method can be applied towards creating flexible electronics with EGaIn switches and fluidic antenna with controllable resonance lengths. Current methods for removing EGaIn from microfluidic channels require the use of acid to reduce the oxide skin allowing surface tension to cause the EGaIn to bead up at the open end of the channel. This new technique utilizes an electrochemical half-reaction to facilitate rate controlled electrocapillary withdrawal from the microfluidic channel. An electrical potential is applied to an aqueous electrolyte in contact with the EGaIn. The electrochemical reaction reduces the EGaIn oxide skin at the electrolyte interface allowing it to bead up at the open end. Removing the applied potential allows the oxide skin to reform and stops the withdrawal from the channel. The EGaIn withdrawal occurs at low voltages (1-5V) and responds to both AC and DC current. Increasing the voltage or concentration of electrolyte results in an increase in the rate of withdrawal. Withdrawal rates were calculated in response to each tested variable. Using this data, it is possible to control the withdrawal of EGaIn to any desired length.

Session 2, D26
Elastomeric Photovoltaics Derived from Microphase-Separated Block Ionomers
Amanda Lee Cox Chemical Engineering
Mentors and/or Co-Authors: Richard Spontak Chemical and Biomolecular Engineering

In our age of dwindling oil reserves and rising energy costs, efforts to identify alternative energy sources are rapidly growing. We are interested in studying the effects of using a pentablock ionomer to facilitate the development of dye-sensitive photovoltaics. Based on the system developed by Velev and co-workers, the two photosensitive dyes incorporated into the copolymer hydrogel are DAS- and [Ru(bpy)3]2+. We have found that the system under investigation produces a current density that is comparable to previous work performed with hydrogels derived from agar. This observation has provided impetus to increase the current density of the cell by changing the solvent used in the dye solution to water, which resulted in a decrease in current density relative to the efficiency of the dyes in ethanol. The effect of using 5 µL of both dyes in the ethanol solvent, putting the DAS dye in the cell first and then adding the [Ru(bpy)3]2+ dye afterward, has produced the highest current densities in repeat experiments, reaching a maximum of 4.19 μA/cm². We propose that this sequence of events might be related to interactions between the functional groups of the copolymer and the DAS dye.

Session 1, C32
Self-propelling particles for enhanced absorption of oil spills
Lisa Ann D’Costa Chemical Engineering
Mentors and/or Co-Authors: Orlin Velev Chemical and Biomolecular Engineering
Rachita Sharma Chemical & Biomolecular Eng

Oil spills have detrimental effects to the environment and economy. The devastating effects of such spills were revealed recently during the oil spill in the Gulf Coast. In order to diminish the impact of oil spills, it is necessary to develop rapid and efficient methods of cleaning up oil on the surface of the water. This research project aims to design and characterize a new class of self-propelling particles that can absorb oil on the surface of water. These particles are composed of polyacrylamide hydrogel infused with sodium dodecyl sulfate, silicone rubber plug, and oil-absorbent. By releasing the surface-active agent they move along the water surface, collecting the oil layer encountered along their trajectories. The rate of absorption is calculated by measuring the changes in the relative intensity of the oil (dyed red) around the particle with time. The relative intensities were calculated using imaging software by analyzing the snapshots of the particles’ movement in oil-contaminated water at various times. The volume of hydrogel and absorbent are varied, while the plug volume is kept constant, to optimize the rate of oil collection by the particles. We found that the rate of oil absorption increases as the volume of hydrogel increases. The rate of absorption for the self-propelling particles is one order of magnitude greater than stationary particles; therefore, movement is a key characteristic for particles that efficiently absorb oil on the surface of the water. In future, we plan to develop improved environmentally friendly self-propelling particles for oil collection.

Session 1, C24
FPGA-Driven Buck Converter for Low-Voltage Solar Panel Emulation
Kyle David Dean Electrical & Computer Engr
Mentors and/or Co-Authors: Subhashish Bhattacharya Elec & Comp Engineering

The goal of this project was to develop a system through which PV solar panels can be emulated using power electronics hardware. The system should produce the voltage and current behavior of a real PV module given manufacturer ratings and specifications as well as real-time temperature and insolation measurements. This allows for experiments or simulations to be carried out without the need for the expensive panels and eliminates the risk of damaging them while performing experiments. A Simulink/PLECS simulation of such a system was first carried out to test the capability of a DC/DC buck converter to accurately reproduce a PV module’s I-V characteristics curve given different temperature and insolation conditions. This was done using a control scheme similar to the one described in “A Grid-Connected System Based on a Real Time PV Emulator: Design and
Experimental set-up” (Piazza et al.). This simulation model was then converted into a system based on a PCB-based DC/DC buck converter and the National Instruments Compact-RIO FPGA system. The Compact-RIO platform was chosen for its capability to take real-time voltage and current measurements as well as output the emulated solar panel’s voltage which can be scaled up and loaded to behave as the real panel.

Session 2, D24
B-Catenin: Target for Cancer Treatment
Mark Stradley Dyson Biochemistry
Mentors and/or Co-Authors: Balaji Rao Chemical & Biomolecular Eng

Beta-Catenin is a protein that has a wide range of roles in the cell. Its an adherens junction protein that is overexpressed in many different types of cancers including prostate cancer in humans. It is also believed to be involved in cell differentiation in stem cells and the WNT cell signaling pathway which regulates cell growth and cell adhesion. Our first goal is to create a beta-catenin protein combined with a super folded green fluorescent protein. Our second goal is to develop binders to block the active sites on the protein. These binders will enable us to study beta-catenin function in cells.

Session 1, B12
Tungsten-based Carbon Microelectrodes: A New Generation of Neurochemical Sensors?
Manix Lukungu Elulu Biomedical Engineering
Mentors and/or Co-Authors: Gregory McCarty Biomedical Engineering

Carbon Fiber microelectrodes are commonly employed to advance understanding of the role of chemical signaling in the brain. Unfortunately, these microelectrodes have several drawbacks including being fragile and having the potential for breaking when inserted into tissue. This drawback makes them difficult to implement in research on awake and behaving animals and makes them inappropriate for use in higher level mammals. This research is creating and testing tungsten-based carbon microelectrodes. These tungsten based carbon microelectrodes will be fabricated by coating tungsten microelectrodes with polymer films and then pyrolyzing the resulting structure to generate a carbon-surface on the microelectrode.

Session 2, A13
Real Time Algorithms for Power System Parameter Estimation
Jennifer Karen Felder Electrical Engr
Mentors and/or Co-Authors: Aranya Chakrabortty Elec & Comp Engineering

The goal of this project is to develop real-time algorithms for power system state prediction. Current state-of-art state estimation algorithms in power control centers only use limited amount of data, leading to local observability. However, this project uses data from wide regions in the grid to gain insight on the global health of the system. The two main challenges for our approach are, therefore, the large size of the system and the large amount of measured data. To accomplish this, a software tool is developed to display two important features: simulated power system data from realistic models of power grids, and predicted state evolution based on the simulated data. Various state prediction algorithms, including the Eigenvalue realization algorithm and nonlinear least squares are used. The former is used to extract modes of interest from data supplied to the algorithm, while the latter is used to estimate the parameters of the differential equations modeling the system. Both are being used to generate a set of data that matches the simulated data as exactly as possible. All of the methods used are then analyzed to draw conclusions on the accuracy of prediction, computational time delay and other factors to assess their inherent tradeoffs.

Session 2, A7
Improving Adhesion Forces of Chromium deposited onto Silicon Dioxide and Silicon Nitride Substrates
Christopher Robert Freeze Materials Engineering
John Obare Materials Science and Engineering;
Jacob Brennan Materials Science and Engineering;
Arsheen Allam Materials Science and Engineering
Mentors and/or Co-Authors: Anatoli Melechko Material Science Engineering
Konstantin Glukh

In microelectronics, proper adhesion of deposited metals onto the substrate is pivotal for device function. For microelectromechanical systems (MEMS) devices, especially, where various forces are present, poor adhesion causes premature device failure. This project is a partnership between NC State University and MEMSCAP, Inc. to understand the causes of poor adhesion and to optimize processing conditions to produce the best adhesion. The systems studied are SiO2, low-stress silicon nitride, and extra-low-stress silicon nitride with 200 Angstroms of Chromium deposited onto each substrate as well. Adhesion can be related to several factors, but this project primarily investigated the effects of different post-treatments, cleaning techniques, and substrates. To measure adhesion forces, 50-70 microns of copper was electroplated onto each wafer, and a simple peel test was constructed with variable weight to quantify the effects. From these tests, we found that chromium deposited by sputtering have much lower adhesion than chromium deposited using electron-beam evaporation. Patterning with liftoff also showed reduced adhesion when compared to patterning by metal etch. Substrate selection also affected adhesion, with SiO2 having the weakest adhesion, and extra-low-stress nitride having the strongest. Cleaning and processing techniques were also shown to have a minor effect on adhesion strength.

Session 2, C15
Increasing the Catalytic Activity of Immobilized Enzymes
Brittany Nicole Glatz Chemical Engineering
Mentors and/or Co-Authors: Saad Khan Chemical and Biomolecular Engineering
Christina Tang Chemical & Biomolecular Eng

Enzymes are highly efficient selective biological catalysts, and hyperthermophilic enzymes are of particular interest due to their ability to function at elevated temperatures common to industrial processes. For our work, we are using the hyperthermophilic enzyme, α-galactosidase from Thermotoga maritima as a model system. The following method for enzyme immobilization is proposed: produce enzyme-loaded poly(vinyl alcohol) (PVA) nanofibers by electrospinning a solution containing enzyme, then chemically crosslinking the
resulting fibers to render them water insoluble to immobilize the enzyme. Initial work indicates that the enzyme loses significant catalytic activity upon immobilization. The aim is to maximize the retained activity of the immobilized enzyme. One approach is to incorporate a small molecule known to prevent dehydration of the enzyme such as trehalose. Another approach is substrate-induced stabilization which involves electrosprinning the enzyme solution with a known substrate, such as raffinose. The hypothesis is that this will help to maintain its active conformation and protect the active site during immobilization. The first step in these approaches is to determine how these additives affect the electrospinning of PVA. Solution dynamics and electrospinnability of these systems were explored. It was found that the addition of raffinose or trehalose did not affect the PVA entanglement required to electrospin. Based on these results, it was determined that the addition of trehalose or raffinose does not affect the electrospinnability of PVA. The next step will be to incorporate the enzyme into the PVA/trehalose or PVA/raffinose system and determine if the performance of the immobilized enzyme is improved.

Session 2, C14
Transmuting TRU Material with Subcritical Annular Core Driven by a Fast Neutron Source
Kyle A Hemker Nuclear Engineering
Mark Hunt Nuclear Engineering
Tengjia Peng Nuclear Engineering;
Matthew Worth Nuclear Engineering;
Amber Purvis Nuclear Engineerin;
Philip Brit Nuclear Engineering

Mentors and/or Co-Authors: Dmitry Anistratov Nuclear Engineering

The goal of this project is to decrease the volume of transuranic waste which is produced as a byproduct of today’s commercial nuclear reactors. Our design to remedy this problem is a subcritical fast reactor that operates with a fast neutron source in the center of the reactor. The high energy neutrons will have enough energy in order to induce fission in the waste, which should successfully turn the waste into short-lived radioactive isotopes as opposed to the long lived isotopes in the waste. The coolant used in this design was a lead-bismuth eutectic, which was chosen due to its low melting point and good thermal transfer properties. The method of modeling this reactor was to use SCALE 6 with the modules KENO-VI, ORIGEN-S, and MONACO/MAVRIC. These modules model specific things such as criticality, burning of waste, and neutron flux throughout the reactor respectively. In order to model the thermal hydraulics, ANSYS was used. The results show that we have successfully burned waste at rates comparable to other published designs, which includes up to 1.2 kilograms of plutonium-239 per day. This is a significant result, since plutonium-239 is a major component in many nuclear weapons as well as transuranic waste, which means our design also has nuclear proliferation ramifications. Other isotopes that burn at notable rates include neptunium-237 and americium-241, which are both long lived actinides in transuranic waste. The economics were not a major concern in our design, and the economic cost of this design is very large.

Session 1, A22
Subspace Methods for Gaussian Process Surrogate Construction
Jason Michael Hite Applied Mathematics

Mentors and/or Co-Authors: Hany Abdel-Khalik Nuclear Engineering

For many techniques of interest in computational science it is often necessary to evaluate a given model a large number of times. This task can become computationally intractable for realistic models, many of which can take hours or days for just a single evaluation even when using leadership-class supercomputers. A common alternative practice is to first construct a computationally inexpensive surrogate from a small number of direct model evaluations, which can then be used as an approximate substitute for the direct evaluation of the model. This research examines one particular class of these surrogates, the so-called Gaussian process. These methods presume that the model is dependent on an underlying set of random variables that are drawn from a Gaussian random field. The parameters describing the underlying field are inferred from the true model evaluations and the resulting Gaussian process can be used to estimate both the true model value and uncertainty at any point in the training domain. Here, we will demonstrate an improvement upon standard Gaussian process techniques that relies on sampling of the model gradients and which permits a reduction in the number of true model evaluations required to reach acceptable accuracy. Numerical experiments show that the new approach produces a dramatic improvement in the accuracy of the resulting surrogate model, as well as reducing the cost of constructing the surrogate itself.

Session 1, C3
Kinetic and Thermochemical Analysis of Pericyclic Transition States in Glucopyranose Isomerization
Jordan Reynolds Keith Chemical Engineering

Mentors and/or Co-Authors: Phillip Westmoreland Chemical and Biomolecular Engineering
Vikram Seshadri Chemical & Biomolecular Engineering;

Kinetics and thermochemistry calculations were performed for elementary reactions of glucose pyrolysis, specifically pyranose to aldose interconversion. CBS-QB3 quantum-chemistry calculations were used for computing the kinetics, along with transition-state theory. It is hypothesized that glucose pyrolysis is relevant to pyrolysis of other simple sugars and of cellulose, one of the three classes of polymers that constitute woody biomass. Transition states were discovered for converting the two cyclic forms, α- and β-glucopyranose, to the linear aldose form. These structures were six-centered pericyclic transition states in boat and chair forms of each stereoisomer. Transition state structures were verified by Internal Reaction Coordinate calculations. Activation energies for these reactions were approximately 27 to 28 kcal/mol.

Session 1, C21
D-T Fusion Neutron Source Shielding and Application Design
Levon P Keusseyan Nuclear Engineering

Mentors and/or Co-Authors: Steven Shannon Nuclear Engineering
Mohamed Bourham Nuclear Engineering

The rapid evolution of the nuclear technology industry has fostered unanticipated applications utilizing nuclear devices for a wide range of applications. The NC State University
High Energy Neutron Source (HENS) design team proposes a comprehensive shielding and application design for a plasma accelerator, a fusion-based neutron source, to be acquired by the Research Triangle Institute (RTI). A full breadth of applications is considered, including, but not limited to, the production of medical isotope as a high priority application, Light Water Reactor (LWR) fuel enrichment verification, and neutron activation analysis techniques. Utilizing a monoenergetic 14.1 MeV isotopic source of $10^{12}$ neutrons/cm²/s generated via Deuterium-Tritium fusion reaction, full graphical design detail is presented for a licensable shielding configuration compliant with NCRP dose limits. Product life cycle analysis revealed unrealistic aspirations of isotope production, yet burgeoning niche applications available. System parameters and flux profile are modeled using Monte Carlo N-Particle (MCNP) software, culminating in a comprehensive three dimensional simulation platform. Engineering design-based applications are considered with special attention paid to product life cycle, resulting in chronological challenge assessment as seen in the following report.

Session 1, A9
An alternative to antibiotics: engineering the CRISPR system to trigger autoimmunity in pathogenic bacteria
Heidi Elizabeth Klumpe Chemical Engineering
Mentors and/or Co-Authors: Chase Beisel Chemical & Biomolecular Engineering

The emergence and spread of antibiotic resistance has significantly reduced our capacity to treat bacterial infections. We propose to reverse engineer the CRISPR system, a bacterial immune response which degrades foreign DNA, to target the bacterium’s own genomic DNA. In a wild-type cell, short RNAs are expressed from the CRISPR locus, and these CRISPR RNAs (or crRNAs) guide the endonucleolytic CRISPR-associated proteins to their targets, usually the DNA of an invading virus or plasmid. The foreign DNA is then degraded to guard against infection.

The goal of this project is to construct a plasmid platform for expression of redesigned crRNAs which will instead target the bacterial genome. Previous work demonstrates that the targets of the CRISPR system can be modified by altering the sequence of the crRNAs. We hypothesize that a successfully-modified system (expressing genome-targeting CRISPR RNAs and the appropriate CRISPR-associated genes) will degrade the genomic DNA, causing rapid bacterial cell death. If successful, targeting the genome with CRISPR could serve as a novel alternative to antibiotics.

Session 1, B24
Nanofibers of Water-Soluble Polymers via Foam Electrospinning
Esther Meerim Lee Chemical and Biomolecular Engineering
Mentors and/or Co-Authors: Saad Khan Chemical and Biomolecular Engineering

A novel, needle-less electrospinning method called foam electrospinning is used to examine the electrospinnability and fiber formation mechanism of poly(ethylene oxide) solutions. Foams are produced by injecting compressed gas through a porous surface into a polymer-solvent solution. As an electric field is applied to the system, jets eject from perturbations formed on the bubbled foam surface, producing nanofibers. These nanofibers are useful in many applications such as tissue scaffolding, energy storage, and catalysis. Throughput is improved since multiple fibers are produced simultaneously, whereas syringe electrospinning is limited to a single fiber; this is a major benefit of utilizing foam electrospinning. We investigated the effects of polymer solution concentration (1-5wt%) on the electrospinnability compared to syringe electrospun fibers and mat quality. Droplets appeared at 1wt% due to a lack of entanglement between polymer chains, and beaded fibers were produced as the concentration increased to 2wt%. Between concentrations of 3wt% and 4wt%, we observed the transition of fiber structures from beaded to smooth, uniform fibers. At a higher concentration, 5wt%, the collected fibers were uniform. The electrospinnability of solutions is highly affected by the interactions between polymer chains, which can be analyzed using rheological properties. These rheological properties and polymer chain interactions in foam electrospinning will be compared with that of syringe electrospinning by utilizing an empirical relationship between the entanglement concentration and onset of fiber formation. Future work will consist of experiments characterizing the effects of surfactants such as Triton X-100® and varying molecular weights.

Session 2, A17
Osseointegration Paired with Whole Body Vibration
Lauren Susanne Little Biology
Mentors and/or Co-Authors: Ola Harrysson E.P.Fitts-Industri & Sys Eng

The loss of a limb is a life-changing trauma affecting an ever-increasing amount of the American population. Once losing a limb, the amputee’s general quality of life is affected drastically. Osseointegration is defined as the direct structural and functional connection between living bone tissue and the surface of a load carrying implant. Prostheses fixated by osseointegration address many of the shortcomings involved with external socket prostheses. Osseointegrated amputees have reported greater control over their prosthesis, heightened osseoperception, less pain and skin irritation, and an improvement in their quality of life. Unfortunately, osseointegration does have its disadvantages including a long rehabilitation time that is required before prosthetic loading can occur. Our research will worked to decrease the rehabilitation time required of these patients by the use of whole body vibration (WBV) in order to increase bone density. There were 36 Sprague-Dawley rats divided equally into three groups, a control group and two experimental groups: Low Vibration Stimulus and High Vibration Stimulus. Each rat was placed in a four chamber vibration platform for 20 minutes a day, five days a week, for five weeks. At the end the rats were euthanized and the bone density was measured with a DEXA Scanner. The data was compared between the groups and showed that the Low Vibration Stimulus was the most effective at increasing bone density and the High Vibration Stimulus was detrimental. These findings can be used to increase the use of WBV on those with osseointegrated prosthetics and hopefully decrease their rehabilitation time.

Session 1, B33
Production of Eutectic Gallium Indium Micro-Droplets
Logan Robert Maxwell Chemical Engineering
Mentors and/or Co-Authors: Michael Dickey Chemical & Biomolecular Eng
Micro-droplets of all sorts of materials are important in industry, from makeup manufacturers to food producers. A lot of companies are attempting to control the size of these droplets, and have them be monodisperse. If the droplets are monodisperse then the company can control the properties of their good. For instance, an oil water emulsion with smaller oil droplets will make a smoother mayonnaise. Liquid metal can also be made into micro-droplets, but the techniques and applications are somewhat different. It was seen that eutectic Indium Gallium, also known as EGaIn, could produce stable micro-droplets when forced through a small gap between a syringe and substrate. In an attempt to establish a relation between micro-droplet radius and different variables the gap height was varied, substrates were varied, and flow rates were varied. It was the intention that this novel technique to produce liquid metal droplets could be used to produce micro-scale monodisperse droplets of other materials. Once it was found that the micro-droplets were not monodisperse, micro-fluidic flow focusing was used to produce monodisperse micro-droplets. These mono-disperse droplets were imbedded in elastomers to raise the dielectric constant. Once the dielectric constant was raised these polymers could be used within the body as components of artificial muscles. Although syringe-substrate gap production did not produce monodisperse droplets, it is a fast, cheap, and convenient way to make disperse micro-scale droplets of eutectic Indium Gallium.

