Office of Student Research

APPALACHIAN STATE UNIVERSITY

Welcome to the 2019 Annual Celebration of Student Research and Creative Endeavors sponsored by the Office of Student Research. The Office of Student Research (OSR) was established in 2005 in order to expand the opportunities for undergraduate and graduate students to engage in research and mentored scholarship at Appalachian State University. We firmly believe that students who understand how discoveries are made in their chosen fields are well-prepared to address the unsolved problems of the future. We are so pleased to host this annual event.

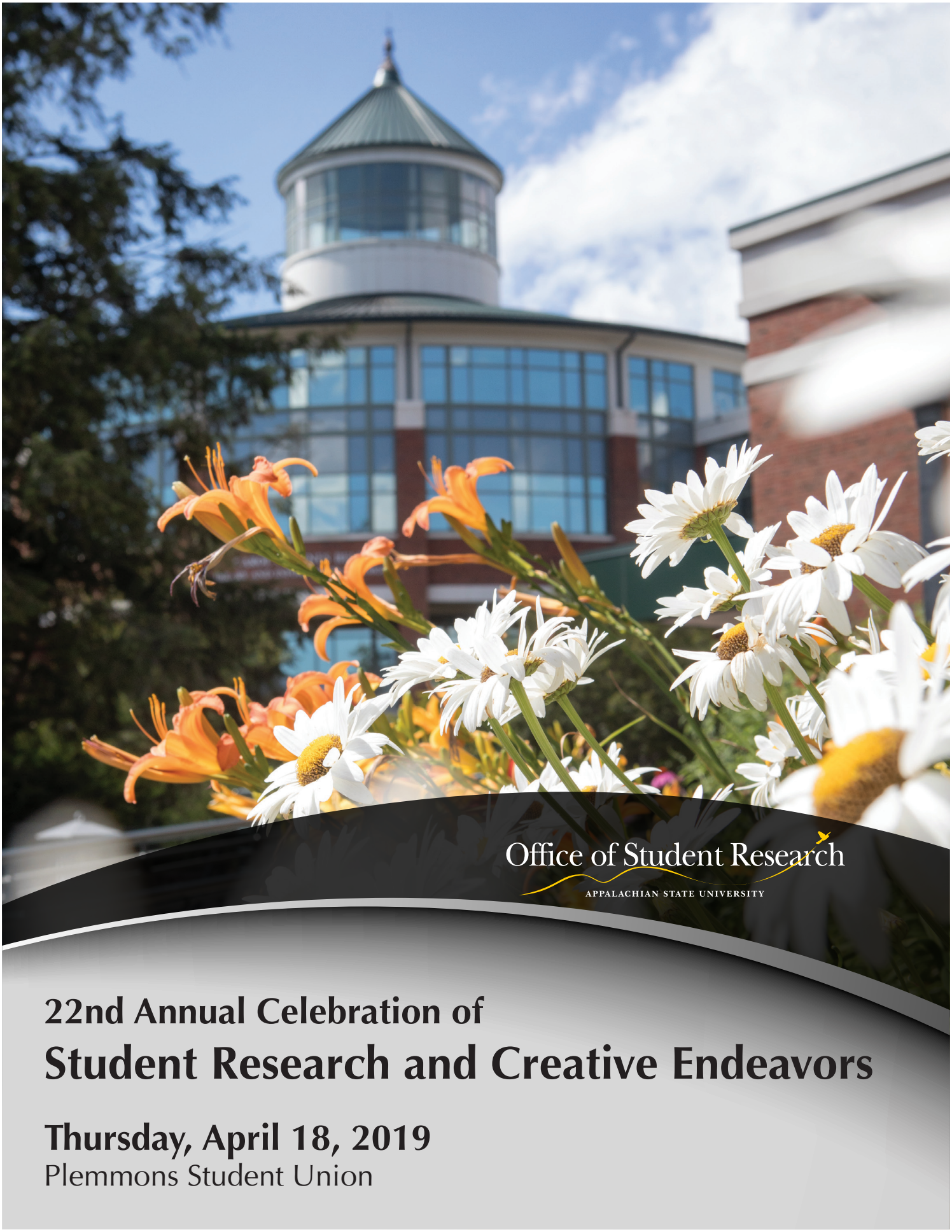
Today marks our 22nd year of celebrating student engagement in research and creative endeavors. However, I want to point out that today also marks the 10th year we have hosted the Student Poster Competition. For the past 10 years, this competition has continued to be a highlight of our event. In 2010, the first competition included 60 entrants - 27 Graduate and 33 Undergraduate students. This year we had 96 students submit abstracts for the competition - 41 Graduate and 55 Undergraduate students. From these, Faculty from various disciplines selected the top 10 student abstracts from each group - a task that is challenging - as there are many well deserving students. Today, at our Celebration, the top abstracts are presented to a panel of faculty judges from which the top 3 posters in each category (Graduate and Undergraduate) are selected and announced during our remarks at 1:15pm.

Much of the work presented today could not be accomplished without dedicated faculty. We would like to thank all of the Faculty that engage students in research and creative activities. We are pleased to honor the winner of our 3rd Annual Undergraduate Research Mentorship Excellence Award.

We hope you engage with the many student presenters and award winners. Included in our events today are the announcement of the Aportfolio Scholars Chancellor's Choice Award as well as the student winner of the Student Research Competition on Latin American or Latino/Hispanic Subjects. Events such as this allow attendees and participants to discover some of the amazing activities occurring across campus and celebrate the advancements these students have made with their research or creative endeavor. These advancements will make our campus, community and world a better place.

Please visit the Office of Student Research website to find out more about student research on campus. We strive to support and assist students and faculty in their efforts to engage in research and creative endeavors. We are so very thankful to have the ability to fund such amazing work and that is in large part to the support from the following areas: Office of Academic Affairs, Office of Student Affairs, Cratis D. Williams Graduate School, Office of Research, Office of International Education and Development, and University College. Finally, a special thank you to the Advisory Board of the Office of Student Research, the faculty reviewers and moderators for today's event and to the staff in the Office of Student Research which include Kathy Weaver Stevens and our Graduate Assistant Zach Leicht.

Rebecca A. Battista, Ph.D., FACSM
Director, Office of Student Research



22nd Annual Celebration of

Student Research and Creative Endeavors

Thursday, April 18, 2019

Plemmons Student Union

The Office of Student Research would like to thank our past and present OSR Advisory Board members for serving in this capacity.

Founding Advisory Board Members – Office of Student Research

(established 2005)

- **Dr. George Barthalmus,** *North Carolina State University*
- **Dr. Nicole Bennett,** *Department of Chemistry*
- **Ms. Shari Galiardi,** *Service Learning*
- **Mr. David Huntley,** *Watauga Global Communities*
- **Dr. Bob Johnson,** *Cratis D. Williams Graduate School*
- **Dr. Lisa McAnulty,** *Department of Nutrition and Healthcare Management*
- **Dr. Jeff McBride,** *Department of Health and Exercise Science*
- **Dr. Ozzie Ostwalt,** *Department of Philosophy & Religion*
- **Mr. Jay Sutton,** *Department of Athletics*
- **Dr. Rahman Tashakkori,** *Department of Computer Science*
- **Ms. Cindy Wallace,** *Division of Student Development*
- **Dr. Mark Zrull,** *Department of Psychology*

Current Advisory Board Members – Office of Student Research

- **Dr. Andrew Bellemer,** *Department of Biology*
- **Dr. Brooke Christian,** *Department of Chemistry*
- **Dr. Jeremy Ferrell,** *Department of Sustainable Technology and the Built Environment*
- **Dr. April Flanders,** *Department of Art*
- **Dr. Amy Galloway,** *Department of Psychology*
- **Dr. Emily Lakey,** *Department of Communication Sciences and Disorders*
- **Dr. Cathy Marcum,** *Department of Government and Justice Studies*
- **Dr. Scott Marshall,** *Department of Geological and Environmental Sciences*
- **Dr. Kim McCullough,** *Department of Communication Sciences and Disorders*
- **Dr. Rachel Wilson,** *Department of Curriculum and Instruction*
- **Dr. Mark Zrull,** *Department of Psychology*
- **Dr. Kevin Zwetsloot,** *Department of Health and Exercise Science*

10th Annual Student Research Poster Competition

Overview: The Office of Student Research is pleased to celebrate the 10th anniversary of our annual Student Research Poster Competition. This competition includes both undergraduate and graduate categories. Each student presenter had an option to submit their abstract for consideration in the competition. A total of 96 posters: 55 undergraduate and 41 graduate posters were submitted into the competition. From these a panel of judges determined the top 10 finalists for each category (finalists are listed below).

Each student will make a 3-5 minute presentation and answer questions from the judges regarding their poster during our morning session. The posters will be evaluated on the following categories: background/rationale, methods or approach to the question, concluding statements/ findings, student's level of leadership/involvement in the project, student's overall understanding of the project/ creative endeavor, student's ability to answer questions on the project and poster appearance.

Finalists for the Undergraduate Student Research Poster Competition

Student	Faculty Mentor	Title
Anna Ruth Carmichael *	Dr. Rebecca Kappus *Department of Health and Exercise Science*	ESTROGEN EFFECTS ON CARDIOVASCULAR FUNCTION
Tierney Daw *	Dr. Mary Kinkel *Department of Biology*	A ZEBRAFISH MODEL OF GUT MOTILITY
Allison Dombrowski *	Dr. Sarah Carmichael *Department of Geological and Environmental Sciences*	A GLOBAL PERSPECTIVE ON LATE DEVONIAN EXTINCTION EVENTS
Brianna Hibner *	Dr. Cole Edwards *Department of Geological and Environmental Sciences*	USING SULFUR ISOTOPES FROM CARBONATE ROCKS TO IDENTIFY ANOXIA DURING THE LATE DEVONIAN: IMPLICATIONS FOR CAUSES OF THE LATE DEVO
Indigo Hollister *	Dr. Jordan Hazelwood *Department of Communication Sciences and Disorders*	SPEECH-LANGUAGE PATHOLOGY GRADUATE STUDENT CLINICIANS' SELF-PERCEIVED COMPETENCY IN DYSPHAGIA MANAGEMENT
Bryson Honeycutt *	Dr. Cole Edwards *Department of Geological and Environmental Sciences*	CARBON ISOTOPE ANALYSIS OF LATE DEVONIAN CARBONATES, WESTERN UNITED STATES: IN SEARCH OF ANOXIA AND THE CAUSE OF THE LATE DEVON
Carly Maas *	Dr. William Anderson *Department of Geological and Environmental Sciences*	AUGMENTED WETLAND IN URBAN TOPOGRAPHY TO MITIGATE SALT CONTAMINATION
Erica Pauer *	Dr. Howard Neufeld *Department of Biology*	THE ROLE OF LEAF ANGLE AND ITS INFLUENCE ON POTENTIAL GAS EXCHANGE IN AN EVERGREEN HOLLY
Caroline Shriver *	Dr. Twila Wingrove *Department of Psychology*	AN EXAMINATION OF DRUNKOREXIA: CALORIE REGULATION PRIOR TO ALCOHOL CONSUMPTION AMONG COLLEGE STUDENTS
John Stevens IV *	Dr. Megen Culpepper *Department of Chemistry*	ACTIVITY OPTIMIZATION OF DIMETHYLSULFIDE MONOOXYGENASE FROM HYPHOMICROBIUM SULFONIVORANS USING FLAVIN REDUCTASE MIMIC PROTEINS

Finalists for the Graduate Student Research Poster Competition

Student	Faculty Mentor	Title
Elizabeth Bailey *	Dr. Maggie Sugg *Department of Geography and Planning*	WEARABLE SENSORS FOR PERSONAL AMBIENT TEMPERATURE EXPOSURE ASSESSMENTS: A VALIDATION STUDY
Amelia Bruce *	Dr. Alan Needle *Department of Health and Exercise Science*	THE EFFECTS OF BRAIN STIMULATION ON NEURAL EXCITABILITY AND FUNCTION IN INDIVIDUALS WITH CHRONIC ANKLE INSTABILITY
David Burton *	Dr. Jon Davenport *Department of Biology*	THE RELATIONSHIP BETWEEN ZOOPLANKTON ASSEMBLAGES AND PREDATORY SALAMANDERS IN PONDS OF THE CENTRAL OZARKS, MISSOURI
Arina Cotuna *	Dr. Kurt Michael *Department of Psychology*	EVALUATING THE EFFECTIVENESS OF COGNITIVE BEHAVIORAL THERAPY IN RURAL APPALACHIAN SCHOOLS
Elizabeth Derrick *	Dr. Christine Leist *School of Music*	AN EXPLORATION OF MUSIC THERAPY FOR RELATIONSHIP COMPLETION IN INDIVIDUALS RECEIVING HOSPICE CARE: A MULTIPLE CASE STUDY
Thomas Hastings *	Dr. Jon Davenport *Department of Biology*	USING PHYSIOLOGICAL CONDITIONS TO ASSESS PATTERNS OF SUBARCTIC WOOD FROG (RANA SYLVATICA) HABITAT SUITABILITY
Timothy Kinlaw *	Dr. Jonathan Sugg *Department of Geography and Planning*	WARM SEASON HYDROCLIMATIC VARIABILITY AND CHANGE IN THE APPALACHIAN REGION OF THE SOUTHEASTERN U.S. FROM 1950-2018
Zachary Leicht *	Dr. Kevin Zwetsloot *Department of Health and Exercise Science*	VEGAN VS. WHEY PROTEIN: EFFECTS OF DIFFERENT PROTEIN SOURCES ON MEASURES OF OXIDATIVE STRESS FOLLOWING ECCENTRIC EXERCISE
Katelyn Meaux *	Dr. Martin Root *Department of Nutrition and Healthcare Management*	DIETARY PLANT PROTEIN AND THE PROGRESSION OF METABOLIC SYNDROME OVER NINE YEARS
Zachary Ripic *	Dr. Herman van Werkhoven *Department of Health and Exercise Science*	THE RELATIONSHIP BETWEEN PLANTARFLEXOR MOMENT ARM, MUSCLE ACTIVATION PATTERNS, AND GAIT VELOCITY IN ELDERLY

The top 3 posters for each category (undergraduate and graduate) will be determined and an awards ceremony will take place at 1:15 pm following our introductory remarks.

Funding for the awards was provided by the Office of Student Research and the Cratis D. Williams Graduate School.

2019 Aportfolio Scholars "Chancellor's Choice" Award

This award honors and acknowledges an Appalachian State University student who develops an outstanding, creative, scholarly, and professional Aportfolio. The winner of this award is selected as an exemplar and their ePortfolio will be added to the Aportfolio site in our top tier directory.

Aportfolios Students applying for the award were challenged to create an ePortfolio that shows awareness of profession audiences, uses intentional visual design, creates an invitational and intuitive navigational structure, honors the privacy, intellectual property and copyrights of self and others, creates clear connections to learning and life experience and highlights samples from a variety of their best work by summarizing the impact, insights and integration of college learning and experiences

The 2019 Aportfolio Scholar winner is

Nadia Livesay
Nutrition Sciences Program

Honorable Mention – Runner Up

Jenny Marie Shoener
Recreation Management Program

Undergraduate Research Mentorship Excellence Award

The Office of Student Research invites nominations each spring for the Undergraduate Research Mentorship Excellence Award. Now in its third year, this award has seen over 90 students nominate over 50 faculty from various disciplines. This award recognizes faculty members who have demonstrated an outstanding commitment to mentoring undergraduate student researchers as well as supporting and promoting the undergraduate research and creative activity initiatives on campus.

Students were asked to nominate faculty and discuss the specific qualities that made their mentor a perfect candidate for the award and explain how their mentor affected their undergraduate education at Appalachian. Nominated Faculty members were then evaluated on their consistent track record of mentoring undergraduate students as well as supporting and encouraging students to present and publish their research or creative endeavors. Many of the Faculty nominated are often role models in their field.

We are pleased to announce the 2018 award winner was Dr. Ellen Cowan from the Department of Geological and Environmental Sciences. This is the second year in a row this Department has had a Faculty win this award.

Dr. Cowan is a Professor in the Department of Geological and Environmental Sciences. Her research area is in glacial-marine sedimentology and sediment transport of coal ash.

Dr. Cowan's students stated the following:

"Since becoming an undergraduate research assistant over a year ago, I've made a significant contribution to the scientific community and presented my research at the annual Geologic Society of America convention in Seattle, Washington! Thanks to her, I feel like I have a purpose and it has given me so much confidence."

"I cannot thank Dr. Cowan enough for giving me the opportunities that allowed me to see that my career path is not as linear as I thought it was before attending. While Dr. Cowan is my research advisor, she also takes a genuine interest in my personal goals and aspirations."

Congratulations again to Dr. Cowan!

The 2019 Undergraduate Research Mentorship Excellence Award will be announced during our awards ceremony at 1:15pm.

The Office of Student Research would like to thank all of the students who nominated their Faculty Mentors and all of the Faculty Mentors for making a significant impact on students.

Student Research Competition

on Latin American or Hispanic/Latinx Subject

APP Unidos, the Hispanic/Latinx Faculty and Staff Association at Appalachian State University, in collaboration with the Office of Student Research, announces the **Second Annual AppState Latin American and Hispanic Research Day** as part of AppState's Celebration of Student Research and Creative Endeavors.

APP Unidos invites all AppState students to submit a paper that relates to a Latin American or Hispanic/Latinx subject in any field. Student presentations will take place from 11 AM to 12 PM on Thursday, April 18, 2019 in the Multicultural Center on the first floor of the Plemmons Student Union.

A panel of faculty judges will evaluate and award prizes to the top three submissions. Winners will be recognized in the afternoon Research Day Awards Ceremony.

Deadline for submissions is
Monday, April 15, 2019 by 5:00 PM
Send an electronic version of the paper, along with an abstract that includes the title, subject, student's name and department to Dr. René Horst at horstrh@appstate.edu

Appalachian STATE UNIVERSITY

Office of Student Research

APPALACHIAN STATE UNIVERSITY

RESEARCH DAY SCHEDULE 2019

MORNING (9:00 AM - 11:40 AM)

Room	Session	Time	#	Presenter(s)	
Beacon Heights 417	Oral	9:00 AM	1	Jeff Miller	
	Oral	9:20 AM	2	Lucian Murray	
	Oral	9:40 AM	3	Greg Rapp	
	Oral	10:00 AM	4	Matthew Winters	
Rough Ridge 415	Oral	10:20 AM	5	Logan Clark	
	Oral	10:40 AM	6	Isabel Sullivan	
	Oral	11:00 AM	7	Nichole Annas	
	Oral	11:20 AM	8	Sarah Quinn	

	Mentor(s)	Title
	Dr. Brooke Hester *Department of Physics and Astronomy*	DETERMINATION OF ELASTIC MODULUS OF CELLS USING OPTICAL TWEEZERS
	Dr. Brooke Hester *Department of Physics and Astronomy*	MEASUREMENTS OF PROTEIN BINDING VIA FLUORESCENCE SPECTROSCOPY
	Dr. Brooke Hester *Department of Physics and Astronomy*	TEMPERATURE DETERMINATION OF OPTICALLY TRAPPED PARTICLES
	Dr. Brock Stoddard *Department of Economics*	RISK PREFERENCES AND PERSONALITY TRAITS
	Dr. Matt Estep *Department of Biology*	DEVELOPMENT OF MICROSATELLITE MARKERS AND EVALUATION OF SPECIES BOUNDARIES BETWEEN LIATRIS HELLERI AND LIATRIS TURGIDA
	Dr. Jennifer Geib *Department of Biology*	GENETIC DIFFERENTIATION OF ALPINE BUMBLE BEES ACROSS THE CENTRAL COLORADO ROCKY MOUNTAINS
	Dr. Emily Dakin *Department of Social Work*	DEMENTIA CARE AND SOCIAL WORK IN RURAL APPALACHIA
	Mrs. Susan Lutz *Department of Theatre and Dance*	UTOPIA: THE CHOREOGRAPHIC DISPLAY OF AN EXPLORATION OF MODERN AND NEOCLASSICAL DANCE WHICH EXPLORES THE IDEA OF CONTENTMENT

MORNING (9:00 AM - 12:00 NOON)

Room	Session	Time	#	Presenter(s)	
Undergraduate Poster Finalists Parkway Ballroom 420	Poster	9:00 AM–12:00 PM	P1U	Anna Ruth Carmichael *	
	Poster	9:00 AM–12:00 PM	P2U	Tierney Daw *	
	Poster	9:00 AM–12:00 PM	P3U	Allison Dombrowski *	
	Poster	9:00 AM–12:00 PM	P4U	Brianna Hibner *	
	Poster	9:00 AM–12:00 PM	P5U	Indigo Hollister *	
	Poster	9:00 AM–12:00 PM	P6U	Bryson Honeycutt *	
	Poster	9:00 AM–12:00 PM	P7U	Carly Maas *	
	Poster	9:00 AM–12:00 PM	P8U	Erica Pauer *	
	Poster	9:00 AM–12:00 PM	P9U	Caroline Shriver *	
	Poster	9:00 AM–12:00 PM	P10U	John Stevens IV *	

	Mentor(s)	Title
	Dr. Rebecca Kappus *Department of Health and Exercise Science*	ESTROGEN EFFECTS ON CARDIOVASCULAR FUNCTION
	Dr. Mary Kinkel *Department of Biology*	A ZEBRAFISH MODEL OF GUT MOTILITY
	Dr. Sarah Carmichael *Department of Geological and Environmental Sciences*	A GLOBAL PERSPECTIVE ON LATE DEVONIAN EXTINCTION EVENTS
	Dr. Cole Edwards *Department of Geological and Environmental Sciences*	USING SULFUR ISOTOPES FROM CARBONATE ROCKS TO IDENTIFY ANOXIA DURING THE LATE DEVONIAN: IMPLICATIONS FOR CAUSES OF THE LATE DEVO
	Dr. Jordan Hazelwood *Department of Communication Sciences and Disorders*	SPEECH-LANGUAGE PATHOLOGY GRADUATE STUDENT CLINICIANS' SELF-PERCEIVED COMPETENCY IN DYSPHAGIA MANAGEMENT
	Dr. Cole Edwards *Department of Geological and Environmental Sciences*	CARBON ISOTOPE ANALYSIS OF LATE DEVONIAN CARBONATES, WESTERN UNITED STATES: IN SEARCH OF ANOXIA AND THE CAUSE OF THE LATE DEVON
	Dr. William Anderson *Department of Geological and Environmental Sciences*	AUGMENTED WETLAND IN URBAN TOPOGRAPHY TO MITIGATE SALT CONTAMINATION
	Dr. Howard Neufeld *Department of Biology*	THE ROLE OF LEAF ANGLE AND ITS INFLUENCE ON POTENTIAL GAS EXCHANGE IN AN EVERGREEN HOLLY
	Dr. Twila Wingrove, *Department of Psychology*	AN EXAMINATION OF DRUNKOREXIA: CALORIE REGULATION PRIOR TO ALCOHOL CONSUMPTION AMONG COLLEGE STUDENTS
	Dr. Megen Culpepper *Department of Chemistry and Fermentation Sciences*	ACTIVITY OPTIMIZATION OF DIMETHYLSULFIDE MONOOXYGENASE FROM HYPHOMICROBIUM SULFONIVORANS USING FLAVIN REDUCTASE MIMIC PROTEINS

MORNING (9:00 AM - 12:00 NOON)

Room	Session	Time	#	Presenter(s)	
Graduate Poster Finalists Parkway Ballroom 420	Poster	9:00 AM–12:00 PM	P1G	Elizabeth Bailey *	
	Poster	9:00 AM–12:00 PM	P2G	Amelia Bruce *	
	Poster	9:00 AM–12:00 PM	P3G	David Burton *	
	Poster	9:00 AM–12:00 PM	P4G	Arina Cotuna *	
	Poster	9:00 AM–12:00 PM	P5G	Elizabeth Derrick *	
	Poster	9:00 AM–12:00 PM	P6G	Thomas Hastings *	
	Poster	9:00 AM–12:00 PM	P7G	Timothy Kinlaw *	
	Poster	9:00 AM–12:00 PM	P8G	Zachary Leicht *	
	Poster	9:00 AM–12:00 PM	P9G	Katelyn Meaux *	
	Poster	9:00 AM–12:00 PM	P10G	Zachary Ripic *	

	Mentor(s)	Title
	Dr. Maggie Sugg *Department of Geography and Planning*	WEARABLE SENSORS FOR PERSONAL AMBIENT TEMPERATURE EXPOSURE ASSESSMENTS: A VALIDATION STUDY
	Dr. Alan Needle *Department of Health and Exercise Science*	THE EFFECTS OF BRAIN STIMULATION ON NEURAL EXCITABILITY AND FUNCTION IN INDIVIDUALS WITH CHRONIC ANKLE INSTABILITY
	Dr. Jon Davenport *Department of Biology*	THE RELATIONSHIP BETWEEN ZOOPLANKTON ASSEMBLAGES AND PREDATORY SALAMANDERS IN PONDS OF THE CENTRAL OZARKS, MISSOURI
	Dr. Kurt Michael *Department of Psychology*	EVALUATING THE EFFECTIVENESS OF COGNITIVE BEHAVIORAL THERAPY IN RURAL APPALACHIAN SCHOOLS
	Dr. Christine Leist *School of Music*	AN EXPLORATION OF MUSIC THERAPY FOR RELATIONSHIP COMPLETION IN INDIVIDUALS RECEIVING HOSPICE CARE: A MULTIPLE CASE STUDY
	Dr. Jon Davenport *Department of Biology*	USING PHYSIOLOGICAL CONDITIONS TO ASSESS PATTERNS OF SUBARCTIC WOOD FROG (RANA SYLVATICA) HABITAT SUITABILITY
	Dr. Jonathan Sugg *Department of Geography and Planning*	WARM SEASON HYDROCLIMATIC VARIABILITY AND CHANGE IN THE APPALACHIAN REGION OF THE SOUTHEASTERN U.S. FROM 1950-2018
	Dr. Kevin Zwetsloot *Department of Health and Exercise Science*	VEGAN VS. WHEY PROTEIN: EFFECTS OF DIFFERENT PROTEIN SOURCES ON MEASURES OF OXIDATIVE STRESS FOLLOWING ECCENTRIC EXERCISE
	Dr. Martin Root *Department of Nutrition and Healthcare Management*	DIETARY PLANT PROTEIN AND THE PROGRESSION OF METABOLIC SYNDROME OVER NINE YEARS
	Dr. Herman van Werkhoven *Department of Health and Exercise Science*	THE RELATIONSHIP BETWEEN PLANTARFLEXOR MOMENT ARM, MUSCLE ACTIVATION PATTERNS, AND GAIT VELOCITY IN ELDERLY

MORNING (9:00 AM - 12:00 NOON)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420	Poster	9:00 AM–12:00 PM	P1.1	Keighly Adams	
	Poster	9:00 AM–12:00 PM	P1.2	Sarah Allred	
	Poster	9:00 AM–12:00 PM	P1.3	Oscar Armengolt	
	Poster	9:00 AM–12:00 PM	P1.4	Angelina Azieva	
	Poster	9:00 AM–12:00 PM	P1.5	Hannah Bagli	
	Poster	9:00 AM–12:00 PM	P1.6	Sydney Bear	
	Poster	9:00 AM–12:00 PM	P1.7	Garett Bonds	
	Poster	9:00 AM–12:00 PM	P1.8	Abie Bonevac	
	Poster	9:00 AM–12:00 PM	P1.9	Frances Claire Brown	
	Poster	9:00 AM–12:00 PM	P1.10	Hannah Bush	
	Poster	9:00 AM–12:00 PM	P1.11	Jessica Chambers	
	Poster	9:00 AM–12:00 PM	P1.12	Kaitlin Clancy	
	Poster	9:00 AM–12:00 PM	P1.13	Lisl Doughton	
	Poster	9:00 AM–12:00 PM	P1.14	Abbey Feather	
	Poster	9:00 AM–12:00 PM	P1.15	Emily Fedders	
	Poster	9:00 AM–12:00 PM	P1.16	Hannah Field	
	Poster	9:00 AM–12:00 PM	P1.17	Kelsey Fish	
	Poster	9:00 AM–12:00 PM	P1.18	Gita Gajjar	
	Poster	9:00 AM–12:00 PM	P1.19	Katrina Godsey	
	Poster	9:00 AM–12:00 PM	P1.20	Myles Grady	

	Mentor(s)	Title
	Dr. Erin Bouldin *Department of Health and Exercise Science*	THE RELATIONSHIP BETWEEN STUDENT ATHLETES AND DEPRESSION AT APPALACHIAN STATE UNIVERSITY
	Dr. Dana Brackney *Department of Nursing*	EFFECTS OF BIRTH ATTENDANT ON MATERNAL OUTCOMES: MIDWIFE VERSUS PHYSICIAN
	Dr. Cynthia Liutkus-Pierce *Department of Geological and Environmental Sciences*	USING ANCIENT SOIL COLOR AND MINERALOGY TO TRACK CLIMATE AND ENVIRONMENTAL CHANGES DURING THE EARLY MIOCENE AT LOPEROT, KENYA
	Dr. Nicholas Shaw *Department of Chemistry and Fermentation Sciences*	TOWARD STEREOSELECTIVE SYNTHESIS OF RESVERATROL USING SOMS NANO-REACTORS
	Dr. Elizabeth Shay *Department of Geography and Planning*	PERCEIVED SAFETY OF PEDESTRIANS IN ENVIRONMENTS WITH SELF DRIVING CARS
	Dr. Suzanna Brauer *Department of Biology*	METHANOGEN COMMUNITIES IN PEATLANDS OF NORTH AMERICA
	Dr. Ece Karatan *Department of Biology*	THE ROLE OF BIOFILM FORMATION AND POLYAMINE UTILIZATION IN COLONIZATION OF ZEBRAFISH BY VIBRIO CHOLERAE
	Dr. Elizabeth Shay, *Department of Geography and Planning*	KEY INFORMANT PERCEPTIONS OF FLOODING AND LANDSLIDES IN WESTERN NORTH CAROLINA, USA FOLLOWING THE 2018 FLOODS AND LANDSLIDES
	Dr. Brooke Hester Department of Physics and Astronomy	HEAT REGULATED SAMPLE CHAMBER TO MAINTAIN OPTIMAL THERMAL CONDITIONS FOR BIOLOGICAL CELL MICROSCOPY
	Dr. Baker Perry *Department of Geography and Planning*	OBSERVATIONS OF SNOW PARTICLE CHARACTERISTICS DURING THE 9-10 DECEMBER 2018 MAJOR SNOWSTORM IN THE SOUTHERN APPALACHIAN MOUNTAIN
	Dr. Twila Wingrove *Department of Psychology*	ATTITUDES TOWARD A CRIMINAL CASE: HOW DOES FRAMING RAPE AS AN ACT OF INTERGROUP VIOLENCE RELATE TO CONVICTIONS?
	Dr. Geri Miller *Department of Human Development and Psychological Counseling*	OPIATE ADDICTION AND PAIN MANAGEMENT: OVERVIEW OF COUNSELING APPROACHES
	Dr. Victor Mansure *School of Music*	THE ELEMENTS OF ART AND MUSIC IN THE ORGANIZATION OF THE CREATIVE PROCESS
	Dr. Lisa Curtin *Department of Psychology*	THE THERAPEUTIC ALLIANCE IN THE CONTEXT OF A BRIEF MOTIVATIONAL INTERVENTION FOR COLLEGE STUDENT ALCOHOL USE
	Dr. William Anderson *Department of Geological and Environmental Sciences*	RIPARIAN SALT STORAGE AND RELEASE ALONG HEADWATER STREAMS IN THE NEW RIVER WATERSHED
	Dr. William Armstrong *Department of Geological and Environmental Sciences*	ANALYSIS OF PROGLACIAL LAKE CHANGE ACROSS NORTHWESTERN NORTH AMERICA UTILIZING REMOTELY SENSED DATA
	Dr. Geri Miller *Department of Human Development and Psychological Counseling*	THE USE OF EVIDENCE-BASED PRACTICES WITH OPPRESSED POPULATIONS
	Dr. Andrew Bellemer *Department of Biology*	THE ROLE OF THOR AND THE EIF4F COMPLEX IN NOCICEPTOR SENSITIVITY
	Dr. Suzanna Brauer *Department of Biology*	ACID MINE DRAINAGE IN THE NEW RIVER: HOW CAN WE USE MICROORGANISMS TO CLEAN UP?
	Dr. John Whitehead *Department of Economics*	ECONOMIC IMPACT OF HEMLOCK WOOLLY ADELGID IN WESTERN NORTH CAROLINA

MORNING (9:00 AM - 12:00 NOON)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420	Poster	9:00 AM–12:00 PM	P1.21	Nadine Gregory	
	Poster	9:00 AM–12:00 PM	P1.22	Noah Gregory	
	Poster	9:00 AM–12:00 PM	P1.23	Allison Griggs	
	Poster	9:00 AM–12:00 PM	P1.24	Tyler Harris	
	Poster	9:00 AM–12:00 PM	P1.25	Jessie Hatcher	
	Poster	9:00 AM–12:00 PM	P1.26	Tania Katherine Ita Vargas	
	Poster	9:00 AM–12:00 PM	P1.27	Daniel Jeffries	
	Poster	9:00 AM–12:00 PM	P1.28	Laura Johnston	
	Poster	9:00 AM–12:00 PM	P1.29	Taylor Le	
	Poster	9:00 AM–12:00 PM	P1.30	Seth Longbottom	
	Poster	9:00 AM–12:00 PM	P1.31	Elisa MacGoun	
	Poster	9:00 AM–12:00 PM	P1.32	Ashlee Myers	
	Poster	9:00 AM–12:00 PM	P1.33	Rowan Parris	
	Poster	9:00 AM–12:00 PM	P1.34	Ella Clare Phillips	
	Poster	9:00 AM–12:00 PM	P1.35	Hannah Phillips	
	Poster	9:00 AM–12:00 PM	P1.36	Anna Rich	
	Poster	9:00 AM–12:00 PM	P1.37	Mitchell Roberts	
	Poster	9:00 AM–12:00 PM	P1.38	Jessica Robinson	
	Poster	9:00 AM–12:00 PM	P1.39	Elsie Rodriguez	
	Poster	9:00 AM–12:00 PM	P1.40	Israel Sanchez	

	Mentor(s)	Title
	Dr. Melissa Gutschall *Department of Nutrition and Healthcare Management*	DIFFERENCES IN ACHIEVING DIETETICS COMPETENCIES THROUGH THE COMMUNITY AND UNIVERSITY SETTING
	Dr. Jefferson Bates *Department of Chemistry and Fermentation Sciences*	STRUCTURAL AND ENERGETIC PROPERTIES OF FCC & BCC MATERIALS FROM ADVANCED DENSITY FUNCTIONALS
	Dr. Cara Fiore *Department of Biology*	THE DISTRIBUTION AND ECOLOGY OF FRESHWATER SPONGES IN WESTERN NORTH CAROLINA
	Dr. Brooke Christian *Department of Chemistry and Fermentation Sciences*	SOD2 OVEREXPRESSION AFFECTS MOUSE HEPATIC OXPHOS COMPLEX INTEGRITY
	Dr. Matt Estep *Department of Biology*	DEVELOPMENT OF MICROSATELLITE MARKERS TO INVESTIGATE RECURRENT POLYPLOIDY WITHIN THE GENUS DICENTRA
	Dr. Baker Perry *Department of Geography and Planning*	SYNOPTIC PATTERNS ASSOCIATED WITH WET SEASON ONSET IN THE TROPICAL HIGH ANDES OF SOUTHERN PERU AND BOLIVIA
	Dr. Raghuveer Mohan *Department of Computer Science*	DSDRAW: A SOFTWARE TOOL FOR PROGRAMMABLE VISUALIZATIONS AND ANIMATIONS
	Dr. Adam Hege *Department of Health and Exercise Science*	CAPTURING WHAT WE KNEAD: COLLABORATIVE USE OF PHOTO VOICE TO IMPROVE FOOD SECURITY IN SOUTHERN APPALACHIA
	Dr. Cara Fiore *Department of Biology*	SHIFTS IN CENTRAL CARBON METABOLISM IN CHLAMYDOMONAS REINHARDTII UNDER PHOSPHORUS DEFICIENCY
	Dr. Jordan Hazelwood *Department of Communication Sciences and Disorders*	HOW DO SPEECH-LANGUAGE PATHOLOGISTS UTILIZE DRINKING STRAWS IN DYSPHAGIA MANAGEMENT?
	Dr. Robert Brown *Department of Geography and Planning*	MARDI GRAS INDIANS OF NEW ORLEANS
	Dr. Jennifer Howard *Department of Health and Exercise Science*	LONG-TERM LOSS OF MOTION DUE TO LABRAL SURGERY
	Dr. Jamie Russell *Department of Sustainable Technology and the Built Environment*	FEASIBILITY ANALYSIS USING LOAD PROFILE MODELING SCENARIOS OF ACHIEVING PEAK SHAVING USING RENEWABLE ENERGY FOR A SMALL UTILITY
	Dr. Dana Brackney *Department of Nursing*	THE RELATIONSHIP BETWEEN NURSING ASSESSMENT AND PREVENTABLE LIMB LOSS IN PERIPHERAL VASCULAR DISEASE: A SYSTEMATIC REVIEW
	Dr. Michael Opata *Department of Biology*	GAMMA DELTA AND NATURAL KILLER CELLS IN SPLENOCYTES OF YOUNG MICE
	Dr. Aruna Weerasinghe *Department of Chemistry and Fermentation Sciences*	SPECTROSCOPIC STUDIES OF NOVEL EU3+ COMPLEXES OF RHODAMINE-B DERIVATIVES FOR SENSING APPLICATIONS
	Dr. Andrew Smith *Department of Psychology*	MOTOR ACTIONS AND THEIR INFLUENCE, OR LACK THEREOF, ON CREATIVITY
	Dr. Jayjit Roy *Department of Economics*	EFFECT OF INTERNATIONAL TRADE BARRIERS ON GLOBAL FOOD SECURITY
	Dr. Cortney Boulding *Department of Biology*	EFFECTS OF CHROMOSOMAL CONTENT ON NEUROMESODERMAL PROGENITORS IN ZEBRAFISH EMBRYOS
	Dr. Andrew Heckert *Department of Geological and Environmental Sciences*	THE UPPER CRETACEOUS J&M SITE: A FRESHWATER ECOSYSTEM WITH MARINE INFLUENCE IN THE WILLIAMS FORK FORMATION, COLORADO

MORNING (9:00 AM - 12:00 NOON)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420	Poster	9:00 AM–12:00 PM	P1.41	Marissa Sariol-Clough	
	Poster	9:00 AM–12:00 PM	P1.42	Savanna Sheridan	
	Poster	9:00 AM–12:00 PM	P1.43	Blaise Smith	
	Poster	9:00 AM–12:00 PM	P1.44	Morgan Smith	
	Poster	9:00 AM–12:00 PM	P1.45	Randi Sparks	
	Poster	9:00 AM–12:00 PM	P1.46	Claire Thomas	
	Poster	9:00 AM–12:00 PM	P1.47	Katlin Travis	
	Poster	9:00 AM–12:00 PM	P1.48	Ashlyn Troutman	
	Poster	9:00 AM–12:00 PM	P1.49	Michael Ulrich	
	Poster	9:00 AM–12:00 PM	P1.50	Chandler Vaughan	
	Poster	9:00 AM–12:00 PM	P1.51	Taylor Warnock	
	Poster	9:00 AM–12:00 PM	P1.52	Amanda Wilkinson	
	Poster	9:00 AM–12:00 PM	P1.53	Killian Wustrow	
	Poster	9:00 AM–12:00 PM	P1.54	Brandon Yokeley	
	Poster	9:00 AM–12:00 PM	P1.55	Brianna Ypema	

	Mentor(s)	Title
	Dr. Twila Wingrove *Department of Psychology*	SPARE THE ROD: PRESCHOOLERS' AND THEIR MOTHERS' PERSPECTIVES OF CORPORAL PUNISHMENT
	Dr. Mary Kinkel *Department of Biology*	LARVAL REARING METHODS FOR SMALL-SCALE PRODUCTION OF HEALTHY ZEBRAFISH
	Dr. Jason Xiong *Department of Computer Information Systems and Supply Chain Management*	THE OPPORTUNITIES AND CHALLENGES OF BLOCKCHAIN ADOPTION IN SUPPLY CHAIN MANAGEMENT
	Dr. Suzanna Brauer *Department of Biology*	MANGANESE (II) OXIDIZING MICROBES AND MINERAL INDUCED SELECTION
	Dr. Dana Brackney *Department of Nursing*	NOISE IN CRITICAL CARE ENVIRONMENT: A SYSTEMATIC REVIEW
	Dr. Dana Brackney *Department of Nursing*	A SYSTEMATIC REVIEW COMPARING PHARMACOLOGICAL AND NON-PHARMACOLOGICAL THERAPIES IN TREATMENT OF ADHD SYMPTOMS IN ADOLESCENTS
	Dr. Zachary Farris *Department of Health and Exercise Science*	SPOTTING THE SPOTTED HYENAS (CROCUTA CROCUTA): FIRST POPULATION ASSESSMENT ACROSS NIOKOLO-KOBA NATIONAL PARK, SENEGAL
	Dr. Martin Root *Department of Nutrition and Healthcare Management*	SERUM AND DIETARY MAGNESIUM AND POTASSIUM AS PREDICTORS OF TYPE 2 DIABETES
	Dr. Jordan Hazelwood *Department of Communication Sciences and Disorders*	CRITICAL REVIEW OF ONLINE RESOURCES FREQUENTLY UTILIZED BY SPEECH-LANGUAGE PATHOLOGISTS FOR DYSPHAGIA MANAGEMENT
	Dr. Brian Bulla *Department of Government and Justice Studies*	COLLABORATIVE WATERSHED GOVERNANCE IN THE NEW RIVER: INSTITUTIONS, ACTORS, AND POLICY COHERENCE
	Dr. Brooke Hester *Department of Physics and Astronomy*	THE DESIGN OF AN OPTICAL TWEEZERS APPARATUS USING SUSTAINABLE METHODS AND MATERIALS
	Dr. Matt Estep *Department of Biology*	TESTING UTILITY OF CURRENT PHYLOGENETIC MARKERS IN GENUS NEOHELIX (GASTROPODA: POLYGYRIDAE)
	Dr. Caroline Smith *Department of Health and Exercise Science*	DETERMINING DERMAL ABSORPTION OF A NON-CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON VIA INTRADERMAL MICRODIALYSIS
	Dr. Sarah Evans *Department of Geological and Environmental Sciences*	UNDERSTANDING ARTIC PERMAFROST LOSS IN RUSSIA WITH BASEFLOW RECESSION ANALYSIS
	Dr. Steve Seagle *Department of Biology*	MAPPING IXODES SCAPULARIS HABITAT SUITABILITY AND LYME DISEASE RISK IN THE SOUTHERN APPALACHIANS

AFTERNOON (1:00 PM - 3:40 PM)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420		**01:15 PM**		**Poster Competition, Hispanic Research Competition, Aportfolio Scholar Award Presentations**	
Beacon Heights 417	Oral	01:00 PM	9	Sydney Singleton	
	Oral	01:20 PM	10	Chloe Dorin	
	Oral	01:40 PM	11	Ross Robertson	
	Oral	02:00 PM	12	Marietta Shattelroe	
Rough Ridge 415	Oral	02:20 PM	13	Megan Staley	
	Oral	02:40 PM	14	Sarah Solberg	
	Oral	03:00 PM	15	Amanda Pinto	
	Oral	03:20 PM	16	Gracie Bowling	

	Mentor(s)	Title
	Remarks	
	Dr. Ross Gosky *Department of Mathematical Sciences*	USING RECRUITMENT RANKINGS AND RETURNING TEAM MEASUREMENTS TO PREDICT COLLEGE FOOTBALL TEAM SUCCESS
	Dr. Rahman Tashakkori *Department of Computer Science*	OBSERVATION OF ANOMALIES IN HONEY BEE HIVE VIDEO RECORDINGS
	Dr. Brooke Hester *Department of Physics and Astronomy*	ALIGNMENT OF A DUAL OPTICAL TWEEZERS APPARATUS FOR INVESTIGATING PICO-NEWTON FORCES
	Dr. Matt Estep *Department of Biology*	GENETIC INVESTIGATIONS OF A FORGOTTEN ENDEMIC, GEUM GENICULATUM MICHX., BENT AVENS
	Dr. Christopher Seitz *Department of Health and Exercise* Science	COLLEGE STUDENTS WHO SHARE E-CIGARETTES: AN EXPLORATORY STUDY
	Dr. Christine Leist *School of Music*	NEUROLOGIC MUSIC THERAPY TO IMPROVE SPEAKING VOICE IN INDIVIDUALS WITH PARKINSON'S DISEASE
	Dr. Rick Elmore *Department of Philosophy and Religion*	UNIVERSITY CLASSROOM ACCESS: A CURRICULAR CRIPHYSTEMOLOGY OF ANXIETY
	Dr. Kristan Cockeril *Department of Interdisciplinary Studies*	BREADMAKING IN THE EARLY-CHILDHOOD MONTESSORI CLASSROOM

AFTERNOON (1:00 PM -4:00 PM)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420	Poster	1:00–4:00 PM	P2.1	Alondra Aguirre	
	Poster	1:00–4:00 PM	P2.2	Taylor Arrowood	
	Poster	1:00–4:00 PM	P2.3	Mason Atkinson	
	Poster	1:00 - 4:00 PM	P2.4	Lila Barrera	
	Poster	1:00–4:00 PM	P2.5	Faith Blume	
	Poster	1:00–4:00 PM	P2.6	Danielle Boase	
	Poster	1:00–4:00 PM	P2.7	John Cantu	
	Poster	1:00–4:00 PM	P2.8	Lauren Clark	
	Poster	1:00–4:00 PM	P2.9	Ashley Clontz	
	Poster	1:00–4:00 PM	P2.10	Stacey Donavant	
	Poster	1:00–4:00 PM	P2.11	Laura Dunn	
	Poster	1:00–4:00 PM	P2.12	Matthew Eads	
	Poster	1:00–4:00 PM	P2.13	Harrison Esterly	
	Poster	1:00–4:00 PM	P2.14	Dalton Fletcher	
	Poster	1:00–4:00 PM	P2.15	Taylor Foote	
	Poster	1:00–4:00 PM	P2.16	Lauren Francis	
	Poster	1:00–4:00 PM	P2.17	Brittian Francisco	
	Poster	1:00–4:00 PM	P2.18	Patrick French	
	Poster	1:00–4:00 PM	P2.19	Emily Frymark	

	Mentor(s)	Title
	Dr. Dana Brackney *Department of Nursing*	DOES OPTIMAL OXYGEN THERAPY FOR PRETERM NEONATES EXIST? WILL THIS METHOD OF CARE ALWAYS BE A TWO-EDGED SWORD?
	Dr. Scott Marshall *Department of Geological and Environmental Sciences*	THREE-DIMENSIONAL GEOPHYSICAL IMAGING OF THE NEW RIVER FLOODPLAIN SUBSURFACE, BOONE, NC
	Dr. Andrew Windham *Department of Sustainable Technology and the Built Environment*	PERCEPTION OF SCALE IN BIM-BASED VIRTUAL REALITY
	Dr. Cara Fiore *Department of Biology*	TRANSFORMATION OF MARINE DINOFLAGELLATES TO SHED LIGHT ON BIOLUMINESCENCE
	Dr. Susan Lappan *Department of Anthropology*	ACOUSTIC COMMUNICATION FEATURES IN AGILE GIBBON (HYLOBATES AGILIS) SONGS
	Dr. Dana Brackney *Department of Nursing*	THE EFFECT OF MEDICATION AND BEHAVIORAL THERAPY IN TREATING PEDIATRIC ATTENTION-DEFICIT/HYPERACTIVITY DISORDER
	Dr. Jonathan Stickford *Department of Health and Exercise Science*	THE AFFECTIVE DIMENSION OF EXERTIONAL DYSPNEA IN OBESE WOMEN
	Dr. Kimberly Fasczewski *Department of Health and Exercise Science*	USING MULTIMEDIA TO INCREASE COMPLIANCE TO PHYSICAL ACTIVITY FOR MEDICAL THERAPEUTIC YOGA IN INDIVIDUALS WITH MULTIPLE SCLEROSIS
	Dr. Twila Wingrove *Department of Psychology*	JUROR PERCEPTIONS OF CRIMINAL CASES
	Dr. Abigail Stickford *Department of Health and Exercise Science*	BLOOD PRESSURE RESPONSES TO A PAINFUL STIMULUS IN ANXIOUS AND NON ANXIOUS YOUNG ADULTS
	Dr. Kyle Thompson *Department of Nutrition and Healthcare Management*	FACTORS INFLUENCING POST-BARIATRIC SURGICAL READMISSIONS WITHIN A HEALTH CARE SYSTEM IN NORTH CAROLINA
	Dr. Andrew Heckert *Department of Geological and Environmental Sciences*	ASSESSING THE USABLE LIFETIME OF TIN-AND PLATINUM-BASED SILICONE RUBBERS UNDER HIGH AND LOW STRESS ENVIRONMENTS
	Dr. Brooke Christian *Department of Chemistry and Fermentation Sciences*	TOXICITY AND IMMUNOGENICITY OF A TARDIGRADE CYTOSOLIC ABUNDANT HEAT SOLUBLE PROTEIN
	Dr. Jonathon Stickford *Department of Health and Exercise Science*	THE EFFECTS OF BEETROOT JUICE SUPPLEMENTATION ON THE OXYGEN COST OF BREATHING IN YOUNG, OBESE MALES
	Dr. Jim Sherman *Department of Physics and Astonomy*	SEASONAL VARIATION OF AEROSOL MASS CONCENTRATIONS, AEROSOL OPTICAL DEPTH, AND AEROSOL LIGHT EXTINCTION
	Dr. Denise Martz *Department of Psychology*	HER OWN WORST ENEMY: THE RELATIONSHIP BETWEEN FAT TALK, WEIGHT TEASING, AND DISORDERED EATING BEHAVIOR
	Dr. Zachary Farris *Department of Health and Exercise Science*	ESTIMATING OCCUPANCY AND DETECTION OF WILD WARTHOG POPULATIONS (PHACOCHOERUS AFRICANUS) IN NIOKOLO-KOBA NATIONAL PARK, SENEGAL
	Dr. Matt Estep *Department of Biology*	EXPLORING THE REPETITIVE FRACTION OF GRASS GENOMES USING GALAXY
	Dr. Alisha Farris *Department of Nutrition and Healthcare Management*	FOOD INSECURITY AND THE EFFECT ON COLLEGE STUDENTS: AN ANALYSIS OF FOOD PANTRIES IN A COLLEGE TOWN IN APPALACHIA

AFTERNOON (1:00 PM - 4:00 PM)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420	Poster	1:00–4:00 PM	P2.20	Julie Fulk	
	Poster	1:00–4:00 PM	P2.21	Morgan Gaglianese-Woody	
	Poster	1:00–4:00 PM	P2.22	Joshua Godwin	
	Poster	1:00–4:00 PM	P2.23	Sarah Heiss	
	Poster	1:00–4:00 PM	P2.24	Amanda Hendrix	
	Poster	1:00–4:00 PM	P2.25	Anthony Hengst	
	Poster	1:00–4:00 PM	P2.26	Anna Jackson	
	Poster	1:00–4:00 PM	P2.27	Samuel Jones	
	Poster	1:00–4:00 PM	P2.28	April Kaiser	
	Poster	1:00–4:00 PM	P2.29	Soundarya Kanthimathinathans	
	Poster	1:00–4:00 PM	P2.30	Ann Klyce	
	Poster	1:00–4:00 PM	P2.31	Katie Krogmeier	
	Poster	1:00–4:00 PM	P2.32	Joe Langston	
	Poster	1:00–4:00 PM	P2.33	Sarah Larson	
	Poster	1:00–4:00 PM	P2.34	Taylor Lovci	
	Poster	1:00–4:00 PM	P2.35	Jonathan Carter Luck	
	Poster	1:00–4:00 PM	P2.36	Alexander Luke	
	Poster	1:00–4:00 PM	P2.37	Emma Lynch	

	Mentor(s)	Title
	Dr. Dana Brackney *Department of Nursing*	IN THE DRUG DEPENDENT POPULATION, ARE HOMEOPATHIC INTERVENTIONS MORE OR LESS EFFECTIVE AT TREATING DRUG ADDICTION THAN METHADONE
	Dr. Matt Estep *Department of Biology*	THE DEVELOPMENT OF MICROSATELLITE MARKERS FOR THE CULTURALLY AND ECONOMICALLY SIGNIFICANT PLANT, ALLIUM TRICOCCUM
	Dr. Andrew Shanely *Department of Health and Exercise Science*	WHOLE-BODY HEAT SHOCK ACCELERATES RECOVERY FOLLOWING IMPACT INDUCED MUSCLE DAMAGE IN MICE
	Dr. Megen Culpepper *Department of Chemistry and Fermentation Sciences*	EXPRESSION OF A PUTATIVE TWO-SUBUNIT DIMETHYLSULFIDE MONOOXYGENASE PROTEIN FROM ARTHROBACTER GLOBIFORMIS
	Dr. Andrew Heckert *Department of Geological and Environmental Sciences*	AN OVERVIEW OF THE TAXONOMIC COMPOSITION OF THE UPPER CRETACEOUS (CAMPANIAN) MENEFEE FORMATION, NEW MEXICO
	Dr. William Armstrong *Department of Geological and Environmental Sciences*	AUTOMATED EXTRACTION OF RECENT GROWTH TRENDS IN ALASKAN PROGLACIAL LAKES USING AN OBJECT-BASED IMAGE PROCESSING ROUTINE
	Dr. Laura McArthur *Department of Nutrition and Healthcare Management*	FOOD INSECURE STUDENTS AT APPALACHIAN STATE UNIVERSITY ALSO SHOW HIGH RATES OF MEDICAL AND LEARNING DISORDERS
	Dr. Duygu Ercan Oruc *Department of Chemistry and Fermentation Sciences*	HAZARDS ANALYSIS CRITICAL CONTROL POINTS FOR THE PRODUCTION OF SOY YOGURT
	Dr. Peter Soule' *Department of Geography and Planning*	A DENDROECOLOGICAL INVESTIGATION OF RED-COCKADED WOODPECKER AND LONGLEAF PINE CAVITY TREES
	Dr. Shawn Bergman *Department of Psychology*	NEEDS ASSESSMENT TO IDENTIFY SKILLS GAPS WITHIN THE NORTHWEST PROSPERITY ZONE OF NORTH CAROLINA
	Dr. Andrew Heckert *Department of Geological and Environmental Sciences*	EARTH SCIENCE EDUCATION AND OUTREACH THROUGH TEACHER AND STUDENT PREPARATION
	Dr. Howard Neufeld *Department of Biology*	IMPACTS OF POLYPLOIDY ON THE ECOPHYSIOLOGY OF SOLIDAGO ALTISSIMA
	Dr. Christopher Thaxton *Department of Physics and Astronomy*	HISTORICAL AIR MASS TYPES IN THE SOUTHERN APPALACHIAN MOUNTAINS (SAM)
	Dr. Sarah Evans *Department of Geological and Environmental Sciences*	"QUANTIFYING RISING SOIL WATER TEMPERATURES IN A SOUTHERN APPALACHIAN WETLAND"
	Dr. Abigail Stickford, *Department of Health and Exercise Science*	LOCOMOTOR RESPIRATORY COUPLING PATTERNS FOLLOWING DISSOCIATIVE AND ASSOCIATIVE ATTENTIONAL STRATEGIES IN UNTRAINED MEN AND WOMEN
	Dr. Abigail Stickford *Department of Health and Exercise Science*	REVERSAL OF RAPID DECLINE IN ACTIVE MUSCLE OXYGEN SATURATION FOLLOWING REVASCULARIZATION IN PERIPHERAL ARTERY DISEASE
	Dr. Ray Williams *Department of Biology*	INVESTIGATION OF ASSOCIATION EFFECTS IN SOLIDAGO SPECIES ON LEAF PHYTOCHEMISTRY AND INSECT GALLS
	Dr. Beverly Moser *Department of Languages, Literatures and Cultures*	LEARNING AND TEACHING GERMAN HISTORY