**Session 2, B19**

**Equine QFBR: A Computational Approach to Equine Temperament Analysis**

Catherine Grace McVey Animal Science

Mentors and/or Co-Authors: Daniel Egger Duke Center for Quantitative Modeling

Within the equestrian community there is a great deal of antiquated knowledge relating anatomical features of the equine face to aspects of personality/temperament. This noninvasive behavioral evaluation technique offers equine professionals a distinct advantage in identifying horses cognitively suited for success in today’s competitive equestrian discipline, yet most methods for applying these techniques have traditionally been guarded as training secrets, and as a result remain highly subjective, inaccessible, and scientifically unexplored. The purpose of this project was to bring objectivity and accessibility to this facial evaluation technique via a user-friendly and statistically validated computational approach. A test-retest methodology was first employed in a bias-controlled setting to evaluate the objectivity of facial classifications. All facial regions rejected the null hypothesis at the 2 % significance level, and the facial characteristics themselves were concluded to be both objective and quantifiable. A total of 26 trigonometric measures were then derived to quantitatively describe this confirmed variation within the relevant structures of the equine face. These measure next were coded into MATLAB, and, using the program’s interactive image-analysis interface, applied to a sample of 81 national-caliber Arabian show horses. The computed measurements were subsequently used to develop a trinomial categorization model capable of predicting riding discipline with 79% accuracy (using only four facial measures) and three separate multiple linear regression models capable of predicting the win percentiles of individual horses within each riding discipline with statistically significant degrees of correlation.

**Session 2, D25**

**Use of Supercharged GFP to Deliver Binding Proteins into Mammalian Cells**

Brinda Monian Chemical Engineering

Mentors and/or Co-Authors: Balaji Rao Chemical & Biomolecular Engineering

Using proteins to study and regulate cells is a promising alternative to genetic manipulation. It is challenging, however, due to the difficulty of transporting proteins past the cell membrane and into the cell. Recent studies have highlighted the potential of supercharged green fluorescent protein (sGFP) in conveying proteins into mammalian cells with a high success rate. Our research goal is to use sGFP to transport our proteins of interest into the cell. We hypothesize that fusions of our proteins with sGFP will have higher rates of uptake by cells than can be accomplished by conventional protein transport techniques. Three main proteins of interest to our lab include (1) a binding protein for β-catenin (a protein involved in signal transduction), (2) a binding protein for the DIX domain of the Dishevelled protein (involved in a cancer and stem cell signaling pathway called the Wnt pathway), and (3) a control protein which is not known to bind anything in the cell. Results of several bacterial cloning steps to create the fusion proteins will be presented, along with preliminary data that show that the proteins migrate into HEK293 cells with a high efficiency.

**Session 2, A29**

**Size-Induced Nanoscale Segregation of Midblock-Selective Cosolvents in Microphase-Ordered Triblock Copolymers**

Daniel Evan Piephoff Chemical Engineering

Mentors and/or Co-Authors: Richard Spontak Chemical and Biomolecular Engineering

In a previously-conducted experimental study, the mechanical attributes of triblock copolymer solutions containing two solvents (cosolvents) differing in size were investigated by means of dynamic rheology. The results of said study demonstrate the existence of time-composition equivalence, which permits a wide range of time scales to be accessed by varying cosolvent composition under isothermal conditions. However, this equivalence assumed that the cosolvents, which differed in molecular size, formed a miscible, thermodynamic solution, which was consistent with the observation that each cosolvent mixture exhibited a single glass-transition temperature. A separate, theoretical study showed that solvent size can induce nanoscale segregation, in which case it is imperative that this assumed uniform segregation behavior be verified. In the present study, self-consistent field theory is used to investigate the spatial distribution of cosolvents differing in size in ordered triblock copolymers. It is found that the spatial cosolvent volume fraction for a cosolvent with \( v_o \) the ratio of the specific volume of solvent to that of copolymer, of 0.002 (corresponding to the hydrogenated resin cosolvent used in the experimental time-composition equivalence study) differs (on average) by <10% (on an absolute basis) with that of a cosolvent having \( v_o \) of 0.006 (corresponding to the aliphatic mineral oil cosolvent used in the same study). This result validates the previous assumption of uniform cosolvent segregation. Additionally, we establish critical cosolvent size differences – as functions of copolymer incompatibility, concentration, and cosolvent selectivity – beyond which nanoscale cosolvent segregation becomes significant, establishing that spatial segregation can occur within a nanostructured polymer.
Targeting Mobile Applications. Hybrid Renewable-Energy System for Battery Extension
Session 1, D17
Gayatri Pongur Snigdha Chemical Engineering

Well as a stabilizing agent for foams. Potentially be used as a carrier-system for pharmaceuticals as route remained stable for weeks. These nanoparticles could measure. Dynamic light scattering and zeta-potential measurements showed that nanoparticles synthesized via this engineered. Nanoparticles of two different craft lignins were developed. Nanoparticles of numerous compounds have recently become attractive due to useful properties exhibited by nanoscale materials. However, the nanoparticles’ long-term stability coupled with recent toxicity and environmental health concerns limit the extent to which they can be responsibly utilized. Here, a novel approach to the synthesis of lignin nanoparticles that could biodegrade after utilization has been developed. Nanoparticles of two different craft lignins were synthesized in primarily water-based solvents with sizes easily tuned between 50 and 500 nanometers based on parameters including pH and solvent viscosity. Nanoparticles stable in the human pH range were synthesized by vigorously diluting an organic solution of lignin with water, an antisolvent. Dynamic light scattering and zeta-potential measurements showed that nanoparticles synthesized via this route remained stable for weeks. These nanoparticles could potentially be used as a carrier-system for pharmaceuticals as well as a stabilizing agent for foams.

Session 1, C22
Improving Patient Flow through a Cancer Hospital’s Infusion Clinic
Dean Stanley Pixton Fitts Dept Industr & Syst Engr
Mentors and/or Co-Authors: Brian Denton E.P.Fitts-Industrl.& Sys Engr

Cancer treatment involves the coordination of multiple complex systems such as a chemotherapy infusion clinic. The chemotherapy treatment provided in an infusion clinic requires expensive resources. Chemotherapy treatment chairs and specially trained nurses need to be highly utilized. However, if these resources are overloaded, patient waiting times can be extremely long. Further complicating the infusion clinic planning process is the uncertainty of patient arrival times from other treatment areas such as phlebotomy, oncology clinics, and radiation oncology, as well as the uncertainty in the durations of chemotherapy infusions. To address these challenges we created a discrete event simulation model of patient flow through the infusion clinic. The model was calibrated using historical data of daily patient demand and infusion durations as well as time studies of other processes in the system. Model validation was completed through code review by project team members, statistical tests comparing simulation model outputs and historical data, and expert opinion of staff members from a local cancer hospital. Our analysis identified several bottlenecks in the chemotherapy treatment process, resulting in multiple recommendations to alter the patient flow process which can collectively decrease patient waiting time by more than 50%.

Session 2, A25
Synthesis and Characterization of Environmentally-Benign Biopolymer Nanoparticles
Dayne A Plemmons Chemical Engineering
Mentors and/or Co-Authors: Orlin Velev Chemical and Biomolecular Engineering

Mentors and/or Co-Authors: Stephen Walsh Elec & Comp Engineering

Our research investigates integrating multiple renewable energy sources to extend the battery life of smartphones as well as design considerations of smartphone interfaces between renewable energy sources and energy storage. The energy sources considered involve solar power and mechanical energy conversion. The battery power thirst of many mobile devices has outstripped the pace of battery power technology development. When renewable energy sources are used to generate power, there are certain electrical properties of each source that need to be considered for the design of energy storage and battery extension. A convenient mobile power management platform called JewelCase (homonym of joule case) was prototyped to effectively extend battery life keeping in mind design considerations for smartphones. Currently, the JewelCase increases the iPhone battery capacity by 60% and can charge the iPhone in 3 hours. The JewelCase is expected to weigh less than 80g and manage smartphone battery-drain. Finally, a design example of the JewelCase will be presented.

Session 2, B26
Effect of Low Magnitude, High Frequency Vibrations on Rotator Cuff Tendon
Arjun Puri Biomedical Engineering
Mentors and/or Co-Authors: Paul Weinhold Biomedical Engineering

Rotator cuff injuries are a common disability for which new therapies are needed to enhance healing and rehabilitation. Low magnitude, high frequency vibration (LMHFV) can stimulate fracture healing and may have potential to stimulate rotator cuff healing. The objective of this study was to evaluate the effect of LMHFV on the geometric and tensile properties of the intact rat rotator cuff to assess its potential for stimulating rotator cuff healing. We hypothesized that LMHFV might improve the cross-sectional area and tensile properties of the tendon. Rats were divided into 3 groups (n=12,9,9) of control, 30Hz vibration, and 60Hz vibration, respectively. Vibrated animals received 20 minutes of whole body vibrations at 0.3G peak-to-peak acceleration, per day, for five weeks. At sacrifice, the intact supraspinatus tendon of the rotator cuff was isolated and the cross-sectional area measured followed by a stress relaxation test and tensile loading to failure. Structural properties of stiffness, displacement at ultimate load, and % relaxation showed no significant differences by one-way ANOVA. The area also did not differ. The ultimate tensile load showed a trend (P=0.057) for improvement with vibration (especially 60Hz). Chi-square analysis revealed a trend (P=0.1) for a change in distribution of failure modes with treatment. Growth plate failures were the most common failure mode in the controls and tendon substance failures became more common in the vibrated groups. Further study is required to determine if the potential improved structural strength with vibration is due to changes in the growth plate or tendon substance.
Session 2, C12
Role of Shaped Electrodes on Secondary Electron Emission in Glow Discharges
Chelsea Robyn Ratzlaf Nuclear Engineering
Mentors and/or Co-Authors: Mohamed Bourham Nuclear Engineering

Glow discharge plasmas have been studied theoretically and experimentally using two parallel plates in which the electric field between the electrodes is assumed uniform. Glow discharge plasma is self-sustained by the emission of secondary electrons from the cathode. The secondary electron emission coefficient (SEEC), the ratio of electrons emitted from the surface of the cathode to the total incident ions impacting the cathode, is affected by electric field, which varies with different electrode shapes. We investigate the effects of differing geometries and materials on the SEEC to determine the dependence of the SEEC on various electrode configurations and materials.

The electrodes were made of aluminum, copper, graphite, and stainless steel. They were shaped as cones, discs, and hemispheres. The pressure, voltage, and discharge current at the time of breakdown were recorded. The corresponding SEEC was then calculated using the breakdown equation. Grouping the data sets by the qualitative factors allowed us to make generalized observations regarding the data. We performed an ANCOVA analysis to identify and to quantify the effects of our experimental configurations with the continuous variables pressure and voltage. A charged particle simulation software package, SimION, was used to help visualize and understand the variable electric field in the space between the electrodes.

We found that the anode material and cathode geometry were very significant in determining the SEEC, as well as the breakdown voltage and associated discharge current. The SEEC values ranged from the order of 0.000001 to 10, with the majority of that range dictated by the pressure and breakdown voltage.

Session 2, D2
The use of a hydrophilically modified charcoal as a pretreatment of transgenic plant extract for the separation of antibodies
Hannah Renee Reese Chemical Engineering
Mentors and/or Co-Authors: Ruben Carbonell BTEC-Biomanufacturing Training Education Center

Monoclonal antibodies for therapeutic use are currently produced in mammalian cell culture which incurs a large manufacturing expense. The use of transgenic plants, which produce abundant IgG and are inexpensive to maintain, to produce IgG is hampered by the difficulty in separating the product from the plant culture which includes phenolic compounds. Activated charcoal has been shown to be able to remove phenolic compounds but also significantly reduce IgG concentration. A novel pretreatment by a hydrophilically modified charcoal is a potential candidate to remove phenolic compounds from plant extract but leave the valuable antibody product intact in solution to be used be further separated. Different concentrations and incubation times of both modified and activated charcoal were used to determine their effects on phenolic and IgG removal. The reduction in both phenolic compounds and IgG concentrations mostly occurred before 10 minutes, remaining relatively constant from 20 minutes to 2 hours. Modified charcoal was not as proficient as the non-modified at removing phenolic compounds at higher concentrations, but was able to retain more of the valuable antibody product than the non-modified. The modified charcoal at a concentration of 10mg/mL with a 10 minute incubation time was optimal for phenol removal and IgG yield. Hydrophilically modified charcoal as a pretreatment for plant extract has the potential to make separation easier and leave the precious IgG product intact. This could improve the competitiveness of IgG produced from transgenic plants and reduce manufacturing costs of IgG type biotherapeutics.

Session 1, D33
Human Adipose-Derived Stem Cells Exhibit Changes in the Conformation and Lineage Specification of Primary Cilia in Response to Chemical and Mechanical Stimuli
Thea Esme Roper Chemical Engineering
Mentors and/or Co-Authors: Elizabeth Loboa Biomedical Engineering
Josephine Bodle Biomedical Engineering

Primary cilia are located on the apical surface of most mammalian cells. They are thought to detect chemical and mechanical stimuli in a variety of cell types such as bone, fat, and muscle. This study focuses on primary cilia on human adipose-derived adult stem cells (hASC). The objective of this study was to analyze conformational changes in hASC cilia in response to cyclic tensile strain. In addition, this study examined the effects of chemical stimulation in the form of osteogenic differentiation medium (ODM), and adipogenic differentiation medium (ADM) as compared to basal complete growth medium (CGM) on primary cilia conformation. We used fluorescence microscopy to image the hASC using an antibody against acetylated-alpha tubulin to visualize cilia, and DAPI to visualize hASC nuclei. Additionally, hASC were immuno-stained for runt-related transcription factor 2 (Runx2) to identify osteogenic differentiation and peroxisome proliferator-activated receptor gamma (Pparg), to identify adipogenesis. Primary cilia are also thought to play a part in signaling lineage specification of stem cells during embryonic development and, based on this knowledge, this study is further the potentially integral role of primary cilia in hASC lineage specification. I am investigating how primary cilia formation, cell body morphology, and human adipose-derived stem cell (hASC) lineage specification will be affected by varying both chemical and mechanical stimuli.

Session 1, A2
Endothelial cell micropatterning for engineering vascularized tissue constructs
Teal Russell Biochemistry
Mentors and/or Co-Authors: Balaji Rao Chemical & Biomolecular Eng

Bioengineered tissues are often limited to thin-layer and avascular tissues because it is extremely challenging to create a functional vascular network that supplies nutrients and oxygen to the cells that comprise complex organs. Having developed a novel method to fabricate microfluidic channels with circular cross-sectional geometries that are mimetic of microvascular networks, our goal was to utilize these microfluidic channels to micropattern endothelial cells within a fibroblast-seeded scaffold, forming a vascularized co-culture
system. Our first aim was to mold a polymer solution within a microfluidic channel to create a molded gel construct, serving as the structural template for forming a microvascular network. A gelatin solution was molded within a PDMS microchannel and subsequently cross-linked. Human umbilical vein endothelial cells were seeded on the gelatin surface and cultured to form the microvascular network. The second aim was to enclose the formed microvascular network within a cell-laden hydrogel, creating a vascularized tissue construct. The molded gelatin was fully enclosed within a collagen gel soaked with GFP+ rat dermal fibroblasts, successfully transferring the vascular-mimetic microchannel template to a biocompatible hydrogel system. These results help to establish a means for developing functional synthetic vascular networks towards the ultimate goal of engineering complex organ tissues.

Session 1, D24
Hyperthermophilic Enzyme Immobilization on Nanofibrous Supports
Pooja K Sarin Biomedical Engineering
Mentors and/or Co-Authors: Saad Khan Chemical and Biomolecular Engineering

Enzymes are highly efficient selective biological catalysts and immobilization can improve their functionality and stability for bioprocessing applications. Hyperthermophilic enzymes, in particular, have optimal catalytic activity at high temperatures that are common to industrial processes. We are using the hyperthermophilic enzyme, a-galactosidase cloned from Thermotoga Maritima as a model system. To immobilize hyperthermophilic enzymes, we use electrospinning of an aqueous poly(vinyl alcohol) (PVA) solution containing enzyme to produce enzyme-loaded nanofibers, and chemical crosslinking to immobilize the a-galactosidase within the nanofibers. We have developed a single-step reactive electrospinning process where we electrospin aqueous solutions of PVA and a-galactosidase with glutaraldehyde, a chemical crosslinking agent and a catalyst HCl, to generate water-insoluble, enzyme-loaded nanofibers. Using this reactive electrospinning method eliminates post-electrospinning treatment accelerating the immobilization process by 7-fold. We determined that the enzyme retains its hyperthermophilic nature in its immobilized state as the optimal activity occurs at between 90 and 95°C. Additionally, we measured the Michaelis-Menten parameters and the activation energy of the immobilized enzyme were explored. Finally, we compared our single-step reactive crosslinking method with alternative two-step methods. While the enzyme activity of the immobilized enzyme using reactive electrospinning was about 5-fold lower than that of the free enzyme, the retained activity was significantly higher than following post-electrospinning treatment using two-step methods. Future work will be focused on improving the performance of the immobilized enzyme by incorporating a substrate of the enzyme in the electrospinning solution which may protect the active site during immobilization.

Session 2, D27
Origami Folding of Polymer Sheets by Local Light Absorption
Brandi LaShea Shaw Chemical Engineering
Mentors and/or Co-Authors: Michael Dickey Chemical & Biomolecular Eng
Jan Genzer Chemical and Biomolecular Engineering

Self-folding is a self-assembly process that causes a predefined 2D template to fold into a desired 3D structure with high fidelity. Self-folding can be applied in the fields of actuation, sensors, and packaging. Our method uses ink hinges printed on pre-stressed polymer sheets using a desktop printer. When exposed to an infrared heat lamp, the polymer underneath the ink hinges absorbs the light more effectively; inducing polymer shrinkage and folding. It provides a simple and inexpensive approach to actuate self-folding. We study the application of self-folding by taking a 2D template and folding it into a complicated 3D origami structure. Also, we investigate the folding/unfolding pathway and the success of folding based on the compactness of the template.

Session 2, A28
Thermal Protective Properties of ALD Coated Fibers
Nikolai Leonid Sigmon Chemical Engineering
Mentors and/or Co-Authors: Gregory Parsons Chemical and Biomolecular Engineering

Flame resistant textiles are typically produced using intumescent surface coatings that char upon heating and reduce heat conduction. These coatings are applied through wet processes that are relatively expensive. In our research, we are exploring Atomic Layer Deposition (ALD) vapor methods as a lower cost alternative to wet intumescent coatings for flame retardancy. This procedure uses gas phase precursors to form nano-scale, ceramic oxide coatings on the substrates at specific temperatures and pressures. An example of a reaction to form aluminum oxide coatings involves trimethyl aluminum reacting with the surface hydroxide groups, followed by a reaction with water, creating new hydroxide groups, with nitrogen purges between each gas dose. The reactions are self-limiting and form coatings of desired thicknesses based on the number of cycles deposited. The process was used to form common aluminum oxide, zinc oxide, and titanium oxide coatings, as well as phosphorus based phosphate, aluminum phosphate, titanium phosphate, and zinc phosphate coatings on nylon, cotton, and a nylon-cotton blend (Nyco). The traditional aluminum oxide, zinc oxide, and titanium oxide coatings show small improvements in the thermal properties of the fibers based on TGA testing. Aluminum oxide and zinc oxide coatings also show slightly decreased flame times on Nyco and cotton fibers based on standard vertical flame tests. Extensive characterization techniques were used to confirm phosphorus deposition. FTIR, EDS, and XPS tests all confirmed phosphorus presence in the coatings. EDS tests in particular show increased phosphorus atomic percent from 2.3 to 6.2 with increased deposition temperature from 110 to 180 C. This process offers a new and potentially less expensive method of creating thermally protective coatings on textiles.

Session 1, D3
Engineering of Biopolymer Particles for Foam Stabilization
Andrew Charles Tibbits Chemical Engineering
There has been recent interest in the use of particles for foam stabilization in place of surfactants. Particles synthesized from biopolymers such as cellulose and lignin are of particular interest as an environmentally friendly means of foam stabilization. Indulin AT, a type of Kraft lignin (KL), is one biomaterial being used to gain more insight on the foam-stabilizing capabilities of biopolymers. Kraft lignin particles can be synthesized using a water based shear process; this method of particle generation is environmentally-friendly and does not involve the use of harsh medium or organic solvents. Results from our study show that particles generated through this shear process can retain more water and become 30x more voluminous than the original bulk lignin. One of our other objectives is to utilize cellulose fibers to make cellulose-enriched foams. This work involves developing methods by which to transform cellulose pulp into an efficient foam stabilizer. Cellulose-enriched foams can find application in food, personal care products as well as sustainable materials.

**Session 1, A24**

**Thermally Activated Optically Functional Surface Features**

Edward Philips Tomlinson Chemical Engineering

Mentors and/or Co-Authors: Michael Dickey Chemical & Biomolecular Eng

Shape memory polymers are “smart materials” capable of returning to a predetermined state in response to an external stimulus. Polymer networks with sufficient chemical or physical cross-linking often demonstrate thermally activated shape memory characteristics. Shape memory characteristics of cross-linked polymers have been thoroughly examined at the macroscopic level. This work demonstrates the potential application of programming, deforming, and recovering small scale surface features in shape memory polymers. Through the use of programmable surface features, it is possible to create optically functional features that remain dormant until exposed to the correct physical environment. Possible applications for programmable surface characteristics range from thermally sensitive packaging to increased photon absorption in photovoltaics. This research examines the potential for deforming and recovering a diffraction grating (small scale surface features capable of dividing incoming light into different wave lengths) imprinted on multiple different cross-linked polymer networks. Several polymer networks were cured on a diffraction grating mold. After curing, the polymer samples were exposed to elevated temperatures and pressure. The shape memory polymers studied held a temporary shape that did not exhibit diffraction grating characteristics. While the surface features never became completely flat, they were deformed to a point where the surface features no longer functioned as a diffraction grating. Recovery of the original optical characteristics was achieved by exposing the deformed shape memory polymer samples to elevated temperatures over an extended period of time. It is believed that this method could be used to mechanically buckle a thin polymer substrate by curing a second polymer on top of the shape memory polymer while it is in its deformed state.