AFTERNOON (1:00 PM - 4:00 PM)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420	Poster	1:00–4:00 PM	P2.38	Cerita Mattison	
	Poster	1:00–4:00 PM	P2.39	Kierdre McFadden	
	Poster	1:00–4:00 PM	P2.40	Haley McGuirt	
	Poster	1:00–4:00 PM	P2.41	Sidney Murray	
	Poster	1:00–4:00 PM	P2.42	Forrest Myers	
	Poster	1:00–4:00 PM	P2.43	Jayvaughn Oliver	
	Poster	1:00–4:00 PM	P2.44	Taylor Parkins	
	Poster	1:00–4:00 PM	P2.45	Makayla Pennington	
	Poster	1:00–4:00 PM	P2.46	Anthony Percival	
	Poster	1:00–4:00 PM	P2.47	Miranda Petrone	
	Poster	1:00–4:00 PM	P2.48	Caroline Piephoff	
	Poster	1:00–4:00 PM	P2.49	Katherine Quinn	
	Poster	1:00–4:00 PM	P2.50	Skyler Ray	
	Poster	1:00–4:00 PM	P2.51	Rosalyn Rease	
	Poster	1:00–4:00 PM	P2.52	Samantha Reis	
	Poster	1:00–4:00 PM	P2.53	Jordan Reisterer	
	Poster	1:00–4:00 PM	P2.54	Patrick Ross	
	Poster	1:00–4:00 PM	P2.55	Aeon Russo	
	Poster	1:00–4:00 PM	P2.56	Allison Sams	
	Poster	1:00–4:00 PM	P2.57	Natalie Sanford	

	Mentor(s)	Title
	Dr. Jon Davenport *Department of Biology*	SIREN INTERMEDIA COLONIZATION OF A RECENTLY CONSTRUCTED WETLAND
	Dr. Andrew Bellemer *Department of Biology*	SEIZURE SUSCEPTIBILITY AND NOCICEPTION SENSITIVITY IN SODIUM GATED ION CHANNELS OF DROSOPHILA
	Dr. Andrew Bellemer, Department of Biology	THE ROLE OF TRANSLATION REGULATION BY LK6 AND TOR IN NOCICEPTOR SENSITIVITY
	Dr. Doris Bazzini *Department of Psychology*	THE INFLUENCE OF FEMALE-ATHLETE IMAGES ON SOCIAL PHYSIQUE ANXIETY
	Dr. Brooke Hester *Department of Physics and Astronomy*	OPTICAL TRAPPING OF VARYING NUMBERS OF GOLD NANOSHELLS
	Dr. Jonathon Stickford *Department of Health and Exercise Science*	CHANGES IN VENTILATION AND OPERATIONAL LUNG VOLUMES DUE TO VENTILATORY CHALLENGES DURING A CONSTANT WORK RATE EXERCISE TEST
	Dr. Yalcin Acikgoz *Department of Psychology*	DEVELOPING A TAXONOMY OF A RECRUITMENT AND JOB SEARCH STRATEGIES
	Dr. Dana Brackney *Department of Nursing*	THE EFFECTS OF DELAYED VERSUS IMMEDIATE UMBILICAL CORD CLAMPING: A SYSTEMATIC REVIEW
	Dr. Howard Neufeld *Department of Biology*	WINTER TIME GAS EXCHANGE IN AN EVERGREEN ANGIOSPERM: INTRA-CANOPY DIFFERENCES AND RESPONSES TO LIGHT
	Dr. Laura McArthur *Department of Nutrition and Healthcare Management*	USE AND PERCEPTIONS OF A FOOD PANTRY AMONG STUDENTS AT APPALACHIAN STATE UNIVERSITY
	Dr. Carla Ramsdell *Department of Physics and Astronomy*	SOLAR CONCENTRATION STRATEGIES FOR EVACUATED TUBES: APPLIED TO WATER PURIFICATION
	Dr. Amy Galloway *Department of Psychology*	UNDERSTANDING INFANT FEEDING PRACTICES AND IMPLICATIONS FOR DEVELOPMENTAL OUTCOMES IN TWO COUNTRIES
	Dr. Steven Hageman *Department of Geological and Environmental Sciences*	ENVIRONMENTAL ANALYSIS OF THE ERWIN FOUNDATION: A SIGNIFICANT SHIFT IN DEPOSITIONAL ENVIRONMENTS IN THE CENTRAL APPALACHIANS
	Dr. Shawn Bergman *Department of Psychology*	THE CHANGING COLLEGE DREAM? DIFFERENCES AMONG STUDENTS' COLLEGE ASPIRATIONS
	Dr. Twila Wingrove *Department of Psychology*	PERCEPTIONS OF JUVENILE OFFENDERS WHO WERE MALTREATED AS CHILDREN
	Dr. Duygu Ercan Oruc *Department of Chemistry and Fermentation Sciences*	HAZARDS ANALYSIS CRITICAL CONTROL POINTS FOR THE PRODUCTION OF DEHYDRATED FRUIT
	Dr. Zachary Farris *Department of Health and Exercise Science*	CAPTURING AND ESTIMATING MADAGASCAR'S VANISHING WILDLIFE: FIRST SURVEY AND ESTIMATES OF DARAINA'S CARNIVORE COMMUNITY
	Dr. William Anderson *Department of Geological and Environmental Sciences*	MODELING MITIGATION OF ROAD SALT AND STORMWATER BY RETROFITTING LOW IMPACT DEVELOPMENT IN A MOUNTAINOUS, URBAN WATERSHED
	Dr. Mary Ballard *Department of Psychology*	IS NEWS EXPOSURE RELATED TO ATTITUDES TOWARDS TRANSGENDER INDIVIDUALS?
	Dr. Christopher Thaxton *Department of Physics and Astronomy*	IDENTIFYING SURFACE ROUGHNESS FOR REGIONAL ATMOSPHERIC MODELING IN THE SOUTHERN APPALACHIAN MOUNTAINS

AFTERNOON (1:00 PM - 4:00 PM)

Room	Session	Time	#	Presenter(s)	
Parkway Ballroom 420	Poster	1:00–4:00 PM	P2.58	Alaska Schubert	
	Poster	1:00–4:00 PM	P2.59	David Schumacher	
	Poster	1:00 -4:00 PM	P2.60	Whitney Self	
	Poster	1:00–4:00 PM	P2.61	Kali Smith	
	Poster	1:00–4:00 PM	P2.62	Michael Spencer	
	Poster	1:00–4:00 PM	P2.63	Nick Stevens Jr.	
	Poster	1:00–4:00 PM	P2.64	Elijah Thompson	
	Poster	1:00–4:00 PM	P2.65	Nick Tocci	
	Poster	1:00–4:00 PM	P2.66	Ellen Trost	
	Poster	1:00–4:00 PM	P2.67	Elizabeth Vaughan	
	Poster	1:00–4:00 PM	P2.68	Linnea Wennborg	
	Poster	1:00–4:00 PM	P2.69	Adam Willits	
	Poster	1:00–4:00 PM	P2.70	Matthew Wilson	
	Poster	1:00–4:00 PM	P2.71	Elise Witwer	
	Poster	1:00–4:00 PM	P2.72	Erin Young	

**Denotes Poster Competition Finalists (Undergraduate and Graduate)*

	Mentor(s)	Title
	Dr. Andrew Heckert *Department of Geological and Environmental Sciences*	A FRESH LOOK AT THE CHONDRICHTHYANS OF THE WESTERN INTERIOR SEAWAY
	Dr. Herman van Werkhoven *Department of Health and Exercise Science*	RELATIONSHIP BETWEEN MUSCLE COACTIVATION AND RUNNING SKILL LEVEL
	Dr. Sandi Lane *Department of Nutrition and Healthcare Management*	NURSING HOME VULNERABILITY ATTRIBUTABLE TO PROXIMITY OF FOOD AND WATER DISTRIBUTORS
	Dr. Peter Groothuis *Department of Economics*	ENVIRONMENTAL GENTRIFICATION IN BROWNFIELD REDEVELOPMENT IN CHARLOTTE, NC
	Dr. Mary Ballard *Department of Psychology*	HORROR VIDEOGAME SOUND EFFECTS AND SHOOTER BIAS
	Dr. Kym Fasczewski *Department of Health and Exercise Science*	A CASE STUDY ON THE IMPACT OF A BOXING INTERVENTION ON QUALITY OF LIFE IN AN INDIVIDUAL DIAGNOSED WITH PARKINSON'S DISEASE
	Dr. Jon Davenport *Department of Biology*	USING TRAIL CAMERAS TO MONITOR SEASONAL MIGRATIONS OF TWO POND-BREEDING SALAMANDER SPECIES
	Dr. Marco Meucci *Department of Health and Exercise Science*	THE EFFECTS OF GENDER DIFFERENCE AND BODY COMPOSITION ON MAXIMAL AEROBIC CAPACITY
	Dr. Ray Williams *Department of Biology*	EFFECTS OF GENETIC VARIATION ON FLOWER TERPENE COMPOSITION IN SOLIDAGO ALTISSIMA
	Dr. Nicholas Shaw *Department of Chemistry*	ESTERIFICATION OF CARBOXYLIC ACIDS FOR ANALYSIS VIA GAS CHROMATOGRAPHY
	Dr. Dana Brackney *Department of Nursing*	LONG-TERM HOSPITALIZATION OF ADOLESCENTS AND ITS RELATIONSHIP TO SOCIAL ISOLATION
	Dr. Andrew Bellemer *Department of Biology*	CELLULAR SIGNALING PATHWAYS REGULATE NOCICEPTOR FUNCTION AND DEVELOPMENT IN DROSOPHILA
	Dr. Maggie Sugg *Department of Geography and Planning*	IDENTIFYING STATISTICAL PRECISION AND ACCURACY OF VULNERABILITY INDICES FOR THE SOUTHEASTERN UNITED STATES
	Dr. Rebecca Kappus *Department of Health and Exercise Science*	THE EFFECTS OF RESISTANCE TRAINING ON CARDIOVASCULAR FUNCTION
	Dr. Ece Karatan *Department of Biology*	IDENTIFICATION OF THE BINDING INTERFACE BETWEEN NSPS AND MBAA IN VIBRIO CHOLERAE

Anthropology

- Faith Blume, Faculty Mentor: Susan Lappan

Subtotal: 1

Biology

- Tierney Daw, Faculty Mentor: Mary Kinkel
- Taylor Le, Faculty Mentor: Cara Fiore
- Ellen Trost, Faculty Mentor: Ray Williams
- Isabel Sullivan, Faculty Mentor: Jennifer Geib
- Erica Pauer, Faculty Mentor: Howard Neufeld
- Allison Griggs, Faculty Mentor: Cara Fiore
- Kierdre McFadden, Faculty Mentor: Andrew Bellemer
- Cerita Mattison, Faculty Mentor: Jon Davenport
- Jessie Hatcher, Faculty Mentor: Matt Estep
- Anthony Percival, Faculty Mentor: Howard Neufeld
- Patrick French, Faculty Mentor: Matt Estep
- Lila Barrera, Faculty Mentor: Cara Fiore
- Morgan Gaglianese-Woody, Faculty Mentor: Matt Estep
- Elijah Thompson,Faculty Mentor: Jon Davenport
- Alexander Luke, Faculty Mentor: Ray Williams
- Hannah Phillips, Faculty Mentor: Michael Opata
- Brianna Ypema, Faculty Mentor: Steve Seagle

Subtotal: 17

Chemistry and Fermentation Sciences

- Tyler Harris, Faculty Mentor: Brooke Christian
- Angelina Azieva, Faculty Mentor: Nicholas Shaw
- Noah Gregory, Faculty Mentor: Jefferson Bates
- Harrison Esterly, Faculty Mentor: Brooke Christian
- Sarah Heiss, Faculty Mentor: Megen Culpepper
- John Stevens IV, Faculty Mentor: Megen Culpepper
- Elizabeth Vaughan, Faculty Mentor: Nicholas Shaw
- Samuel Jones, Faculty Mentor: Duygu Ercan Oruc
- Jordan Reisterer, Faculty Mentor: Duygu Ercan Oruc
- Anna Rich, Faculty Mentor: Aruna Weerasinghe

Subtotal: 10

Communication Sciences and Disorders

- Indigo Hollister, Faculty Mentor: Jordan Hazelwood
- Michael Ulrich, Faculty Mentor: Jordan Hazelwood
- Seth Longbottom, Faculty Mentor: Jordan Hazelwood

Subtotal: 3

Computer Information Systems and Supply Chain Management

- Blaise Smith, Faculty Mentor: Jason Xiong

Subtotal: 1

Computer Science

- Chloe Dorin, Faculty Mentor: Rahman Tashakkori
- Daniel Jeffries, Faculty Mentor: Raghuveer Mohan

Subtotal: 2

Economics

- Matthew Winters, Faculty Mentor: Brock Stoddard
- Myles Grady, Faculty Mentor: John Whitehead
- Jessica Robinson, Faculty Mentor: Jayjit Roy
- Kali Smith, Faculty Mentor: Peter Groothuis

Subtotal: 4

Geography and Planning

- Hannah Bush, Faculty Mentor: Baker Perry
- Hannah Bagli, Faculty Mentor: Elizabeth Shay

Subtotal: 2

Geological and Environmental Sciences

- Bryson Honeycutt, Faculty Mentor: Cole Edwards
- Oscar Armengolt, Faculty Mentor: Cynthia Liutkus-Pierce
- Hannah Field, Faculty Mentor: William Armstrong
- Aeon Russo, Faculty Mentor: William Anderson
- Israel Sanchez, Faculty Mentor: Andrew Heckert
- Anthony Hengst, Faculty Mentor: William Armstrong
- Alaska Schubert, Faculty Mentor: Andrew Heckert
- Amanda Hendrix, Faculty Mentor: Andrew Heckert
- Ann Klyce, Faculty Mentor: Andy Heckert
- Taylor Arrowood, Faculty Mentor: Scott Marshall
- Emily Fedders, Faculty Mentor: William Anderson
- Matthew Eads, Faculty Mentor: Andrew Heckert
- Brandon Yokeley, Faculty Mentor: Sarah Evans
- Skyler Ray, Faculty Mentor: Steven Hageman
- Carly Maas, Faculty Mentor: William Anderson
- Sarah Larson, Faculty Mentor: Sarah Evans
- Brianna Hibner, Faculty Mentor: Cole Edwards
- Bryson Honeycutt, Faculty Mentor: Cole Edwards

Subtotal: 18

Health and Exercise Science

- Ashlee Myers, Faculty Mentor: Jennifer Howard
- Taylor Lovci, Faculty Mentor: Abigail Stickford
- Patrick Ross, Faculty Mentor: Zach Farris
- Katlin Travis, Faculty Mentor: Zachary Farris
- John Cantu, Faculty Mentor: Jonathan Stickford
- Anna Ruth Carmichael, Faculty Mentor: Rebecca Kappus
- Megan Staley, Faculty Mentor: Christopher Seitz
- Nick Tocci, Faculty Mentor: Marco Meucci
- Stacey Donavant, Faculty Mentor: Abigail Stickford
- Elise Witwer, Faculty Mentor: Rebecca Kappus
- Lauren Clark, Faculty Mentor: Kimberly Fasczewski
- Keighly Adams, Faculty Mentor: Erin Bouldin
- Brittian Francisco,Faculty Mentor: Zachary Farris
- Nick Stevens Jr., Faculty Mentor: Kym Fasczewski

Subtotal: 14

Interdisciplinary Studies

- Gracie Bowling, Faculty Mentor: Kristan Cockerill

Subtotal: 1

Languages, Literatures and Cultures

- Emma Lynch, Faculty Mentor: Beverly Moser

Subtotal: 1

Mathematical Sciences

- Sydney Singleton, Faculty Mentor: Ross Gosky

Subtotal: 1

Nursing

- Julie Fulk, Faculty Mentor: Dana Brackney
- Danielle Boase, Faculty Mentor: Dana Brackney
- Alondra Aguirre, Faculty Mentor: Dana Brackney
- Sarah Allred, Faculty Mentor: Dana Brackney
- Makayla Pennington, Faculty Mentor: Dana Brackney
- Claire Thomas, Faculty Mentor: Dana Brackney
- Ella Clare Phillips, Faculty Mentor: Dana Brackney
- Linnea Wennborg, Faculty Mentor: Dana Brackney
- Randi Sparks, Faculty Mentor: Dana Brackney

Subtotal: 9

Nutrition and Healthcare Management

- Nadine Gregory, Faculty Mentor: Melissa Gutschall
- Emily Frymark, Faculty Mentor: Alisha Farris

Subtotal: 2

Philosophy and Religion

- Amanda Pinto, Faculty Mentor: Rick Elmore

Subtotal: 1

Physics and Astronomy

- Taylor Foote, Faculty Mentor: Jim Sherman
- Joe Langston, Faculty Mentor: Christopher Thaxton
- Frances Claire Brown, Faculty Mentor: Brooke Hester
- Jeff Miller, Faculty Mentor: Brooke Hester
- Taylor Warnock, Faculty Mentor: Brooke Hester
- Lucian Murray, Faculty Mentor: Brooke Hester
- Natalie Sanford, Faculty Mentor: Chris Thaxton
- Forrest Myers, Faculty Mentor: Brooke Hester
- Caroline Piephoff, Faculty Mentor: Carla Ramsdell
- Greg Rapp, Faculty Mentor: Brooke Hester

Subtotal: 10

Psychology

- Taylor Parkins, Faculty Mentor: Yalcin Acikgoz
- Ashley Clontz, Faculty Mentor: Twila Wingrove
- Mitchell Roberts, Faculty Mentor: Andrew Smith
- Caroline Shriver, Faculty Mentor: Twila Wingrove
- Samantha Reis, Faculty Mentor: Twila Wingrove
- Abbey Feather, Faculty Mentor: Lisa Curtin

Subtotal: 6

Social Work

- Nichole Annas, Faculty Mentor: Emily Dakin

Subtotal: 1

Theatre and Dance

- Sarah Quinn, Faculty Mentor: Susan Lutz

Subtotal: 1

Biology

- Amanda Wilkinson, Faculty Mentor: Matt Estep
- Savanna Sheridan, Faculty Mentor: Mary Kinkel
- Garett Bonds, Faculty Mentor: Ece Karatan
- Marietta Shattelroe, Faculty Mentor: Matt Estep
- Katie Krogmeier, Faculty Mentor: Howard Neufeld
- Morgan Smith, Faculty Mentor: Suzanna Brauer
- Logan Clark, Faculty Mentor: Matt Estep
- Adam Willits, Faculty Mentor: Andrew Bellemer
- Sydney Bear, Faculty Mentor: Suzanna Brauer
- Katrina Godsey, Faculty Mentor: Suzanna Brauer
- David Burton, Faculty Mentor: Jon Davenport
- Erin Young, Faculty Mentor: Ece Karatan
- Gita Gajjar, Faculty Mentor: Andrew Bellemer
- Thomas Hastings, Faculty Mentor: Jon Davenport
- Elsie Rodriguez, Faculty Mentor: Cortney Bouldin
- Haley McGuirt, Faculty Mentor: Andrew Bellemer

Subtotal: 16

Geography and Planning

- Elisa MacGoun, Faculty Mentor: Robert Brown
- April Kaiser, Faculty Mentor: Peter Soulé
- Tania Katherine Ita Vargas, Faculty Mentor: Lester Baker Perry
- Elizabeth Bailey, Faculty Mentor: Maggie Sugg
- Abie Bonevac, Faculty Mentor: Elizabeth Shay
- Timothy Kinlaw, Faculty Mentor: Johnathan Sugg
- Matthew Wilson, Faculty Mentor: Maggie Sugg

Subtotal: 7

Government and Justice Studies

- Chandler Vaughan, Faculty Mentor: Brian Bulla

Subtotal: 1

Health and Exercise Science

- Laura Johnston, Faculty Mentor: Adam Hege
- Zachary Ripic, Faculty Mentor: Herman van Werkhoven
- Jonathan Carter Luck, Faculty Mentor: Abigail Stickford
- Zachary Leicht, Faculty Mentor: Kevin Zwetsloot
- David Schumacher, Faculty Mentor: Herman Van Werkhoven
- Dalton Fletcher, Faculty Mentor: Jonathon Stickford
- Jayvaughn Oliver, Faculty Mentor: Jonathon Stickford
- Joshua Godwin, Faculty Mentor: Andrew Shanely
- Killian Wustrow, Faculty Mentor: Caroline Smith
- Amelia Bruce, Faculty Mentor: Alan Needle

Subtotal: 10

Human Development and Psychological Counseling

- Kaitlin Clancy, Faculty Mentor: Geri Miller
- Kelsey Fish, Faculty Mentor: Geri Miller
- Emily Proctor, Faculty Mentor: Geri Miller

Subtotal: 3

Music

- Elizabeth Derrick, Faculty Mentor: Christine Leist
- Lisl Doughton, Faculty Mentor: Victor Mansure
- Sarah Solberg, Faculty Mentor: Christine Leist

Subtotal: 3

Nutrition and Healthcare Management

- Katelyn Meaux, Faculty Mentor: Martin Root
- Whitney Self, Faculty Mentor: Sandi Lane
- Ashlyn Troutman, Faculty Mentor: Martin Root
- Laura Dunn, Faculty Mentor: Kyle Thompson
- Anna Jackson, Faculty Mentor: Laura McArthur
- Miranda Petrone, Faculty Mentor: Laura McArthur

Subtotal: 6

Physics and Astronomy

- Ross Robertson, Faculty Mentor: Brooke Hester

Subtotal: 1

Psychology

- Sidney Murray, Faculty Mentor: Doris Bazzini
- Jessica Chambers, Faculty Mentor: Twila Wingrove
- Katherine Quinn, Faculty Mentor: Amy Galloway
- Michael Spencer, Faculty Mentor: Mary Ballard
- Sidney Murray, Faculty Mentor: Doris Bazzini
- Jessica Chambers, Faculty Mentor: Twila Wingrove
- Katherine Quinn, Faculty Mentor: Amy Galloway
- Rosalyn Rease, Faculty Mentor: Shawn Bergman
- Lauren Francis, Faculty Mentor: Denise Martz
- Marissa Sariol-Clough, Faculty Mentor: Twila Wingrove

Subtotal: 10

Sustainable Technology and the Built Environment

- Rowan Parris, Faculty Mentor: Jamie Russell
- Mason Atkinson, Faculty Mentor: Andrew Windham

Subtotal: 2

Anthropology

- Susan Lappan

Subtotal: 1

Biology

- Andrew Bellemer
- Cortney Bouldin
- Suzanna Brauer
- Jon Davenport
- Matt Estep
- Cara Fiore
- Jennifer Geib
- Ece Karatan
- Mary Kinkel
- Howard Neufeld
- Michael Opata
- Steve Seagle
- Ray Williams

Subtotal: 13

Chemistry and Fermentation Sciences

- Jefferson Bates
- Brooke Christian
- Megen Culpepper
- Duygu Ercan Oruc
- Nicholas Shaw
- Aruna Weerasinghe

Subtotal: 6

Communication Sciences and Disorders

- Jordan Hazelwood

Subtotal: 1

Computer Information Systems and Supply Chain Management

- Jason Xiong

Subtotal: 1

Computer Science

- Raghuveer Mohan
- Rahman Tashakkori

Subtotal: 2

Economics

- Peter Groothuis
- Jayjit Roy
- Brock Stoddard
- John Whitehead

Subtotal: 4

Geography and Planning

- Robert Brown
- Baker Perry
- Elizabeth Shay
- Peter Soulé
- Johnathan Sugg
- Maggie Sugg

Subtotal: 6

Geological and Environmental Sciences

- William Anderson
- William Armstrong
- Sarah Carmichael
- Cole Edwards
- Sarah Evans
- Steven Hageman
- Andrew Heckert
- Cynthia Liutkus-Pierce
- Scott Marshall

Subtotal: 9

Government and Justice Studies

- Brian Bulla

Subtotal: 1

Health and Exercise Science

- Erin Bouldin
- Zachary Farris
- Kym Fasczewski
- Adam Hege
- Jennifer Howard
- Rebecca Kappus
- Marco Meucci
- Alan Needle
- Christopher Seitz
- Andrew Shanely
- Caroline Smith
- Abigail Stickford
- Jonathon Stickford
- Herman van Werkhoven
- Kevin Zwetsloot

Subtotal: 15

Human Development and Psychological Counseling

- Geri Miller

Subtotal: 1

Interdisciplinary Studies

- Kristan Cockerill

Subtotal: 1

Languages, Literatures and Cultures

- Beverly Moser

Subtotal: 1

Mathematical Sciences

- Ross Gosky

Subtotal: 1

Music

- Christine Leist
- Victor Mansure

Subtotal: 2

Nursing

- Dana Brackney

Subtotal: 1

Nutrition and Healthcare Management

- Alisha Farris
- Melissa Gutschall
- Sandi Lane
- Laura McArthur
- Martin Root
- Kyle Thompson

Subtotal: 6

Philosophy and Religion

- Rick Elmore

Subtotal: 1

Physics and Astronomy

- Brooke Hester
- Carla Ramsdell
- Jim Sherman
- Christopher Thaxton

Subtotal: 4

Psychology

- Yalcin Acikgoz
- Mary Ballard
- Doris Bazzini
- Shawn Bergman
- Lisa Curtin
- Amy Galloway
- Denise Martz
- Kurt Michael
- Andrew Smith
- Twila Wingrove

Subtotal: 10

Social Work

- Emily Dakin

Subtotal: 1

Sustainable Technology and the Built Environment

- Jamie Russell
- Andrew Windham

Subtotal: 2

Theatre and Dance

- Susan Lutz

Subtotal: 1


Office of Student Research
APPALACHIAN STATE UNIVERSITY

ANTHROPOLOGY

Faith Blume, Anthropology, Undergraduate

Faculty Mentor: Susan Lappan, Arts & Sciences

Coauthor(s): Yi Heng Pang (Universiti Sains Malaysia), Nadine Ruppert (Universiti Sains Malaysia), and Susan Lappan

ACOUSTIC COMMUNICATION FEATURES IN AGILE GIBBON (HYLOBATES AGILIS) SONGS

Many animals use acoustic communication to defend territories, attract and defend mates and identify conspecifics. Agile gibbons (Hylobates agilis) are territorial, monogamous apes that communicate with neighboring conspecifics through elaborate vocal duet songs audible at distances ≥1 km. Gibbon songs are complex and vary in the patterning of notes, and their frequency and amplitude. We analyzed recordings of wild agile gibbons to test the hypothesis that the songs of male and female pair-mates have complementary but distinct functions requiring transmission at different spatial scales. Specifically, we predicted that male and female songs are produced at different volumes and display different patterns of attenuation over space. We recorded songs in the Ulu Muda Forest Reserve in Malaysia using triangular arrays of three passive acoustic monitors (PAM) at 300-400-m intervals. The PAM recorded songs and ambient noises from 5:00-11:00 h daily. We identified female-specific and male-specific song elements and measured their acoustic characteristics using Raven Pro 1.5. We compared amplitudes of notes in the same frequency range for male and female pair-mates and estimated detectability of male and female notes from recorders at different distances. Preliminary results suggest that female notes have higher amplitude and frequency, and that male notes attenuate more quickly. Our results shed light on the functions of duet songs for male and female gibbons.