**Session 1, A11**

**Nanotechnology Applications in Medicine: Drug Delivery to Diagnostics to Tissue Engineering**

Mentors and/or Co-Authors: Orlin Vele Chemical and Biomolecular Engineering

Nanotechnology is the recent development of controlling matter measured below 100nm. The size scale imparts unique properties, thus these materials are being studied for a wide range of applications including medicine, cosmetics, textiles, and energy. The focus of this research highlights the impact of nanotechnology in medicine to improve health in the areas of drug delivery, diagnostics, and tissue engineering. In drug delivery applications, nanotechnology may be able to allow for more targeted delivery. Biodegradable nanoparticles such as those made from biological materials such as liposome or synthetic materials such as poly(lactic-co-glycolic acid) (PLGA) are attractive as it ensures the safe clearance of materials after its intended use. The application of nanotechnology use in diagnostics could lead to a cost efficient and time saving method for an early detection of potentially life-threatening diseases. Lab-on-a-chip devices are of particular interest. Tissue engineering, a field aimed at repairing or replacing damaged tissue, may benefit from the use of nanotechnology as scaffolds as it may better mimic the tissue’s natural environment. Despite current research and promise, the long-term safety and toxicity of nanotechnology is not well understood. Further, complicating this issue is the toxic effects of a material depend on a number of properties including size, composition, surface chemistry, surface charge, and method of production and each nanomaterial must be considered individually. Therefore, before commercial production is an option these issues along with other regulations needs to be resolved.

**Session 2, C27**

**Introducing Tunable Shape-Memory Effects into Thermoplastic Elastomers**

Stephen Evans White Chemical Engineering

Mentors and/or Co-Authors: Richard Spontak Chemical and Biomolecular Engineering

Shape-memory polymers constitute a broad class of relatively soft materials that can memorize deformed shapes on a temporary basis and return to their original shape in response to an external stimulus. Because of their innate ability to return from a deformed state to their initial state, this class of polymers is often referred to as intelligent or smart. The key features of a shape-memory polymer are “netpoints,” which hold the polymer matrix together even upon applied deformation, and “switching segments,” which remain deformed upon cessation of an applied stress. Thermoplastic elastomers are typically described as triblock copolymers with glassy/semi-crystalline endblocks and a rubbery midblock. In this study, we demonstrate that physical blending can be used to impart shape memory to a thermoplastic elastomer, thereby providing a commercially viable and tunable means of achieving stimuli responsiveness for a wide range of technologies.
This research examines the impacts of the social and political environments on students' reading fluency outcomes. The idea of parent tutoring is an area of research that is promising as a means for assisting students who need to improve academic skills, such as reading. The primary purpose of this study was to assess the degree to which parents can implement The Helping Early Literacy with Practice Strategies Program (HELPs) reading intervention program consistently and accurately (i.e., with integrity), and how implementation integrity correlates with students' reading improvements. Participants in this study included 17 first and second-grade students and their parents. Findings showed little relationship between parent implementation integrity and student reading improvements, but this was likely due to little variability in parents' implementation integrity data. Low levels of variability likely resulted due to the training parents received prior to the study. Implications, limitations, and future research directions will be discussed.

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My research centers around the question, can resilience theory explain changes in consumerism? Resilience theory postulates the magnitude of disturbance that can be absorbed before a socio-ecological system is forced to restructure by changing the variables and processes that control behavior. This definition emphasizes conditions far from steady-state. Instead, in resilience theory, instabilities can flip a system from one regime of behavior into another, more stable regime. In layman's terms resilience theory is the ability of socio-ecological systems to remain functionally flexible in the face of stress and to recover following a disturbance. The data analyzed for this research explores the relationship between resilience theory and household economies, specifically the ownership of consumer items. A comparison between 2002 and 2010 shows that in the municipality of Calakmul, Mexico, households demonstrated an increased interest in consumer items, increased disposable income, incorporation into global economies (via migration), and possible increase in social stratification. Overall, the comparison shows a marked increase in consumerism in a region previously characterized by subsistence farming. The research examines these findings in light of two types of resilience, ecological resilience (as described above) and engineering, more commonly used definition. Engineering resilience is a return time to a steady-state following perturbation. The poster concludes that resilience theory is ambiguous in this case because it offers two possible interpretations; 1) Calakmul is undergoing a "state flip" and changing the existing social structures or, 2) Calakmul is passing through a "phase change" and consumerism comprises a "normal," progressive change.

This two-part study with working adults examines which communication behaviors occur at work and how these communication behaviors are evaluated. Through an analysis of organizational communication publications (articles, organizational case studies, textbooks), authors identified 343 communication behaviors; sorting analysis reduced this list to 163 verbal communication behaviors used in the workplace. In an online survey, 126 working adults identified communication behaviors in which they had participated the previous day in the workplace. 44 communication behaviors were identified by 50% or more of the participants, indicating their frequent use in the workplace. In Study 2, 331 working adults evaluated their effectiveness on the 44 verbal communication behaviors. Factor analysis reduced that list to 36 verbal workplace communication behaviors comprised of four factors: information sharing, relational maintenance, expressing negative emotion, and organizing communication behaviors. The Workplace Communication Behavior Inventory is presented.

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Many scholars and policymakers have called attention to the severity and extent of the “obesity epidemic” in the United States. Although these trends have affected all major racial and ethnic groups, all regions of the country, and all socioeconomic strata, the largest increases in obesity rates have occurred among children and minorities (Olichansky et al. 2005). Most previous research has focused on individual eating behaviors while ignoring the wider structural factors contributing to these trends, particularly among low-income populations. This poster is part of a larger project that aims to better understand how “food environments,” which include social, cultural, political, economic, and environmental factors, affect childhood obesity patterns. The project adopts a participatory, community-based approach that ultimately allows us to join with the communities to transform research findings into action. It utilizes asset mapping, a participatory research technique commonly used in community health research, to allow research participants to identify existing assets related to food access and availability of safe places for physical activity in their communities. About 16 key stakeholders and 22 community members from Harnett County, North Carolina, took part in the asset-mapping exercise over two full days. The activities allowed them to work together to identify community food access and security, identify available resources related to food within the community, and develop priorities for future action. The community can apply for mini-grants through Dr. Bowen's larger grant to address these priorities. This poster highlights the activities in the asset mapping workshop and discusses the results.

Session 2, C2
Implementation of an Electronic Medical Record Keeping System via iPad in Santa Cruz La Laguna, Sololá, Guatemala
Sarah Michelle Guess Biomedical Engineering and Anthropology
Mentors and/or Co-Authors: James Wallace Sociology and Anthropology

For the municipality of Santa Cruz La Laguna and its nearby neighbors, healthcare is often limited to state-sponsored clinics that are lacking in services and resources. Geographically, these communities are some of the least accessible in the region, further limiting adequate healthcare from reaching the people. Within Santa Cruz, there is one clinic endeavoring to improve the health of the local people. I collaborated with the clinic to expand their technological capabilities in an effort to improve patient care. For this paper, I present some of the benefits and challenges of implementing an Electronic Medical Record Keeping System within this clinical practice.

Session 1, D9
The Thoughts of Adolescents on Messages in Hip Hop Music
Franchesca Camille Jones Psychology
Mentors and/or Co-Authors: Pamela Martin Psychology

Hip-Hop music has become very synonymous with African American culture, which would not be such a bad thing if Hip-Hop had not become synonymous with violence, sex, the drug game and negative stereotypical behavior. African Americans are the ones who pioneered Hip-Hop music so one would think that African Americans would want to hold on tightly to the thing that they helped give to the world. Hip-Hop music currently is a far cry from the days African-Americans were trying to cultivate themselves and stake out a top spot in American society. The beginning of Hip-Hop was talking about oppressive situations or having a good time but now the party is still going but it is the music that is doing the oppressing. This genre of music is most popular amongst African America youth whom a great deal of the music is geared towards. This research will explore how African American youth feels about the messages conveyed in Hip Hop music.

Session 2, D20
Europe's Zivilmacht State: Germany's current political identity within Europe and the effects of German-style policy making in the European Union
Erika Ruth Koerner International Studies
Mentors and/or Co-Authors: Carol Lewald Interdisciplinary Studies

Firmly grounded within the European community both economically and politically since reunification, Germany promotes its foreign policy as a combination of multilateralism and soft power politics. Its reputation as a "Zivilmacht" or "civilian power" emerges in its preference for negotiation within intergovernmental organizations and hesitation to wield military force. Furthermore, Germany has in the recent past assisted struggling economies within the European Union and pushed for further EU integration through initiatives like the Stability and Growth Pact. Recent calls for strict reforms and austerity, however, suggest a shift in policy strategies. This research examines Berlin’s historically multilateral policy in light of the EU economic crisis and assesses Germany’s views of the benefits and costs of further European integration. With an emphasis on the ways in which the crisis has affected the German relationship with France and other EU powers, the research closely evaluates Franco-German cooperation and the potential for the diplomatic effectiveness of such an alliance. Caught within a divided and financially fragile European Union, Germany is faced with certain policy challenges that will invariably affect the organization, reliability and influence of the European community. The new “German question” addressed by this research posits whether further EU integration and multilateralist policy will continue to flow from the Bundestag. Much of the research suggests, that the days of a willing European Germany have perhaps given way to the creation of a German Europe, in which the Federal Republic’s interests and goals will likely become the building blocks for future European policy.

Session 1, B21
An analytical look at the immigration policy of Spain
Steven Mark Maddox International Studies- International Relations Concentration
Mentors and/or Co-Authors: Carol Lewald Interdisciplinary Studies

Spain is experiencing rapid immigration on a level never before seen in that nations history, and as a result its immigration policy could be viewed as a model for European Union nations in the coming years. In this work, I examine the immigration policy of Spain and the impact it has on the
integration of Spain within the European Union. This work attempts to explain the role of of Spain's national government to accommodate the relatively new phenomenon of high levels of immigration into the country. Throughout this work I employ three key factors when examining the recent history of Spanish immigration: the economic impact of immigration on Spain, the political implications of Spanish immigration policy, coupled with how this policy works with or against greater EU policies, and the nationalistic or cultural consequences of immigration on Spanish identity. Seen as a bellwether to all of Europe on this important issue, this research draws important conclusions. By examining Spanish immigration policy, one may be able to glean important insights into imminent events that the continent as a whole may face. Torn between national sovereignty and membership to a supranational organization Spain’s policy decisions could be followed by other nations.

Session 2, D3
The Effects of Self-Consciousness on Job Performance in a Customer Service Setting
Kevin Trevor Martell Psychology
Mentors and/or Co-Authors: Bart Craig Psychology
Non-cognitive scales have been demonstrated to be useful in a wide variety of assessment and personnel selection settings. One of the most widely used types of non-cognitive scales is personality scales, research on which has identified personality traits that correlate with measures of job performance. Using the Self-Consciousness Scale (SCSR; Scheier & Carver, 1985), the present study examined the personality trait of self-consciousness and its role as a predictor of job performance. In the first part of the study, the SCSR was administered to 40 employees working in customer service positions at North Carolina State University (NCSU) residence halls. In the second part of the study, performance evaluations of each participant were collected from their respective supervisors. Results will be interpreted in terms of the potential utility of trait self-consciousness for personnel selection.

Session 2, C11
Maritime Piracy in Southeast Asia and East Africa
Courtland Hamilton Matthews International Studies
Mentors and/or Co-Authors: D. Murray Chass-Dean's Office
This poster examines the historical and current challenges presented by maritime piracy in Southeast Asia and East Africa. There has been limited progress in preventing and responding to piracy despite the very real consequences of inaction, as maritime piracy constitutes a real and growing threat to the world’s commercial waterways. Millions of dollars each year are lost by businesses through seizures of goods from ships as well as ransom, which pales in comparison to the more significant security concerns that stem from maritime piracy. The potential profit and the unlikelihood of prosecution encourages radical groups and terrorists to turn to piracy as a way to fund their activities. Maritime piracy has proven quite detrimental to the environmental health of the oceans and continues to threaten fragile ecosystems. Skirmishes between pirates and oil tankers have led to minor oil spills in the past and the possibility exists for a more significant environmental catastrophe. Despite the gravity of these concerns, coordinated international efforts in addressing piracy largely have been unfocused and disjointed. This poster presents instances where nations such as Singapore and Malaysia have focused on a coherent, integrated strategy for successful anti-piracy efforts. The poster also highlights the legal ambiguities making it difficult to prosecute pirates. This research suggests the need for increased international cooperation and mutual assistance amongst nations facing the threat of maritime piracy. While bilateral cooperation is necessary and encouraged, a synchronized multilateral effort is the only path for fully addressing the issue of maritime piracy.

Session 2, B15
Historical Prevalence of Infectious Veterinary Disease In Wartime
Daniel Lawson Norris Animal Science
Mentors and/or Co-Authors: William Kimler History
Historically in wartime the existence of disease has been the cause of major mortality and morbidity that influenced the outcome of many conflicts. Domestic animals have always been an important part of human activity, including warfare. Therefore, this study focuses on the prevalence of infectious diseases among domestic animals in wartime throughout history. This study focuses on the incidence of different diseases in specific places and the spread of diseases throughout domestic animal populations when compared to the movement of troops and supplies through troop lines. The study examines the spread of disease not only from service animals to service animal, but also from service animals to other animals in the area and the subsequent spread. Diseases are spread in wartime through the high density of animals in contact with one another. Both proximity of troops and persistent contact in areas of high troop movement have contributed historically to the increased spread of infectious disease through service animals in wartime.

Session 2, B25
Community Investment and Conservation in Ecuador
Brian Christopher Parham International Cultural Studies
Mentors and/or Co-Authors: Carol Lewald Interdisciplinary Studies
With the global population growth, the preservation and sustainable use of the world's natural resources has only grown in importance and many countries are now funding conservation projects at a record rate. With more money invested in conservation projects, including both domestic and internationally funded projects through development aid organizations, conservation NGOs and government initiatives, it is now time to assess the effectiveness of the different strategies to aid local economies, protect natural resources and improve quality of life. Ecuador is a leading country in world conservation, with over 25% of their land holdings devoted in some aspect to conservation. Regarding natural heritage, Ecuador is home to the world's most biodiverse area-Yasuni National Park, the world-renowned Galapagos Islands, and two of Conservation International's world biodiversity hotspots-the tropical Andes and the Tumbez-Choco Magdalena corridor. This study investigates the role that community investment in conservation projects has played in the last twenty years in Ecuador. Research investigated recent conservation projects initiated by communities, NGOs and the Ecuadorian government. The purpose of the research was to determine the extent to which local people were involved in the successes and failures, with particular emphasis on
Session 1, B26
**Becoming Mainstream: The LGBT Movement**
Jeanine Rafiq Soufan Political Science
*Mentors and/or Co-Authors: Traciel Reid Public & International Affairs*

This paper compares the gay and transgendered rights movements to examine the interplay among politics, law, and culture to assess whether successful social movements involving marginalized groups need to focus on changing cultural perception in addition to advocating institutional reforms. The gay and transgendered rights movements represent two groups, which have faced and continue to confront discriminatory practices and policies that keep them outside of America’s mainstream society. Although these two groups form what is known as the LGBT movement, some have argued that gay and transgendered rights activists have not always worked harmoniously. This friction may stem from society’s cultural perceptions of gays and transgendered people, in which gays have received comparatively more mainstream support than transgendered people. This paper argues that the success of the gay rights movement reflects changing perceptions of homosexuality in American society as a prerequisite for achieving full equality in American society.

Session 1, A12
**Comparative Approaches to Transitional Justice in the Former Yugoslavia**
Medha Surampudy Political Science
*Mentors and/or Co-Authors: Traciel Reid Public & International Affairs*

This project examines the international and domestic efforts in the Balkans to create peace, security, and a reconciliation process after the devastating wars of the 1990s. Through the examination of the International Criminal Tribunal for the Former Yugoslavia, and the domestic courts in Serbia, and Bosnia and Herzegovina, this project determines the value of these efforts in establishing the facts of the war, but argues that these institutions largely failed to provide widespread justice and, equally important, reconciliation among the groups. It is argued that, in addition to these institutional failures, the Dayton Accords created a system that is designed to prevent future conflicts, but is not conducive to reconciliatory efforts, particularly within Bosnia and Herzegovina. By examining these institutions and the Dayton Accords, it is established that governmental efforts at transitional justice have largely failed to create social capital and understanding in the region. It is argued that, in order to see improved relations among the various ethnic and religious groups, international and domestic actors must instead focus on the development of civil society, nongovernmental organizations, and a reformed educational system. It is through these societal vehicles that these conflicting and polarized parties can develop the necessary social capital to move towards reconciliation.

Session 1, B28
**Mi Casa NO Es Su Casa: Colombian natural resources and the effects of Neoliberalism on Indigenous an Afro-Colombian communities.**
Luis Miguel Valencia Interdisciplinary Studies
*Mentors and/or Co-Authors: Carol Lewald Interdisciplinary Studies*

This research evaluates the social, economic, and environmental implications caused by the presence and practices of the multinational mining corporations in Colombia. Recently Colombia signed three Free Trade Agreements (FTAs) with countries that could use their economic power to invest in Colombia’s natural resources. Colombia is one of the main exporters of coal and gold in the world and its mines are highly desirable to multinational corporations. However, the indigenous and Afro-Colombians communities living around these mines do not see any of the benefit from these profitable businesses. In addition, these FTAs will make the native communities less likely to win their fight for labor and land rights, as there would be very little government protection and regulations of foreign trade and investors. Nevertheless, in an attempt to conclude with an optimistic future, the research also identifies the concerns voiced by leaders and members of the native communities affected by the businesses, with the intent of presenting solutions for a sustainable, environmentally friendly, and peaceful utilization of the land.

Session 1, A29
**An Evaluation of a Parent Tutoring Reading Fluency Program**
Stephanie George Wilson Psychology
*Mentors and/or Co-Authors: John Begeny Psychology
Rachel Mitchell Psychology*

Reading is a complex and critical skill. In early education, reading is regarded as one of the most important skills for a child to master. Yet, many students struggle to become fluent readers. There is also a growing body of research suggesting that parent tutoring offers promise for assisting children who need to improve their reading skills. Therefore, straightforward and structured interventions need to be identified for parents to use. Previous research has shown that the Helping Early Literacy with Practice Strategies (HELPS) Program improves students’ reading fluency and comprehension when implemented by research assistants, elementary school teachers, and teaching assistants. This
study examined the effects of the HELPS Program on child reading outcomes when implemented by parents of first and second grade students over the summer months. Using a one-group pre-test-post-test quasi-experimental design with the addition of a nonequivalent dependent variable, findings showed that students receiving HELPS significantly improved on four measures of early reading, with effect sizes ranging from medium to large. This study is the first to demonstrate that such effects can be obtained when HELPS is implemented over the summer months by parents with their children.
Poole College of Management

Session 1, B34

Optimizing the BCS Tournament Format

Andre Kurepa Waschka, Applied Mathematics/Economics

Mentors and/or Co-Authors: Robert Hammond, Economics

The current college football system known as the Bowl Championship Series (BCS) and the attendant human polls have ignited numerous debates over the competence, efficiency, and fairness of the system. The complaints about the current system can be organized into two major areas: the ineffective or low-predictive power of the current system to determine a national champion, and the radical inequality in the distribution of the economic benefits among the various university teams and conferences. In addition, recent changes to the BCS have denied the possibility of using the national championship as a collectively consumed good. An improvement to the current system that makes use of a binary, single elimination tournament format for four teams is proposed as a solution to many of the problems of the present system. The results, based on a mathematical analysis using a Monte Carlo method of testing indicate that the predictive power of the system could be significantly improved at the cost of one additional game. Furthermore, a basic statistical analysis of bowl game revenues indicates that a non-trivial amount of money could be brought into the system with the addition of that single game.
**College of Natural Resources**

**Session 1, C4**

**Enabling dignified livelihoods through People-First Tourism**

Jennifer Rice Iyengar Parks, Recr & Tourism Mgmt

Mentors and/or Co-Authors: Duarte Morais Parks, Recreation & Tourism Mgmt

Gene Brothers Parks Recreation and Tourism Management

Tourism has economically benefited vast segments of society through increased employment and public tax earnings – which are then used to fund social services and public infrastructure. Such economic impact is undoubtedly important to the State of NC but much of the income is still captured by corporations, and many tourism jobs are seasonal and servile. As a result, scholars interested in maximizing the benefits of tourism to host communities have begun leveraging the economic force of tourism to enable sustainable and dignifying entrepreneurial livelihoods. We are participating in the People-First Tourism project, which attempts to enable tourism micro-entrepreneurship in rural settings. Our goal is to gain experience in participatory action research methods as we a) contribute to the project and b) try to better understand how new models of tourism development can be introduced and developed. We worked to inventory micro-businesses in select counties throughout North Carolina; we did field work in these counties participating in stakeholder meetings and conducting informal interviews with micro-entrepreneurs; and we are examining secondary data about tourism, poverty, and environmental resources in these regions. This poster will document a summary of our contributions to the People-First Tourism Project and our preliminary findings on how select communities have reacted to the introduction of these new tourism development models.