BIOLOGY

Lila Barrera, Biology, Undergraduate

Faculty Mentor: Cara Fiore, Arts & Sciences

Coauthor(s): Mookho Paw, Ni Eban, Cara Fiore

TRANSFORMATION OF MARINE DINOFLAGELLATES TO SHED LIGHT ON BIOLUMINESCENCE

Dinoflagellates are planktonic eukaryotes abundant in many aquatic habitats. While these organisms are ecologically relevant and several species are known for their negative impact on human health due to toxin production, there are few examples of genetic manipulation with these organisms, which could improve our understanding of their physiology and population dynamics. Three main challenges obstruct genetic manipulation in dinoflagellates; the large genome size has prevented genome sequencing of any free-living species, the presence of a cell wall, and a slow growth rate. Here, we have leveraged elements of previously published work in other systems and one study with dinoflagellates to develop a protocol for transformation and creation of a mutant library using the bioluminescent marine dinoflagellate, Pyrocystis lunula. Our system for transformation is currently being used to identify proteins involved in the signaling pathway for bioluminescence. We are particularly interested in the mechanoreceptor involved in initiation of the pathway as this class of cell receptors is poorly characterized compared to chemoreceptors and dinoflagellate bioluminescence provides an avenue for exploring potential novel receptors. To our knowledge, we have created the first mutant library of dinoflagellates using a plasmid with a Green Fluorescence Protein reporter gene. This approach will likely grant new insight into dinoflagellate physiology and into the bioluminescent signaling pathway.

Sydney Bear, Biology, Graduate

Faculty Mentor: Suzanna Brauer, Arts & Sciences

Coauthor(s): Sydney Bear, Suzanna Bräuer, L Jamie Lamit, and Nathan Basiliko

METHANOGEN COMMUNITIES IN PEATLANDS OF NORTH AMERICA

Peatlands are wetland environments that account for an estimated one third of the Earth's terrestrial carbon. Peatland soil contains communities of archaea, bacteria, and fungi that interact with each other through nutrient cycling and competition. The methanogenic archaea in these communities create methane gas as a product of their metabolism. A community analysis of these methanogen orders and their abundances in varying environments will give insight into their interactions and how the changing environment will affect them. Extracted DNA from peat samples of 19 sites in eastern North America was analyzed through Illumina amplicon sequencing of the mcrA gene to observe changes in methanogenic community assemblages in varying environments. It is expected that the community analysis will show preferences for depths near the anaerobic/aerobic transition zone as well as the substrate and pH preferences of certain orders of methanogens. These data may provide insight into the make- up and interactions of methanogen communities in peatland environments and are important to consider in the face of climate change.

Garett Bonds, Biology, Graduate

Faculty Mentor: Ece Karatan, Arts & Sciences

Coauthor(s): Ece Karatan, Ted Zerucha

THE ROLE OF BIOFILM FORMATION AND POLYAMINE UTILIZATION IN COLONIZATION OF ZEBRAFISH BY VIBRIO CHOLERAE

Vibrio cholerae, the causative agent of the diarrheal disease cholera, is an aquatic bacterium that uses biofilms as a part of its life cycle. Biofilms have been shown to protect from environmental stresses as well as facilitate adhesion and are thought to aid in the transmission of this disease-causing agent into its hosts. Polyamines, small hydrocarbon molecules that most cells synthesize, are found to play an important role in the regulation of biofilms and several polyamine pathways have proteins that are upregulated in animal model infection.

The goal for this study is to use the zebrafish model to investigate the role of polyamine synthesis, transport, and signaling pathways and biofilm formation in colonization. Zebrafish have been used in previous colonization studies of V. cholerae and are established as an effective model organism. Specifically, we are comparing the colonization efficiency of wild-type bacteria with mutant strains that are deficient in: biofilm formation and synthesis, detection, and transport of polyamines.

Zebrafish are co-infected with V. cholerae by inoculating the water. After 24 hours, fish are euthanized and the intestines are surgically removed, homogenized, and plated on selective and differential media to quantify the number of wild-type and mutant strains.

To date biofilm formation does not seem to assist colonization of the zebrafish intestine. Interruption of certain polyamine pathways have been shown to impact colonization efficiency.

David Burton, Biology, Graduate

Faculty Mentor: Jon Davenport, Arts & Sciences

Coauthor(s): Thomas Anderson, Brittany Ousterhout, Jacob Burkhart, Jon Davenport

THE RELATIONSHIP BETWEEN ZOOPLANKTON ASSEMBLAGES AND PREDATORY SALAMANDERS IN PONDS OF THE CENTRAL OZARKS, MISSOURI

Zooplankton are ubiquitous primary and secondary consumers in freshwater ecosystems. One of the largest sources of mortality for zooplankton is predation by aquatic predators. In many wetlands, the Eastern Newt (Notophthalmus viridescens) is the most abundant predator. Both the larvae and adults are aquatic carnivores. Newts are known to be size-selective predators that can have keystone effects on wetland community structure. Along with newts, ambstomatid salamander larvae are also important predators in wetland food webs. To understand how newt and salamander abundance affected zooplankton communities, we sampled 22 ponds in the central Ozarks (Fort Leonard Wood, Missouri) three times during the spring of 2018. Minnow traps were deployed for two consecutive days with trap number scaled relative to the surface area of each wetland. We sampled zooplankton communities using a water column sampler to take four water samples per pond. Zooplankton samples were filtered through a 45µm mesh filter and preserved in 70% EtoH. A subsample was taken from each zooplankton sample for counting, identification, and body length measurements. Preliminary analyses across all wetlands indicate that higher newt densities in early spring were related to lower total zooplankton abundance, indicating that newts are likely the driving force behind zooplankton biomass. Further data analysis on zooplankton size structure and diversity will elucidate on any potential keystone effects of salamanders.

Logan Clark, Biology, Graduate

Faculty Mentor: Matt Estep, Arts & Sciences

Coauthor(s): Matt Estep

DEVELOPMENT OF MICROSATELLITE MARKERS AND EVALUATION OF SPECIES BOUNDARIES BETWEEN LIATRIS HELLERI AND LIATRIS TURGIDA

The North American genus Liatris is composed of 40-50 species mainly confined to the eastern seaboard of North America (Gaiser, 1946; Weakley, 2015). Liatris has been considered a genus of "unusual difficulty" due to intraspecific variability and hybridization between species that has lead to unclear delineation of species boundaries (Gaiser, 1946). This has been the case with L. helleri and its closely related congener, L. turgida (Gaiser, 1946; Nesom, 2005b). Previous genetic and morphological studies in this species have suggested that L. helleri may in fact represent a singular species that would include populations of L. turgida. A series of high-resolution microsatellite markers were developed specifically for use in this study and their utility will hopefully provide future studies with the ability to address species boundaries throughout the genus Liatris. The present study evaluates the genetic diversity, population structure, and the taxonomic identity of these species within the genus Liatris in order to provide land managers and conservation agencies with genetic data to best manage these species and their natural communities.

Tierney Daw, Biology, Undergraduate

Faculty Mentor: Mary Kinkel, Arts & Sciences

Coauthor(s): Tierney Daw, Mary Kinkel

A ZEBRAFISH MODEL OF GUT MOTILITY

Human gut motility disorders are widespread and result from a variety of genetic mutations that impair gut transit. The goal of this research is to develop a gut motility assay to better understand how human gut motility disorders arise. Larval zebrafish offer advantages as a model, including transparent body walls and a straight gut tube, which could allow imaging of the gut wall and gut contents in live fish. I have determined that a meal of brine shrimp is highly visible through the body wall of live larvae. I have also found that some larvae eat brine shrimp as early as 5 days post fertilization (dpf), but that the majority ingests shrimp by 9 dpf. Therefore, I used 9 dpf larvae to develop a gut motility assay. I found that wild-type larvae digest a meal within approximately 4 hours and that motility of the gut wall pushes undigested waste out by 5 hours. The assay was performed 3 times with consistent results. I hypothesize that this assay will be useful to better understand how specific genes function in healthy gut motility. Future studies will allow us to use this assay to test gut function in mutant versus wild-type zebrafish, providing clues to the genes and mechanisms involved in healthy intestinal development and motility.

Patrick French, Biology, Undergraduate

Faculty Mentor: Matt Estep, Arts & Sciences

Coauthor(s): Matt C. Estep

EXPLORING THE REPETITIVE FRACTION OF GRASS GENOMES USING GALAXY

Poaceae, the diverse family commonly known as the grasses, contains some of the most economically important plants on Earth like maize (Zea mays), sugarcane (Saccharum officinarum) and sorghum (Sorghum bicolor). Complete sequenced genomes are available for maize, sorghum, and other grass species. Partially sequenced genomes are also available for sugarcane. The repetitive DNA elements that make up to 75% of these genomes have yet to be thoroughly studied. This project aims to explore and characterize the repetitive elements in six grass genomes that are closely related to the grass tribe Andropoginae. With the ultimate goal of better understanding the mechanisms that have driven the diversification of this important clade. The platform Galaxy utilizes graph-based clustering to characterize repetitive sequences and homology search tools to detect transposable element protein coding domains. Using this tool, the distribution and characterization of repetitive sequences such as satellite repeats and transposable elements in the genome can be quantified. This has the potential for the discovery of novel transposable elements or other repetitive sequences. An improved understanding of repetitive elements across the grass phylogeny will provide better resolution to the grass clade and may uncover the mechanism behind the explosive evolutionary radiation of the grasses.

Morgan Gaglianese-Woody, Biology, Undergraduate

Faculty Mentor: Matt Estep, Arts & Sciences

Coauthor(s): Matt Estep, Jennifer Rhode Ward

THE DEVELOPMENT OF MICROSATELLITE MARKERS FOR THE CULTURALLY AND ECONOMICALLY SIGNIFICANT PLANT, ALLIUM TRICOCCUM

Allium tricoccum Ait. is an herbaceous monocot in the Amaryllidaceae family and is most commonly known as a ramp or wild leek. Ramps are traditionally used in Native American and Appalachian cultures, but their rich history and unique garlicy taste have gained the attention of the general public over the past fifteen years. Although not a rare plant, its growing popularity has led to over-harvesting and population declines. As a result of local population declines, the Great Smoky Mountain National Park (GSMNP) banned harvesting within its boundaries in 2002. This ban was reinforced by a study by Rock and colleagues that concluded that a ten percent harvest of a ramp-clump every ten years is the maximum sustainable harvesting intensity. However, no recent work has been done to understand the genetic variation or population structure of Allium tricoccum in the park since the ban. The purpose of this project is to develop microsatellite markers for Allium tricoccum. To date, we have generated Illumina data for the species and used MSAT Commander to identify potential hypervariable loci. This work will provide the tools necessary for population genetic studies of Allium tricoccum and will help inform conservation management decisions. Additionally, this project will screen for cross-species amplification of the markers in the narrow-leaved wild leek, Allium burdickii, and the nodding onion, Allium cernuum.

Gita Gajjar, Biology, Graduate

Faculty Mentor: Andrew Bellemer, Arts & Sciences

THE ROLE OF THOR AND THE EIF4F COMPLEX IN NOCICEPTOR SENSITIVITY

Pain-sensing neurons, which are known as nociceptors, are used by our body's peripheral nervous system to detect potentially damaging stimuli in a process called nociception. Following tissue damage, nociceptors become sensitized, and this is thought to cause chronic pain. There are statistics showing chronic pain as America's number one cause of disability, therefore understanding its development at molecular level can help treat it. During chronic pain, there is evidence that new proteins are synthesized in the nociceptors, and thus we study the mechanism that regulate protein synthesis. It is our hypothesis that synthesis of new proteins regulate the process of nociception in the nociceptors. We have focused our studies on the eIF4F complex of proteins, which regulates the initiation of protein synthesis. We do this by using genetic tools available to Drosophila, allowing for tissue-specific gene manipulation of different proteins from the eIF4F complex. We study Thor protein, which regulates the assembly eIF4F. When Thor function is removed from the nociceptors, we find that nociception behavior was unchanged in thermal and mechanical nociception assays. However, injury induced sensitized experimental group, showed significantly more pain, indicating Thor functions as regulator switch for nociceptor sensitization. These results give us an insight into nociceptor plasticity in chronic pain as we test other proteins of the eIF4F complex.

Katrina Godsey, Biology, Graduate

Faculty Mentor: Suzanna Brauer, Arts & Sciences

Coauthor(s): Sarah Carmichael, Sydney Bear, Morgan Smith, Suzanna Brauer

ACID MINE DRAINAGE IN THE NEW RIVER: HOW CAN WE USE MICROORGANISMS TO CLEAN UP?

Acid mine drainage (AMD) from the Ore Knob Superfund Site outside of Jefferson, NC drains into Peak Creek, which flows into the South Fork of the New River. AMD is formed when sulfide minerals, exposed to both oxygen and water, break down into sulfuric acid. The acid lowers the pH of the water and allows heavy metals to go into solution, leading to toxic effects to plants and animals in the surrounding environment. Dissolved manganese (Mn) is a common constituent of AMD. The oxidation of dissolved Mn to microcrystalline Mn oxide, hydroxide, and oxyhydroxide minerals (commonly referred to as Mn oxides) is most commonly assisted by bacteria and fungi. Biological Mn oxides can absorb dissolved heavy metals like a sponge and remove them from the environment. We have collected Mn oxide coated rocks and pebbles from Ore Knob and isolated bacteria and fungi responsible for the Mn oxidation in Peak Creek. The bacteria identified belong to the genera Brevibacillus and Chryseobacterium, while the fungus belongs to the genera Plectosphaerella. Identification of these organisms is the first step in future bioremediation of Ore Knob's acid mine drainage problem, allowing for subsequent experiments designed to stimulate biomineral production that can remove heavy metals from the Ore Knob drainage into Peak Creek.

Allison Griggs, Biology, Undergraduate

Faculty Mentor: Cara Fiore, Arts & Sciences

Coauthor(s): Dave Corcoran, Joel Smith, Christina Strobel, Taylor Strope, Cara Fiore

THE DISTRIBUTION AND ECOLOGY OF FRESHWATER SPONGES IN WESTERN NORTH CAROLINA

In western North Carolina little is known about the identification and distribution of freshwater sponges, or what factors drive their distribution. We have identified several freshwater sponge species at our collection sites in three major rivers near Boone, N.C. In May of 2017 we began monitoring the nutrients at two of our collection sites. We hypothesized that inorganic nutrients such as, nitrate, phosphate, sulfate, and chloride, may influence the distribution of freshwater sponges. Inorganic nutrient analyses indicated low nutrient concentration across locations and seasons. Chloride concentrations were the most variable, showing the most potential for influencing the sponge distribution. GIS was used to analyze the landcover around the rivers and a 100-yard buffer was used to visualize the landcover immediately around our collection sites. Preliminary analysis indicates a mix of hay pasture and woods, with some cultivated crops lands near each of our collection sites. Long-term monitoring and more collection sites are needed to better understand the influence that land cover may have on sponge distribution. It is clear however, that suitable bottom-type (i.e., large rocks) is critical for sponge colonization. These data are a first step in exploring freshwater sponge distribution ecology in western North Carolina. Future monitoring will include other parameters such as, temperature, pH, and conductivity, as well as exploring other potential sponge habitat.

Thomas Hastings , Biology, Graduate

Faculty Mentor: Jon Davenport , Arts & Sciences

Coauthor(s): Jon Davenport, LeeAnn Fishback

USING PHYSIOLOGICAL CONDITIONS TO ASSESS PATTERNS OF SUBARCTIC WOOD FROG (RANA SYLVATICA) HABITAT SUITABILITY

Arctic regions are especially susceptible to the effects of climate change, with surface warming rates greater than the global average. Climate change influences wildlife habitat suitability by altering environmental conditions and can be impactful for wildlife that must meet physiologically requirements. The wood frog (Rana sylvatica) is a Subarctic amphibian species that must maintain water balance conditions in terrestrial environments. I hypothesize that the evaporative water loss (EWL) rates of R. sylvatica will differ among three Subarctic habitat types (tundra, boreal forest, and transition) with water loss greatest in the tundra due to increased exposure to environmental variables. I also predict that as a result, tundra will be the least suitable habitat. To address our hypotheses, I selected four sites within northern Manitoba and deployed five plaster models along two randomly located transects within each habitat type. Fully hydrated models were reweighed after a two-hour deployment period to determine EWL rates. Environmental conditions were also measured at model locations. I found that EWL rates are significantly greater in tundra habitat and lowest in forest habitat. Preliminary analyses also indicated that plaster model surface temperature, humidity, ground temperature, and wind speed were significant indicators of EWL rates during the summer. Based on our results, potential wood frog surface activity and habitat suitability will be reduced in the tundra.

Jessie Hatcher, Biology, Undergraduate

Faculty Mentor: Matt Estep, Arts & Sciences

Coauthor(s): Jessie Hatcher, Lindsay Shields, Matt Estep

DEVELOPMENT OF MICROSATELLITE MARKERS TO INVESTIGATE RECURRENT POLYPLOIDY WITHIN THE GENUS DICENTRA.

The genus Dicentra (Fumariaceae, Bernhardi 1833) is a small group of herbaceous plants containing seven species found in North America and one species found in eastern Asia. Three species; D. eximia, D. cucullaria, and D. canadensis display an interesting polyploid series in the Southern Appalachians, where D. eximia is a diploid (2N=16), D. cucullaria is a tetraploid (2N=32) and D. canadensis is an octoploid (2N=64). To investigate recurrent polyploidy within the genus, a set of microsatellite markers are needed to assess whether populations are more closely related by ploidy level or geographic location. 50 primer pairs were identified with various microsatellite motifs via sequence data from D. cucullaria. These primer pairs were first tested on a small number of individuals including all three species. Those that successfully amplified across all samples were fluorescently labeled and submitted for genotyping. Chromatograms were assessed for ease of scorability and allelic diversity.

Katie Krogmeier, Biology, Graduate

Faculty Mentor: Howard Neufeld, Arts & Sciences

Coauthor(s): Howard S. Neufeld

IMPACTS OF POLYPLOIDY ON THE ECOPHYSIOLOGY OF SOLIDAGO ALTISSIMA

Polyploidy in plants could be an evolutionary dead end or it could lead to creation of new species. Goldenrod (Solidago altissima) has diploid and hexaploid populations: diploids and hexaploids in the midwest and only hexaploids in the east. We propose that the different geographic distributions of the polyploids result from natural selection. Polyploids have larger cells, which can affect stomatal densities, sizes, kinetics, and gas exchange rates. We conducted measurements on potted plants at the ASU greenhouse using the Li-6800. Measurements at full light were made in July and light response curves in September. Rates of photosynthesis were higher in July than September for all populations and highest for diploids compared to hexaploids, which did not differ (20.4 vs 16.6 μmol $m^{-2} s^{-1}$, p = 0.042). There were no population differences in stomatal conductance, transpiration or water use efficiency. In Sept., maximum photosynthetic rates were still lowest in eastern hexaploids, but midwest hexaploid rates remained elevated and were not distinguishable from diploids (12.8 vs 9.6 μmol $m^{-2} s^{-1}$, p = 0.031). The drop in photosynthetic rates in Sept. may have resulted from leaf aging and/or rust infection, which became prominent late in the season, although only uninfected leaves were measured for gas exchange. SEM and light microscopy measurements are being made on leaf cross sections to ascertain morphological differences in cell size and leaf structure between cytotypes.

Taylor Le, Biology, Undergraduate

Faculty Mentor: Cara Fiore, Arts & Sciences

Coauthor(s): Cara Fiore, Brandon Short, Coleman Woody

SHIFTS IN CENTRAL CARBON METABOLISM IN CHLAMYDOMONAS REINHARDTII UNDER PHOSPHORUS DEFICIENCY.

Algae are well known to increase production of triglycerides and to undergo fundamental physiological changes, such as remodeling lipid membranes, during nutrient limitation. The increase in triglycerides in particular has received attention with the goal of manipulating this pathway to improve the production of oil for biofuels. There is also some indication that algae increase the production of secondary metabolites under nutrient limitation, which are of interest in natural product research. However, our understanding of the central metabolic shifts that underpin these changes is still limited. With phosphorus limitation in particular, recent research characterized a phosphate starvation response gene (psr1) in the model alga, Chlamydomonas reinhardtti, which coordinates the metabolic response to phosphorus and nitrogen limitation. While the genes that the Psr1 protein interacts with have now been identified, the resulting shifts in metabolic pathways outside of starch and lipid metabolism have not been investigated. Here, we leverage published transcriptomic analysis in C. reinhardtii with our investigation into gene expression for genes involved in central metabolism. We found evidence of shifts in gene expression under phosphorus limitation for three TCA cycle genes that may shuttle carbon into specific pathways for lipid and secondary metabolite production. This work has implications for improving genetic engineering of algae for pharmaceutical and biofuel products.

Alexander Luke, Biology, Undergraduate

Faculty Mentor: Ray Williams, Arts & Sciences

Coauthor(s): Alexander Luke

INVESTIGATION OF ASSOCIATION EFFECTS IN SOLIDAGO SPECIES ON LEAF PHYTOCHEMISTRY AND INSECT GALLS

Despite prolific work on effects of genotypes on the leaf phytochemistry of Solidago altissima, variation due to mixed species association effects has received little consideration. Building on methodological frameworks used to study genotype effects within S. altissima, we conducted a field experiment focused on phytochemistry and gall formation in the presence of another species, S. rugosa. Both S. altissima and S. rugosa occur commonly in mixed plots, suggesting that the interactions between species could have a similar effect on the phytochemistry of a Solidago stand. A site was identified at Brookshire Park in Boone, NC where both species existed in a continuous stand. This was divided into three blocks of three one-meter-square plots containing either S. altissima, S. rugosa, or a mixture of both species. These were monitored for gall and insect abundance throughout the summer growing season of 2018, after which leaf samples were collected for terpene analysis. By using gas chromatography to quantify the terpene profiles of each plot, the treatments could be analyzed for evidence of phytochemical effects of species association. Gall abundance and diameter data exhibited little variation between treatments; however, the study has identified significant effects between treatments in seven of thirteen terpenes analyzed. Further statistical analysis will be completed to determine the implications of each for future study of species association effects.

Cerita Mattison, Biology, Undergraduate

Faculty Mentor: Jon Davenport, Arts & Sciences

Coauthor(s): Kenzi M. Stemp, Jon M. Davenport

SIREN INTERMEDIA COLONIZATION OF A RECENTLY CONSTRUCTED WETLAND

The world has lost 87% of wetlands since 1700, which has undoubtedly affected many wetland-dependent species. In response to wetland loss, restoration and construction of wetlands has been increasing, though little is known about how these wetlands are colonized and used. Siren intermedia is a top vertebrate predator in many wetland ecosystems and can colonize newly constructed wetlands via drainages. To better understand population parameters in a recently constructed wetland in southeastern Missouri, we monitored a local population for 20 months. Each month, we set 19 minnow traps and checked them daily for 4 trap nights; all captured salamanders were marked and measured in the lab, then released.

In total, we captured 123 unique salamanders. Total biomass was greatest during March 2017 with a maximum of 1755.1g in a single trapping cycle. Peak biomass coincided with peak abundance during late winter. Recaptures were more common in the summer season. Preliminary estimates of the population are >500 unique individuals. Our results for peak wetland use by Siren are similar to other published studies. Overall, our study demonstrates that Siren will utilize newly constructed wetlands and populations have the potential to function similarly to natural wetland habitats. Further studies should investigate the usage of wetland-dependent species of constructed wetlands and best management practices.

Kierdre McFadden, Biology, Undergraduate

Faculty Mentor: Andrew Bellemer, Arts & Sciences

Coauthor(s): Andrew Bellemer

SEIZURE SUSCEPTIBILITY AND NOCICEPTION SENSITIVITY IN SODIUM GATED ION CHANNELS OF DROSOPHILA

Epilepsy is a chronic neurological disorder defined by many neurons firing uncontrollably and synchronously. Single mutations have been associated with several epileptic disorders with most mutations occurring in genes that encode proteins necessary for regulating neuronal excitability including voltage and ligand-gated channels. These channels have highly conserved homologs in Drosophila melanogaster, and an ortholog is seen in mammalian nervous systems. Identifying factors that contribute to seizure susceptibility, as well as comorbidities that may result from mutations in regulatory proteins, is important to provide avenues for treatment of seizures. In flies, mutations in the para voltage-gated sodium gene can cause seizure susceptibility and we are interested in understanding how factors such as age and genetic backgrounds might modify this susceptibility. Control and para mutant flies were tested at different ages for changes in seizure susceptibility. These flies were also tested for nociceptive defects to mechanical and thermal stimuli. An increase in age led to increased seizure susceptibility. The para mutation also led to no change in mechanical nociception while hyposensitivity was noted during thermal stimulation. To study the impact certain genes have on seizure susceptibility, genes Split ends (Spen) and Brahma (Brm), which are predicted to enhance para expression, will be used to study their impact on seizure susceptibility and nociceptive functioning.