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**Session 1, A32**

**Bioenergy Production Using Trees at Wastewater Treatment Facilities**

Andrew Wayne Radford Biology

Mentors and/or Co-Authors: Elizabeth Nichols Environmental Technology

Some North Carolina municipal wastewater treatment land apply wastewater to tree plantations for nutrient removal. My research is part of a larger effort to determine if these facilities can be used to grow trees for bioenergy and still meet regulatory permits for nutrient removal. The objective of my research is to determine growth and/or mortality for trees planted at 1 m$^2$ spacings at the Biofuel Center of North Carolina in Oxford, NC. I recorded each tree’s global position, alive/dead status, and growth parameters if alive (height and DBH). I collected field data on cottonwoods, provided by two different companies. I will report tree survival, biomass growth, and which clones performed best.

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**Session 1, D8**

**Psychological Attachment and the Influences of Constraints and Motivations: A Study on the Students of North Carolina State University**

Christopher William Schaefer Parks, Recr & Tourism Mgmt

Mentors and/or Co-Authors: Jonathan Casper Parks, Recreation & Tourism Mgt

For years marketers have used product or service consumption as a way to segment markets. The Psychological Continuum Model (PCM) has been able to provide a new method of segmenting markets based on psychological segments and the degree of attachment. The purpose of this study was to gain a better understanding on how motivations and constraints relate to spectatorship based on the four different psychological segments of the PCM. It was hypothesized that as an individual moves up the PCM the motivations will become more important and the constraints will be less important. In order to test this hypothesis surveys were distributed across the campus of North Carolina State University using a convenience sample (N = 226). The results confirm the hypotheses. As the levels of the PCM increase from awareness to attachment constraints and motivations show an inverse relationship. As one proceeds up the levels of the PCM, the importance of the constraints decreases while the importance of the motivations increases. The most important constraints were location, lack of team success and an individual’s time and schedule. The most important motivations were socialization, performance and excitement. This study is important because it gives marketers an alternative way to segment the market. By doing this, marketers can alter strategies and tactics to hit more specific target markets and ultimately increase a consumer’s attachment to a team, sport or organization.

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**Session 2, B14**

**Hydrologic and Scaling Study of an Inactive Hog Farm**

Heather Leigh Shipman Environmental Technology

Mentors and/or Co-Authors: Elizabeth Nichols Environmental Technology

Concentrated Animal Feeding Operations have used lagoons to temporarily store and treat waste since the 1960’s. The lagoons have the potential to impact subsurface, groundwater and surface water pools. Hydrological modeling is used to understand the potential impacts of these operations. Input data is an important consideration in hydrological modeling. The goal of this project is to compare field measurements with available spatial data commonly used in hydrological modeling.

The scope of my project was to collect soil data and to determine groundwater flow dynamics. I performed gravimetric soil moisture analysis, soil texture analysis and slug tests to determine moisture, texture and hydraulic conductivity. I compared this data to SSURGO and STATSGO data. Groundwater flow velocity was calculated using Darcy’s Law.

My study site, located in Johnston County, North Carolina was a hog farm that ceased operation in 2006. Depth-to-water measurements were collected from October 2010 to September 2011 in eight wells to determine groundwater elevation for the water year. A tipping bucket rain gauge was also installed to log rainfall amounts and compared to two off-site gauges.

The soil moisture agreed with the low range of SSURGO data, while the soil texture was determined to be clay and
sandy clay. The hydraulic conductivities were low which would be expected in a clayey soil. Soil texture and hydraulic conductivity demonstrated a more detailed view when compared to SSURGO data due to the finer scale and more direct sampling.
College of Physical and Mathematical Sciences

Session 2, C17
Effect of type II supernovae on the weak s-process in low-metallicity rotating stars.
Scott Robert Akerman Physics

Mentors and/or Co-Authors: Carla Frohlich Physics

Massive stars and their supernovae dominate the early evolution of galaxies and seed their chemical enrichment. These supernovae synthesize and eject intermediate-mass and iron-group elements, and may be a site for the synthesis of the heaviest elements. However, the origin of some of the lighter heavy elements (between iron and the rapid neutron-capture process elements at mass number A=130) is not well understood at low metallicity. Recent observations of low-metallicity stars have shown an enhanced primary nitrogen content that is higher than traditional non-rotating stellar models predict but is consistent with improved models which include the effects of stellar rotation. An elevated primary nitrogen abundance implies an increased amount of $^{22}$Ne which may allow for the weak component of the slow neutron-capture process (weak s-process) to produce greater yields of heavy elements. Data from a recent evolution of a low-metallicity rotating 15 Msun star we simulate a Type II supernova explosion and analyze the effect of the shock wave on weak s-process yields. The shock wave is artificially initiated by a burst of pressure at 1.4 Msun with an energy such that 1 foe is observed in the ejecta. Temperatures which allow for the weak s-process are achieved but the primary yields are light elements with only minor increases in the yields of heavy elements.

Session 1, B3
ROLE OF POSITIVE CHARGE ON SUBSTRATE BINDING TO DEHALOPEROXIDASE ENZYME FOUND IN ARMPHITRITE ORNATA
Chinwe Coretta Anumudu Biochemistry

Mentors and/or Co-Authors: Stefan Franzen Chemistry

The rate of catalytic activity of the Dehaloperoxidase enzyme found in the marine worm, armphitrite ornata, is greatly influenced by its net charge. It was observed that by mutating a charge near the active site of the enzyme to a more positive charge while still maintaining the general structure of the site (i.e. mutating glutamine to a glutamate), the rate of binding to TCP to the active increases. This is due most likely to the fact that the affinity of the negative substrate for the now more positive active site is increased based on charge-charge interactions. During this research experience, my goal was to determine if a change in charge will affect the binding rate of the substrate (TCP) to the enzyme (DHP) and what type of effect it would have. The observations presented in this report show how increased positive charge near the active site of the enzyme increases the rate of binding of the substrate to the enzyme when compared to wild type DHP.

Observational Constraints on the Origin of Light Neutron-Capture Elements in Metal-Poor Stars
Oindree Banerjee Physics

Mentors and/or Co-Authors: Carla Frohlich Physics

The origin of elements heavier than iron has been a longstanding open question in Astrophysics. Intermediate mass and iron-group elements are synthesized during stellar evolution and are ejected in subsequent supernova explosions. The elements beyond iron are generally attributed to the r-process (rapid neutron-capture process) and the s-process (slow neutron-capture process) thought to occur in supernovae and asymptotic giant branch stars, respectively. The abundance pattern of elements starting at barium, as observed in metal-poor stars, can be explained satisfactorily by the r-process. Using the online database Stellar Abundances for Galactic Archaeology (SAGA), we compile abundance data for the light neutron-capture elements in metal-poor stars. We analyze these data for metallicity trends of the light neutron-capture elements and also test for correlations of these elements with other elements of known nucleosynthetic origin. Our results are consistent with an additional nucleosynthesis process such as the postulated Lighter Element Primary Process. Moreover, we can make predictions for the conditions necessary for the synthesis of these light neutron-capture elements.

Session 1, C18
A computational study of electronic excitations in Fe(II)-polypyridines in the visible light region.
Lyndsay Johnson Barnes Chemical Engineering

Mentors and/or Co-Authors: Elena Jakubikova Chemistry

Dye-sensitized solar cells (DSSCs) are used to convert solar energy to electricity. They are based on chromophores that harvest the sunlight and inject photo-excited electrons into the semiconductor. Some of the most efficient DSSCs to date employ Ru(II)-polypyridines as chromophores. Ru is, however, rare, expensive and toxic. The use of Fe instead of Ru will make the cells cheaper and more economical. In this research, the Fe(bpy)$_2$(CN)$_2$ (bpy = bipyridine), and its derivatives, Fe(dppe-bpy)(CN)$_2$, Fe(dppe-bpy)$_2$(CN)$_2$, (dppe-bpy = 4,4'-diphenylphosphonate-2,2'-bipyridine, dppe-bpy = 5,5'-diphenylphosphonate-2,2'-bipyridine), are tested as potential dye candidates to be used in the DSSCs. Density functional theory calculations (DFT) at the B3LYP level of theory with 6-31G* and SDD basis sets were employed to obtain optimized geometries of the three compounds. Time-dependent DFT (TD-DFT) was used to simulate the absorption spectrum in acetone for all the molecules in the visible light region. The calculated spectra are analyzed and the results are discussed in terms of the light-harvested properties of the Fe(II)-polypyridine chromophores. Based on the TD-DFT calculations, all three molecules display absorption peaks between the 300-400 nm and 450-550 nm ranges. We found that the addition of phosphonate acid linker does not change the absorption spectrum significantly.

Session 2, C23
A Computational Study of Interfacial Electron Transfer in Fe(II)-polypyridine Sensitized TiO$_2$ Surfaces
James H Blew Chemistry

Mentors and/or Co-Authors: Elena Jakubikova Chemistry
We used density functional theory (DFT) to study attachment of Fe(dca-bpy)(CN)_2; dye (dca-bpy=4,4'-dicarboxy-2,2'-bipyridine) on (101) surface of TiO_2 anatase via carboxylic acid linker and CN ligand, time-dependent DFT (TD-DFT) to obtain absorption spectrum of Fe(dca-bpy)(CN)_2, and quantum dynamics simulations to model the interfacial electron transfer (IET) between the dye and nanoparticle. According to the TD-DFT calculations, Fe(dca-bpy)(CN)_2 has two prominent absorption peaks in the visible region centered between 500-600 nm and at 400 nm. The peak at 500-600 nm corresponds to the metal-to-ligand charge transfer (MLCT) transitions into the HOMO and HOMO+1 orbitals, while the second peak arises from a combination of MLCT and MC (metal-centered) transitions into the higher-energy orbitals. The calculated IET rates from HOMO and HOMO+1 orbitals are comparable or slower than the rate of the excited-state decay into the non-emissive, metal-centered states of the Fe(II) dye-sensitizer (~150 fs), indicating that the IET upon excitation of this band is unlikely. The IET rates from the second absorption band in the visible region range between 20 fs and 20 ps, suggesting the possibility of IET between the second absorption band in the visible region range and the Fe(II)-sensitizer and TiO_2 nanoparticle upon excitation with visible light. Our results are consistent with the previous experimental work on Fe(II) sensitizers (Ferrere, S. Chem. Mater. 2000, 12, 1083) and elucidate the band-selective nature of the IET in these compounds.

Session 1, A3
Surface roughness of nanoscale epitaxial Graphene films on SiC, in comparison with Graphite and SiC surfaces
Ansel Lou Blumers Physics
Mentors and/or Co-Authors: Jack Rowe Physics

This research project is about making nanoscale measurement using atomic force microscopy (AFM) to study the surface roughness of graphene nanoscale thin films grown on substrates of single-crystal Silicon Carbide (SiC). For comparison, HOPG (Graphite) and annealed SiC surfaces are also measured and studied. Surface roughness in nanoscale is important for ballistic transport of high-speed electronic devices. Surface roughness is a quantity that measures the texture of a surface, and it is quantified by the vertical deviation from a surface’s ideal form. Graphite surface exhibits no periodicity. Annealed SiC surface exhibits periodicity in the direction perpendicular to steps. So does epitaxial graphene on SiC substrate. Annealed SiC surface is approximately 10X smoother than HOPG while epitaxial graphene is approximately 25% rougher than SiC.

Session 2, D18
Exploring the Use of Heating From Embedded Metal Nanoparticles to Actuate Shape Memory Polymers
Mary Terese Burkey Physics, Chemistry, Applied Math
Mentors and/or Co-Authors: Laura Clarke Physics

Shape Memory Polymers (SMPs) are smart materials that retain a programmed equilibrium shape that they will return to if exposed to an outside stimulus (chemical reagent, magnetic field, heat, etc). However, due to the often-difficult logistics of applying these stimuli, the SMP has limited applications. One possible remedy for this is the use of nanoparticles exhibiting Surface Plasmon Resonance (SPR). Exposure of these nanoparticles to light of a certain wavelength induces a temperature increase in the particle. The localized heat produced by the particle can be used as a shape change stimulus for SMPs which respond to temperature change. By extruding the SMP provided by Lubrizol (Tecoflex EG 72D) into threads infused with Sigma-Aldrich SPR gold nanoparticles (that require green light), we exhibit that for low concentrations of particles, rapid shape changes in the polymer can be induced. To estimate the feasibility of this method, segments of the polymer are stretched and allowed to retract into their original form while measuring the force of retraction on a gauge. This shape change is induced both by conventional heating methods and nanoparticles with green light (photothermal effect). We show preliminary mechanical data for the shape memory transition strength and characterization.

Session 2, C16
Relative Quantification of N-linked Glycans on a Reverse Phase Chromatography Platform Coupled Online to Mass Spectrometry: Practical and Experimental Advantages Over HILIC Separation
Brandon Colby Carlisle Biology
Mentors and/or Co-Authors: David Muddiman Chemistry
Steven Walker Chemistry

Glycans have traditionally been separated by liquid chromatography methods other than reverse phase (RP), such as hydrophilic interaction chromatography (HILIC) due to the hydrophilic nature of the glycans. However, the development of hydrophobic hydrazide glycan reagents brings about the possibility to increase the hydrophobicity of N-linked glycans and to retain derivatized glycans on a RP column. Originally, derivatization of N-linked glycans was known to have the following two advantages: 1) hydrophobic derivatization increases the ionization efficiency of glycans in electrospray ionization (ESI) mass spectrometry (MS), and 2) allows for incorporation of stable isotopes for the mass differentiation and relative quantification of two samples. The research herein reveals a novel third advantage in that the increase in hydrophobicity allows N-linked glycans to be both retained and separated on a RP (C18) column, a property that has several practical and experimental advantages that are not usually exploited in glycan analysis. It was shown that only derivatized glycans were detected in RP, eliminating the competition with underivatized, native glycans present in HILIC. Glycan retention widths are smaller and more uniform in RP than those in HILIC, and there is no ammonium addition in RP chromatography. This decreases the detection limit and allows for low abundant glycans to be better detected. Finally, the number of N-linked glycans detected in human plasma increased nearly 50% when analyzed by RP chromatography. RP chromatography can now be utilized to interrogate the glycome and the proteome, allowing laboratories to easily transition to glycomics analyses.

Session 2, D15
Predictions of Supernova Neutrino signals in IceCube with Earth Matter Effects
You Shya Chiou Physics/Mathematics
Mentors and/or Co-Authors: Jim Kneller Physics

The flavor oscillations of neutrinos are modulated by passage through matter therefore neutrinos from a core-collapse supernova will be affected by the passage through the Earth if
a neutrino detector lies in the shadow of our planet. We examine whether IceCube, a recently completed South Pole neutrino observatory, can observe Earth matter effects within neutrino signals from Galactic core-collapse supernovae. Starting from two-dimensional hydrodynamical simulation data of a 15 solar mass supernova provided by the Garching simulation group, we impose parametrically the Mikheyev-Smirnov-Wolfenstein (MSW) matter effects, the neutrino self-interaction effects that occur within the supernova, and the Earth matter effects numerically, into the neutrino spectra using the Preliminary Earth Reference Model (PREM) (Dziewonski & Anderson, 1981). The PREM is a realistic Earth density profile which takes into account the discontinuities in density as one travels through the different layers of Earth. We considered the cases where neutrinos enter the Earth at the North Pole, the Equator, and the South Pole, as well as both normal and inverted neutrino hierarchies. We find using the PREM that Earth matter has a negligible effect on the observable event rate in IceCube no matter where the neutrino entered, in contrast with previous findings that used a constant density profile. We suspect that the more realistic profile increases the adiabaticity of neutrino propagation in the Earth and indicates a reduced possibility of observing Earth matter effects in supernova neutrino signals.

Session 1, B15
Direct Analysis of Textile Fibers and Dyes Using MALDESI Mass Spectrometry
Kristin Harr Cochran Chemistry
Mentors and/or Co-Authors: David Muddiman Chemistry

The forensic analysis of textile fabric uses a variety of techniques from microscopy to spectroscopy. Among those techniques, mass spectrometry (MS) is often used to identify the dye(s) within the fabric. Prior to mass spectrometric analysis, the dye must be extracted from the fabric and the dye components are then separated by chromatography. Direct analysis of dye molecules from the fabric can greatly reduce overall analysis time by omitting the extraction step and lengthy sample preparation involved in extraction. Direct analysis can be done using the matrix assisted laser desorption electrospray ionization (MALDESI) source for mass spectrometry. In MALDESI, an infrared (IR) laser is used to desorb analyte molecules from the sample, which are then ionized by electrospray ionization (ESI). A variety of dye classes were directly analyzed from several different textile samples. Dye classes were ionized by electrospray ionization (ESI). A variety of dye classes were then desorbed analyte molecules from the sample, which are then ionized by electrospray ionization (ESI). A variety of dye classes were then desorbed analyte molecules from the sample, which are then ionized by electrospray ionization (ESI). A variety of dye classes were then desorbed analyte molecules from the sample, which are then ionized by electrospray ionization (ESI). A variety of dye classes were then desorbed analyte molecules from the sample, which are then ionized by electrospray ionization (ESI). A variety of dye classes were then desorbed analyte molecules from the sample, which are then ionized by electrospray ionization (ESI).

Session 1, B10
Facile Synthesis of a Close Analogue of Vitamin B12
Richard McAlister Deans Chemistry
Mentors and/or Co-Authors: Jonathan Lindsey Chemistry

Vitamin B12 is the most architecturally complex molecule employed in enzymatic catalysis in living systems. Understanding the catalytic properties of such cofactors requires access to a range of synthetic analogues for examination in diverse model reactions. However, the complexity of vitamin B12 has stymied this time-honored approach. The molecular skeleton of vitamin B12 is a corrin, which differs from the well-known porphyrins (e.g., heme) in (i) the high degree of saturation, and (ii) the contraction of the ring by one carbon. Fully unsaturated corrin analogues (octadehydrocorphins) have been studied extensively, yet more reduced analogues have remained synthetically inaccessible. We found previously that self-condensation of a dihydrodipyrin-acetal affords a B,D-tetradehydrocorrin (TDC-T17) in good yield. Tetradehydrocorrin macrocycles occupy a reduction level halfway between that of octadehydrocorphins and corphins, and have been little studied despite their close similarity to corphins. However, the reactive 1-acetal moiety of TDC-T17 was an Achilles heel, enabling rearrangement of the macrocycle to the analogous bacteriochlorin under acidic conditions. Here, the reaction of two distinct dihydrodipyrins in the presence of Ga(OtBu)3 afforded (29% yield) a novel B,D-tetradehydrocorrin (TDC-EP-T17), which lacks the reactive 1-acetal moiety and is stable to acid. Furthermore, this directed route enabled the installation of distinct substituents on opposite sides of the macrocycle. We are presently examining the metalation of TDC-EP-T17 with cobalt and nickel to achieve further structural similarity with vitamin B12. The facile access to stable, synthetically tailored metallo-B,D-tetradehydrocorphins should open the door to diverse fundamental studies related to vitamin B12.

Session 2, B22
Stability of 1-dodecyne-Capped Gold Nanoparticles in Solution
Travis John Dunbar Chemistry
Mentors and/or Co-Authors: Christopher Gorman Chemistry

The use of 1-dodecyne as a ligand to cap the surface sites gold nanoparticles is explored to determine how stable these particles are with these capping ligands. The 1-dodecyne capped nanoparticles were tested for stability against the more widely studied triphosphinephosphine ligand. Gold nanoparticles...
aggregate and then precipitate from solution over time depending on their relative stability. We have studied both of these processes using UV-Vis spectroscopy. The wavelength of the optical absorbance maximum of the surface plasmon resonance peak of the particles gives indication about relative particle size in solution. Overall absorbance indicates how many of the particles are lost from solution due to precipitation. Experiments were performed as a function of temperature, solvent, and exposure to air. From changes in optical absorbance maximum and magnitude of absorbance, conclusions are drawn about the relative stability of these particles.

Session 1, C23
Analyzing the Release of Toxic Chemicals Over Time: Is it the Economy or the Environment?
Amanda Marie English
Majors: Chemistry; Statistics
Managers and/or Co-Authors: Bill Hunt Statistics

Over the past decade toxic releases in the United States have been steadily decreasing. During the same time period, we have also seen a major economic downturn, prompting many US industries to move production overseas. It is possible that this trend is impacting the amount of toxic releases within our border. We investigated the Toxic Release Inventory emissions provided by the Environmental Protection Agency (EPA) for our client Dr. Barry Nussbaum, EPA’s Chief Statistician, in order to examine whether these changes are a result of environmental policy or more a result of economic troubles. We compared this data with economic data using exploratory statistical methods. We then developed a statistical model using major economic measures as predictors for toxic chemical releases in order to get a good idea of how the economy is impacting toxic releases. We then examined chemical releases in specific industries and interviewed representatives from companies who have consistently reported over the past twenty years. After exploring all of the data with various statistical methods, we are now prepared to answer the question at hand: Is it the environment or is it the economy?

Session 1, B31
Influence Of the Madden Julian Oscillation On Nutrient Availability In the Galapagos Region
Jillian Breidge Gilmarin
Majors: Meteorology & Marine Science
Managers and/or Co-Authors: Dan Kamykowski Marine Earth And Atmospheric Sciences

The Galapagos Archipelago, which famously exhibits low biodiversity but high endemism among the Islands, is located near the equator in the Pacific Ocean, off of the west coast of South America. In the surrounding ocean are Tropical Instability Waves (TIW). TIW are a collection of westward waves near the Galapagos islands that form at the boundary between warmer and colder sea surface temperatures. Lasting a period of approximately 17 days, TIW are caused by shearing of the northern branch of the westward South Equatorial Current (SEC) and the eastward Equatorial Undercurrent (EUC). Oscillations occurring over a period of 33 days are created by the shearing of the SEC and North Equatorial Countercurrent. The Madden Julian Oscillation (MJO) is another type of wave resulting from atmospheric circulation and tropical convection. Preliminary observations suggest that the MJO, which originates in the Indian Ocean, also influences TIW in the vicinity of the Galapagos. The MJO is most easily seen as an eastward wave progression with a period of 30-60 days. The purpose of my present research is to investigate the implications of the MJO on the Galapagos, and to examine its influence on the nutrient availability in the Galapagos Region.