Haley McGuirt, Biology, Graduate

Faculty Mentor: Andrew Bellemer, Arts & Sciences

THE ROLE OF TRANSLATION REGULATION BY LK6 AND TOR IN NOCICEPTOR SENSITIVITY

Chronic pain is a condition of persisting pain that lasts longer than 90 days and has become an epidemic across the globe. Chronic pain affects 1.5 billion people worldwide and 100 million in the United States alone. The Institute of Medicine states that chronic pain costs the U.S. around $600 billion a year in healthcare cost and lost productivity. The National Institute of Health is currently spending 30% of its budget on pain research and effective treatments are still lacking. My research aims to understand the role of translation regulation in the development of chronic pain. To study translation regulation I use, Drosophila melanogaster. Drosophila allows me to observe how behavioral responses vary when genes known to function in translation are nonfunctional. The genes I am interested in, Tor and Lk6, encode for kinases known to enhance translation during the first phase, initiation. It is hypothesized that disruptions in translation initiation, through Tor and Lk6 knockdowns, will disrupt sensory neuron function and thus alter behavioral responses. After successfully knocking down Tor and Lk6, the behavioral response from Drosophila larvae to noxious stimuli were quantified. Current results show that Tor loss of function correlates with decreased sensitivity to noxious stimuli, while Lk6 loss of function had no effect on baseline sensitivity. Future directions will focus on identifying the role these kinases play in neuron development and hypersensitization.

Erica Pauer, Biology, Undergraduate

Faculty Mentor: Howard Neufeld , Arts & Sciences

Coauthor(s): Fernando K. Alejo-Vann, Kathryn M. Young, Anthony C. Percival, Liliana K Rangel-Parra, Courtney R. Watts, and Howard S. Neufeld

THE ROLE OF LEAF ANGLE AND ITS INFLUENCE ON POTENTIAL GAS EXCHANGE IN AN EVERGREEN HOLLY

The angle of display and azimuthal direction are major determinants of the incident radiation captured by a leaf. These factors can affect the timing and amount of photosynthesis that a leaf can perform, as well as alter transpiration rates through effects on leaf water relations and stomatal conductance. As part of an intensive investigation on the wintertime ecophysiology of an evergreen holly, Ilex x 'Nellie R. Stevens', we measured the distribution of leaf angles and azimuths on bushes growing outside of Rankin Science South. A total of 300 leaves were measured at mid-canopy over 3 bushes on both the north and south facing sides. Leaves were grouped into angle and azimuthal classes for analysis. For the sun leaves, 58% were within 40° of horizontal. In contrast, 77% of shade leaves were within 40° of horizontal. Approximately 41% of sun leaves were oriented to within 45° of vertical compared to only 15% of shade leaves. Thus, overall, sun leaves are more vertically oriented, and face toward the south and west (61% of sun leaves) whereas shade leaves are more horizontally oriented, and face toward the north and east (85% of shade leaves). These groupings will be used to calculate the total radiation incident on leaves over a season, using the NASA Solar Angle calculator and other estimation programs. The results will show how different the gas exchange physiology can be for broad-leaf woody plants. This should be useful in developing models of whole canopy gas exchange.

Anthony Percival, Biology, Undergraduate

Faculty Mentor: Howard Neufeld, Arts & Sciences

Coauthor(s): Liliana K. Rangel-Parra, Erica G. Pauer, Kathyrn M. Young, Fernando K. Alejo-Vann, Courtney R. Watts, Howard S. Neufeld

WINTER TIME GAS EXCHANGE IN AN EVERGREEN ANGIOSPERM: INTRA-CANOPY DIFFERENCES AND RESPONSES TO LIGHT

Research on winter season gas exchange has been conducted primarily on woody evergreen gymnosperms. We know less about whether evergreen woody angiosperms can maintain positive rates of photosynthesis while exposed to high light at or near below-freezing temperatures, a condition known to cause photoinhibition, a result of damage primarily to PS II. Holly (Ilex sp.) are common, broad-leaved evergreen trees and landscape plants, capable of forming dense canopies. Previous research on European holly (I. aquifolium) showed a capability for positive photosynthesis during winter, but leaves exposed to the combination of high light and low temperatures suffered photoinhibition, which was quickly alleviated by imposition of higher temperatures and shading. We are interested in whether the landscape shrub Ilex x 'Nellie R. Stevens' exhibits measurable gas exchange during the winter and whether diurnal variation exists in gas exchange as a result of canopy aspect. Using the LI-6800 and LI-6400XT gas exchange systems we measured leaf responses at ambient winter conditions at 2 sec intervals for ~6-hour periods on sunlit and shaded sides of holly, as well as dark-adapted fluorescence. Under ambient conditions sunlit leaves had higher photosynthetic rates than shaded leaves (2.8 vs 1.1 µmol m-2 s-1), due to much greater light levels (567 vs 32 µmol m-2 s-1), even though they had lower Fv/Fm (0.319 vs .0.658, $p < .001$), indicative of photoinhibition.

Hannah Phillips, Biology, Undergraduate

Faculty Mentor: Michael Opata, Arts & Sciences

Coauthor(s): Lyndsay Richard, Michael Opata

GAMMA DELTA AND NATURAL KILLER CELLS IN SPLENOCYTES OF YOUNG MICE

Immunity to malaria requires an elongated time to develop and the understanding of the immune response to malaria, especially in children under five, is limited due to the lack of a reliable animal model to study the pathogenesis of the disease. By utilizing a newly developed young rodent model in our lab, we have observed that splenocytes and purified CD4+ T cells from 8-week adult mice proliferate faster than day 15 old young mice (pups) when stimulated in vitro. When transferred to immunocompromised RAGKO mice, both pup and adult cells protected from death. These data suggest that apart from CD4+ T cells, there is a faster responsive cell population in the pups that may promote protection against malaria infection in mice. To better understand this responsive cell population in young mice, we adoptively transferred splenocytes from both adults and pups into immunocompromised RAGKO mice and infected these cell recipients with P. chabaudi. We observed higher proportions and numbers of gamma delta T cells in the pup splenocyte recipients when compared to adult counterparts on day 8 post-infection. Interestingly, we observed lower proportions and numbers of natural killer (NK) cells in the adult cell recipients compared to pup recipients. Taken together, our findings suggest that pup cells are enriched or promote an innate immune response comprising of gamma delta and NK cells, while adult cells inhibit the expansion of these innate lymphocyte cells in malaria infection.

Elsie Rodriguez, Biology, Graduate

Faculty Mentor: Cortney Bouldin, Arts & Sciences

Coauthor(s): Cortney Bouldin

EFFECTS OF CHROMOSOMAL CONTENT ON NEUROMESODERMAL PROGENITORS IN ZEBRAFISH EMBRYOS

Stem cells are undifferentiated cells that can, through proliferation and differentiation, give rise to all cell types in a multicellular organism. Neuromesodermal progenitor cells (NMps), stem-like cells essential for body formation in vertebrates, are held in the G2 phase of the cell cycle during posterior axis elongation in zebrafish. Following S phase, G2 phase cells have double the DNA content. Polyploid cells have been shown to be involved in regeneration, genomic buffering against mutation and resistance to apoptosis. Cells held in G2, with double the DNA content, might be mimicking benefits seen in polyploid cells. To examine the connection between differing DNA contents and NMps differentiation, haploid and diploid zebrafish were generated via in vitro fertilization. The genes tbxta, tbx16, tbx16l, and myoD1 are mesoderm specific genes with explicit domains of expression in differentiating progenitors. To date, we have used in situ hybridization with a probe for tbxta which is expressed in the least differentiated NMps as the body forms. Across haploid and diploid zebrafish, the staining for tbxta, shows varying domains of expression at 16 hours post fertilization. In haploids, split notochords and less tbxta expression at the tip of the tailbud were observed. Therefore, less DNA content may hinder the ability of an NMps remain undifferentiated. Future directions include staining with additional mesoderm specific genes and a comparison including tetraploid zebrafish.

Marietta Shattelroe, Biology, Graduate

Faculty Mentor: Matt Estep, Arts & Sciences

Coauthor(s): Matt C. Estep

GENETIC INVESTIGATIONS OF A FORGOTTEN ENDEMIC, GEUM GENICULATUM MICHX., BENT AVENS.

Geum geniculatum Michx. (Roseaceae), bent avens, is a perennial herb restricted to the high elevations of three mountaintops between North Carolina and Tennessee. Although geographically restricted, occurrences on these mountaintops can have up to hundreds and occasionally thousands of individuals. Because of its limited geographic distribution and affinity for high elevations, it is thought to belong to a group of plants endemic to the southern Appalachians that are considered post-Pleistocene relics including its charismatic cousin Geum radiatum. While population size has been monitored, scientific studies are lacking for G. geniculatum. Therefore, there is a need for research to understand basic life history traits, pollination biology, population demography, and genetic diversity in order to understand how the species may respond to our changing climate and inform conservation strategies for the species. In order to begin to understand G. geniculatum further, a population genetics study was performed to understand genetic variation and connectivity within the species and between populations. Individuals were sampled from the three mountains where it occurs and genotyped using previously developed microsatellite markers for other Geum species. Using this data population genetics analysis were completed.

Savanna Sheridan, Biology, Graduate

Faculty Mentor: Mary Kinkel, Arts & Sciences

Coauthor(s): Savanna Sheridan, Tierney Daw, Alena Norton, Mary Kinkel

LARVAL REARING METHODS FOR SMALL-SCALE PRODUCTION OF HEALTHY ZEBRAFISH

Zebrafish are an important model organism for biomedical research. However, raising larvae to provide a source of specimens is a significant challenge. On a daily basis, larvae require multiple feedings and careful water quality monitoring. Further, larvae grow rapidly and their care needs continually change as they grow. Their changing needs require transitioning them through different feeding, housing, and water conditions. Even for skilled researchers, larval survival rates are often low. To offset low survival rates, a common strategy is to raise large numbers of larvae in order to generate enough survivors for experiments. However, small labs lack the support staff needed for this approach. Therefore, our goals were to 1) streamline procedures so that students could balance coursework with raising fish, and 2) develop techniques that promoted a high rate of survival. We designed an easy feeding regimen, a low-maintenance nursery to hold fish tanks, and a novel tank cleaning method that is fast and simple. To further streamline procedures, we tested whether larvae could be raised without feeding them cultures of paramecia or rotifers. We found that most larvae can eat brine shrimp early in life. As brine shrimp are easier to culture, we added this approach to our regimen. We tested the regimen across multiple clutches and generations and found 75-100% survival rates. We believe these methods will be useful for raising small cohorts of healthy zebrafish.

Morgan Smith, Biology, Graduate

Faculty Mentor: Suzanna Brauer, Arts & Sciences

Coauthor(s): Katrina Godsey, Suzanna Brauer, Sarah Carmichael

MANGANESE (II) OXIDIZING MICROBES AND MINERAL INDUCED SELECTION

Manganese oxidizing microorganisms are abundant in nature and play an important role in biogeochemical cycles in the environment. Cave and karst systems are important natural resources because they provide significant sources of the world's drinking water and support biological communities. The microbial ecology of Mn oxide deposits is not well understood, and even less is known about the factors that stimulate Mn-oxidizing microbes in situ. Previous studies suggest that biological Mn oxide minerals are strongly oxidative and have highly charged surfaces making them highly reactive. For example, they have the ability to degrade humic substances, scavenge reactive oxygen species, concentrate rare earth elements, and influence trace metal bioavailability and speciation. However, the microbes that generate these reactive Mn oxides show a strong preference for some rock/mineral surfaces over others, even when these surfaces are in direct proximity to each other. Based on field observations in a variety of cave, karst, and wetland environments, it is predicted that Mn oxidizers prefer to grow on quartz rather than calcite. The aim of this study is to identify which Mn oxidizing microbes within a local microbial community preferentially colonize some minerals instead of others. Predicting how and where Mn oxides will grow is a vitally important tool for the production of reactive mineral species, which can be used in a variety of water filtration and bioremediation technologies.

Isabel Sullivan, Biology, Undergraduate

Faculty Mentor: Jennifer Geib, Arts & Sciences

Coauthor(s): Kaitlyn Whitley, Jennifer Geib

GENETIC DIFFERENTIATION OF ALPINE BUMBLE BEES ACROSS THE CENTRAL COLORADO ROCKY MOUNTAINS

Mountain ecosystems have experienced significant environmental impacts from climate change in the last 50 years, creating challenges for native species. Extant populations with greater connections (dispersal and gene flow) should be more likely to withstand environmental challenges. These projects aim to investigate the relative extent of genetic connectance among populations of Bombus balteatus and B. sylvicola, two ecologically important native bumblebee species in the alpine of Central Colorado Rocky Mountains. These species have experienced relative abundance declines, likely due to climate-caused floral declines and competition with upwardly mobile lowland Bombus species. We first examine population genetic structure using microsatellite markers and use geospatial modeling to determine how landscape features (elevation, land-use) influence dispersal and gene flow by correlating genetic distances to landscape resistance distances. B. balteatus and B. sylvicola are restricted to high elevations, yet differ in tongue length and body size, which may influence their dispersal ranges. Comparisons of these two species from identical elevations and study sites may show differences in their dispersal across the landscape and exchange genes. Comparing how the population genetic structure of these two alpine bumblebees is influenced by various landscape features allows for predictions of persistence. Determining population persistence in the alpine allows for a conservation focus.

Elijah Thompson, Biology, Undergraduate

Faculty Mentor: Jon Davenport, Arts & Sciences

Coauthor(s): Elijah J. Thompson, Kenzi M. Stemp, Thomas L. Anderson, Brittany H. Ousterhout, Jake Burkhart, and Jon M. Davenport.

USING TRAIL CAMERAS TO MONITOR SEASONAL MIGRATIONS OF TWO POND-BREEDING SALAMANDER SPECIES

The timing of life history events, can be influenced by abiotic factors such as rainfall, temperature, and photoperiod. In amphibian communities, the timing of breeding events and arrival order of species can directly influence food web interactions and entire pond community structure. To better understand the variability of arrival times, we monitored breeding phenology of two fall-breeding salamander species, the Marbled Salamander (Ambystoma opacum) and the Ringed Salamander (Ambystoma annulatum). We used two drift fences to partially enclose approximately 50% of three wetlands in central Missouri; each fence had an entry point with a trail camera mounted above to capture photos of salamanders moving into and out of wetlands. Cameras were set to capture images via motion trigger and a timelapse, with recordings every minute between 20:00-06:00 from 9/3/2017-11/17/2017, and 9/6/2018- 11/01/2018. Through the fall of 2017, we found 37 A. opacum and 139 A. annulatum migrating to or from wetlands, with major breeding pulses occurring on 9/17/17-9/18/17 and 10/3/17-10/6/17. Additionally found were 17 other species of herpetofauna and 11 species of non-herpetofauna, suggesting that camera traps may be a useful and non-invasive tool for monitoring movements of amphibians as well as predator presence at wetlands. The data presented here are the first two years of an ongoing monitoring project. We will continue to gather information on the effectiveness of trail cameras to monitor amphibian phenology.

Ellen Trost, Biology, Undergraduate

Faculty Mentor: Ray Williams , Arts & Sciences

EFFECTS OF GENETIC VARIATION ON FLOWER TERPENE COMPOSITION IN SOLIDAGO ALTISSIMA

Genetic variation within a species can lead to a variation in secondary metabolite production among individuals. Terpenes are volatile secondary metabolites produced by plants to communicate with the insects that consume and pollenate them. By determining how different genotypes can impact the production of terpenes we can better understand the interactions between plants and insects. Solidago altissima (tall golden rod) is found as a hexaploid, tetraploid, and a diploid across the Midwest United States. Plants with varying genotypes from different regions were collected and grown in a common garden. Using gas chromatography we quantified the terpenes in flower tissue to see if there were any patterns among genotypes. We found that germacrene D was by far the most abundant terpene in almost all of the genotypes, with the diploid genotypes producing the most. Limonene and α-pinene were also found in large quantities among the genotypes.

Amanda Wilkinson, Biology, Graduate

Faculty Mentor: Matt Estep, Arts & Sciences

Coauthor(s): R. Wayne Van Devender, Amy S. Van Devender, and Matt C. Estep

TESTING UTILITY OF CURRENT PHYLOGENETIC MARKERS IN GENUS NEOHELIX (GASTROPODA: POLYGYRIDAE)

As a significant source of calcium carbonate for wildlife and a major native detritivore that decomposes understory litter, land snails have a strong impact on our local ecosystem. Native land snails of the Appalachians have been highly understudied compared to other regional mollusks. A better phylogenetic understanding of this group would contribute to our taxonomic and ecological understanding of Appalachian land snails. This project aims to test currently available phylogenetic markers for applicability within Genus Neohelix. A group of six genetic loci from past studies on snails were PCR amplified with published primers and conditions to assess their utility for identifying polymorphisms. These markers include cytochrome oxidase I (COI) or a partial cytochrome oxidase I, cytochrome b (Cytb), large ribosomal subunits 16S and 28S, small ribosomal subunit 12S, and histone 3. DNA sequence alignments and an analysis of polymorphism from a small subset of individuals are presented with suggestions for marker use in phylogenetic studies of land snails.

Adam Willits, Biology, Graduate

Faculty Mentor: Andrew Bellemer, Arts & Sciences

Coauthor(s): Josh Herman, Andrew Bellemer

CELLULAR SIGNALING PATHWAYS REGULATE NOCICEPTOR FUNCTION AND DEVELOPMENT IN DROSOPHILA

Chronic pain is a major public health concern that affects about 100 million Americans, costs $600 billion in healthcare costs, and is a major cause of missed work. For these reasons, it is important to research the mechanisms of pain to develop more effective clinical interventions. To better understand pain, my research uses Drosophila melanogaster to investigate sensory neuron function. My major goal is to understand the cellular signaling mechanisms that control sensory neuron sensitivity. In one project, I studied flies lacking the function of the G-alpha-q and norpA genes involved in neurotransmitter signaling, and I found that both are required for behavioral responses to harsh thermal and mechanical stimuli. Removal of their function does not result in morphological differences in the sensory neurons that detect harsh stimuli, which suggests that they are involved in signaling in these neurons instead of development. In a second study, I have targeted a gene involved in the Wnt signaling pathway called off-track 2 (otk2), which encodes a transmembrane receptor in Drosophila. Loss-of-function of otk2 suggests that it plays a role in sensory neurons in the detection of harsh thermal stimuli but not harsh mechanical stimuli. In addition, loss of otk2 function results in a defect where the dendrites of sensory neurons develop to be more complex than wild-type neurons. I am currently conducting experiments to uncover more about the role of otk2 in development.

Erin Young, Biology, Graduate

Faculty Mentor: Ece Karatan, Arts & Sciences

Coauthor(s): Erin Young, Ece Karatan

IDENTIFICATION OF THE BINDING INTERFACE BETWEEN NSPS AND MBAA IN VIBRIO CHOLERAE

Vibrio cholerae is an aquatic, Gram-negative bacterium that is the causative agent of the diarrheal disease cholera. Typically, cholera is contracted through drinking contaminated water and affects millions of people every year. Important to its lifecycle, V. cholerae exists in two different states: a motile, free-swimming state associated with increased virulence and a sessile, biofilm state thought to be important to environmental persistence.

This study investigates the proposed interaction between two proteins, NspS and MbaA, which compose a putative signaling pathway regulating biofilm formation in response to environmental signals. It is hypothesized that NspS interacts with the periplasmic domain of MbaA to alter the enzymatic activity of MbaA, which leads to either enhanced or inhibited biofilm formation. The aim of this work is to identify the binding interface between NspS and MbaA by a random mutagenesis approach. Error prone PCR was performed to introduce random mutations into the nspS gene and the products were used to generate a mutant library. This library was transformed into a mutant nspS strain of V. cholerae and mutant clones were assessed for biofilm formation using crystal violet staining. Mutant clones deficient in biofilm formation were sequenced and thirteen amino acids of NspS were identified in the mutant clones, which are hypothesized to be crucial for the interaction between NspS and MbaA.

Brianna Ypema, Biology, Undergraduate

Faculty Mentor: Steve Seagle, Arts & Sciences

Coauthor(s): Brianna A. Ypema, Steven W. Seagle

MAPPING IXODES SCAPULARIS HABITAT SUITABILITY AND LYME DISEASE RISK IN THE SOUTHERN APPALACHIANS

The Blacklegged tick (Ixodes scapularis; BLT) has recently expanded its range southward into the Southern Appalachians, posing a risk to human health in the form of increased Lyme disease incidence. Our objectives are (1) to estimate the extent and spatial distribution of Lyme disease risk in the Southern Appalachians by mapping habitat suitability, and (2) to use habitat suitability mapping to guide experimental field tests of BLT survivorship. Mapping of potential suitable habitat was based on the physiological requirements of BLTs, and was derived using topographic, land cover, and climate data bases. Potential suitable habitat was ranked according to its likelihood of providing conditions in which BLTs can avoid desiccation during molting and questing. The resulting maps were then compared with mapped areas of concentrated human population. The predicted optimum habitat is widely distributed but sparse throughout the Southern Appalachians, and most often occurs outside of areas populated by humans. As less optimal habitat conditions were considered, percentage of suitable map pixels increased from 0.03%, to 22%, to 53%, and association with human populations increased. In order to test the predictions of habitat suitability, enclosure experiments will be designed and implemented in late spring 2019 to quantify survivorship in areas of predicted high quality sites and predicted low quality sites.

CHEMISTRY AND FERMENTATION SCIENCES

Angelina Azieva, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Nicholas Shaw, Arts & Sciences

Coauthor(s): Nicholas Shaw

TOWARD STEREOSELECTIVE SYNTHESIS OF RESVERATROL USING SOMS NANO-REACTORS

Swellable organically modified silica (SOMS) is capable of behaving as a nano-reactor to facilitate organic synthesis of importance, such as the synthesis of biodiesel synthesis, peptides, , and therapeutic drugs. Resveratrol is a trans-alkene produced by some plants as a protective reaction against parasites, such as bacteria or fungi. Therapeutically, in experiments with mice and rats, resveratrol demonstrated antitumor and anti-inflammatory activity, while also demonstrating the ability to lower blood sugar, afford cardioprotection and other positive effects. In addition, studies have shown the ability of resveratrol to increase the life expectancy of some invertebrates and short-lived fish. When traditional synthetic methods are used to conduct the Wittig reaction that produces resveratrol, two products are produced; resveratrol (the trans product) and a cis co-product. Unfortunately, the presence of the cis co-product greatly diminishes the yield of resveratrol and necessitates purification before pure resveratrol is obtained. It is believed that synthesis of resveratrol in SOMS nano-reactors will produce only trans product. Advancements toward this outcome will be presented by the authors.

Harrison Esterly, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Brooke Christian, Arts & Sciences

Coauthor(s): Esterly, H.J., Crilly, C., Piszkiewicz, S., Pielak, G.J., and Christian, B.E.

TOXICITY AND IMMUNOGENICITY OF A TARDIGRADE CYTOSOLIC ABUNDANT HEAT SOLUBLE PROTEIN

Tardigrades are microscopic animals recognized for their resilience to extreme stresses, including desiccation, freezing, boiling, low and high pressures, and high doses of radiation. Their ability to survive desiccation is attributed to tardigrade-specific cytosolic abundant heat soluble (CAHS) proteins. Expression of these proteins in other cells increases the desiccation tolerance of those species, and in vitro, CAHS proteins inhibit desiccation-induced inactivation of other proteins. We are seeking to test the ability of CAHS proteins to stabilize protein-based therapeutics, which require refrigeration for transportation and storage. The ability of CAHS proteins to preserve the activity of these pharmaceuticals upon desiccation at room temperature would increase their availability and reduce their cost. To this end, we investigated the toxicity and immunogenicity of CAHS D when injected into mice. Recombinant CAHS D was expressed in E. coli and purified by cation-exchange chromatography. Purity was verified by mass spectrometry prior to endotoxin removal. Purified CAHS D was injected at various concentrations, and mice were monitored for symptoms of toxicity. No changes in weight or behavior were observed during the 28-day monitoring period. A large-scale toxicity study, as well as additional studies to test immunogenicity, is underway.

Noah Gregory , Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Jefferson Bates , Arts & Sciences

Coauthor(s): Noah Gregory, Jefferson Bates

STRUCTURAL AND ENERGETIC PROPERTIES OF FCC & BCC MATERIALS FROM ADVANCED DENSITY FUNCTIONALS

The random phase approximation (RPA) is an advanced density functional theory (DFT) method that overcomes many shortcomings of traditional DFT approximations. RPA is self- interaction free, naturally incorporates van der Waals and London dispersion forces, and contains no fitted parameters, but it is generally more computationally expensive than other DFT methods such as PBE or B3LYP. In order to reduce the computational cost of RPA calculations, range-separated RPA was introduced in order to avoid the need for large basis sets to reach convergence. Here we explore the application of range-separated RPA to several bulk face centered and body centered cubic materials. Convergence of the lattice constants are studied with respect to the basis set size, as well as with respect to changes in the range-separation distance scale. We compare our range-separated RPA results to benchmark theoretical results and to experimental data when available. Range-separated RPA results are close to RPA, PBE, and experimental results for lattice constants. Future work will be focused toward optimizing the range separation parameter for more general crystal structures and atomic compositions.

Tyler Harris, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Brooke Christian , Arts & Sciences

Coauthor(s): Samantha Steyls, Brooke Christian

SOD2 OVEREXPRESSION AFFECTS MOUSE HEPATIC OXPHOS COMPLEX INTEGRITY

Reactive oxygen species (ROS), such as superoxide and hydrogen peroxide, are produced as byproducts of cellular respiration and can damage DNA, proteins, and lipids within a cell. To combat the production of superoxide, cells express superoxide dismutase 2 (SOD2), an antioxidant enzyme which converts superoxide into hydrogen peroxide. Mice that overexpress SOD2 were used to examine tissue-specific ROS-responsive genes. Microarray data indicates a disruption in genes encoding proteins that function in oxidative phosphorylation in SOD2 mice. BN-PAGE analysis confirms the defect, but kinetic analysis of complexes 2 and 5 show no significant difference. We propose that the overexpression of SOD2 may destabilize assembled OXPHOS complexes, rendering them more sensitive to detergent. Current research is being conducted to test the stability of SOD2 oxidative phosphorylation complexes against oxidative stress, as well during aging.

Sarah Heiss, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Megen Culpepper, Arts & Sciences

Coauthor(s): Lydia Harris, Megen Culpepper

EXPRESSION OF A PUTATIVE TWO-SUBUNIT DIMETHYLSULFIDE MONOOXYGENASE PROTEIN FROM ARTHROBACTER GLOBIFORMIS

Dimethylsulfide (DMS), is the most abundant volatile organic sulfur compound (VOSC) affecting the global sulfur cycle. It is a key component in climate control due to its involvement in increased cloud formation leading to decreased solar radiation. The enzyme DMS monooxygenase has been characterized by the soil bacteria, Hyphomicrobium sulfonivorans. It readily oxidizes DMS and molecular oxygen into methanethiol and formaldehyde. Two subunits are required for catalysis, a DmoA FMNH2 dependent monooxygenase and a DmoB flavin reductase. Phylogenic analysis has identified a putative DMS monooxygenase in the soil bacteria, Arthrobacter globiformis (A. globiformis), which also contains genes corresponding to dmoA and dmoB on the operon. Both subunits have been expressed in BL21DE3 E.coli cells and purified. The Mr of AglobA (51 kDa) and AglobB5 (18 kDa) based off their amino acid sequences were confirmed by SDS-PAGE analysis. Enzyme activity of AglobB5 is observed in the presence of co-substrates NADH and FMN. Control experiment exhibit no activity. Michaelis-Menten kinetics studies and protein structure determination by X-ray crystallography are underway.

Samuel Jones, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Duygu Ercan Oruc, Arts & Sciences

Coauthor(s): Maria Santiago, Kayla Brown, Paige Banks

HAZARDS ANALYSIS CRITICAL CONTROL POINTS FOR THE PRODUCTION OF SOY YOGURT

Hazards analysis critical control points (HACCP) is a preventive documented approach to ensure food safety. The aim of this study was to develop a HACCP plan for the production non-dairy, soy-based yogurt for individual serving sale, containing Lactobacillus delbrueckii, Lactobacillus plantarum, and Streptococcus thermophilus. Critical control points for soy yogurt production were determined by conducting hazard assessment for each raw material and for each production step and by considering prerequisite programs (GMP, SOP, SSOP). Critical control points were concerned primarily with bio-hazards such as mycotoxins, Listeria monocytogenes, etc. Reception of soy milk, reception of starter cultures, sterilization, and fermentation steps were considered as critical control points for soy yogurt production. Then, critical limits, monitoring procedures, and corrective actions were determined for each critical control points to produce safer soy yogurt.

Jordan Reisterer, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Duygu Ercan Oruc, Arts & Sciences

Coauthor(s): Emily Burton, GiGi Kakouras, Tommy McLaughlin

Hazards analysis critical control points for the production of dehydrated fruit flavored probiotic yogurt

Development of hazards analysis critical control points (HACCP) plan prevents potential food safety hazards rather than detects. In this study, HACCP plan was developed for the production of dehydrated fruit flavored probiotic yogurt. First, the production steps and production conditions were determined. After determination of prerequisite programs (good manufacturing practices, standard operating procedures, and sanitation standard operating procedures), hazard assessments for each raw material and for each production step were conducted to determine the critical control points for the HACCP plan. As a result, receiving fruit, pasteurization, and fermentation steps were selected as critical control points. Then, critical limits, monitoring procedures, and corrective actions were determined.

Anna Rich, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Aruna Weerasinghe, Arts & Sciences

Coauthor(s): Zach Reynolds, Dale E. Wheeler, Aruna J. Weerasinghe

SPECTROSCOPIC STUDIES OF NOVEL EU3+ COMPLEXES OF RHODAMINE-B DERIVATIVES FOR SENSING APPLICATIONS

Europium complexes have gained much interest recently for sensing applications due to their interesting spectroscopic properties. Three novel europium complexes bearing rhodamine-B derivatives were prepared in acetonitrile and evaluated for their usefulness in sensing applications. Binding of Eu3+ caused a shift in ligand absorbance depending on the binding pocket of the ligand. Job's plot analysis was conducted to determine the binding stoichiometry and found 1:1 and 1:3 (Eu3+: Ligand) binding. The variation in binding stoichiometry was due to the size variation in the binding pocket of the ligand. The ability to tune the ligand absorbance band with the change in binding pocket of the ligand creates an opportunity to utilize such complexes for sensing applications. Fluorescence and UV-Vis absorbance data of these complexes with nerve agents as target analyte will be presented.

John Stevens IV, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Megen Culpepper, Arts & Sciences

Coauthor(s): Matthew B. Culpepper, Megen A. Culpepper

ACTIVITY OPTIMIZATION OF DIMETHYLSULFIDE MONOOXYGENASE FROM HYPHOMICROBIUM SULFONIVORANS USING FLAVIN REDUCTASE MIMIC PROTEINS

Dimethylsulfide (DMS) is a volatile organic sulfur compound which has climate regulating effects when introduced into the atmosphere. DMS monooxygenase is present in the bacteria Hyphomicrobium sulfonivorans and degrades DMS to methanethiol and formaldehyde via a two-component enzyme requiring a monooxygenase (DmoA) and an NADH dependent FMN oxiodoreductase (DmoB). Expression and purification of the DmoA subunit in E. coli has been successful. The DmoB subunit expresses as inclusion bodies and is therefore inactive. The goal of the project is to detect methanethiol formation in the presence of DMS resulting from the DmoA monooxygenase protein using mimic reductase proteins of the B subunit.

We have determined two protein mimics of DmoB to use as substitute FMN oxiodoreductases. NADH:FMN oxiodoreductase (EmoB) from Mesorhizobium and Alkanesulfonate FMN reductase (SsuE) from Escherichia coli were both used to characterize the catalytic degradation of DMS by the DmoA subunit. B mimic proteins were screened for optimum expression, determined to be in BL21DE3 E. coli cell line. Both exhibited enzymatic activity by monitoring NAD(P)H consumption at 340 nm in the presence of FMN. No activity was observed in the absence of FMN. Consumption of NAD(P)H by both mimics only in the presence of FMN confirmed both reduced FMN to FMNH2, the required cofactor for DmoA. Kinetic studies will be continued on DmoA with FMN reductase mimics to further investigate the catalytic mechanism by which DMS monooxygenase degrades DMS into methanethiol.

Elizabeth Vaughan, Chemistry and Fermentation Sciences, Undergraduate

Faculty Mentor: Nicholas Shaw, Arts & Sciences

Coauthor(s): Taylor Ramsey, Nicholas Shaw, Megen Culpepper

ESTERIFICATION OF CARBOXYLIC ACIDS FOR ANALYSIS VIA GAS CHROMATOGRAPHY

Gas chromatography is a popular method for the identification and quantification of organic mixtures. Currently, there are no simple methods for the quantitative analysis of carboxylic acids via gas chromatography. This research proposes an efficient universal method for the derivatization of carboxylic acids to methyl esters in the presence of an acid catalyst through the employment of novel nano-reactors. These nano-reactors force the esterification reaction toward completion in two ways: 1) by forcing reagents to interact and 2) by removing the water byproduct from the reaction vessel to invoke Le Chatelier's principle. This conversion will theoretically produce quantitative yields, efficiently, without excessive heat or expensive catalysts, making it an ideal choice for the chromatographic analysis of carboxylic acids. The use of a representative library of simple carboxylic acids, along with spectral data collected from proton nuclear magnetic resonance spectroscopy and comparative retention times collected from a gas chromatogram, will be used to validate the hypothesis set forth in this project. Establishing an experimental procedure through this endeavor will set the groundwork for the eventual optimization and application of this esterification method to more complex molecules.

COMMUNICATION SCIENCES AND DISORDERS

Indigo Hollister, Communication Sciences and Disorders, Undergraduate

Faculty Mentor: Jordan Hazelwood, Health Sciences

Coauthor(s): Jordan Hazelwood

Speech-language pathology graduate student clinicians' self-perceived competency in dysphagia management

Speech-language pathologists are the primary care providers for people with swallowing disorders (dysphagia). Despite the complexity of dysphagia, SLPs are not adequately prepared to comprehensively assess and treat this disorder. Competency in dysphagia management is imperative in order to provide best patient care and achieve maximum quality of life. The Dysphagia Competency Verification Tool (DCVT) is a metric used to measure clinician competency. By modifying the DCVT for SLP graduate student clinician use, we can systematically measure competency of knowledge and skills in the area of dysphagia. The overarching goal of this research is to explore how the DCVT can be utilized by SLP graduate student clinicians to evaluate and document dysphagia competency. Results of a pilot study revealed an increase in all participants' self-perceived competence for all domains of the DCVT. This poster will discuss these results in detail and explore future directions of this research by explaining how perception of competency may change throughout SLP graduate student clinicians' program of study. By self-assessing competency throughout schooling, future SLPs may better direct their education as they train to become dysphagia specialists.

Seth Longbottom, Communication Sciences and Disorders, Undergraduate

Faculty Mentor: Jordan Hazelwood, Health Sciences

Coauthor(s): Jordan Hazelwood

HOW DO SPEECH-LANGUAGE PATHOLOGISTS UTILIZE DRINKING STRAWS IN DYSPHAGIA MANAGEMENT?

As the preferred healthcare providers for people with swallowing disorders (dysphagia), speech-language pathologists (SLPs) may recommend that patients with dysphagia use plastic straws to increase oral intake and bolus control, and to encourage independence in self-feeding. However, plastic drinking straws have recently been banned in some public places. While advocates for this ban often cite environmental pollution as the driving factor for their support, this trend of banning plastic drinking straws raises concern for medical SLPs. A widespread ban on plastic straws may negatively impact people with dysphagia who have therapeutic goals aimed to increase nutrition and quality of life, and could possibly infringe upon the rights of those with disabilities. Additionally, questions about infection control and safety of reusable straws in the healthcare setting are currently unanswered. The purpose of this poster is to explain the current state of the straw ban, discuss the therapeutic benefit of straws for people with dysphagia, and describe our plans to study how SLPs utilize drinking straws in dysphagia management.

Michael Ulrich, Communication Sciences and Disorders, Undergraduate

Faculty Mentor: Jordan Hazelwood, Health Sciences

Coauthor(s): Jordan Hazelwood, Heather Miller, Lindsey Austin

CRITICAL REVIEW OF ONLINE RESOURCES FREQUENTLY UTILIZED BY SPEECH-LANGUAGE PATHOLOGISTS FOR DYSPHAGIA MANAGEMENT

Online resources are available to the public in various forms, including social media, personal and professional blogs, and video sharing websites. While much of the information online is valuable, the best clinical and evidence-based practice requires a critical review of resource quality and credibility. Speech-language pathologists (SLPs) should focus on developing their critical review skills in order to provide optimal care and mitigate patient harm. Therefore, the goals of the research include: 1) identifying online resources frequently utilized by SLPs, 2) evaluating identified resources against a critical review metric, and 3) describing how choosing online resources may change as SLP training advances. The results from a pilot study concluded the majority of online resources frequently used by SLP graduate students lacked credibility when compared to a standardized critical review metric. This poster will discuss the detailed results of this study and explore future directions of this research by describing plans to determine if similar results will be found for certified SLPs. We hypothesize that as professionals progress in their training, their ability to critically review online resources will improve.

COMPUTER INFORMATION SYSTEMS AND SUPPLY CHAIN MANAGEMENT

Blaise Smith, Computer Information Systems and Supply Chain Management, Undergraduate

Faculty Mentor: Jason Xiong, Business

THE OPPORTUNITIES AND CHALLENGES OF BLOCKCHAIN ADOPTION IN SUPPLY CHAIN MANAGEMENT

Blockchain and its related technologies start to present the business values recently. The purpose of this study is to analyze blockchain adoption within the field of supply chain management by looking at companies that have already put into place blockchain technology practices. Before looking at blockchain applications, you first need to have a basic understanding of blockchain technology. Blockchain, was first introduced to the public in 2008 after Satoshi Nakamoto, whose identity is kept secret, released the whitepaper "Bitcoin: A Peer to Peer Electronic Cash System" (Marr, 2018). Since then, fascination has grown exponentially with Blockchain technology, and with cryptocurrencies in general. Blockchain technology is the foundation of cryptocurrencies. It is also a shared ledger that cannot be altered and facilitates the process of transactions and tracking assets in a business network. Since blockchain technology is a fairly new topic, there is much to be looked at with thinking about its impacts, good or bad, on the field of supply chain management. Within this study I will look at challenges that companies will face or potential opportunities when putting into place blockchain adoption. This study looks at blockchain adoption within real companies. It will also look at the effects on various aspects of supply chain management, such as quality, efficiency, traceability, and more.

COMPUTER SCIENCE

Chloe Dorin, Computer Science, Undergraduate

Faculty Mentor: Rahman Tashakkori, Arts & Sciences

Coauthor(s): Patrick Beekman

OBSERVATION OF ANOMALIES IN HONEY BEE HIVE VIDEO RECORDINGS

This study analyzes the behavior of European honeybees, Apis mellifera, using a camera connected to a Raspberry Pi system above hive entrances. Three hives have been monitored since April 2018, with one-minute videos recorded every 5 minutes from sunrise to sunset. Recordings are sampled for the ten videos with the highest relative hive activity for each hive per day to find correlations between honeybee behaviors and hive disease pathology, parasitism, and survivability. A positive correlation between hive activity and video file size was determined by earlier studies, allowing us to use graphs of video file size to identify peaks in activity. The graphs serve to indicate abnormalities in hive behavior for investigation. In September, hive rpi24 exhibited symptoms of Deformed Wing Virus, a pathogen that is indicative of a severe infestation of varroa mites, Varroa destructor. A video sample prior to the first expression of DWV symptoms confirmed a heightened varroa mite load. Additionally, the hive showed higher numbers of drones than is typical later in the year; this was investigated as indicative of either a failing queen or of high resources. Finally, one hive, rpi12b, experienced severe robbing throughout October and November 2018. This hive demonstrated symptoms of colony collapse and is still being investigated. Hypotheses for causations of these abnormalities in hive behavior and health were posed and will be supported or rejected through continued video sampling.

Daniel Jeffries, Computer Science, Undergraduate

Faculty Mentor: Raghuveer Mohan, Arts & Sciences

DSDRAW: A SOFTWARE TOOL FOR PROGRAMMABLE VISUALIZATIONS AND ANIMATIONS

Teaching in computer science and STEM disciplines presents many challenges due to the ability to abstract lower level concepts. Verbal explanations often fail to satisfy students' desires for intuitive understanding, but well-crafted visualizations build intuitions and provide students with an accessible mental picture. Unfortunately, commercial tools tend to be expensive and overwhelming, requiring licensing and training for effective use. Most free tools offer basic utilities and preset graphics but lack flexibility and expressive power.

As a solution we develop dsDraw, a lightweight web interface for recording whiteboard-style lectures with instructional audio. Graphics are created within the editor using the mouse and keyboard or by invoking commands in an interactive console. The resulting videos can be exported to common file formats for use in other mediums.

The dsDraw language provides a familiar C-like programming syntax, allowing users to minimize repetition and work at a higher level of abstraction. It includes built-in functions for common structures such as flowcharts and trees, but users can define their own functions to enhance their editing workflow.

This software offers solutions to instructors facing growing enrollments of students in STEM disciplines. It is particularly well suited for computer science topics including data structures, algorithms, and computer science theory, as well as other STEM areas such as chemistry and mathematics.

ECONOMICS

Myles Grady, Economics, Undergraduate

Faculty Mentor: John Whitehead, Business

Coauthor(s): John Whitehead, Luis Rangel

ECONOMIC IMPACT OF HEMLOCK WOOLLY ADELGID IN WESTERN NORTH CAROLINA

This research aims to determine the economic impact of the Hemlock woolly adelgid (HWA), a non-native species found from Georgia to Maine, in Western North Carolina. Data were collected via online surveys in the summer of 2018 to a random sample of NC residents. We focus on residents who have visited NC in the last 12 months. Making use of regression and sensitivity analyses on the SPSS software platform we estimate a linear probability model of recreation trips at different levels of HWA. We use this model and estimate the decrease in recreational visits and consumer surplus as a result of varying degrees of consistent exposure to HWA. The research points to there being a significant relationship between increases in HWA a decrease in recreational visits to WNC. The results are important for economic impact and benefit-cost analysis.

Jessica Robinson, Economics, Undergraduate

Faculty Mentor: Jayjit Roy, Business

EFFECT OF INTERNATIONAL TRADE BARRIERS ON GLOBAL FOOD SECURITY

The United Nations defines food security as the state when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. INTERNATIONAL trade theory states that economies which are open grow faster than relatively closed ones, and conditions in those countries are generally better-off. This study aims to answer whether trade makes countries more food secure. Moreover, since trade in food products may also influence volatility in food prices, and thereby access to food, the effect of such trade on food security is also examined. Utilizing a regression framework and country-level data over multiple years, the effect of trade on food security is analyzed after controlling for relevant country-specific characteristics such as value of food production and Gross Domestic Product per capita. The expected results of this study are that the more open to trade a country proves to be, the less food insecure it will be in return.

Kali Smith, Economics, Undergraduate

Faculty Mentor: Peter Groothuis, Business

ENVIRONMENTAL GENTRIFICATION IN BROWNFIELD REDEVELOPMENT IN CHARLOTTE, NC

As new businesses enter, looking to capitalize on Charlotte's opportunities, one of the many paths they are looking to for cheap land are Brownfield sites. The EPA defines Brownfields as, "vacant, abandoned, or underutilized commercial and industrial properties where real or perceived environmental contamination is an obstacle to redevelopment or utilization" and have been historically linked to environmental justice issues. In the United States, there exist over 81,500 acres of brownfields, with over 1800 unique sites in North Carolina. However, taking on a parcel of land to cleanup comes with many liabilities. As brownfields are tagged because of potential or confirmed contamination and often bid on before proper assessment has been done to determine the extent of the pollutant, many businesses are hesitant to buy in because of the asymmetrical information. A rising trend among developers and city officials is to begin mass greening, where in new "green spaces" are created in urban areas, typically in the form of parks, bike paths, or walking paths. With the introduction of these large green infrastructure projects (LGIP), real estate values have been shown to rise significantly, causing environmental gentrification as previous residents are unable to keep up with rising property values. Using data on housing values, I analyze how brownfield remediation influences housing prices and the environmental gentrification in the surrounding neighborhoods in Charlotte, NC.

Matthew Winters, Economics, Undergraduate

Faculty Mentor: Brock Stoddard, Business

Coauthor(s): Matthew Winters, Brock Stoddard

RISK PREFERENCES AND PERSONALITY TRAITS

Research in psychology and economics is becoming more closely related. We study the correlation between risk preferences and personality traits in a laboratory experiment. We elicit risk preferences using a ten question lottery task. For each question, subjects choose either lottery with a high or low pay-off or a riskless option with a single guaranteed payoff. The probabilities of receiving the high and low payoffs varied across the ten lotteries. To measure subjects' personality traits, subjects completed a ten-question version of the Big Five personality survey. Results from the study indicate correlations between personality traits and risk are not significant. Thus, we could not reject the null hypothesis that risk preferences are not correlated with personality traits. As with previous studies, we do, however, find a significant correlation between certain personality traits, those being: extraversion and emotional stability, extraversion and conscientiousness, conscientiousness and openness. Our results suggest high amounts of variation of risk preferences for each personality trait. However, we measured risk preferences using lotteries with no externalities to other subjects. An interesting follow up study would be to examine the correlation between personality traits and risk preferences when the risk taker's decisions affect other subjects' earnings.

GEOGRAPHY AND PLANNING

Hannah Bagli, Geography and Planning, Undergraduate

Faculty Mentor: Elizabeth Shay, Arts & Sciences

Coauthor(s): Abie Bonevac, Hannah Bagli, Steffey Guigou, Kai Kelley Jr, Kayleigh Mielenz, Brian Dunleavy, Jake Hair, Tatiana Magee

PERCEIVED SAFETY OF PEDESTRIANS IN ENVIRONMENTS WITH SELF DRIVING CARS.

Self-driving cars, pedestrians, and perceived safety: Connected and automated vehicles (CAVs) are currently being tested in live traffic around the country and expected to be common in most cities within a decade. Commonly cited positive impacts include improved safety (because the vast majority of crashes are caused by human error), great efficiency (smaller vehicles, traveling faster and more closely together), and more mobility for all (including currently mobility-poor vulnerable populations). However, many questions remain about how CAVs will interact with other vehicles and with other travelers in the transportation network. This project took on the challenge of visualizing Boone intersections~both under current conditions and with likely alterations to accommodate CAVs, and surveying pedestrians about how safe they perceive those intersections to be. The research team used SketchUp to visualize the intersections with both static (snapshot) and dynamic representations, and developed and piloted public intercept survey and focus group instruments to test this question, to support ongoing research on how CAVs will interact with pedestrians

Elizabeth Bailey, Geography and Planning, Graduate

Faculty Mentor: Maggie Sugg, Arts & Sciences

Coauthor(s): Maggie Sugg, Christopher Fuhrmann, Jennifer Runkle

WEARABLE SENSORS FOR PERSONAL AMBIENT TEMPERATURE EXPOSURE ASSESSMENTS: A VALIDATION STUDY

Heat exposure is the leading weather-related cause of death in the United States. The impacts of heat on human health has sparked research on different approaches to predict heat exposure at more precise spatiotemporal scales. Personal heat sensor studies have gained popularity in recent years due to the fine spatiotemporal scale that they are able to achieve through the use of wearable sensors that can continuously measure ambient temperatures as individuals move through time and space. The quantification of differences between these sensors has yet to be fully researched. This study applies a similar methodology to that utilized throughout air quality sensor validation studies to assess the validity of personal temperature sensors. Data were collected by 38 participants in Boone, NC, and Starkville, MS who simultaneously wore four types of sensors during their daily routines for various 7-day study periods throughout the summer of 2018. Sensors were also attached to weather stations in each study location. Bland-Altman analysis, correlation coefficients, and index of agreement statistics were used to quantify the difference between sensor and weather station temperature measurements. Results demonstrated significant differences in temperature readings based on the location of sensors on participant's bodies, sun angle, and sensor type. Future research should account for these differences in personal ambient temperature readings based on placement and device type.

Abie Bonevac, Geography and Planning, Graduate

Faculty Mentor: Elizabeth Shay, Arts & Sciences

KEY INFORMANT PERCEPTIONS OF FLOODING AND LANDSLIDES IN WESTERN NORTH CAROLINA, USA FOLLOWING THE 2018 FLOODS AND LANDSLIDES

In May 2018, exceptional flooding and subsequent landslides devastated Western North Carolina (WNC). The region is not typically considered water-vulnerable and few studies have explored flooding and landslides in WNC. However, the region is projected to experience elevated water vulnerability due to rapid population growth and increased climatic variability. Recent events highlight the need for communities to better understand flooding and perceptions to inform proactive policies for risk mitigation in WNC. The author conducted phone interviews with key informants from sectors in Buncombe and Watauga County to evaluate stakeholder experiences and perceptions related to the 2018 events and then analyzed their responses using content analysis software. A companion study was completed in 2017 for the same counties with a focus on drought and wildfire. Similar themes of natural resources and environment and emergency response emerged. Other common themes of discussion by key informants included flooding risk, vulnerability, and mapping programs. Additional themes varied by county, which demonstrates the importance of local context with natural disasters. Stakeholders across all sectors placed significant emphasis on communication within agencies and to the public. By identifying key themes communities can have a better understanding of key informant experiences and perceptions and policymakers will be better equipped to address policy shortcomings and prepare for future hazards.

Hannah Bush, Geography and Planning, Undergraduate

Faculty Mentor: Baker Perry, Arts & Sciences

OBSERVATIONS OF SNOW PARTICLE CHARACTERISTICS DURING THE 9-10 DECEMBER 2018 MAJOR SNOWSTORM IN THE SOUTHERN APPALACHIAN MOUNTAIN

Although major snowstorms result in substantial societal and economic impact across the southern Appalachian Mountains, numerous critical parameters (e.g., lower tropospheric thermal structure, snow crystal type and degree of riming, quantitative precipitation forecast) are frequently not well characterized in numerical weather prediction models. This poster analyzes the meteorological characteristics of the 9-10 December 2018 major winter storm using data from a Multi-Angle Snowflake Camera (MASC), a vertically pointing Micro Rain Radar (MRR), the North American Regional Reanalysis (NARR) dataset, and other in-situ measurements. In particular, the MASC data allowed for classification of snow crystal types, complexities, and degree of riming throughout the entire storm. There is a clear correlation in the complexity and radial variance of the ice crystals as the storm progressed in time. This correlation aligns with different weather variables that were collected on the surface as well as aloft. This study enhances an understanding of the process and components of the winter storm along with an improved understanding of the differences among snowfall events.

Tania Katherine Ita Vargas, Geography and Planning, Graduate

Faculty Mentor: Lester Baker Perry, Arts & Sciences

Coauthor(s): L. Baker Perry, Margaret Sugg, Isabel Moreno, Christian Barreto Schuler, Joseph Jonaitis, Heather Guy.

SYNOPTIC PATTERNS ASSOCIATED WITH WET SEASON ONSET IN THE TROPICAL HIGH ANDES OF SOUTHERN PERU AND BOLIVIA

In the southern Andes of Peru and Bolivia where a clear distinction between the wet and dry season exists, precipitation is one of the most relevant factors in determining glacier mass balance since the wet season onset interrupts the ablation period caused by low albedo and intense solar radiation at the end of the dry season. This study examines daily precipitation observations from 1979 to 2017 in Peru and Bolivia and identifies the wet season timing, annual variability, and tendencies. The ERA-Interim Reanalysis (80 km - 6 hours) provides insights into the seasonal variation of atmospheric variables over the study area. We identify subregional variations in the wet season timing related to the distance to the equator and to the Amazon basin, in which onset dates exhibits a pronounced variability. Significant trends to delay the wet season onset in the southwestern subregions in 0.4 to 0.7 days/year were found as well as significant differences in the very strong El Niño years, associated with the early/late wet season onset cases. A low-level northwesterly flow east of the Andes is the main feature in the lower troposphere related to the wet season onset, as well as an anticyclonic circulation in mid-troposphere and northwesterly winds in upper troposphere. Changes in the position and strength of these circulations are observed during early/late wet season onset cases. This result has implications for improving seasonal precipitation predictions from tropical high Andes.

April Kaiser, Geography and Planning, Graduate

Faculty Mentor: Peter Soulé, Arts & Sciences

Coauthor(s): Peter Soulé, Saskia van de Gevel, Paul Knapp, Arvind Bhuta, Jeffrey Walters, Evan Montpellier

A DENDROECOLOGICAL INVESTIGATION OF RED-COCKADED WOODPECKER AND LONGLEAF PINE CAVITY TREES.

Old-growth longleaf pine (Pinus palustris) is a keystone species for 29 threatened or endangered species in the coastal plain of the southeastern United States. Red-cockaded woodpecker (Leuconotopicus borealis; RCW) and longleaf pine have an established ecological association. In this study we explore differences in climate-growth response in trees with RCW cavities compared to non-cavity trees in the Sandhills Gameland Reserve. This 60,000 acre nature reserve located in Hoffman, North Carolina contains one of the most well-recovered RCW populations and provides a unique opportunity to also explore cavity tree characteristics. Specifically, we compare heartwood and sapwood ratios, diameters at breast height (DBH), and tree age between the RCW cavity and non-RCW trees. We hope to foster a better understanding of why red-cockaded woodpeckers select specific longleaf pine trees for cavities and how these cavities influence longleaf pine radial growth and climate sensitivity. With this additional and new knowledge, proper conservation regulations for both endangered species should improve.

Timothy Kinlaw, Geography and Planning, Graduate

Faculty Mentor: Johnathan Sugg, Arts & Sciences

Coauthor(s): Johnathan Sugg

WARM SEASON HYDROCLIMATIC VARIABILITY AND CHANGE IN THE APPALACHIAN REGION OF THE SOUTHEASTERN U.S. FROM 1950 TO 2018

Uncertainty is embedded in climatic research and variability challenges water resource security. This is especially the case in the southern Appalachian region of the southeastern U.S., which contains much climatic and topographic variability. Previous hydroclimate research identified several broad climate trends across the southeast, including increased precipitation, intensified summer rainfall, and prolonged dry periods. However, research has yet to determine whether these trends are present at the regional scale across the mountains. This study examines warm season hydroclimatic change and variability in the southern Appalachian Mountains from 1950 to 2018 using the Global Historical Climatological Network (GHCN) daily data record. Daily rainfall is classified according to different intensities, ranging from light to heavy, and a Mann-Kendall test is used to determine the trend at each station. The results indicate significant change to the frequency of dry days and light precipitation days across all elevations. The most frequent changes across stations suggest that dry days became less common and light precipitation became more common across the southern Appalachian region. Similarly, the length of dry spells became shorter at most elevations of this mountainous region. In conclusion, hydroclimatic variability and change in the southern Appalachian region suggest a different trend than that of the broader southeastern U.S.