Session 2, C21
Study of Zinc Chloride aqueous solutions using UV-Vis Spectroscopic Techniques
Elijah Ezekiel Gordon
Majors: Philosophy and Religious Studies
Managers and/or Co-Authors: James Martin Chemistry
Bradley Losey Chemistry

ZnCl2 hydrate materials are of significant interest because both zinc and chloride can play many important roles in biology and material applications. To fully understand the solution process, ZnCl2 is an ideal material because of its extremely high aqueous solubility (432 g/100g H2O at 25 C), which offers a large range over which to study the solubility process. In previous work, the Martin group has identified the possibility of distinct structural compositions at 75, 90 and 96 mole % water, that correspond to ionic liquid structures with one, two and three hydration shells around some of the zinc cations. To study the transition from "hydration shell" water to network water, this research is analyzing ZnCl2 solutions using UV-Vis and Near IR spectroscopy. Analysis of the charge transfer transitions suggests that anhydrous ZnCl2 purchased from Sigma-Aldrich is not fully anhydrous, and also likely contains some hydroxyl impurity. Sublimation removes this impurity. Interestingly when allowed to slowly hydrate, the initial liquid hydrate formed (with both as purchased and sublimed starting materials) exhibits an absorption peak at 420 nm, resulting in a yellow color. It is hypothesized that this spectral feature is a result of some oligomeric zinc chloride hydrate. Interestingly, when larger amounts of water (15-25 equivalents) are added to the sublimed ZnCl2, this 420 nm peak is observed to show a significant time dependence, increasing for about 12 h, then disappearing over the next 48 h. The same behavior is not observed if one starts with the less pure, and slightly hydrated ZnCl2. Remarkably, it appears that the equilibrium solution structure takes days to form.

Session 1, D13
Synthesis of 1,5-Disubstituted-2-Aminoimidazole/Triazole Conjugates and Their Biological Activity
Alexis Jean Householder
Majors: Chemistry
Managers and/or Co-Authors: Christian Melander Chemistry

A large number of bacterial infections are biofilm based, additionally bacteria are becoming more resistant to conventional antibiotics. Thus, there is an ever increasing need for new strategies to counter these problems. A library of 1,5-disubstituted-2-aminimidazoles with various substituents on the 2-aminoimidazole ring have been synthesized. Each compound has been tested for the ability to inhibit biofilms. They have been tested in conjunction with oxacillin, which is a β-lactam antibiotic and have been shown to re-sensitize...
methicillin-resistant *Staphylococcus aureus* (MRSA).

**Session 1, C1**

**Background-Subtracted Fast-Scan Cyclic Voltammetry to Detect Reactive Oxygen Species**

*Rochana Jayakumar* Biomedical Engineering  
*Mentors and/or Co-Authors: Leslie Sombers* Chemistry

Reactive oxygen species (ROS) are highly reactive oxygen-containing molecules that are endogenously produced in biological systems. The overproduction of ROS is thought to generate oxidative stress and contribute to degeneration in neurological disease states. Current analytical techniques lack the selectivity and temporal resolution to discern between various ROS including hydrogen peroxide and a key precursor, superoxide anion. Using background-subtracted fast-scan cyclic voltammetry (FSCV) at carbon-fiber microelectrodes, we are developing a method to detect and distinguish between two endogenously produced ROS, hydrogen peroxide and superoxide anion.

**Session 1, A27**

**A QCM Study of the Tribological Properties of Nanodiamonds**

*Dustin A Leininger* Physics  
*Mentors and/or Co-Authors: Jackie Krin Physics*

The Quartz Crystal Microbalance (QCM) is a measurement device which relies on the piezoelectric effect inherent in quartz crystals. It consists of a single quartz crystal which oscillates in a transverse motion at 5 MHz. It has been used for decades for micro-weighing purposes, and was adapted for friction measurements in 1986-88 by Widom and Krim. It was the focus of this study to use the QCM to discern the tribological properties of nanodiamonds. The literature indicates that nanodiamonds could be used as a solid lubricant in industrial and engineering applications. To test this, I used 5mm diameter steel ball bearings in two different configurations on a 5 MHz QCM. In both configurations, a frequency measurement was taken before and after the addition of a single ball bearing. The frequency shift is indicative of the changes in the frictional forces at work in the setup. By comparing the frequency shift while submersed in various solutions, it can be determined which solutions are better lubricants. Base frequency shift measurements were taken in air, water, and a water-soap solution. These were then compared to a nanodiamond-water solution.

**Session 2, B13**

**Harnessing the Power of the Sun Through Metal to Metal Charge Transfer**

*Travis T Lekich* Chemistry  
*Mentors and/or Co-Authors: Walter Weare Chemistry*

As the world's population grows, so does its use of fossil fuels and CO$_2$ output. Many have proposed use of alternative energy sources to solve this problem such as hydroelectric, wind, and solar power. Even though these technologies are promising, they all lack an important aspect that fossil fuels have which is the storage of energy. For these reasons, we are studying molecular systems that can capture sunlight and store that energy in a chemical species such as hydrogen or CO$_2$. To do this, we have designed a compound containing an oxygen-bridged molybdenum and titanium that is potentially capable of light-induced metal to metal charge transfer. This charge transfer is used to provide high-energy electrons and holes for catalysis of unfavorable reactions such as the splitting of water into oxygen and hydrogen.

**Session 1, B29**

**Influential Beta-Decay Rates In The Rare Earth Peak: An r-Process Sensitivity Study**

*Caleb A Marshall* Physics  
*Mentors and/or Co-Authors: Gail McLaughlin Physics Matthew Mumpower Physics*

Half of the heavy elements past Iron in the universe are believed to be produced by the rapid neutron capture process, or “r-process.” Beta decay rates of the short-lived nuclei participating in the r-process are crucial in determining the final abundances we observe in nature. It has been shown from various observations that the distribution of abundances throughout the rare earth peak is very consistent, and in addition the rare earth peak has some of the highest abundances outside of the large peaks occurring at A=130 and A=195, whose existences are easily described by their closed neutron shells. These two points make the task of finding the possible beta-decay rates for this region an important topic. Using computer simulations we studied individual beta decay rates in the rare earth region and showed how changes to these rates influence the abundances. We found that changes to beta decay rates by only a factor of 2 have a significant impact on the final abundances.

**Session 1, D21**

**Background-subtracted fast-scan cyclic voltammetry to detect reactive nitrogen species**

*Hadeer Usama Metwally* Biochemistry  
*Mentors and/or Co-Authors: Leslie Sombers Chemistry*

Nitric Oxide (NO) is a free radical found in biological systems that has been characterized as a signaling neurotransmitter. NO is highly reactive and known to contribute to both nitrooxidative and oxidative stress, and has been hypothesized to play a role in neurodegenerative disease states. Due to its reactive properties, current analytical techniques lack the selectivity and temporal resolution to quantify dynamic NO fluctuations in living brain tissue. We are using background-subtracted fast-scan cyclic voltammetry (FSCV) at carbon-fiber microelectrodes as an analytical tool to selectively characterize rapid NO fluctuations in vitro. FSCV is an electrochemical detection technique that provides sub-second temporal resolution with qualitative information, enabling the measurement of rapid chemical dynamics in living tissue. Preliminary data shows reproducibility and a signal that increased when the perfluorinated polymer, Nafion, was used to coat the electrode. This work lays the foundation for direct monitoring of real-time NO fluctuations in living brain tissue.
The TALSPEAK process is used for separating lanthanides and actinides in nuclear waste in order for it to be reprocessed or stored in a safer fashion. The process involves selective extraction of lanthanides into the organic phase using bis-(2-ethyl(hexyl)) phosphoric acid and retention of actinides in the aqueous phase by means of a holdback reagent - diethylenetriamine-N,N,N',N'',N''-pentaacetic acid (DTPA). We use density functional theory at the B3LYP level to study interactions of hydrated La$^{3+}$ ion with N-methylglycine, which serves as a simplified model of DTPA. We obtained optimized geometry of the [La(H$_2$O)$_6$]$^{3+}$ ion, as well as La$^{3+}$ complexes with N-methylglycine. Finally, we evaluated enthalpies and Gibbs free energies for the exchange reactions of the hydrated La$^{3+}$ with the model holdback reagent. This provides a basis for future investigation of enthalpic effects in the holdback reagent – ion interaction for a series of hydrated Ln(III) and Act(III) metals, with the goal to optimize the separation process.

Session 1, A1
Modification of inhibitor binding in the distal cavity by L100F site mutations in dehaloperoxidase-hemoglobin
Ashlee Marie Plummer Chemistry
Mentors and/or Co-Authors: Stefan Franzen Chemistry
Dehaloperoxidase (DHP A), a unique multi-functional enzyme, from the marine annelid Amphitrite ornata dehalogenates 2,4,6-trihalophenols to form 2,6-dibromo-1,4-benzoquinone. The catalytic cycle of DHP is similar to horseradish peroxidase (HRP), involving a high-valent oxoferryl heme and two one electron transfers from the aromatic substrate to the enzyme. Unlike HRP, DHP has an internal binding cavity on the distal side of the heme capable of accommodating monohalogenated phenols. Internal binding of monohalogenated phenols in the distal cavity of DHP inhibits peroxydase function. Therefore, despite the similarity of the peroxydase mechanism of DHP to HRP, DHP is not capable of oxidizing the same range of halogenated substrates. Blocking internal binding in DHP may be the key to effectively enable DHP to function as a peroxydase on the full range of halogenated phenols. The distal cavity of DHP is surrounded by several hydrophobic amino acids that stabilize internal binding of the monohalogenated phenols: several phenylalanine residues, a valine residue, and a leucine residue near the back edge of the heme. We have recently expressed L100F, L100Q, L100T, and L100V mutants of DHP in an effort to prevent internal binding and turn the inhibitors into substrates. These mutants have been characterized by UV-vis spectroscopy, resonance Raman spectroscopy, and molecular dynamics simulations. Kinetic assays and resonance Raman indicate that the peroxydase activity of the L100T and L100F mutants is increased compared to native DHP in the presence of 4-bromophenol suggesting a reduction in the inhibitor binding constant.

Session 2, A19
Lissajous Figures as a Model for Neutrino Oscillations
James Rudolph Rowland Physics
Mentors and/or Co-Authors: Chueng Ji Physics
Our research proposes a novel model to visualize neutrino oscillations. Neutrino oscillation is the phenomena whereby neutrinos can change flavor. Motivated by two dimensional models for a simple harmonic oscillator, we discovered that Lissajous figures compose an analogous model to neutrino oscillations. These figures provide insight into neutrino oscillations with regards to the effect of interaction strength and relative masses of neutrinos. Neutrinos are of increased interest with the recent Daya Bay result eluding to larger than expected theta 1,3 mixing angle.

Session 1, B32
Computer Tomography Investigations into Cranial Pneumaticity in a Fossil Diving Bird
Alyssa E Stubbs Geology
Mentors and/or Co-Authors: Daniel Ksepka Marine,Earth & Atmospheric Sci
The skull of a fossil sulid bird, Charleston Museum PV4287, was collected during an expedition in 2002 at the Ashley Formation of South Carolina. This skull provides a look at the cranial development of the Sulidae, which provides insight on the feeding habits of these birds. Computed tomography scans were conducted on the skull of CM PV4287 as well as the skulls of two other extant birds, Sula leucogaster and Phalacrocorax auritus. These scans give insight into the development of the brain cavity and pneumatic passages of the Sulidae. Increased pneumatization of the skull can be seen by examining CM PV4287 and the S. leucogaster scans. P. auritus does not show the same level of pneumaticity as the two sulids. The level of pneumaticity within the fossil sulid implies that plunge diving had already evolved in Sulidae 25 million years ago and was employed even by small, primitive species.

Session 1, B17
Do Heatwaves Impact Ground Level Ozone Levels?
Holly Christine Sweeney Mathematics
Mentors and/or Co-Authors: Bill Hunt Statistics
Heat waves are currently defined as extended periods of unusually hot weather. These periods of time can affect us in many ways, such as worsened drought conditions and increased energy use (e.g. air conditioning). It is also known that ground level ozone exposure can lead to respiratory problems and high levels can damage vegetation and ecosystems. The relationship between heat waves and ground level ozone is currently not well known. Our client from the North Carolina State Climate Office asked us to examine heat wave occurrences in North Carolina and then examine the relationship between these heat waves and ground level ozone during the same time period, focusing on the months of April through September, North Carolina’s ozone season. We
analyzed climate and ground level ozone data from seven stations across North Carolina covering the coastal, piedmont, and mountain regions. We focused on five variables for our heat wave analysis for each station: number of unusually hot days, number of heat waves, and length, intensity, and frequency of heat waves. We are currently comparing the ozone and climate data to see if there is a relationship between the length and intensity of heat waves and ground level ozone. Successfully de-trending the ozone data by taking precursor hydrocarbon and nitrogen oxides emission reductions into account will allow us to see the direct relationship between the two. Our finished analysis will provide information to make more informed decisions about public health resulting from heat waves and ground level ozone concentrations.

Session 2, A12
Aniline catalyzed hydrazone formation for the derivatization of N-linked glycans
Amber D Taylor Chemistry
Mentors and/or Co-Authors: David Muddiman Chemistry
Steven Walker Chemistry

The development of hydrophobic hydrazide reagents has afforded several advantages for the ESI-MS analysis of N-linked glycans: 1) increased ESI efficiency and ion abundance afforded several advantages for the ESI-MS analysis of N-linked glycans, and 2) the ability to incorporate stable isotopes onto the linked glycans: 1) increased ESI efficiency and ion abundance afforded several advantages for the ESI-MS analysis of N-linked glycans, and 3) the ability to retain and separate N-linked glycans on a C18 reverse phase chromatography platform. The near stoichiometric reaction efficiency has been demonstrated previously; however, the reaction conditions are at elevated temperatures and low pH. This has been shown to cause partial degradation of sialic acid residues at an incidence of up to 15%. It is hypothesized that using an aniline catalyst can speed up the reaction at ‘near physiological conditions,’ and allow for several important advantages such as decreased degradation, the decrease in reaction time, and the ability to use less excess tagging hydrazide reagent. It is shown that aniline is capable of catalyzing the reaction of hydrazide reagents with N-linked glycans, both simple (linear) and complex (branched). Additionally, the optimization via a fractional factorial design is performed in order to determine the most productive reaction conditions such as pH, temperature, reaction time, reagent excess, and catalyst concentration. Using the optimized reaction conditions, the aniline catalysis method will be compared to the non-catalyzed tagging strategy in order to determine the better method for the hydrazone formation reaction of N-linked glycans.

Session 2, D8
Predicting Observed Soil Moisture Using Statistical Modeling
Joseph Tokeshi Taylor Marine Earth & Atmospheric Sci
Mentors and/or Co-Authors: Ryan Boyles Marine,Earth & Atmospheric Sci

Soil moisture is the amount of water contained in a volume of soil. This parameter is very important to agriculture, coastal ecosystems, and environmental engineering. For example, the amount of water holding capacity for a particular soil type is essential when studying the low elevation ecosystems and learning how to prevent flooding. However, soil moisture is only measured at certain locations in the U.S. The North Carolina Environment and Climate Observing Network (ECONet) measures this parameter. The purpose of this study is to evaluate the accuracy of a soil moisture estimation technique to assist with quality control of ECONet data, and prediction of missing data. Observed hourly average of soil moisture from each station is used to create a statistical model that can produce a predicted value. Using 4 to 5 years of hourly data, this model has a time series component to account for the change in soil moisture. The model can predict values up to 24 hours in advance. With every new observed soil moisture value, the model corrects itself to account for new information. The model captures the observed soil moisture with an average error of less than +/- 0.07 at every ECONet and USCRN station. However, one limitation of the model is that the station of interest must measure soil moisture for at least a year in order to have minimal error.

Session 1, B9
Characterization of the Morphology and Performance of Differentially Cast Organic Thin-Film Transistors
Anne M Watson Physics
Mentors and/or Co-Authors: Harald Ade Physics

A recognition of the link between the polymeric structure and performance of organic thin-film transistors has been under investigation recently, with a corresponding development of improved imaging techniques. Running parallel to that physical experimentation of the interfacial morphology is a chemical exploration of the materials best suited for organic electronic applications. This research investigates the specific morphology and performance of an organic thin-film transistor using a polymer (P3HT) acting as a semiconducting layer atop another polymer (PMMA) dielectric layer. A material analysis was first conducted on single layers of the polymers. Using an AFM, it was found that using chloroform or p-xylene as a solvent for P3HT had a large effect on the size of the aggregates formed through annealing at high temperatures. Further morphological characteristics were additionally investigated with the use of special x-ray scattering techniques at the Advanced Light Source in California, yielding data on the interface between the polymer layers. Full devices were then constructed in the bilayer format, with a custom evaporator mask to deposit aluminum for the contacts. These devices were tested using a probe station testing setup constructed in-house for this project, and the characteristic output and transfer curves for a transistor were obtained. Results were subsequently analyzed to show the relation between interface morphology and device performance.

Session 1, A28
Characterization of P3HT Films Grown by Thermal Evaporation in High Vacuum
Mark Koneczal Wetherington Physics
Mentors and/or Co-Authors: Daniel Dougherty Physics

Organic solar cells are commonly made by spin casting a blend of P3HT (an organic semi-conductor) and PCBM (a small fullerene derivative) from a solution onto a conducting substrate. We have confirmed that it is possible to evaporate P3HT via thermal deposition in high vacuum to create extraordinarily smooth films. This could potentially allow very precise composition and thickness control for P3HT-based thin film solar cells. We have characterized these novel vacuum-deposited P3HT films by Atomic Force Microscopy,
X-ray photoelectron spectroscopy, and device current-voltage characteristics.

Session 1, C19  
Assessment of Air Quality Trends Near Roadways  
James Taylor York Statistics  
Carey Jackson Statistics;  
Aaron Lamb Statistics  
Mentors and/or Co-Authors: Bill Hunt Statistics

The EPA currently has many air pollution monitors across the United States. Some of these are close to the road while others are further from the road. The purpose of our research is to see how air pollution varies according to distance from the road and the volume of traffic on the road. Are air pollution concentrations at “near-road” monitors changing at a different rate than monitors located elsewhere? Our goal for this project is to analyze records, both past and recent, to determine if our monitors are truly effective. For our purposes, we will focus on CO, NO₂, and PM₂.5. Five to ten case studies will be picked throughout different regions of the country, and exploratory statistical methods determined the relationship between setback distances, traffic counts and air pollution. Data was used to determine if monitors near-roads and monitors elsewhere had concentration levels changing at different rates for the last several years, certain days of the week, and hourly. We will also be examining if the pollution rates within each city are dropping at the same rate for each pollutant. We will also see if we can use analysis of the wind speed and direction to identify sources of pollution of each monitor. This information will help develop better monitoring regulations and guidance for State and local air pollution control agencies.
Understanding the mechanical, chemical, and mass transport properties that are essential to cell-surface interactions for 3D electrospun fibrous mats is a crucial step to successful tissue engineering. The goal of this research is to develop a methodology to compare “hard” materials (polylactic acid) (PLA) to “soft” materials (polydimethylsiloxanes) (PDMS) in the aforementioned properties with respect to proliferation and differentiation of human dermal fibroblasts. We designed our experiments to systematically compare 2D films and 3D nanofibers scaffolds of PLA and PDMS for variance in porosity (2D versus 3D), modulus (PLA versus PDMS) and surface chemistry. Initial results show successful cultivation of HDFs on PLA mats as compared to PLA films. The difference between PLA films and PDMS 2D films was not as distinct. Determination of the collagen coating pretreatment for each substrate is underway. This is a key factor to determining surface chemistry effects between the two polymer systems. We are also currently studying the cellular behavior on PDMS fibers, a more challenging material to produce in 3D form. Finally, we outline our experimental design to determine small molecule transport through the 3D scaffolds.

The purpose of this research project is to determine the necessity of LC-MS analysis on dye extracts from unknown fiber samples. More specifically, this project is trying discover if it is necessary to use LC-MS analysis on extracts from unknown fiber samples for the determination of same source origin, or is the combination of the less expensive techniques of Thin Layer Chromatography (TLC) and microspectrophotometry (MSP) adequate. This study uses a total of 48 blue fiber samples presumed to be polyester from the State Bureau of Investigation (SBI) in Raleigh. Near Infrared Spectroscopy was used to confirm the fiber identification as polyester. Dyes were extracted from each fiber sample (in accordance to the SBI and SWIGMAT general fiber dye extraction procedure) and analyzed using High Performance Liquid Chromatography Time of Flight Mass Spectrometry (HPLC TOF-MS) and TLC. A total of 5 unknown fiber samples were randomly collected from the SBI samples by an individual outside of this project to allow for comparison between the HPLC TOF-MS and TLC data. The dyes were extracted from these unknowns and analyzed using HPLC TOF-MS and TLC. The results of both these analyses were then compared. Currently the actual analysis of the samples and unknowns via MSP has not been performed; however preliminary analytical method development for MSP has begun.
focuses on high-value added materials derived from lignin including micro- and nano- fibers, surfactants for fuel emulsions, and resin-coated proppants. Our initial work evaluated the compatibility of silicon-containing plasticizers with a commercial kraft lignin, Indulin AT. Lignin’s highly branched molecular structure limits it use as a carbon fiber precursor due to its inherent brittle nature. Lignin’s rich carbon content and abundance in nature highly motivates the elimination of this challenge. Utilizing an inherently flexible poly(dimethylsiloxane) (PDMS) co-polymer, we successfully electrospun core-sheath (lignin-PDMS) microparticles and microfibers. Tuning the morphology of the resultant materials is enabled through control of solvent, viscosity, and surface tension of the initial formulation. Preliminary thermal analysis data indicates an interaction between the silicon-containing component and Indulin AT. This work represents a key starting point for fundamental understanding on the interfacial compatibility between these two components. Future work aims to convert the particles and fibers to ceramic-carbon materials through pyrolysis.
# Index of Student Presenters in Alphabetical Order by Lead Presenter

<table>
<thead>
<tr>
<th>Poster no.</th>
<th>Student Presenter(s)</th>
<th>Project Title</th>
<th>Mentor College / Content Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1, A19</td>
<td>Cara J Adrian Biology</td>
<td>Ethical Issues Concerning the Uses of Genetic Technology</td>
<td>Agriculture and Life Sciences / Animal Science</td>
</tr>
<tr>
<td>Session 2, C4</td>
<td>Obed Kwame Agyei Biology</td>
<td>Effects of site-directed mutagenesis on the binding affinity of tamoxifen to the estrogen receptors of a teleost fish, Micropogonias undulatus.</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
</tr>
<tr>
<td>Session 2, C17</td>
<td>Scott Robert Akerman Physics</td>
<td>Effect of type II supernovae on the weak s-process in low-metallicity rotating stars.</td>
<td>Physical and Mathematical Sciences / Physics</td>
</tr>
<tr>
<td>Session 1, A4</td>
<td>De'Ja Sade Alexander Biology, Jennifer Wheelely Biological Sciences-Human Biology Concentration, Brittany Lang Human Biology</td>
<td>Qualitative Assessment of Medical Students’ Definition of Childhood Obesity</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
</tr>
<tr>
<td>Session 2, B1</td>
<td>Katlin Rae Allsbrook Genetics</td>
<td>Cytochrome P450 2D6 Genetic Testing at LabCorp: Impact of CYP450 2D6 Metabolizer Phenotype</td>
<td>Agriculture and Life Sciences / Genetics</td>
</tr>
<tr>
<td>Session 2, C26</td>
<td>Ahmad Rabi Amini Chemical Engineering</td>
<td>The Gelation Mechanics of Silk Fibroin</td>
<td>Engineering / Chemical &amp; Biomolecular Engineering</td>
</tr>
<tr>
<td>Session 1, D12</td>
<td>Joel E Anderson Computer Science</td>
<td>Graph-Theoretic Algorithms for Optimal Sensor Placement and Malicious Attack Detection in Large Power Grids</td>
<td>Engineering / Electrical &amp; Computer Engineering</td>
</tr>
<tr>
<td>Session 2, B6</td>
<td>Michelle Carolyn Anderson Biology</td>
<td>Barriers to Implementing Nutrition Education in Head Start Preschool Classrooms</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
</tr>
<tr>
<td>Session 2, D5</td>
<td>Amanda Clarissa Antono Biological Sciences and Nutrition Sciences</td>
<td>Parenting Picky Eaters: Strategies to Get Preschool Children to Eat Previously Rejected Foods</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
</tr>
<tr>
<td>Session 1, B3</td>
<td>Chinwe Coretta Anumudu Biochemistry</td>
<td>Role of Positive Charge on Substrate Binding to Dehaloperioxidase Enzyme Found in Armphitrite ornata</td>
<td>Physical and Mathematical Sciences / Biochemistry</td>
</tr>
<tr>
<td>Session 1, C8</td>
<td>Sophie Leigh Austin Biology, Kirstin Morris Nutrition Science, Karim Ghanem Biology Concentration: Human &amp; Religious Studies, Heather Kashner Biochemistry, Jennifer Tier Human Biology, Ar’neka Montford Human Biology, Brandon Williams Biochemistry</td>
<td>The Impact of Concussions on Contact Sports and Their Athletes</td>
<td>Agriculture and Life Sciences / Biochemistry</td>
</tr>
<tr>
<td>Session 1, D5</td>
<td>Oindree Banerjee Physics</td>
<td>Observational Constraints on the Origin of Light Neutron-Capture Elements in Metal-Poor Stars</td>
<td>Physical and Mathematical Sciences / Physics</td>
</tr>
<tr>
<td>Session, Page</td>
<td>Name</td>
<td>Major</td>
<td>Title</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>1, A34</td>
<td>Katherine Caroline Barefoot</td>
<td>Polymer and Color Chemistry</td>
<td>Intelligent Design of 3D Scaffolds for Tissue Engineering</td>
</tr>
<tr>
<td>1, D28</td>
<td>Laura Denise Barlow</td>
<td>Psychology</td>
<td>The Effect of Parent Implementation Integrity on Students' Reading Fluency Outcomes</td>
</tr>
<tr>
<td>1, C18</td>
<td>Lyndsay Johnson Barnes</td>
<td>Chemical Engineering</td>
<td>A computational study of electronic excitations in Fe(II)-polypyridines in the visible light region.</td>
</tr>
<tr>
<td>1, A10</td>
<td>Jennifer Brooke Beane</td>
<td>Animal Science</td>
<td>Non-Nutritive Oral Behaviors of Holstein Dairy Cows: A Free-stall v. Pasture Study</td>
</tr>
<tr>
<td>2, D21</td>
<td>Richard Byron Beddingfield</td>
<td>Electrical &amp; Computer Engr</td>
<td>Parallel Active Filter for Load Generated Harmonic Distortion Removal</td>
</tr>
<tr>
<td>2, B11</td>
<td>Adriano Alejandro Bellotti, Tori Jefferson, Richard Sater, Avinash Pyreddy, Ravi Dixit, Kayla Hurst</td>
<td>Biomedical Engineering, Ecology &amp; Evolutionary Biology, Biochemistry, Biology, Microbiology</td>
<td>A translational frameshift in the tail assembly chaperone of mycobacteriophage Astraea</td>
</tr>
<tr>
<td>2, A27</td>
<td>Ermias Bizuwork</td>
<td>Chemical Engineering</td>
<td>Dielectric Elastomer with Tunable Shape Anisotropy</td>
</tr>
<tr>
<td>2, C18</td>
<td>Elsie Bjarnason</td>
<td>Chemical Engineering</td>
<td>Manipulation of the Shape and Properties of a Liquid Metal</td>
</tr>
<tr>
<td>1, C26</td>
<td>Alaina Lynn Blevins</td>
<td>Biology</td>
<td>Biology Lab TA teaching project</td>
</tr>
<tr>
<td>2, C23</td>
<td>James H Blew</td>
<td>Chemistry</td>
<td>A Computational Study of Interfacial Electron Transfer in Fe(II)-polypyridine Sensitized TiO2 Surfaces</td>
</tr>
<tr>
<td>1, A3</td>
<td>Ansel Lou Blumers</td>
<td>Physics</td>
<td>Surface roughness of nanoscale epitaxial Graphene films on SiC, in comparison with Graphite and SiC surfaces</td>
</tr>
<tr>
<td>2, A14</td>
<td>Elisabeth A Braswell</td>
<td>Biochemistry</td>
<td>Cabbage leaf curl virus but not Beet curly top virus Induce Senescence in Arabidopsis thaliana</td>
</tr>
<tr>
<td>1, D34</td>
<td>Alicia M Braxton</td>
<td>Zoology</td>
<td>The evaluation of MMP-2 and -9 in urine samples from canine cancer patients</td>
</tr>
<tr>
<td>1, C5</td>
<td>Rebecca O Breese, Pei-Chun Chu, Paige Jacobs, Laura Buckner</td>
<td>Biology, Biochemistry, Zoology, Biological Science</td>
<td>There's More to Genes than Meets the Eye</td>
</tr>
<tr>
<td>1, C11</td>
<td>Philip Stuart Britt</td>
<td>Nuclear Engineering</td>
<td>Multiphase Turbulent Flow Visualization in a Nuclear Reactor Channel</td>
</tr>
<tr>
<td>Session, Group</td>
<td>Name</td>
<td>Degree Program(s)</td>
<td>Title</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Session 2, C13</td>
<td>Justin Jeffrey Whitaker Brooks</td>
<td>Nuclear Engineering; Joshua Earp Nuclear Engineering; Stephen Ramey Nuclear Engineering</td>
<td>Eliminating Transuranic Material Utilizing HE-MOX</td>
</tr>
<tr>
<td>Session 1, D18</td>
<td>Heather Christine Brown</td>
<td>Animal Science</td>
<td>Effects of Diet and Feeding Schedule on Equine Glucose Metabolism</td>
</tr>
<tr>
<td>Session 2, D6</td>
<td>Michael G Browne</td>
<td>Biomedical Engineering</td>
<td>Biomechanical Analysis of both a Globally Inspired and a Variable Movement Clubfoot Brace using a Surrogate Biomodel</td>
</tr>
<tr>
<td>Session 2, A9</td>
<td>Justin David Buie</td>
<td>Biology</td>
<td>Cortical Damage Impacts Ependymal Cell Homeostasis within the Mouse Neural Stem Cell Niche</td>
</tr>
<tr>
<td>Session 2, C16</td>
<td>Mary Patricia Bulfin</td>
<td>Biology</td>
<td>Identification of the Gene Responsible for the Chicken L Alloantigen by Whole Genome Association Mapping and Assessment of Potential Implications on Poultry Immunological Response</td>
</tr>
<tr>
<td>Session 1, C15</td>
<td>Morgan Elizabeth Carter</td>
<td>Biochemistry; Kimberly Amick Microbiology, William Kohlway IV Microbiology</td>
<td>Drivers of genome evolution: homing endonuclease genes in mycobacteriophages</td>
</tr>
<tr>
<td>Session 2, C25</td>
<td>Emily Rose Carr</td>
<td>Biology</td>
<td>Relative Quantification of N-linked Glycans on a Reverse Phase Chromatography Platform Coupled Online to Mass Spectrometry: Practical and Experimental Advantages Over HILIC Separation</td>
</tr>
<tr>
<td>Session 1, B22</td>
<td>Kristy M Casper</td>
<td>Animal Science</td>
<td>Bartonella Detection after Storage</td>
</tr>
<tr>
<td>Session 2, D4</td>
<td>Kaitlyn Eileen Casulli</td>
<td>Food Science</td>
<td>Effect of High Pressure Processing on Viscosity and Immunoglobulin G Content in Bovine Colostrum</td>
</tr>
<tr>
<td>Session 2, C20</td>
<td>Lauren Elizabeth Cates</td>
<td>Biology</td>
<td>Lionfish: Kudzu of the Caribbean</td>
</tr>
<tr>
<td></td>
<td>Marissa Herchler; Kayla Dennis; Patrick McCarthy; Jenna Montminy; Paige Harrethon; Kylie Glisson; Carolina Caro; Hannah Howard; Noelle Dalhouse; Rocco Colucci</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Session 2, C9

Joseph Aaron Cheek  
*Plant and Soil Sciences: Agronomic Science*

samantha cohen  
*biology*

Caitlin Davis  
*Horticultural Science*

Tony Mayer  
*Plant Biology*

Emily Robertson  
*Biochemistry*

christine kerrigan  
*(human biology)*

Andrew Scruggs  
*Horticulture Science*

Kaitlyn Casulli  
*Food Science*

Nicholas Lannon  
*Agricultural and Environmental Technologies & International Studies*

**World Food Security in 2050: Can we meet food, feed, and fuel needs?**  
*Agriculture and Life Sciences / Soil Science*

---

Session 2, A21

Justin Chew  
*Chemical Engineering*

**Electrocapillary Withdrawal of EGaIn from Microfluidic Channels**  
*Engineering / Chemical & Biomolecular Engineering*

---

Session 2, D15

Yeou Shya Chiou  
*Physics/Mathematics*

**Predictions of Supernova Neutrino signals in IceCube with Earth Matter Effects**  
*Physical and Mathematical Sciences / Physics*

---

Session 1, A23

Ellen L. Cho  
*Interdisciplinary Studies*

**The Present and Future Prospects of the Chilean Education System**  
*Humanities and Social Sciences / Interdisciplinary Programs*

---

Session 2, A11

Kayla Nicole Claassen  
*Biochemistry, Bioprocessing*

**Essential Oil Concentration and Grain Type Affect Broiler Ileal Traits at Market Age**  
*Agriculture and Life Sciences / Poultry Science*

---

Session 1, D6

Cashlyn Elizabeth Coburn  
*Biology*

Ian Chapman  
*Biological Sciences-Human Biology*

Blake Hess  
*Biological Sciences-Human Biology*

Sarah Finegan  
*Biological Sciences*

**A Comparative Study of Specific Neurological Diseases: Alzheimer's, Parkinson's and Schizophrenia**  
*Agriculture and Life Sciences / Biological Sciences*

---

Session 1, B15

Kristin Harr Cochran  
*Chemistry*

**Direct Analysis of Textile Fibers and Dyes Using MALDESI Mass Spectrometry**  
*Physical and Mathematical Sciences / Chemistry*

---

Session 1, D11

Lauren Margaret Cole  
* Biology*

Bernice Gyamfi  
*Nutrition Sciences*

Daljinder Bhangoo  
*Biological Sciences*

Jacey Byers  
*Nutrition Sciences*

Tiffany Matthews  
*Biological Sciences*

Iesha Arfeen  
*Biological Sciences*

Peyton Huneycutt  
*Biological Sciences*

Eric Pierce  
*Biological Sciences*

Emily Sayavong  
*Biological Sciences*

**The Effects of Maternal Obesity During Pregnancy on Offspring Health**  
*Agriculture and Life Sciences / Animal Science*

---

Session 1, C25

Casey Elizabeth Collins  
*Bioarchaeology*

**Can Resilience Theory Explain Changes in Consumerism?**  
*Humanities and Social Sciences / Sociology & Anthropology*

---

Session 2, D23

Michael Clifton Collins  
*Physics*

**Helium Diffusion, Solubility, and Permeability Measurements of nEDM Experiment Construction Materials**  
*Physical and Mathematical Sciences / Physics*
Session 1, A13  Morgan Leigh Collins  Animal Science  The effect of different feeding practices on blood glucose concentrations in horses.  Agriculture and Life Sciences / Animal Science

Session 2, A26  Katrina Elaine Connor  Food Bioprocessing and Nutrition  Natural Colorants as Alternatives to FD&C Yellow 5 in Pasteurized Pickle Products  Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences

Session 2, D26  Amanda Lee Cox  Chemical Engineering  Elastomeric Photovoltaics Derived from Microphase-Separated Block Ionomers  Engineering / Chemical & Biomolecular Engineering

Session 1, B18  Mary Ashleigh Craver  Biology  Nutrition and Dining at North Carolina State University and Beyond  Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences

Session 1, D32  Victoria Elizabeth Crisci  Biology  Identification of cell-type specific peptide ligands for human preadipocytes  Agriculture and Life Sciences / Microbiology

Session 1, C29  Colleen Nicole Crozier  Poultry Science  Jessica Pritchett  Animal Science; Christon Wiles  Zoology  The effects of nematode infection on eosinophil major basic protein and mast cell tryptase levels in the equine colon  Agriculture and Life Sciences / Population Health & Pathobiology

Session 2, D17  Tayla W Cunningham  Human Biology  The mutagenesis of the rpsL gene of Campylobacter rectus (ATCC 33238) to confer streptomycin resistance  Agriculture and Life Sciences / Microbiology

Session 1, C32  Lisa Ann D’Costa  Chemical Engineering  Self-propelling particles for enhanced absorption of oil spills  Engineering / Chemical & Biomolecular Engineering

Session 2, A1  Erika Anne Davis  Biological Sciences  Fiddler crab interspecific competition influences species? sediment choice in North Carolina salt marsh  Agriculture and Life Sciences / Biological Sciences

Session 2, A10  Meredith Lane Davis  Animal Science  Development of an Anatomy Laboratory Manual as a Study Aid for an Animal Science Course  Agriculture and Life Sciences / Animal Science

Session 1, C24  Kyle David Dean  Electrical & Computer Engr  FPGA-Driven Buck Converter for Low-Voltage Solar Panel Emulation  Engineering / Electrical & Computer Engineering

Session 1, B10  Richard McAlister Deans  Chemistry  Facile Synthesis of a Close Analogue of Vitamin B12  Physical and Mathematical Sciences / Chemistry

Session 1, B30  Alexander Michael Doane  Food Bioprocessing and Nutrition  Kenneth Miller  Bioprocessing Science; Dylan Page  Bioprocessing Science; Rachel Geiger  Bioprocessing Science; Aaron Anders  Bioprocessing  The Validation of Methods to Micro-Aerate the Fermentation of Red Ale Wort  Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences

Session 2, B22  Travis John Dunbar  Chemistry  Stability of 1-dodecyne-Capped Gold Nanoparticles in Solution  Physical and Mathematical Sciences / Chemistry

Session 2, D24  Mark Stradley Dyson  Biochemistry  B-Catenin: Target for Cancer Treatment  Engineering / Chemical & Biomolecular Engineering

Session 1, C30  Rahma K Elkamhawy  Food Bioprocessing and Nutrition  Is Toothpaste killing more than it's supposed to? : Environmental Impacts of Toothpaste  Education / Adult & Higher Education
<table>
<thead>
<tr>
<th>Session 1, B12</th>
<th>Manix Lukungu Eluhu</th>
<th>Biomedical Engineering</th>
<th>Tungsten-based Carbon Microelectrodes: A New Generation of Neurochemical Sensors?</th>
<th>Engineering / Biomedical Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1, C23</td>
<td>Amanda Marie English</td>
<td>Statistics</td>
<td>Analyzing the Release of Toxic Chemicals Over Time: Is it the Economy or the Environment?</td>
<td>Physical and Mathematical Sciences / Statistics</td>
</tr>
<tr>
<td></td>
<td>James Wrenn Statistics; Bomin Kim Statistics; William James Statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 1, C12</td>
<td>Kevin Favreau</td>
<td>Biology</td>
<td>Bailey Green Biology; Jenna Beck Biological Sciences: Integrated Physiology &amp; Neurobiology; Christopher Carr Biology</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
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<tr>
<td>Session 1, C14</td>
<td>Jordan Lindsey Ferguson</td>
<td>Biological Sciences</td>
<td>Hedgehog Signaling Controls Intestinal Rotation and Epithelial Cell Development in Xenopus laevis</td>
<td>Agriculture and Life Sciences / Molecular Biomedical Sciences</td>
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<tr>
<td>Session 2, A15</td>
<td>Cassandra Lynn Ferring</td>
<td>Animal Science</td>
<td>The Effect of Sire Breed on Birth Weight, Pre-Weaning Average Daily Gain, and Weaning Weight of Angus and Angus Cross Calves</td>
<td>Agriculture and Life Sciences / Animal Science</td>
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<tr>
<td>Session 1, A35</td>
<td>Emily Ford</td>
<td>Communication</td>
<td>Investigating Verbal Workplace Communication Behaviors</td>
<td>Humanities and Social Sciences / Communication</td>
</tr>
<tr>
<td>Session 2, D14</td>
<td>Eva Marie Frantz</td>
<td>Animal Science</td>
<td>Using Moodle Forums: ANS 230 Nutrition of Domestic Animals</td>
<td>Agriculture and Life Sciences / Animal Science</td>
</tr>
<tr>
<td>Session 2, A7</td>
<td>Christopher Robert Freeze</td>
<td>Materials Engineering</td>
<td>Improving Adhesion Forces of Chromium deposited onto Silicon Dioxide and Silicon Nitride Substrates</td>
<td>Engineering / Materials Science &amp; Engineering</td>
</tr>
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<td>Session 2, B8</td>
<td>Emma Rose Friberg</td>
<td>Biology</td>
<td>Modified Neurosphere Differentiation to Assay Neurotoxicants</td>
<td>Agriculture and Life Sciences / Genetics</td>
</tr>
<tr>
<td>Session 2, B4</td>
<td>Ariel Ruth Fugate</td>
<td>Interdisciplinary Studies</td>
<td>Perceptions of Community Food Systems</td>
<td>Humanities and Social Sciences / Sociology &amp; Anthropology</td>
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<tr>
<td>Session 2, A3</td>
<td>John W Galloway</td>
<td>Forestry</td>
<td>NCSU Solar Site Evaluation</td>
<td>Agriculture and Life Sciences / Forestry &amp; Environmental Resources</td>
</tr>
<tr>
<td>Session 1, A33</td>
<td>Miranda Lynn Ganci</td>
<td>Plant and Soil Science</td>
<td>Assessing the Affect of the Plant Pathogen, Pythium irregulare, and Vermicompost on Arbuscular Mycorrhizal Fungi in Strawberry Roots</td>
<td>Agriculture and Life Sciences / Crop Science</td>
</tr>
<tr>
<td>Session 1, A21</td>
<td>Hannah Elizabeth Gardner</td>
<td>Zoology</td>
<td>Zoonosis: the fear, recognition, and reaction to BSE</td>
<td>Agriculture and Life Sciences / Zoology</td>
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<td></td>
<td>Christian Tilley Human Biology; Samantha Goodwin; Alexis Barnes Human Biology; Jennifer Okpala</td>
<td></td>
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</tbody>
</table>
Stephanie Mayor; Jennine Lection Animal Science; Bridget Conley Microbiology; Katherine Boyette; Mary Klinck Agriculture Business; Zachary Spencer Poultry Science; Vanessa Wolf Animal Science; Eileen McAnarney Human Biology; Madison Roche Biology