Elisa MacGoun, Geography and Planning, Graduate

Faculty Mentor: Robert Brown, Arts & Sciences

MARDI GRAS INDIANS OF NEW ORLEANS

This research offers an analysis of the "Mardi Gras Indians" of New Orleans, Louisiana, USA. The Mardi Gras Indians are primarily comprised of African-American communities within the inner city of New Orleans. The research process utilized American newspaper articles from the Times-Picayune newspaper, an American newspaper published in New Orleans dating back to January 1837. The newspaper articles examined reference Mardi Gras Indians specifically and reference the years 1837 through present-day. The newspaper editions referenced all reside on the Christian day of Ash Wednesday, which changes day and time depending on the year but always falls on the day after American Mardi Gras. The aim of this research is to reveal the much belabored mysteries and histories of the Mardi Gras Indians in New Orleans.

Matthew Wilson, Geography and Planning, Graduate

Faculty Mentor: Maggie Sugg, Arts & Sciences

Coauthor(s): Maggie Sugg, Sandi Lane, Raghuveer Mohan, Johnathan Sugg

IDENTIFYING STATISTICAL PRECISION AND ACCURACY OF VULNERABILITY INDICES FOR THE SOUTHEASTERN UNITED STATES

An increase in disaster frequency has prompted an increase in vulnerability index creation studies. To test the validity of the models used in these studies, an interdisciplinary approach is used to assess the vulnerability of nursing homes throughout the Southeastern U.S. Using an inductive-hierarchical index structure; underlying community characteristics, natural hazards frequency, and nursing facility data are combined to create the Multivariate Nursing Home Vulnerability Index (MNHVI). To internally validate the multivariate index, both a manual construction method and Monte Carlo simulations are used to create multiple unique versions of the MNHVI. Each iteration of the MNHVI considers alternative model stages for insight into regions of precision within the model and the average amount of variation. External validation is used to determine if the indices are accurately predicting harm and mortality due to storm events. Harm is identified from NOAA's Storm Events database which identified harm at the county scale as reported by emergency management personnel, damage surveys, and local news outlets. Additionally, North Carolina death certificates are examined at the Census Tract scale with a pre/post-storm analysis to determine natural disasters' impact on mortality at 30/90-days pre/post-storm. Identifying accuracy and precision for vulnerability indices additional information so that officials may be confident about where individuals and property may be most at-risk.

GEOLOGICAL AND ENVIRONMENTAL SCIENCES

Oscar Armengolt, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Cynthia Liutkus-Pierce, Arts & Sciences

Coauthor(s): Cynthia Liutkus-Pierce, Kevin Takashita-Bynum

USING ANCIENT SOIL COLOR AND MINERALOGY TO TRACK CLIMATE AND ENVIRONMENTAL CHANGES DURING THE EARLY MIOCENE AT LOPEROT, KENYA

We examine the color and mineralogy of 13 paleosols from the early Miocene site of Loperot (western Turkana, Kenya) to better understand the environmental conditions during soil formation. Found in the region are fossils of Cercopithecoidea and Hominoidea, two primate groups that diversified during the early Miocene (23-16 Ma) making this region important for understanding the environment our ancestors inhabited. Soil chroma values track paleoclimate during the time of soil formation: low chroma values indicate humid conditions and higher chroma values indicate aridity. Soil chroma values at Loperot decrease upsection, suggesting increased humidity. To test this, we examined each paleosol's mineralogy. Paleosols formed under arid conditions should indicate the presence of K-feldspar and evaporite minerals, and those formed under more humid conditions should show a decrease in K-feldspar abundance at the expense of clay production. X-ray diffraction results indicate that K-feldspar and illite are abundant low in the section and decrease in abundance upsection, coincident with an increase in montmorillonite. Thus, mineralogy confirms our predictions from the soil chroma data, and suggests that climate changed from arid to humid over time. There is limited literature about the environmental conditions under which our ancestors diversified during the early Miocene; our results allow us to better understand the environmental conditions that influenced their evolution.

Taylor Arrowood, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Scott Marshall, Arts & Sciences

Coauthor(s): Scott Marshall

THREE-DIMENSIONAL GEOPHYSICAL IMAGING OF THE NEW RIVER FLOODPLAIN SUBSURFACE, BOONE, NC

Geophysics offers non-invasive and environmentally-safe methods for imaging the subsurface in three dimensions. Here, we present results from 68 transects of Ground-Penetrating Radar (GPR) and direct current electrical resistivity surveys that we use to construct a three-dimensional model of the subsurface along the New River floodplain in Boone, NC. The combination of resistivity and GPR data is advantageous because GPR provides a detailed image of subsurface layering, while resistivity data constrains the composition of subsurface materials. In general, we observe two distinct types of sediment. The first consists of gravel and sand deposits, interpreted from the strong GPR reflectors present and resistivity values between 1000-4000 ohm-m. The second are layered floodplain deposits, interpreted to be silt or fine sand deposits, which appear well-stratified but with weak reflectors in GPR data and have resistivity values between 50-400 ohm-m. Below the sediments, the geophysical data constrains the depth to bedrock throughout the floodplain, which occurs at approximately 1.5-6.2 m depth. We interpret two different variations of the local Cranberry Gneiss bedrock. One has resistivity values of 50-300 ohm-m, while the other has values of > 4000 ohm-m. Additionally, we identify buried river channels in the subsurface based on spatially-correlated channel shaped GPR reflectors at depth suggesting that the New River channel has migrated over time.

Allison Dombrowski, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Sarah Carmichael, Arts & Sciences

Coauthor(s): Sarah Carmichael, Peter Koenigshof, Sersmaa Gonchigdorj, Johnny Waters

A GLOBAL PERSPECTIVE ON LATE DEVONIAN EXTINCTION EVENTS

The Late Devonian Period (350-375 million years ago) was a time of great change for Earth's biodiversity and climate and is bracketed by two major mass extinctions. Most of what is known about these extinctions comes from restricted marine basins and shallow continental seas in Europe and North America; almost nothing is known from sites in open ocean systems such as island arcs and isolated island chains. In summer of 2018, I traveled to the Gobi-Altai region in Mongolia to map sediments of the Hoshoot Shiveetiin Gol site, which preserve the mass extinctions. The lithology and fossil assemblages indicate a shallow marine paleoenvironment subject to frequent volcanic events, which are recorded by bentonite (volcanic ash) layers. A 167-meter-long stratigraphic section was measured on a centimeter scale and sampled for macrofossils, microfossils, and sediment geochemistry. Stratigraphy of the site shows multiple cyclostratigraphic patterns, indicating Milankovitch climate cycles. Geochemical and mineralogical analyses of the bentonite samples suggest the site has an island arc provenance, which is in agreement with regional tectonic maps. This project gives a global perspective on the open ocean ecosystems and earth processes during the Late Devonian and provides insight on how marine ecosystems survived these mass extinction events.

Matthew Eads, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Andrew Heckert, Arts & Sciences

Coauthor(s): Andrew Heckert

ASSESSING THE USABLE LIFETIME OF TIN- AND PLATINUM-BASED SILICONE RUBBERS UNDER HIGH AND LOW STRESS ENVIRONMENTS.

The goal of this project was to assess differences in quality and production of casts from tin-based (TB) and platinum-based (PB) silicone rubber molds, while also considering the molds' rigidity under high and low stress environments. PB are advertised as ideal for shelf life, but are not intended for mass production, whereas TB are the opposite. We compared two PB rubbers MS16 and DS along with three TB rubbers MM10, MM27, and MM40. The casting agent was Smooth-Cast® 320 urethane resin and a tooth of Carcharocles megalodon was used for our comparison. Each material was used to make a pair of one part molds, with the tooth positioned identically in each mold. Two tests were done on each of the five mold types: a short-term, high-stress and a long-term, low-stress test. During curing, the resin reaches 60°C, which causes the mold to become dry and more susceptible to tearing. Our results demonstrate lower rigidity molds will outperform high rigidity regardless of material type. DS and MM10 both have a shore value (scale used to determine the flexibility of a mold) of 10A, the lowest used thus far, and outperformed all other molds with no discernable loss of cast fidelity. Due to no observable negatives to using flexible molds, we plan another series of identical tests with shore values of 00-10 to 00-50 using EcoFlex™ 00-10, 00-20, 00-30, and 00-50. We predict that in this range of values there will be the best balance of long term use and flexibility.

Emily Fedders, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: William Anderson, Arts & Sciences

Coauthor(s): William P. Anderson, Jr.

RIPARIAN SALT STORAGE AND RELEASE ALONG HEADWATER STREAMS IN THE NEW RIVER WATERSHED

Hardin and Boone Creeks are two small, headwater streams which drain watershed areas encompassing Boone, NC, USA and the surrounding areas. Conductivity data collected as a proxy for stream salinity from a network of in-stream monitoring sites indicate that part of the salty water entering these streams as winter runoff from salted roads and walkways is stored in the near-stream aquifer. This stored salty water seeps back into the streams during periods of low discharge, elevating stream salinity year-round. Here we utilize a combination of observed and synthetic stream salinity and stage data with cross-sectional models of both streams in Feflow modeling software to address two questions: 1) Has the system reached steady state conditions, or will stream salinities continue increasing if road salt application continues at the current rate? 2) How much could reduction of storm stage fluctuation magnitude via improved runoff management infrastructure and/or diminished road salt application reduce the amount of salt stored and therefore mitigate future increases in stream salinity? Model results indicate that salt reduction has a greater mitigating impact on riparian salt accumulation, but that improved runoff management also has positive impacts. This gives hope for salinity reduction in areas where reduced salting is not feasible.

Hannah Field, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: William Armstrong, Arts & Sciences

Coauthor(s): William Armstrong

ANALYSIS OF PROGLACIAL LAKE CHANGE ACROSS NORTHWESTERN NORTH AMERICA UTILIZING REMOTELY SENSED DATA

The development of proglacial lakes due to glacial retreat influences both upstream glacier evolution and downstream biogeochemical systems. Proglacial lakes can accelerate glacier mass loss by enabling calving and submarine melt. Proglacial lakes also modulate dynamics of sediment and nutrient transport, altering downstream habitats and channel morphology. We utilize the satellite record to evaluate the spatiotemporal pattern of proglacial lake change and provide insight into controlling physical factors (e.g., topography, climate). We assess the change in size and spatial distribution of proglacial lakes across northwestern North America between 1985 and 2018 using Landsat data. We analyze sites spanning a large range of environments to account for variable latitude, longitude, continentality, lake size, and elevation, which are variables that may contribute to lake growth behavior. We delineate proglacial lakes by visual interpretation of Landsat-derived Normalized Difference Water Index (NDWI) and panchromatic imagery. To investigate the effect of climate on proglacial lake evolution, we analyze how changes in climatic parameters (e.g. precipitation, temperature) are related to lake area change. A sample of lakes (n = 77), located from 48°N to 69°N, shows a change in average lake area from 6.81 km^2 to 9.66 km^2 (with increases up to 54.62 km^2). This work will contribute to understanding how topographic and climatic factors influence proglacial lake change.

Amanda Hendrix, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Andrew Heckert, Arts & Sciences

Coauthor(s): Austin Deans, Alaska Schubert, Andrew Heckert

AN OVERVIEW OF THE TAXONOMIC COMPOSITION OF THE UPPER CRETACEOUS (CAMPANIAN) MENEFEE FORMATION, NEW MEXICO

The Allison Member of the Menefee Formation, San Juan Basin, New Mexico has continuously yielded microvertebrates from site L-5636 since 2007. Sediment from this site is picked under a microscope for fossils such as bones, osteoderms, and teeth. These specimens are then identified ideally to the genus level. Presently, there are 3116 specimens, with hundreds more unidentifiable bone and tooth fragments. Of these 3116 specimens, 1266 (41%) belong to chondrichthyans, the cartilaginous fish such as sharks and rays. An additional 704 teeth (23%) are identified as belonging to osteichthyans, or bony fish. 398 teeth (13%) are assigned to Reptilia. Just 13 teeth are identified as belonging to mammalia (less than 1%), which are reported as the oldest mammalian fossils found in New Mexico. 3 fragments of amphibian dentaries have been collected as well, leaving 732 specimens yet to be identified or in too poor a condition to provide crucial diagnostic features. The preservation and taxonomic bias of this microvertebrate site gives us several key indicators about its environment of deposition. There is a clear marine bias regarding both preservation and abundance in this collection. Chondrichthyan and osteichthyan teeth are the most abundant and well preserved microfossils, and suggest some sort of brackish influence inland from the Western Interior Seaway of the late Cretaceous. This is the richest and more diverse Menefee Formation site recorded thus far.

Anthony Hengst, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: William Armstrong, Arts & Sciences

Coauthor(s): William Armstrong

AUTOMATED EXTRACTION OF RECENT GROWTH TRENDS IN ALASKAN PROGLACIAL LAKES USING AN OBJECT-BASED IMAGE PROCESSING ROUTINE

The formation of a proglacial lake can change the behavior of both the upstream glacier and downstream fluvial system over a relatively short period of time. The development of a proglacial lake provides a body of water into which calving may occur, increasing glacier mass loss which further contributes to proglacial lake growth. The formation of a proglacial lake also behaves as an efficient sediment trap, removing a large fraction of the sediment that would otherwise be distributed downstream and affecting downstream hydrology and ecology. We develop a semi-automated algorithm to delineate proglacial lakes and analyze proglacial lake area change over the satellite record to investigate proglacial lake growth rates and physical controls on glacier-lake-fluvial behavior. We utilize modern and historical Landsat satellite data and digital elevation models over northwestern North America to identify and analyze proglacial lake area change. We utilize a maximum likelihood supervised classification and vectorization algorithm trained on multiband Landsat 8 imagery as well as elevation data to delineate proglacial lakes and track their evolution over the satellite record. In preliminary data, we find some lakes have grown by 3.1 km2 while some ice-dammed lakes have shrunk by 31.8 km2 . Investigating proglacial lake behavior over large spatial and temporal scales will improve understanding of the dynamics of these complex and changing systems.

Brianna Hibner, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Cole Edwards, Arts & Sciences

Coauthor(s): Cole Edwards, Bryson Honeycutt

USING SULFUR ISOTOPES FROM CARBONATE ROCKS TO IDENTIFY ANOXIA DURING THE LATE DEVONIAN: IMPLICATIONS FOR CAUSES OF THE LATE DEVO

The Devonian Period is known for major biological and environmental changes on Earth, including the demise of reef communities and a mass extinction. During the Late Devonian, species-level biodiversity declined by 70% across the Frasnian-Famennian Boundary (FFB; ~372 myr ago). This biotic crisis is thought to be caused by global anoxia based on the co-occurrence of a positive carbon isotope (d13C) excursion during the major extinction pulses. Anoxia will cause a d13C excursion via the burial of 12C-enriched organic matter, but geologic processes other than anoxia can also cause these excursions (e.g. weathering of C-bearing rocks). Thus, an independent proxy is needed to confirm whether anoxia occurred during the Late Devonian. Sulfur isotopic values (d34S) are one such proxy for anoxia, which will enhance pyrite burial rates to remove 32S-enriched sulfate from the marine reservoir and create a positive d34S excursion.

This study reports d34S trends from a Late Devonian carbonate succession from the Great Basin region, USA to test whether d34S trends agree with the d13C record and resolve whether anoxia occurred. We identify a single positive d34S excursion of ~8‰ coeval with a ~1‰ d13C excursion. These paired d13C and d34S excursions occur above the FFB, thus post-dating the main pulses of the mass extinction. This discovery challenges the notion that anoxia was the main driver of this mass extinction and suggests other causes may have been more important (e.g. cooling).

Bryson Honeycutt, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Cole Edwards, Arts & Sciences

Coauthor(s): Cole Edwards, Brianna Hibner

CARBON ISOTOPIC ANALYSIS OF LATE DEVONIAN CARBONATES, WESTERN UNITED STATES: IN SEARCH OF ANOXIA AND THE CAUSE OF THE LATE DEVON

The causes of the "big five" mass extinctions of marine life are fairly well understood, but the cause(s) of the Late Devonian mass extinction are less clear. Anoxia is thought to be one such cause based on the co-occurrence of organic-rich shales and positive carbon isotopic excursions (d13C) in Late Devonian carbonates. Indirect evidence for anoxia (i.e. d13C excursions) primarily comes from carbonate rocks in Europe, which occur at the Frasnian-Famennian Stage boundary (FFB). d13C excursions recorded in carbonates, however, can be produced from other processes unrelated to anoxia (e.g. alteration). Thus, to confirm whether d13C values of carbonate rocks do in fact record anoxic conditions, d13C values should also be measured from organic matter of the same rocks to confirm that the d13C value of the local carbon pool had increased.

This study tests the hypothesis that anoxic conditions existed prior to the FFB in carbonates exposed in the Great Basin region, western USA. Paired d13C values from bulk carbonate and organic matter measured from Late Devonian carbonate successions record evidence of anoxia, albeit above the FFB. Positive d13C excursions of 1.0‰ and 5‰ are preserved in bulk carbonate and organic carbon trends, respectively. The fact that the anoxic interval occurs above the FFB and post-dates the main extinction pulses suggests that anoxia was not be the main driver of this mass extinction and may have been more localized or diachronous than previously thought.

Ann Klyce, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Andy Heckert, Arts & Sciences

Coauthor(s): Marta Toran, Andy Heckert

EARTH SCIENCE EDUCATION AND OUTREACH THROUGH TEACHER AND STUDENT PREPARATION

The Geological and Environmental Sciences (GES) outreach programs focus on building long term relationships with teachers, schools, and campus faculty with the goal of improving scientific literacy. Programs occur both on and off campus, including those delivered with our mobile classroom. The diversity of the GES facilities allows us to break K-12 classes into smaller groups where they will tour both outdoor and indoor exhibits. The museum's traditional exhibits and hands-on activities are specifically designed for a wide range of age groups. The rock garden is a unique resource where students learn about the rock cycle by interacting with boulders of sedimentary, igneous, and metamorphic origin. Outreach events provide authentic scientific practice, presented as a tangible part of the standard curriculum that extends beyond the walls of the school classroom. Forging lasting relationships with teachers and our own students that persist through changing school years incentivizes teachers to return with their classes year after year. We also use workshops to bring new and exciting information to teachers, and to help fill gaps in their prior knowledge. Extensive, and free, resources are also provided to teachers. Undergraduate students are constantly encouraged to be involved with outreach programs which not only develops communication skills in upper level students, but also creates enticing learning environments that lower level students may not be otherwise exposed to.

Sarah Larson, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Sarah Evans, Arts & Sciences

"QUANTIFYING RISING SOIL WATER TEMPERATURES IN A SOUTHERN APPALACHIAN WETLAND"

Wetlands are critical ecosystems that provide habitats to an array of species, protect and improve water quality, and aid in flood prevention. Throughout the Appalachian highlands, many wetlands are classified as fens: wetlands with a typically alkaline water chemistry and groundwater-controlled saturation. Southern Appalachian fens provide habitats to numerous endangered plant and animal species. The endangered bog turtle (Glyptemys muhlenbergii) is a wetland vertebrate that depends on the thermally buffered soil and water of fens to survive and reproduce. However, as global air temperatures increase, the generally stable hydrologic conditions of healthy fens may be affected, inhibiting the bog turtle's ability to successfully hibernate in the winter and thermoregulate in the summer. In this study, we conducted field measurements to quantify spatial and temporal trends of soil water warming at Bluff Mountain fen in West Jefferson, North Carolina. The fen was instrumented with 10 plastic stakes each with three Thermochron iButtons at 2.5, 5, and 10 cm. below ground. The iButtons recorded ground temperature every 30 minutes, and were collected for data recovery every three months. Temperature data was then compiled through MATLAB for temporal analysis and ArcGIS for spatially analysis. Results provide novel spatial and temporal temperature data that allow for future evaluation of how discharging groundwater mitigates rising temperatures in a southern Appalachian wetland.

Carly Maas, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: William Anderson, Arts & Sciences

Coauthor(s): William P. Anderson Jr., Emily R. Fedders

AUGMENTED WETLAND IN URBAN TOPOGRAPHY TO MITIGATE SALT CONTAMINATION

Boone Creek drains a 5.2 km2 watershed in Boone, NC, and suffers chronic and acute saline contamination due to road salt. High runoff ratios that produce flashy conditions drive the road salt into the riparian aquifer during meltwater events. Summer storms push the salt into the aquifer and prolong residence times. In previous studies, salt transport was measured through a wetland in a stormwater culvert draining to Boone Creek. Measurements indicated that the wetland delayed the arrival of the salt plume entering Boone Creek and reduced the peak salinity levels. The wetland prompted a study of the influence of constructed wetlands, built at the outlets of storm drains, on timing of salt arrival to streams.

We modeled solute transport under salty meltwater conditions using the Ogata-Banks solution. Next, a simple mixing model generated hypothetical stream salinities under different baseflow and meltwater discharge rates and percentages of wetland retrofits in the watershed. The model assumes that all salty water draining to the stream is produced by runoff.

Model output was compared to input salinities at values ranging from zero to 100 percent enhanced wetlands. The addition of the wetlands decreased peak salinities from meltwater events by up to 20% of the original peak values and delayed the arrival of the peak salinities by at least 30 days. Wetland construction in stormwater culverts improves urban stream water quality by reducing acute and chronic chloride contamination.

Skyler Ray, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Steven Hageman, Arts & Sciences

ENVIRONMENTAL ANALYSIS OF THE ERWIN FORMATION: A SIGNIFICANT SHIFT IN DEPOSITIONAL ENVIRONMENTS IN THE CENTRAL APPALACHIANS

The Erwin Formation is part of the Chilhowee Group from the Cambrian Period (515 Ma). It was deposited in a passive margin environment and shows several characteristics of a transgressive, waning storm and fair-weather sequence. My previous work showed that the Erwin Formation was comparable to modern Atlantic shoreline to shallow marine sediments, however the decrease in shale in the northern sections could indicate a change to a near shore environment with coarser sands and dwelling traces indicative of an active shoreline. In this study, I am looking for a location where the interbedded sands disappear, suggesting a new environment. The northern sections of the Erwin Formation (northern Virginia) were analyzed and compared to the previous study area in Tennessee and southern Virginia. A cluster analysis was preformed using PAST, based on grain sizes, sorting and sedimentary structures to distinguish groups of sediment types of the northern Virginia stratigraphic columns. Over the hundreds of kilometers the Erwin spans, the results show a coarsening of sand sizes, Scolithos presence and an abrupt decrease in amount of shale in the northern Erwin sections compared to the southern regions. I hope to find a locality that exhibits a change from interchanging shallow marine to mostly shoreline occurring across the Erwin Formation. Application of similar methods to the Southern Erwin may highlight environmental differences between the Erwin Formation in Georgia and Tennessee.

Aeon Russo, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: William Anderson, Arts & Sciences

MODELING MITIGATION OF ROAD SALT AND STORMWATER BY RETROFITTING LOW IMPACT DEVELOPMENT IN A MOUNTAINOUS, URBAN WATERSHED

Urbanization and traditional development has resulted in higher stormwater runoff (SWR) and declining water quality. Deicing salts have given rise to increased salinity in streams draining urban areas that experience snowfall. Low impact development (LID) has been shown to mitigate both the intensity of SWR and the concentration of pollutants in a stream. In this study, scenarios that retrofit existing impervious surfaces with LID in the Boone Creek Watershed are modeled. This study also models future projections if traditional development continues at its current pace. The Curve Number equation is used to estimate direct runoff and is combined with mass balance equations to estimate groundwater flow and Cl- concentrations. Impervious layers are digitized using 6" aerial photography and separated into specific classes to be used in 30 model scenarios. Maximum potential benefits were estimated to decrease SWR by 30.1-50.0%, decrease mean Cl- concentrations by 1.0-2.6%, and decrease max Cl- concentrations by 17.2-31.8%. The rate of land cover change is derived from the National Land Cover Dataset (NLCD). The NLCD analysis estimates catchment imperviousness to be increasing by 0.18%/yr. By 2029, the model estimates that SWR will increase by 11.7%, mean Cl- concentration will increase by 0.3%, and max Cl- concentration will increase by 5.9%. This will result in more consistent chronic levels of Cl- and increase the frequency of acute Cl- levels, while increasing flood intensity.

Israel Sanchez, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Andrew Heckert, Arts & Sciences

Coauthor(s): Andrew B. Heckert, Nick Brand, John Foster

THE UPPER CRETACEOUS J&M SITE: A FRESHWATER ECOSYSTEM WITH MARINE INFLUENCE IN THE WILLIAMS FORK FORMATION, COLORADO

The Williams Fork Formation is a poorly understood Upper Cretaceous stratigraphic unit exposed in Colorado and Utah. One locality near Rangely, Colorado, known as the J&M site, yields a wealth of vertebrate microfossils. These fossils were recovered from a cross-bedded sandstone that forms a scour over the underlying fine-grained sediment. Material was gathered for study through previous years' Triassic Trips (GLY 2857). Small (≤5 cm) sandstone blocks were immersed in dimethyl sulfoxide (DMSO) to break down. The resulting sediment was then screen washed and run through nested sieves, allowing the fossil specimens to be picked with the aid of optical microscopes. Fossils recovered from the J&M site includes gastropods, bivalves, sharks and rays, amiid fish and gars, turtles, and crocodylians, fossils that generally support interpretations of a freshwater environment. There are also badly worn dinosaurian and mammalian teeth, these may have washed in from upstream. Among the sharks recovered are the guitarfish Myledaphus bipartitus and the hybodont Lonchidion griffisi, generally known from freshwater environments. Other cartilaginous fish from the site may represent marine influence, including the guitarfish Cristomylus sp. and Pseudomyledaphus madseni, and orectolobiformes Chiloscyllium sp. and Cantioscyllium markaguntensis. These animals may represent a freshwater river ecosystem in close proximity to, and influenced by, the Western Interior Seaway.

Alaska Schubert, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Andrew Heckert, Arts & Sciences

Coauthor(s): Amanda Hendrix

A FRESH LOOK AT THE CHONDRICHTHYANS OF THE WESTERN INTERIOR SEAWAY

The Menefee Formation of the San Juan Basin, New Mexico, records a brackish to freshwater environment of the Late Cretaceous Western Interior Seaway (WIS) during the earliest Campanian. Here we revisit diagnostic characters described in earlier publications naming several genera of the identified chondrichthyans (sharks and rays) that inhabited the WIS. This analysis includes the thousands of chondrichthyan specimens collected from an unpublished Menefee locality. Our analysis focuses on the batoid (ray) teeth and attempts to determine the proportion of each of the three most prominent batoid genera present in the WIS, Myledaphus, Pseudomyledaphus, and Cristomylus during the early Campanian of NM. Because there is a great deal of discrepancy between published diagnostic and nondiagnostic features used to originally describe these genera, often based solely on their teeth, we highlight some of these inconsistencies for the purpose of determining a more definitive set of diagnostic features. To do this, we examine teeth which exhibit unique characteristics unlike those described in previous publications, as well as compare many cases of overlapping diagnostic characters in individual specimens of these three genera. This examination of published specimens alongside our own collected teeth may further complicate, or even disprove the separation of these previously described batoid genera.