Session 2, B7
Rachel Elizabeth Garris
Biochemistry
Reproducing results utilizing previous inoculation methods to determine if Bacteria is a factor in Disease in A1 and G2 species of Creeping Bentgrass
Agriculture and Life Sciences / Biological Sciences

Session 1, B31
Jillian Breidge Gilmartin
Meteorology & Marine Science
Influence Of the Madden Julian Oscillation On Nutrient Availability In the Galapagos Region
Physical and Mathematical Sciences / Marine Earth and Atmospheric Sciences

Session 2, C15
Brittany Nicole Glatz
Chemical Engineering
Increasing the Catalytic Activity of Immobilized Enzymes
Engineering / Chemical & Biomolecular Engineering

Session 2, C21
Elijah Ezekiel Gordon
Philosophy and Religious Studi
Study of Zinc Chloride aqueous solutions using UV-Vis Spectroscopic Techniques
Physical and Mathematical Sciences / Chemistry

Session 1, A5
Matthew David Gromlich
Plant Biology
Establishing a STEM Educational Program at the Boys Club of Wake County and Evaluating its Effectiveness to Increase Students? Interest in and Attitude Towards STEM Careers and Courses
Agriculture and Life Sciences / Mathematics, Science & Technology Education

Session 2, C2
Sarah Michelle Guess
Biomedical Engineering and Anthropology
Implementation of an Electronic Medical Record Keeping System via iPad in Santa Cruz La Laguna, Sololá, Guatemala
Humanities and Social Sciences / Sociology & Anthropology

Session 2, C3
Candice Lynn Gurkin
Biochemistry
The Preliminary Steps in Production of Biofuel from the Microalgae Tetraselmis chuii: Maintaining a Culture, Extraction of RNA and Creation of cDNA
Agriculture and Life Sciences / Biochemistry

Session 1, A18
Jennifer Nicole Hamilton
Animal Science
Analysis of Long-Term Culture of Pig Gonocytes
Agriculture and Life Sciences / Animal Science

Session 1, D29
Justyne Starr Hammond
Biochemistry, Human Biology
Proteomic Analysis of the Human Respiratory Ciliary Membrane using Streptavidin Affinity Purification and Liquid Chromatography-Tandem Mass Spectrometry
Agriculture and Life Sciences / Biochemistry

Session 1, B5
Kristin E Hartgrove
Horticultural Science; Plant Biology
Micromorphological Characterization of Leaf Structure of Three Cercis (Redbud) Botanical Varieties and an Ultra-pubescent Mutant by Scanning Electron Microscopy
Agriculture and Life Sciences / Horticultural Science

Session 2, A16
Sameera Hassan
Biology
Cameron Parnell Animal Science;
Global Drinking Water and Sanitation Challenges Demand Communal and Multifaceted Solutions
Agriculture and Life Sciences / Soil Science
<table>
<thead>
<tr>
<th>Session, Location</th>
<th>Name(s)</th>
<th>Title</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4, 2</td>
<td>Analiesel Hannes, Tatiana Suvorova, John Buchenberger, Amira Said</td>
<td>Microbiology; Human Biology; Biology</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
</tr>
<tr>
<td>A14</td>
<td>Molli Katharine Hayworth</td>
<td>Effects of Propolis on Honeybee Immunity</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
</tr>
<tr>
<td>C14</td>
<td>Kyle A Hemker, Mark Hunt, Tengjia Peng, Matthew Worth, Amber Purvis, Philip Britt</td>
<td>Transmuting TRU Material with Subcritical Annular Core Driven by a Fast Neutron Source</td>
<td>Engineering / Nuclear Engineering</td>
</tr>
<tr>
<td>B17</td>
<td>Giovanna Elizabeth Hernandez</td>
<td>Regulation of Gene Expression in Drosophila Midline Development</td>
<td>Agriculture and Life Sciences / Genetics</td>
</tr>
<tr>
<td>C9</td>
<td>Mark Edward Herring</td>
<td>Preschool Education in Agriculture/Nutrition Sciences: The Barriers in the Development and Implementation of Early Childhood Nutrition Intervention Curriculum</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
</tr>
<tr>
<td>B4</td>
<td>David Michael Higgins</td>
<td>Shoot apical meristem formation is controlled by physical protein-protein interactions of SEUSS and members of the BELL-LIKE HOMEODOMAIN family.</td>
<td>Agriculture and Life Sciences / Genetics</td>
</tr>
<tr>
<td>D13</td>
<td>Justin L. Hills, Jin Yin, Byrd Nichols</td>
<td>What Happens in Utero Does Not Stay in Utero: The Effects of Maternal Depression and Stress on Fetal Development</td>
<td>Agriculture and Life Sciences / Animal Science</td>
</tr>
<tr>
<td>A22</td>
<td>Jason Michael Hite</td>
<td>Subspace Methods for Gaussian Process Surrogate Construction</td>
<td>Engineering / Nuclear Engineering</td>
</tr>
<tr>
<td>A27</td>
<td>Ginger Danielle Hobgood</td>
<td>Exploring issues and making recommendations regarding the use of veterinary pharmaceuticals in animal production agriculture</td>
<td>Agriculture and Life Sciences / Poultry Science</td>
</tr>
<tr>
<td>D13</td>
<td>Alexis Jean Householder</td>
<td>Synthesis of 1,5-Disubstituted-2-Aminimidazole/Triazole Conjugates and Their Biological Activity</td>
<td>Physical and Mathematical Sciences / Chemistry</td>
</tr>
<tr>
<td>A7</td>
<td>Joseph Michael Hutchinson, Raaveel Sayed, Jennifer Nguyen, Joseph D'Alessandro</td>
<td>The Interconnectedness of the Human Body: Cardiovascular, Muscular, Nervous, and Immune Systems</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
</tr>
<tr>
<td>A22</td>
<td>Elizabeth W Hyde</td>
<td>Meeting the Welfare Needs of Captive Black Bears: The Effectiveness of Food Enrichment</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
</tr>
<tr>
<td>C4</td>
<td>Jennifer Hice Iyengar</td>
<td>Enabling dignified livelihoods through People-First Tourism</td>
<td>Natural Resources / Parks, Recreation &amp; Tourism Management</td>
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<td>Session, Code</td>
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<td>1, C1</td>
<td>Rochana Jayakumar, Biomedical Engineering</td>
<td>Background-Subtracted Fast-Scan Cyclic Voltammetry to Detect Reactive Oxygen Species</td>
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<tr>
<td>1, D9</td>
<td>Franchesca Camille Jones, Psychology</td>
<td>The Thoughts of Adolescents on Messages in Hip Hop Music</td>
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<tr>
<td>1, A16</td>
<td>Ashley Loray Jones, Plant Biology</td>
<td>Sensitized Genetic Backgrounds Reveal a Role of PERIANTHIA in Ovule Formation and AGAMOUS Repression</td>
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<tr>
<td>1, A20</td>
<td>Diana C. Joseph, Biology</td>
<td>Recommendations to Achieve Global Water and Sanitation</td>
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<tr>
<td>1, C1</td>
<td>Jodie Louise Joseph, Animal Science</td>
<td>Understanding the Pre-Veterinary Track Population Enrolled in a Professional Development Course</td>
<td></td>
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<tr>
<td>1, D31</td>
<td>Natalie Nadia Kandinata, Biochemistry</td>
<td>DNA Genotyping Using Agarose Gel Electrophoresis</td>
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<tr>
<td>1, C3</td>
<td>Jordan Reynolds Keith, Chemical Engineering</td>
<td>Kinetic and Thermochemical Analysis of Pericyclic Transition States in Glucopyranose Isomerization</td>
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<tr>
<td>1, D26</td>
<td>Hannah Deering Kellam, Biology</td>
<td>New Method of Teaching Introductory Biology Lab</td>
<td></td>
</tr>
<tr>
<td>1, C21</td>
<td>Levon P Keusseyan, Nuclear Engineering</td>
<td>D-T Fusion Neutron Source Shielding and Application Design</td>
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<tr>
<td>1, D25</td>
<td>Imad Khan, Biology</td>
<td>The Effect of Clofibrate on Renal Fatty Acid Oxidation in Neonatal Pigs</td>
<td></td>
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<tr>
<td>2, B18</td>
<td>Ashley Jeanne Kirby, Zoology</td>
<td>Veterinary Treatments on Museum Reptiles and Amphibians</td>
<td></td>
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<tr>
<td>1, B1</td>
<td>Melinda Elizabeth Klang, Biochemistry</td>
<td>The Asian Needle Ant</td>
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<tr>
<td>1, A9</td>
<td>Heidi Elizabeth Klumpe, Chemical Engineering</td>
<td>An alternative to antibiotics: engineering the CRISPR system to trigger autoimmunity in pathogenic bacteria</td>
<td></td>
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<tr>
<td>2, D20</td>
<td>Erika Ruth Koerner, International Studies</td>
<td>Europe's Zivilmacht State: Germany's current political identity within Europe and the effects of German-style policy making in the European Union</td>
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<tr>
<td>Session, Code</td>
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<td>1, C6</td>
<td>Effects of Genetic Mutations on Anatomy, Heritable, and Infectious Diseases</td>
<td>Effects of Genetic Mutations on Anatomy, Heritable, and Infectious Diseases</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
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<tr>
<td>2, C8</td>
<td>The Effects of Toxic Endophyte Positive Fescue Seed on Purine Derivatives in Angus Steers</td>
<td>The Effects of Toxic Endophyte Positive Fescue Seed on Purine Derivatives in Angus Steers</td>
<td>Agriculture and Life Sciences / Animal Science</td>
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<td>2, B3</td>
<td>Qualitative Assessment of Medical School Coursework Received by Third and Fourth Year Medical Students for the Treatment and Prevention of Childhood Obesity</td>
<td>Qualitative Assessment of Medical School Coursework Received by Third and Fourth Year Medical Students for the Treatment and Prevention of Childhood Obesity</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
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<tr>
<td>2, B12</td>
<td>Ecosystem fragmentation leads to utilization of a suboptimal prey type in endemic livebearing fishes of the Bahamas</td>
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<td>Agriculture and Life Sciences / Biological Sciences</td>
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<td>1, D16</td>
<td>Iodothyronine deiodinase type II and possible significance in sex change in the Bluehead wrasse (Thalassoma bifasciatum)</td>
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<td>Agriculture and Life Sciences / Zoology</td>
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<td>1, B24</td>
<td>Nanofibers of Water-Soluble Polymers via Foam Electrospinning</td>
<td>Nanofibers of Water-Soluble Polymers via Foam Electrospinning</td>
<td>Engineering / Chemical &amp; Biomolecular Engineering</td>
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<td>1, A27</td>
<td>A QCM Study of the Tribological Properties of Nanodiamonds</td>
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<td>Physical and Mathematical Sciences / Physics</td>
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<td>2, B13</td>
<td>Harnessing the Power of the Sun Through Metal to Metal Charge Transfer</td>
<td>Harnessing the Power of the Sun Through Metal to Metal Charge Transfer</td>
<td>Physical and Mathematical Sciences / Chemistry</td>
</tr>
<tr>
<td>1, B8</td>
<td>Population shifts in <em>Aspergillus flavus</em></td>
<td>Population shifts in <em>Aspergillus flavus</em></td>
<td>Agriculture and Life Sciences / Plant Pathology</td>
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<td>1, B23</td>
<td>Neonatal Bisphenol A exposure alters sexually dimorphic gene expression in the postnatal rat hypothalamus</td>
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<td>Agriculture and Life Sciences / Biological Sciences</td>
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<td>1, B20</td>
<td>Tetracycline Residues in Porcine Stomach</td>
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<td>Agriculture and Life Sciences / Population Health &amp; Pathobiology</td>
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<tr>
<td>2, A17</td>
<td>Osseointegration Paired with Whole Body Vibration</td>
<td>Osseointegration Paired with Whole Body Vibration</td>
<td>Engineering / Biomedical Engineering</td>
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<td>1, A15</td>
<td>Using Past Histories, Milk Testing, and Hormone Testing to Predict Mare Foaling Dates</td>
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<td>Agriculture and Life Sciences / Animal Science</td>
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<td>2, D12</td>
<td>The effect of small interfering proteins on Drosophila melanogaster development</td>
<td>The effect of small interfering proteins on Drosophila melanogaster development</td>
<td>Agriculture and Life Sciences / Genetics</td>
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</table>
Session 1, B21  **Steven Mark Maddox**  
*International Studies-International Relations Concentration*  
An analytical look at the immigration policy of Spain  
**Humanities and Social Sciences / Foreign Languages & Literatures**

Session 2, B21  **Madiha S Malik**  
*Graphic Design*  
Glorifying the Holy Script: The Past and Present of Islamic Calligraphy and Typography  
**Design / Graphic Design**

Session 2, A20  **Emily Katherine Marquez**  
*Biology*  
Using Gene Strips to Aid Understanding of Topics Related to DNA and RNA Sequences in Introductory Genetics  
**Agriculture and Life Sciences / Honors Teaching Students**

Session 1, B29  **Caleb A Marshall**  
*Physics*  
Influential Beta-Decay Rates In The Rare Earth Peak: An r-Process Sensitivity Study  
**Physical and Mathematical Sciences / Physics**

Session 2, D3  **Kevin Trevor Martell**  
*Psychology*  
The Effects of Self-Consciousness on Job Performance in a Customer Service Setting  
**Humanities and Social Sciences / Psychology**

Session 1, A8  **Alexa Kathryn Martin**  
*Biology*  
A Qualitative Assessment of the Preference of Fruits and Vegetables among Preschoolers  
**Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences**

Session 2, C11  **Courtland Hamilton Matthews**  
*International Studies*  
Maritime Piracy in Southeast Asia and East Africa  
**Humanities and Social Sciences / Sociology & Anthropology**

Session 2, B2  **Molly Anastasia Matty**  
*Genetics*  
Development and application of an assay to determine relative telomere length in Mus musculus as compared to a single copy gene, epidermal growth factor receptor, using real time quantitative PCR  
**Agriculture and Life Sciences / Genetics**

Session 1, B33  **Logan Robert Maxwell**  
*Chemical Engineering*  
Production of Eutectic Gallium Indium Micro-Droplets  
**Engineering / Chemical & Biomolecular Engineering**

Session 1, C28  **Geoffrey Benjamin Maxwell**  
*Biochemistry*  
Procaspsase-7 Purification and Crystallization  
**Agriculture and Life Sciences / Biochemistry**

Session 1, C31  **Christina Alice Grace McChesney**  
*Biology*  
Survival and Mobility of an Intein within an Essential Protein of Mycobacteriophage Astraea  
**Agriculture and Life Sciences / Microbiology**

Session 2, D19  **Kelsey Leigh McDonald**  
*Human Biology*  
The Effectiveness of Learning Objectives  
**Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences**

Session 1, B13  **Anna Noel Carolyn McKain**  
*Animal Science*  
Assessment of Vector Competence for Tick Species of North Carolina  
**Agriculture and Life Sciences / Clinical Sciences**

Session 1, D22  **Ryan Hampton McNamara**  
*Food Bioprocessing and Nutrition*  
New Milk Flavor Could Open Old Doors  
**Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences**
<table>
<thead>
<tr>
<th>Session, Room</th>
<th>Title</th>
<th>Presentation Details</th>
<th>Department</th>
</tr>
</thead>
</table>
| Session 2, B19 | Catherine Grace McVey  
Animal Science | Equine QFBR: A Computational Approach to Equine Temperament Analysis                                      | Engineering / Animal Science         |
| Session 1, D21 | Hadeer Usama Metwally  
Biochemistry | Background-subtracted fast-scan cyclic voltammetry to detect reactive nitrogen species                   | Physical and Mathematical Sciences / Chemistry               |
| Session 2, D10 | Summer Dawn Mims  
Physics | Nickel-Catalyzed Cross-Coupling of Pyridine Derivatives with Grignard Reagents using an Aminohydroxyphosphine Ligand | Physical and Mathematical Sciences / Chemistry               |
| Session 2, C5  | Alison N. Mitchell  
Biology | Teacher Perceptions on Inquiry-Based Nutritional Educational Program in Low Income Preschools           | Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences |
| Session 2, D25 | Brinda Monian  
Chemical Engineering | Use of Supercharged GFP to Deliver Binding Proteins into Mammalian Cells                                | Engineering / Chemical & Biomolecular Engineering            |
| Session 1, B14 | Joseph Anthony Moo-Young  
Chemical Engineering, Textile Engineering | Molecular Dynamics Simulations of Carbon Nanotube-Polythiophene Interactions                             | Textiles / Textile Engineering, Chemistry & Science           |
| Session 1, D30 | Megan Alyse Morse  
Genetics | Correlation between Genotype and Mouse Limb Length                                                      | Agriculture and Life Sciences / Genetics                  |
| Session 1, B25 | Travis W Morton  
Physics | Computational study of polyaminocarboxylate interactions with La(III) ions                              | Physical and Mathematical Sciences / Chemistry               |
| Session 2, D28 | Matthew Bijan Movassaghi  
Animal Science | Molecular Characterization and Comparison of Multidrug Resistant (MDR) Salmonella isolated from Humans and Swine in North Carolina | Agriculture and Life Sciences / Population Health & Pathobiology |
| Session 2, C7  | Asia Jacqueline Murphy  
Wildlife Sciences | Turning Up the Heat: Effects of Artificial Temperature Increase on Post-Dispersal Seed Predation        | Agriculture and Life Sciences / Biological Sciences         |
| Session 2, B15 | Daniel Lawson Norris  
Animal Science | Historical Prevalence of Infectious Veterinary Disease In Wartime                                         | Humanities and Social Sciences / History                      |
| Session 2, A8  | Chigozirim Okey-Nwamara  
Nutrition Science | Barriers in Implementing a Positive Mealtime Environment in a Preschool Classroom                      | Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences |
| Session 1, B2  | Lindsey Marie Pandorf  
Human Biology | Developing Training Tools to Evaluate Mealtime Emotional Climate of Teachers in a Preschool Setting     | Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences |
| Session 2, B25 | Brian Christopher Parham  
International Cultural Studies | Community Investment and Conservation in Ecuador                                                        | Humanities and Social Sciences / Interdisciplinary Programs  |
| Session 1, B19 | Cameron Tyler Parsons  
Food Bioprocessing and Nutrition  
Tim Carver Food Science; Robert Price Food Science; Chaunyetta Barkley Food Science | Improved Shelf Life of Chocolate Milk                                                                  | Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences |
<table>
<thead>
<tr>
<th>Session, Location</th>
<th>Author(s)</th>
<th>Title</th>
<th>Department(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 2, B9</td>
<td>Breanna Lauren Pasko</td>
<td>The contribution of macrophage dynamin-mediated endocytosis to Borrelia burgdorferi sonicate- and culture supernatant-elicited Type I IFN response</td>
<td>Agriculture and Life Sciences / Microbiology</td>
</tr>
<tr>
<td>Session 1, C33</td>
<td>Nishika Shina Patel</td>
<td>Neuropeptide Y and Leptin Receptor mRNA Expression in Brain Tissue of a Teleost Fish, the Hybrid Striped Bass</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
</tr>
<tr>
<td>Session 1, D20</td>
<td>Hitesh R Patel</td>
<td>The Role of Arabidopsis Response Regulator 7 (ARR7) in Gemivirus Infection</td>
<td>Agriculture and Life Sciences / Biochemistry</td>
</tr>
<tr>
<td>Session 2, D1</td>
<td>Caleb Dale Pearce</td>
<td>Fungicide Resistance of U.S. Phytophthora infestans Pathogens</td>
<td>Agriculture and Life Sciences / Plant Pathology</td>
</tr>
<tr>
<td>Session 2, A29</td>
<td>Daniel Evan Piephoff</td>
<td>Size-Induced Nanoscale Segregation of Midblock-Selective Cosolvents in Microphase-Ordered Triblock Copolymers</td>
<td>Engineering / Chemical &amp; Biomolecular Engineering</td>
</tr>
<tr>
<td>Session 1, D2</td>
<td>Jessica Christine Piner</td>
<td>A Qualitative Assessment of the Motivators and Facilitators for Teachers and Administrators for Nutrition Education in Preschool Classrooms</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
</tr>
<tr>
<td>Session 1, C22</td>
<td>Dean Stanley Pixton</td>
<td>Improving Patient Flow through a Cancer Hospital?s Infusion Clinic</td>
<td>Engineering / Industrial &amp; Systems Engineering</td>
</tr>
<tr>
<td>Session 2, A25</td>
<td>Dayne A Plemmons</td>
<td>Synthesis and Characterization of Environmentally-Benign Biopolymer Nanoparticles</td>
<td>Engineering / Chemical &amp; Biomolecular Engineering</td>
</tr>
<tr>
<td>Session 1, A1</td>
<td>Ashlee Marie Plummer</td>
<td>Modification of inhibitor binding in the distal cavity by L100 site mutations in dehaloperoxidase-hemoglobin</td>
<td>Physical and Mathematical Sciences / Chemistry</td>
</tr>
<tr>
<td>Session 1, D17</td>
<td>Gayatri Pongur Snigdha</td>
<td>Hybrid Renewable-Energy System for Battery Extension Targeting Mobile Applications.</td>
<td>Engineering / Electrical &amp; Computer Engineering</td>
</tr>
<tr>
<td>Session 1, A17</td>
<td>Bradley Glynn Poston</td>
<td>Source of calcium increase produced by histamine in human adipose-derived stem cells</td>
<td>Agriculture and Life Sciences / Zoology</td>
</tr>
<tr>
<td>Session 2, C24</td>
<td>Elizabeth Ashley Pragar</td>
<td>Analyzing Copy Number Aberrations of Tumor Suppressor Genes and Oncogenes In Feline Sarcoma</td>
<td>Agriculture and Life Sciences / Molecular Biomedical Sciences</td>
</tr>
<tr>
<td>Session 2, D7</td>
<td>Michele Lee Price</td>
<td>Everyone Says You Are What You Eat</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
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<td>Session 2, C19</td>
<td>Kira Ashton Pruitt</td>
<td>Inducing Early Flowering in Tobacco using a PVX Viral Expression System</td>
<td>Agriculture and Life Sciences / Crop Science</td>
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<td>Session 2, B26</td>
<td>Arjun Puri Biomedical Engineering</td>
<td>Effect of Low Magnitude, High Frequency Vibrations on Rotator Cuff Tendon</td>
<td>Engineering / Biomedical Engineering</td>
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<td>Session 1, D4</td>
<td>Joshua David Quinn Biology; Wesley Yang Biochemistry;</td>
<td>Ethical Issues Regarding Genetically Modified Organisms</td>
<td>Agriculture and Life Sciences / Genetics</td>
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<td>Colleen Fleming Biology; John Encarnacion Biology; Wesley Sayre Biology</td>
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<td>Session 1, A32</td>
<td>Andrew Wayne Radford Biology</td>
<td>Bioenergy Production Using Trees at Wastewater Treatment Facilities</td>
<td>Natural Resources / Forestry &amp; Environmental Resources</td>
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<td>Session 2, D9</td>
<td>Travis Wayne Radford Biology; Steven Clark Biological Sciences; Andrew</td>
<td>Etiology of Amyotrophic Lateral Sclerosis</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
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<td>Nagler Biological Sciences; Andrew Blank Biological Sciences; Pourva Apte</td>
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<td>Session 1, C2</td>
<td>Mariam Rashid Biology</td>
<td>Assessing Preschool Teachers’ Definition of a Positive Mealtime Environment</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
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<td>Session 2, B23</td>
<td>Charlotte Emily Rastas Biology</td>
<td>Sequencing and Evolutionary Analyses of SEPALATA-1 Genes in the Dogwood Family</td>
<td>Agriculture and Life Sciences / Plant Biology</td>
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<td>Session 2, C12</td>
<td>Chelsea Robyn Ratzlaff Nuclear Engineering</td>
<td>Role of Shaped Electrodes on Secondary Electron Emission in Glow Discharges</td>
<td>Engineering / Nuclear Engineering</td>
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<td>Session 2, D2</td>
<td>Hannah Renee Reese Chemical Engineering</td>
<td>The use of a hydrophilically modified charcoal as a pretreatment of transgenic plant extract for the separation of antibodies</td>
<td>Engineering / Chemical &amp; Biomolecular Engineering</td>
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<td>Session 1, D14</td>
<td>Brooke Elizabeth Reimer Human Biology &amp; Nutrition Science</td>
<td>Attitudes, knowledge, and beliefs of health care providers regarding the use of donor human milk in the NICU</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
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<td>Session 1, D27</td>
<td>Allison Ruth Rhodes Biology</td>
<td>A Research Model for Childhood Obesity: The Effects of Overfeeding on Commercial Piglets</td>
<td>Agriculture and Life Sciences / Animal Science</td>
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<td>Heather Ann Marie Roberts Food Bioprocessing and Nutrition Jeffrey</td>
<td>Validation of CO2 Control Systems used in Fermentation</td>
<td>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</td>
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<td>Pineda Bioprocessing Science; Campbell Stubbs IV Bioprocessing Science;</td>
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<td>William Hughes Bioprocessing Science</td>
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<td>Session 1, B11</td>
<td>Katie Elaine Robertson Zoology</td>
<td>The ontogeny of stress coping behavior in the zebrafish, Danio rerio</td>
<td>Agriculture and Life Sciences / Biological Sciences</td>
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<td>Session 1, D33</td>
<td>Thea Esme Roper Chemical Engineering</td>
<td>Human Adipose-Derived Stem Cells Exhibit Changes in the Conformation and Lineage Specification of Primary Cilia in Response to Chemical and Mechanical Stimuli</td>
<td>Engineering / Biomedical Engineering</td>
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<td>James Rudolph Rowland</td>
<td>Physics</td>
<td>Lissajous Figures as a Model for Neutrino Oscillations</td>
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<td>Teal Russell</td>
<td>Biochemistry</td>
<td>Endothelial cell micropatterning for engineering vascularized tissue constructs</td>
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<td>Session 1, B7</td>
<td>Supriya Sadagopan</td>
<td>Biochemistry; Sunny BhatheLA</td>
<td>Disruptions of Endocrine Signaling and Potential Therapeutic Treatments using Tissue Engineering and Prevention through Environmental Toxin Identification</td>
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<td>Session 1, C20</td>
<td>Audreyanna Salinas</td>
<td>Biological Sciences: Molecular, Cellular, Developmental Biology</td>
<td>Exploring the Binding Affinities of Genistein to Estrogen Receptors by the Use of Site Mutagenesis</td>
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<td>Session 1, D24</td>
<td>Pooja K Sarin</td>
<td>Biomedical Engineering</td>
<td>Hyperthermophilic Enzyme Immobilization on Nanofibrous Supports</td>
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<td>Session 1, D8</td>
<td>Christopher William Schaefer</td>
<td>Parks, Recr &amp; Tourism Mgmt</td>
<td>Psychological Attachment and the Influences of Constraints and Motivations: A Study on the Students of North Carolina State University</td>
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<td>Session 1, D1</td>
<td>Michael Fredrick Schwartz</td>
<td>Plant Biology/Biology</td>
<td>SEU and BUM1 affect shoot apical meristem termination and vegetative to floral transition in Arabidopsis thaliana</td>
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<td>Session 1, C17</td>
<td>Emily Gibson Seberger</td>
<td>Biological Sciences</td>
<td>Genetics in Human Affairs: An Audience Response System (ARS) strategy to improve grades in the classroom</td>
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<td>Eric F Seders</td>
<td>Biology</td>
<td>Oral Health Education and Hygiene Practices in Elementary-Aged Children</td>
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<td>Session 1, C35</td>
<td>Deanna Michelle Sedlak</td>
<td>Animal Science</td>
<td>Comparison of Protocols for Ovulation Synchronization (Ov-Synch) and Timed Artificial Insemination (TAI) of Goats</td>
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<td>Session 2, A6</td>
<td>Ronnie Labib Shammas</td>
<td>Biology</td>
<td>Effects of a Collaborative Active Learning Format for Introductory Biology on Student Performance and Higher Order Thinking</td>
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<td>Session 2, D27</td>
<td>Brandi LaShea Shaw</td>
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<td>Origami Folding of Polymer Sheets by Local Light Absorption</td>
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<td>Session 2, B14</td>
<td>Heather Leigh Shipman</td>
<td>Environmental Technology</td>
<td>Hydrologic and Scaling Study of an Inactive Hog Farm</td>
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<td>Session 2, A28</td>
<td>Nikolai Leonid Sigmon</td>
<td>Chemical Engineering</td>
<td>Thermal Protective Properties of ALD Coated Fibers</td>
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<td>Shikha Singh</td>
<td>Textile Engineering Chem &amp; Sci</td>
<td>Duke Hospital Research PACU Data Manipulation</td>
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<td>Miles Patrick Smaxwell</td>
<td>Psychology</td>
<td>JavaTutor: The Influence of Learning Environment and Engagement Level on Conceptual Change</td>
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<td>Session 2, B29</td>
<td>Colin Travis Smith</td>
<td>Mechanical &amp; Aerospace Engr</td>
<td>Modeling the Effects of Microgravity on Overall Proximal Tibia Bone Stiffness</td>
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<td>Aravind Somasundaram</td>
<td>Biology</td>
<td>Stacy Ingram Biology; Nikki Brandon Biology; Alexander Melvin Biology</td>
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<td>Session 2, D11</td>
<td>Aravind Somasundaram</td>
<td>Biology</td>
<td>BIO 483: Parkinson's Disease</td>
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<td>Session 2, C10</td>
<td>Jodi Coons Soto</td>
<td>Microbiology</td>
<td>Berberine traps the influenza A hemagglutinin in the Golgi Apparatus</td>
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<td>Session 1, B26</td>
<td>Jeanine Rafiq Soufan</td>
<td>Political Science</td>
<td>Becoming Mainstream: The LGBT Movement</td>
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<td>Session 2, C6</td>
<td>Hillary Beth Spangler</td>
<td>Food Bioprocessing and Nutrition</td>
<td>Comparing Children's Fruit and Vegetable Preferences: Using a Pictorial Tool Versus a Tasting Assessment</td>
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<td>Session 2, A23</td>
<td>Rochelle Denise Strednak</td>
<td>Plant Biology</td>
<td>Novel Polyunsaturated Omega-3 Oil Genes from Wild Soybean</td>
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<td>Session 1, B32</td>
<td>Alyssa E Stubbs</td>
<td>Geology</td>
<td>Computer Tomography Investigations into Cranial Pneumaticity in a Fossil Diving Bird</td>
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<td>Session 1, A12</td>
<td>Medha Surampudy</td>
<td>Political Science</td>
<td>Comparative Approaches to Transitional Justice in the Former Yugoslavia</td>
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<td>Session 1, A26</td>
<td>Kendra Sutton</td>
<td>Food Science and Nutrition</td>
<td>Haiti Fruit Bar Project</td>
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<td>Session 2, C22</td>
<td>Claire Ingrid Svendsen</td>
<td>Food Bioprocessing and Nutrition</td>
<td>Chemical Comparison of North Carolina and California Cabernet Sauvignon</td>
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<td>Session 1, B17</td>
<td>Holly Christine Sweeney</td>
<td>Mathematics</td>
<td>Do Heatwaves Impact Ground Level Ozone Levels?</td>
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<td>Session 2, A12</td>
<td>Amber D Taylor</td>
<td>Chemistry</td>
<td>Aniline catalyzed hydrazone formation for the derivatization of N-linked glycans</td>
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<td>Session 1, C7</td>
<td>Jordan Daniel Taylor</td>
<td>Biology</td>
<td>Kenzi Stemp Biology; Taylor Shropshire Biological Oceanography</td>
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Session 2, D8  
**Joseph Tokeshi Taylor**  
*Marine Earth & Atmospheric Sciences*  
Predicting Observed Soil Moisture Using Statistical Modeling  
**Physical and Mathematical Sciences / Marine Earth and Atmospheric Sciences**

Session 1, B6  
**Ian Robert Thompson**  
*Environmental Technology and Management*  
**Kryie Hooton**  
*Environmental Technology and Management; Sarah Leichter*  
*Biological Sciences*  
The Importance of the Amazon Rainforest, Coral Reefs, and Honey Bees as Indicators of Environmental Degradation.  
**Agriculture and Life Sciences / Biological Sciences**

Session 1, A6  
**Catherine Teressa Thriveni**  
*Biology*  
**Franklin Beeninga**  
*Biological Sciences; Krina Patel**  
*Human Biology; Kylie Broderick*  
*International Studies*  
Language Processing and Motor Function Impairment in Neurological Disorders: A Focus on Huntington's Disease and Schizophrenia  
**Agriculture and Life Sciences / Biological Sciences**

Session 1, D3  
**Andrew Charles Tibbits**  
*Chemical Engineering*  
Engineering of Biopolymer Particles for Foam Stabilization  
**Engineering / Chemical & Biomolecular Engineering**

Session 1, A24  
**Edward Philips Tomlinson**  
*Chemical Engineering*  
Thermally Activated Optically Functional Surface Features  
**Engineering / Chemical & Biomolecular Engineering**

Session 2, A18  
**Taylor Alexander Treadaway**  
*Genetics*  
Gene Level Pain Expression in Feline Associated Degenerative Joint Disease  
**Agriculture and Life Sciences / Animal Science**

Session 2, B28  
**Rachel Lynne Turner**  
*Biology*  
Characterization of a recombinant Metallosphaera sedula lipase (Msed_1072) for algae biofuel production  
**Agriculture and Life Sciences / Microbiology**

Session 2, A24  
**Sarah Louise Turner**  
*Human Biology*  
**Mackenzie Stevens**  
*Animal Science; Taylor DeMorat**  
*Biology; Valerie Asadian*  
*Integrative Neurobiology and Physiology; Melissa Zinter**  
*Human Biology; Traci Barbour**  
*Human Biology; Amanda Choi**  
*Human Biology*  
The Effects of Chronic and Acute Maternal Stress on Postnatal Health  
**Agriculture and Life Sciences / Animal Science**

Session 1, B28  
**Luis Miguel Valencia**  
*Interdisciplinary Studies*  
Mi Casa NO Es Su Casa: Colombian natural resources and the effects of Neoliberalism on Indigenous and Afroc- Colombian communities.  
**Humanities and Social Sciences / Interdisciplinary Programs**

Session 2, B10  
**Courtney Michelle Vaughn**  
*Biology*  
**Caelia Park**  
*Biochemistry; Ryan McMillan**  
*Biochemistry; Danyell Tetreault**  
*Zoology; Jeannie Paik**  
*Biochemistry; Peter Le Biochemistry; Gabrielle Kattan**  
*Human Biology*  
Mercury: Fact and Fiction  
**Agriculture and Life Sciences / Biochemistry**
Nicole Bolick  Human Biology; Morgan Carter  Biochemistry; Hadeer Metwally  Biochemistry; Nidhi Gandhi  Biochemistry; Megan Davis  Biology; Lavanya Rao  Biochemistry; Grace Jones  Biology

**Session 1, C10**  
Akshitha Vijayakumar  
*Biochemistry*  
Clay Gruber  *Biology*; Austin Graves  *Biological Sciences*; Heather Hill  *Biochemistry*; Megan Fruchte  *Biological Engineering*  
A Putative tmRNA of Mycobacteriophage Astraea  
*Agriculture and Life Sciences / Microbiology*

**Session 1, D10**  
Melissa Erin Vinson  
*Polymer and Color Chemistry*  
Forensic Analysis of Disperse Dyes on Polyester  
*Textiles / Textile Engineering, Chemistry & Science*

**Session 1, A31**  
Keiko Marie Wadsworth  
*Microbiology*  
Environmental Carcinogen-induced Retinal Degeneration in a Population-based Mouse Model  
*Agriculture and Life Sciences / Genetics*

**Session 2, B27**  
Samantha Lenore Walker  
*Zoology*  
The Effects of Nosema on Honey Bee (Apis mellifera) queens.  
*Agriculture and Life Sciences / Entomology*

**Session 1, A11**  
Kirsty Jane Ward  
*Biochemistry*  
Dhaval Patel  *Biology*; Courtney Maguire  *Microbiology, German Language*; Noukon Chanthamavong  *Biology*; Shaneice Mitchell  *Biochemistry*  
Nanotechnology Applications in Medicine: Drug Delivery to Diagnostics to Tissue Engineering  
*Engineering / Chemical & Biomolecular Engineering*

**Session 1, B34**  
Andre Kurepa Waschka  
*Applied Mathematics/Economics*  
Optimizing the BCS Tournament Format  
*Management / Economics*

**Session 1, D7**  
Julia Michelle Washburn  
*Biology*  
Jessica Proctor  *Zoology*; Karinna Alvarez Trujillo  *Biology*; Hira Faisal  *Biology*  
Advancements in Medical Technology and Anesthesiology: Treatments for Skin Cancer, Rabies and Spinal Muscular Atrophy  
*Agriculture and Life Sciences / Biological Sciences*

**Session 1, C27**  
Julie Ann Wasko  
*Food Science*  
Nick Fragedakis  *Food Science*; Anita Shek  *Food Science*; Amanda Burgess  *Food Science*  
Alternative Use for Sweet Potato Processing By-Products  
*Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences*

**Session 1, B9**  
Anne M Watson  
*Physics*  
Characterization of the Morphology and Performance of Differently Cast Organic Thin-Film Transistors  
*Physical and Mathematical Sciences / Physics*

**Session 1, A28**  
Mark Konczal Wetherington  
*Physics*  
Characterization of P3HT Films Grown by Thermal Evaporation in High Vacuum  
*Physical and Mathematical Sciences / Physics*

**Session 1, B16**  
Joshua James Wheeler  
*Biochemistry*  
Thomas George  *Biological Sciences-Human Biology*; Mary Austin  *Animal Science*; Jared Davis  *Zoology*  
Research and Technology in Gene Therapy  
*Agriculture and Life Sciences / Animal Science*
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<tr>
<th>Session 2, A5</th>
<th>Jennifer Renee Wheeley</th>
<th>Qualitative Assessment of Third and Fourth Year Medical School Students Knowledge of Childhood Obesity Gained from Clinical Rotations</th>
<th>Agriculture and Life Sciences / Food, Bioprocessing, and Nutrition Sciences</th>
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<td>De'Ja Alexander</td>
<td>Biological Sciences</td>
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<td>Brittany Lang</td>
<td>Human Biology</td>
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<td>Session 2, C27</td>
<td>Stephen Evans White</td>
<td>Introducing Tunable Shape-Memory Effects into Thermoplastic Elastomers</td>
<td>Engineering / Chemical &amp; Biomolecular Engineering</td>
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<td>Session 2, A4</td>
<td>Amanda M Wilkins</td>
<td>Gibberellic Acid and Liquid Smoke Influence Seed Germination of Verbena bonariensis</td>
<td>Agriculture and Life Sciences / Horticultural Science</td>
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<td>Session 2, B24</td>
<td>Necho Durelle Williams</td>
<td>The precedence of Trademarks, Services marks, Small Businesses and the relationship to current state of the Economy.</td>
<td>Agriculture and Life Sciences / Agricultural &amp; Resource Economics</td>
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<td>Business Management</td>
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<td>Megan Elizabeth Williamson</td>
<td>Genetics in Medicine: Implications for Healthcare</td>
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<td>Samantha Lane</td>
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<td>Mallory Cochran</td>
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<td>Session 1, A29</td>
<td>Stephanie George Wilson</td>
<td>An Evaluation of a Parent Tutoring Reading Fluency Program</td>
<td>Humanities and Social Sciences / Psychology</td>
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<td>Session 2, C28</td>
<td>Meghan Elizabeth Wilt</td>
<td>Lignin as a Material Platform for Bio-Derived Macromolecules and Fibers</td>
<td>Textiles / Textile Engineering, Chemistry &amp; Science</td>
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<td>Session 2, B20</td>
<td>Rebecca S Wood</td>
<td>Comparison of Extraction Methods for Natural Yellow Color from Sweet Potato Leaves</td>
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<td>Session 2, B5</td>
<td>Alyssa Bryn Worf</td>
<td>Fruit and Vegetable Familiarity Among Preschoolers</td>
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<td>Michael Thomas Wyngarden</td>
<td>Binding Properties and Function of M. undulatus Estrogen Receptors with Chlordane and the Effects of Amino Acid Mutation on Binding</td>
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<td>Shinhae Yoon</td>
<td>Understanding the role of blood flow in Registration of Hematopoietic development</td>
<td>Agriculture and Life Sciences / Microbiology</td>
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<td>James Taylor York</td>
<td>Assessment of Air Quality Trends Near Roadways</td>
<td>Physical and Mathematical Sciences / Statistics</td>
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<td>Aaron Lamb</td>
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<td>Christine Anne Zabel</td>
<td>Lionfish: Kudzu of the Caribbean</td>
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<td>Katherine Cassady</td>
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Overall Summary of Participants and Presentations

Total Participants = 482 (Lead Student Presenters: 252 / Co-Presenters: 230)
Total Posters = 252

Summary of Presentations by Content Area
Adult & Higher Education = 1
Agricultural & Resource Economics = 1
Animal Science = 24
Biochemistry = 9
Biological Sciences = 30
Biomedical Engineering = 6
Chemical & Biomolecular Engineering = 24
Chemistry = 15
Clinical Sciences = 2
Communication = 1
Crop Science = 3
Economics = 1
Electrical & Computer Engineering = 5
Entomology = 2
Environmental Sciences & Natural Resources Academic Programs = 1
Food, Bioprocessing, and Nutrition Sciences = 28
Foreign Languages & Literatures = 1
Forestry & Environmental Resources = 2
Genetics = 12
Graphic Design = 1
History = 1
Honors Teaching Students = 1
Horticultural Science = 2
Industrial & Systems Engineering = 1
Interdisciplinary Programs = 4
Marine Earth and Atmospheric Sciences = 3
Materials Science & Engineering = 1
Mathematics, Science & Technology Education = 1
Microbiology = 11
Molecular Biomedical Sciences = 3
Nuclear Engineering = 7
Parks, Recreation & Tourism Management = 2
Physics = 11
Plant Biology = 2
Plant Pathology = 2
Political Science = 2
Population Health & Pathobiology = 3
Poultry Science = 3
Psychology = 5
Sociology & Anthropology = 4
Soil Science = 3
Statistics = 3
Textile Engineering, Chemistry & Science = 5
Zoology = 3

Summary by College (Participant's Main Mentor)
Agriculture and Life Sciences = 146
Design = 1
Education = 2
Engineering = 43
Humanities and Social Sciences = 17
Management = 1
Natural Resources = 4
Physical and Mathematical Sciences = 33
Textiles = 5

Participant's Classification:
Seniors : 160 (Lead Student Presenters) / 77 (Co-Presenters) (237)
Juniors : 57 (Lead Student Presenters) / 61 (Co-Presenters) (118)
Sophomores : 25 (Lead Student Presenters) / 48 (Co-Presenters) (73)
Freshmen : 9 (Lead Student Presenters) / 44 (Co-Presenters) (53)