Brandon Yokeley, Geological and Environmental Sciences, Undergraduate

Faculty Mentor: Sarah Evans, Arts & Sciences

Coauthor(s): Sarah Evans

UNDERSTANDING ARCTIC PERMAFROST LOSS IN RUSSIA WITH BASEFLOW RECESSION ANALYSIS

Air temperatures in the Arctic are increasing at twice the rate of the global average, causing thinning of permafrost and increasing discharge from Arctic streams. While past rates of air temperature warming are well known, physical responses to warming are difficult to measure at continental scales. Thus, it is necessary to employ indirect methods to examine the effects of warming on permafrost loss in Arctic regions. Baseflow recession analysis is one such method where changes in streamflow over times are mathematically linked to changes in subsurface characteristics such as permafrost thickness. In this study we determine the effect of rising global air temperatures on streamflow and permafrost loss in Russia for the first time by computing minimum and peak discharge and performing a baseflow recession analysis on daily streamflow records from 1912-2002 for 139 stations with varying types of permafrost cover. Preliminary results indicate that there is an increase in the minimum and peak discharge from 1912 to 2002 for the months of September and October. Average slope values from our analysis show a positive trend over the period of record, with an average slope from 1912-2002 of 0.32%, slope from 1912-1979 of 0.38%, and slope from 1975-2002 of 0.36%. This indicates an overall thinning of permafrost throughout Russia which has widespread implications for water resources, human infrastructure, and ecosystems downstream.

GOVERNMENT AND JUSTICE STUDIES

Chandler Vaughan, Government and Justice Studies, Graduate

Faculty Mentor: Brian Bulla, Arts & Sciences

Coauthor(s): Brian Bulla, Tatyana Ruseva

COLLABORATIVE WATERSHED GOVERNANCE IN THE NEW RIVER: INSTITUTIONS, ACTORS, AND POLICY COHERENCE

Communities across the United States have recognized a need for intergovernmental collaboration to manage common pool resources and mitigate potential environmental degradation. Because the New River and surrounding watershed provides a variety of social, cultural, economic, biological, and recreational benefits to the neighboring communities it is important to examine and map the governance structure of this historic watershed. Researchers from the Department of Government and Justice Studies at Appalachian State University are studying the network of collaborative stewardship in the New River Watershed. Specific goals of the study are: to map the complex network of institutions and actors involved in managing the suite of resources and to better understand how institutions at one policy level affects the formation and implementation of policies by institutions at other levels within the New River Watershed.

In the Celebration of Student Research and Creative Endeavors, I will introduce the concept of collaborative watershed governance as well as explain the directives of our research. These objectives will be delivered through an engaging presentation that explains the need for collaborative watershed governance as a method to prioritize future regional goals and efforts, and briefly mention how other watersheds have been managed that might inform coordination across the New River Watershed.

HEALTH AND EXERCISE SCIENCE

Keighly Adams, Health and Exercise Science, Undergraduate

Faculty Mentor: Erin Bouldin, Health Sciences

Coauthor(s): Alexa Asher, Brad Wasserman, Heather Fuchs

THE RELATIONSHIP BETWEEN STUDENT ATHLETES AND DEPRESSION AT APPALACHIAN STATE UNIVERSITY

Purpose: To look at the relationship between athletes at Appalachian State and depression.

Methods: We used the data from the Campus Wellness Assessment that took place on the campus of Appalachian State University. Students indicated “yes” or “no” to two different questions pertaining to if they are an athlete and if they have experienced feelings that they perceive as recurring depression. We used a chi-square test to evaluate the null hypothesis for the p-value and also used a DAG along with a logistic regression.

Results: From the 1,863 respondents, the p-value relating athletes and depression is significantly significant at 0.033, while none of the other confounding variables were found to be statistically significant after running the logistic regression model.

Conclusion: Athletes do have a higher rate of depression than non-athletes at Appalachian State University according to the Campus Wellness Assessment. This means that there might have to be a program put in place to screen athletes and get them the help they need with depression if needed. The resources on campus should also be emphasized for athletes like the Wellness and Prevention Services and the Counseling center.

Amelia Bruce, Health and Exercise Science, Graduate

Faculty Mentor: Alan Needle, Health Sciences

Coauthor(s): Jennifer Howard, Herman van Werkhoven, Jeffrey McBride, Alan Needle

THE EFFECTS OF BRAIN STIMULATION ON NEURAL EXCITABILITY AND FUNCTION IN INDIVIDUALS WITH CHRONIC ANKLE INSTABILITY

Adverse changes in brain function in patients with chronic ankle instability (CAI) indicate decreased neural excitability that contribute to poor balance & re-injury. These changes are tied to high injury rates, suggesting clinicians need to modify rehabilitation strategies. Brain stimulation through anodal transcranial direct current stimulation (aTDCS) with eccentric strengthening, may restore function by facilitating neural adaptations. We aimed to determine the effects of eccentric ankle strengthening with aTDCS on nervous system excitability and dynamic balance in individuals with CAI.

Independent variables included group (aTDCS versus sham stimulation) and time (0, 2, 4, and 6 weeks). Twenty-two participants with CAI were randomly placed in aTDCS and sham groups. Outcome measures included neural excitability to peroneus longus (PL) and dynamic balance in a hop-to-stabilization test. Participants completed 10 eccentric ankle training sessions over 4 weeks. The intervention group received cortical stimulation for 18 minutes (1.5mA), while the sham group received no stimulation.

Our results showed adding aTDCS, improved neural excitability beyond eccentric strengthening alone ($p=0.027$), resulting in leftward shift of the stimulus-response curve. Eccentric training of PL improved side-to-side stability across all groups ($p<0.001$). This is the first study using brain stimulation to show improvements in patients with joint injuries.

John Cantu, Health and Exercise Science, Undergraduate

Faculty Mentor: Jonathan Stickford, Health Sciences

Coauthor(s): Jonathon Stickford, Jayvaughn Oliver, Dalton Fletcher, Sera Denlea, Taylor Lovci

THE AFFECTIVE DIMENSION OF EXERTIONAL DYSPNEA IN OBESE WOMEN

Dyspnea is the perception and intensity of breathlessness an individual may experience alongside of cardiovascular and pulmonary diseases (Andreas Von Leupoltd 2008) (Society 1998). Obesity is a condition that can lead to such diseases and is extremely harmful to those who possess it due to this (John M. Jakicic 2006)(Health 1998). If the perception of dyspnea could be altered then this could greatly benefit obese individuals with the condition. This study examines this by altering the affective dimension of dyspnea in obese women with exertional dyspnea. The purpose of this study is to evaluate ratings of perceived breathlessness and unpleasantness of breathlessness during exercise while viewing positive, neutral, and negative affective picture series in obese women with exertional dyspnea. Subjects of this study were shown affective picture series from the IAPS database during exercise on a cycle ergometer to examine their perception of breathlessness. It is expected that perceived unpleasantness will decrease with positive affective pictures and increase with negative affective pictures. Furthermore, it is expected that perceived breathlessness will stay the same while viewing positive and negative affective pictures in comparison with perceived breathlessness while viewing neutral affective pictures.

Anna Ruth Carmichael, Health and Exercise Science, Undergraduate

Faculty Mentor: Rebecca Kappus, Health Sciences

ESTROGEN EFFECTS ON CARDIOVASCULAR FUNCTION

Cardiovascular disease (CVD) is the number one killer of all-aged women and men in the United States (CDC, 2015). However, women do not develop CVD until 7-10 years later than men. This age gap is correlated with the onset of menopause in women, leading researchers to think that the development of CVD in women is due to the withdrawal of estrogen. The purpose of this study was to explore the role of estrogen in vascular function in young, healthy males and females. We hypothesized that females would display lower blood pressures and enhanced vascular function compared to males due to estrogen. 10 male and 10 female subjects completed the one-visit study. Females were tested during the early follicular phase of their menstrual cycle to control for estrogen levels. All subjects were tested in the morning after an overnight fast to control for diurnal variations in hormones. Anthropometric, resting blood pressure, pulse wave analysis (augmented pressure, AIx), pulse wave velocity, carotid artery compliance and β-stiffness, and carotid artery intima-media thickness measurements were taken. We found females had significantly lower brachial, carotid, and aortic pulse pressures, carotid systolic blood pressure, and significantly higher AIx and augmented pressure. These findings demonstrate differences between healthy males and females in relation to cardiovascular function but suggest further research is needed to determine the effects of estrogen on cardiovascular function.

Lauren Clark, Health and Exercise Science, Undergraduate

Faculty Mentor: Kimberly Fasczewski, Health Sciences

Coauthor(s): LaVerne Garner, Sara Migliarese

USING MULTIMEDIA TO INCREASE COMPLIANCE TO PHYSICAL ACTIVITY FOR MEDICAL THERAPEUTIC YOGA IN INDIVIDUALS WITH MULTIPLE SCLEROSIS

Multiple Sclerosis (MS) is a chronic, inflammatory neurodegenerative disease which results in deficits in physical function, coordination, strength, and cognition. Physical Activity (PA) has been shown to aid symptom management and improve quality of life (QoL). However, individuals diagnosed with MS rarely meet the recommended amount of PA. Ongoing research examining the effects of an interdisciplinary medical therapeutic yoga (MTY) program on the physical functioning and QoL outcomes in individuals diagnosed with MS has demonstrated positive results however at home compliance between sessions has proven to be a challenge. Participant feedback from program evaluations suggested video instruction may be beneficial to address the cognitive challenges experienced when trying to remember the protocol. The goal of this project was to develop an instructional video component for the at-home aid portion of the MTY program. Two videos demonstrating a summation of the class activities were created and provided to participants via a Vimeo link. It was expected that visual aids would allow for greater retention and understanding of the exercises thus increase compliance. Results indicated that while participants found the idea of the video useful, it was difficult for them to use/access and thus was not effective for enhancing at-home participation. Future research should focus on developing a more user-friendly video protocol or alternative modes of recall assistance.

Stacey Donavant, Health and Exercise Science, Undergraduate

Faculty Mentor: Abigail Stickford , Health Sciences

Coauthor(s): Abigail Stickford, Jonathan Stickford, J. Carter Luck, Danna Rodriguez, Taylor Lovci

BLOOD PRESSURE RESPONSES TO A PAINFUL STIMULUS IN ANXIOUS AND NON ANXIOUS YOUNG ADULTS

Chronic high levels of anxiety are associated with increased risk of cardiovascular complications later in life. However, the impact of anxiety on cardiovascular function in otherwise healthy young adults is not entirely clear.

Purpose: To examine the blood pressure response to a painful stimulus in healthy, normotensive college-aged non anxious and anxious subjects.

Methods: After completing a pre-health screening and consent form, non-anxious (n=4; 2 females) and mild to moderately anxious (n=4; 2 females) participants came into the laboratory for cardiovascular testing. Blood pressure (BP) was measured during a two-minute baseline (BL), followed immediately by a two-minute Cold Pressor Test (CPT) and two minutes of recovery. Mean arterial pressure (MAP) was calculated from systolic and diastolic BP data.

Results: Average BL MAP in the non anxious and anxious groups were 95 ±7 mmHg and 107 ± 15 mmHg, respectively. Peak MAP during the CPT was 111 ± 10 mmHg for the non-anxious group and 124 ± 14 mmHg for the mild-moderately anxious group. During recovery, MAP was 98 ± 2 mmHg and 113 ± 22 mmHg for non anxious and anxious groups, respectively.

Conclusion: While no formal conclusions can be made at the present time due to the small sample size, observable differences indicate that healthy, normotensive young adults may have a greater BP response to pain.

Dalton Fletcher, Health and Exercise Science, Graduate

Faculty Mentor: Jonathon Stickford, Health Sciences

Coauthor(s): Jonathon Stickford, Abigail Stickford, Andrew Shanely, Jayvaughn Oliver, John Cantu

THE EFFECTS OF BEETROOT JUICE SUPPLEMENTATION ON THE OXYGEN COST OF BREATHING IN YOUNG, OBESE MALES

Obesity is known to increase the oxygen cost of breathing (V̇O2RM), which is associated with a heightened perception of dyspnea. Beetroot juice (BRJ) has been shown to lower oxygen utilization (V̇O2) within exercising muscle. We hypothesized that BRJ supplementation would reduce V̇O2RM in obese males when compared with placebo. Body composition, pulmonary function, and aerobic capacity (V̇O2peak) were measured during the initial laboratory visit. Visits 2 and 3 followed a 10-day supplementation period of either beetroot or tomato (placebo) juice. The supplementation periods were separated by a 10-day washout period. To measure V̇O2RM, subjects mimicked ventilations equal to those measured at 50%, 70%, and 90% V̇O2peak while seated at rest. Subjects (n= 6; age: 23.0 +/- 0.9 y; BMI: 34.7 +/- 3.7 kg/m^2; % body fat: 36.21 +/- 6.6%) displayed a low functional residual capacity (73.7 +/- 11.0% predicted) but maintained normal forced expiratory volume in one second (98.0 +/- 8.3% predicted). Additionally, subjects exhibited poor physical fitness (V̇O2peak = 26.3 +/- 5.0 mL/kg/min; 62.4 +/- 12.0%predicted). V̇O2RM from rest to the ventilation rate that corresponds to 70% of V̇O2peak was 303 mL O2/L V̇E (n=1; R^2=0.985). In conclusion, altered lung volumes, poor physical fitness, and an elevated V̇O2RM are negative ramifications associated with obesity.

Brittian Francisco, Health and Exercise Science, Undergraduate

Faculty Mentor: Zachary Farris, Health Sciences

Coauthor(s): Mamadou Kane, Zachary Farris

ESTIMATING OCCUPANCY AND DETECTION OF WILD WARTHOG POPULATIONS (PHACOCHOERUS AFRICANUS) IN NIOKOLO-KOBA NATIONAL PARK, SENEGAL

Senegal is home to a large diversity of ungulates that are threatened by habitat loss, overhunting and other anthropogenic threats. My aim is to investigate naturogenic factors influencing common warthog populations across the Niokolo-Koba National Forest via a collaboration with wildlife managers in the Senegalese government.

To obtain data, camera traps were set up at two separate locations "Ling" (28 cameras) and "Nio" (27 cameras) in the Niokolo-Koba National Park where cameras ran for an average of seventy-six nights. We estimated the probability of occupancy and detection, while accounting for imperfect detection, and we investigated how a range of variables predation (wild dogs, leopards, lions, and hyenas), habitat (soil, litter, rock, canopy cover and density) influenced these population parameters.

Warthog total captures were 663 (Ling) and 146 (Nio) which provided a trap success rate of 32.54 (Ling) and 9.11 (Nio). Naive occupancy of 0.93. Although early, models are showing that wild dogs an average rock coverage have a strong correlation with common warthog detection while aerial coverage is showing a correlation on occupancy.

Although currently listed as least concern, the ICUN states that research needs of this species include population trends and monitoring. These estimates and evaluations of naturogenic factors will provide vital and timely information for this poorly studied species, the managers working to protect it and the threatened ecosystem it occupies

Joshua Godwin, Health and Exercise Science, Graduate

Faculty Mentor: Andrew Shanely, Health Sciences

Coauthor(s): Charles Hodgman, Haylee Brownlee, Kevin Zwetsloot, R Andrew Shanely

WHOLE-BODY HEAT SHOCK ACCELERATES RECOVERY FOLLOWING IMPACT INDUCED MUSCLE DAMAGE IN MICE

Contusions are a common sports injury, often resulting in skeletal muscle contractile dysfunction. Whole-body heat shock is reported to attenuate skeletal muscle atrophy in animal models. PURPOSE: To test the hypothesis that whole-body heat shock attenuates impact-induced skeletal muscle contractile dysfunction. METHODS: Male mice were randomized to either whole-body heat shock (WBHS) or normal body temperature (NBT) groups. Under anesthesia, in vivo torque-frequency relationship of the anterior crural muscle group was measured in all mice. Body temperature was raised to 41°C (WBHS) or maintained at 37°C (NBT) for 30min. 24 hours later all mice received a single impact delivered via mass-drop technique. Following assigned recovery (2-hr, 2-d, 5-d), in vivo torque-frequency was re-measured in all mice. RESULTS: There was a significant group-time-frequency interaction ($F=3.41$, $p<0.0001$). Within group comparison pre to 5-d recovery revealed, WBHS fully recovered ($p=0.901$), and NBT did not recover ($p<0.0001$) contractile function. Comparison pre to 2-d recovery revealed, WBHS recovered ($p=0.090$), and NBT did not recover ($p<0.0001$) contractile function. Comparison pre to 2-hours recovery revealed both WBHS and NBT did not recover contractile function ($p=0.001$, $p<0.0001$ respectively). CONCLUSION: WBHS treatment prior to a single impact-induced contusion injury accelerates the rate of recovery of in vivo skeletal muscle contractile function within the 2-d and 5-d recovery periods.

Laura Johnston, Health and Exercise Science, Graduate

Faculty Mentor: Adam Hege, Health Sciences

Coauthor(s): Chris Seitz, Adam Hege, Erin Bouldin, Madalyn Davis

CAPTURING WHAT WE KNEAD: COLLABORATIVE USE OF PHOTOVOICE TO IMPROVE FOOD SECURITY IN SOUTHERN APPALACHIA

"Capturing What We Knead: Collaborative Use of PhotoVoice to Improve Food Security in Southern Appalachia" is a community development project conducted in McDowell County, North Carolina by Appalachian Studies graduate student, Laura Johnston, under the advisement of Public Health Professors Dr. Chris Seitz, Dr. Adam Hege, and Dr. Erin Bouldin, alongside fellow graduate student, Madalyn Davis. Members of the Wellness Ministry of Grace Community Church in Marion, North Carolina—a Southern Appalachian town that is the county seat of McDowell County—focus on outreach to community members experiencing poverty, since there is a direct link between poverty—and food insecurity—and health issues such as obesity and diabetes. While undergoing a year-long ethnographic field study with the church, the opportunity arose to conduct a PhotoVoice project with members of the community experiencing food insecurity. With PhotoVoice projects, cameras are put into the hands of the people experiencing a problem, giving a voice to people who might not otherwise have one. Leaders in the church are working closely with local government and non-profit agencies to try to improve health and wellness in the area. A mobile PhotoVoice exhibit is a vital tool in their efforts to make a true, positive impact in their community. The PhotoVoice project was exhibited at an event in Marion in October 2018 and is being exhibited at the McDowell Arts Council Association Gallery throughout the month of March 2019.

Zachary Leicht, Health and Exercise Science, Graduate

Faculty Mentor: Kevin Zwetsloot, Health Sciences

Coauthor(s): David C. Nieman, and Kevin A. Zwetsloot

VEGAN VS. WHEY PROTEIN: EFFECTS OF DIFFERENT PROTEIN SOURCES ON MEASURES OF OXIDATIVE STRESS FOLLOWING ECCENTRIC EXERCISE

Protein supplements are often consumed after exercise to decrease muscle soreness and enhance muscle recovery. Eccentric exercise induces high levels of oxidative stress, which can further lead to muscle damage and deficits in muscle function. It is unknown whether the source of protein supplement alters muscle recovery and oxidative stress. Purpose: To examine markers of oxidative stress following an eccentric exercise bout in healthy men consuming different sources of protein supplementation. Methods:untrained but healthy men (N=31; 39.5 ± 3 yrs) were randomly assigned to either whey protein (WP), pea protein (PP), or apple juice control (AJ), then underwent a 90-minute eccentrically-biased exercise protocol. Nutritional supplements were ingested prior to the exercise bout, immediately post-exercise, and then once daily for 4 days. Blood samples were collected at the same time points. Ferric Reducing Ability of Plasma (FRAP) and Malondialdehyde (MDA) assays were performed to measure the total antioxidant capacity of the blood and lipid peroxidation levels, respectively.Results: There was no overall interaction (p=0.942) or effect of protein supplement on FRAP (p=.288); however, there was a significant main effect of time (p=.001) on measures of FRAP. Conclusion: Eccentric exercise significant increases markers of oxidative stress, but the two protein supplements did not differ in their magnitudes of effect.

Taylor Lovci, Health and Exercise Science, Undergraduate

Faculty Mentor: Abigail Stickford, Health Sciences

Coauthor(s): Abigail Stickford, Jonathon Stickford, Sera Denlea

LOCOMOTOR RESPIRATORY COUPLING PATTERNS FOLLOWING DISSOCIATIVE AND ASSOCIATIVE ATTENTIONAL STRATEGIES IN UNTRAINED MEN AND WOMEN

Scientists have found that a link exists between locomotion and ventilation – this is referred to as locomotor-respiratory coupling (LRC), or ventilatory entrainment. There have been indications that LRC may result in perceptual and/or energetic effects that could benefit endurance performance in prolonged periods of exercise; however, the determining factors for these benefits are not fully understood. The purpose of this study is to examine the difference between associative and dissociative attentional focus on LRC in young, untrained men and women. Consenting subjects, age 18-35, will run on a treadmill while focusing their attention either internally, concentrating on their breathing or running movement by listening to verbal cues played on a loop, or externally, watching a light-hearted television show. To measure the levels of LRC, subjects will wear a facemask, HR monitor, pulse oximeter, and event switches attached to the bottom of each foot. The expected result of this study will be that associative attentional strategies have a negative impact on LRC patterns and running economy, and in turn, decrease performance during a bout of exercise. The findings of this research will help us understand the impacts of associative and dissociative attentional strategies and will be beneficial to untrained men and women participating in endurance exercise, as these results may be used to improve physical activity habits.

Jonathan Carter Luck, Health and Exercise Science, Graduate

Faculty Mentor: Abigail Stickford, Health Sciences

Coauthor(s): J. Carter Luck, Abigail S. L. Stickford, Lawrence I. Sinoway

REVERSAL OF RAPID DECLINE IN ACTIVE MUSCLE OXYGEN SATURATION FOLLOWING REVASCULARIZATION IN PERIPHERAL ARTERY DISEASE

Peripheral artery disease (PAD) limits oxygen (O2) delivery to skeletal muscles in the lower extremity and is associated with an exaggerated blood pressure response to exercise (e.g., walking). The purpose of the study was to examine whether revascularization procedures improve lower leg skeletal muscle O2 saturation (SmO2) and reduce blood pressure during foot exercise in patients with PAD. We hypothesized that revascularization would improve SmO2 responses (indicating greater tissue perfusion) and that blood pressure would decrease during exercise. Patients with symptomatic PAD (n = 6) performed incremental supine plantar flexion exercise, starting at 0.5 kg and increased by 0.5 kg every minute for up to 6 minutes, pre- and one-month post peripheral revascularization procedure. SmO2 was measured continuously from the gastrocnemius muscle, while heart rate and blood pressure were measured beat-by-beat. Reductions in SmO2 from baseline to end-exercise were attenuated post-revascularization when compared to pre-intervention (-6.5 ± 6.2% vs. -39.8 ± 22.5%, $P < .05$). The change in mean arterial blood pressure was reduced post-revascularization (16 ± 12 mmHg vs. 4 ± 4 mmHg $P < .05$). PAD patients exercised longer post-revascularization (4.0 ± 1.5 min vs. 5.8 ± 0.4 min $P < .05$). These data suggest that revascularization reverses the rapid decline in SmO2 during exercise and attenuates the blood pressure response in patients with PAD.

Ashlee Myers, Health and Exercise Science, Undergraduate

Faculty Mentor: Jennifer Howard, Health Sciences

Coauthor(s): Jennifer Howard

LONG-TERM LOSS OF MOTION DUE TO LABRAL SURGERY

Background: Glenohumeral (GH) labral tears are a common shoulder-related season-ending injury. Typical treatment includes surgery and rehabilitation. A collegiate softball player, presented with range of motion (ROM) deficits and pain with throwing. After failing non-operative therapy, she was referred for surgery.

Treatment: Labral fixation was performed in January 2017. Failure to progress in ROM resulted in a manipulation under anesthesia (MUA) in April 2017. Due to continued pain and limited ROM, a 2nd MUA with capsular release, bursectomy, removal of labral anchors, and chondroplasty was done in July 2017. ROM gains were only maintained 3 days. In January 2018, an examination under anesthesia with debridement and manipulation, was performed. Aggressive ROM began immediately, facilitated by a regional block and anesthetic infusion pump. Pain was substantially improved. Rehabilitation continued 5 days/week. A throwing progression was initiated at 1 month, followed by a hitting progression at 10 weeks.

Outcome: The athlete never fully returned to practice, but was able to take the field for Senior Day. No underlying cause for adhesions/hyperalgesia was ever identified. Pain management following the 4th procedure was key to achieving/maintaining ROM. While return-to-play prospects are generally considered good, rates as low as 38% have been reported. Athletic trainers and patients should be aware of the widely variable rates of return-to-sport associated with shoulder surgery.

Jayvaughn Oliver, Health and Exercise Science, Graduate

Faculty Mentor: Jonathon Stickford, Health Sciences

Coauthor(s): Rebecca Kappus, Abigail Stickford, Dalton Flethcer, John Cantu

CHANGES IN VENTILATION AND OPERATIONAL LUNG VOLUMES DUE TO VENTILATORY CHALLENGES DURING A CONSTANT WORK RATE EXERCISE TEST.

Introduction: The underlying respiratory mechanics of exertional dyspnea in healthy individuals are not completely understood. Purpose: The purpose of this study is to examine Ventilation ($\dot{V}E$) and operational lung volumes in college-aged students when introduced to ventilatory challenges during exercise. Methods: During visit one, participants completed standardized body composition, pulmonary function, and a maximal aerobic capacity ($\dot{V}O2max$) exercise test. In visit 2, participants completed four, 6-min constant work rate cycling trials at 50% $\dot{V}O2max$. During three of the cycling trials, the participants were introduced to different ventilatory challenges: increased dead space (DS), added resistance (RS), or heliox (HEL). $\dot{V}E$, end expiratory (EELV), and end inspiratory (EILV) lung volumes were examined during all cycling trials. Results: Four participants (2 female) completed all testing procedures. $\dot{V}E$ and EILV showed increases with added DS (66.50±24.0 L·m-2¬ and 5.42±0.50 L¬) compared to control (36.58±7.75 L·m-2 and 4.73±0.60 L). EELV in the DS trial was less than control (3.13±0.36 and 3.13±0.36 respectively). Values for $\dot{V}E$, EELV, and EILV in the HEL and RS trials were unchanged as a result of the challenges. Conclusion: This data suggests that 4 students introduced to DS during a constant work rate exercise will tend to ventilate at lower lung volumes; this could potentially contribute to perceptions of breathlessness in the DS trial.

Zachary Ripic, Health and Exercise Science, Graduate

Faculty Mentor: Herman van Werkhoven, Health Sciences

Coauthor(s): Alan Needle, Kym Fasczewski, Herman van Werkhoven

THE RELATIONSHIP BETWEEN PLANTARFLEXOR MOMENT ARM, MUSCLE ACTIVATION PATTERNS, AND GAIT VELOCITY IN ELDERLY

Previous research suggests a link between mortality and reductions in gait velocity among elderly, potentially associated with the effects of aging on the musculoskeletal and nervous systems. Yet underlying processes contributing to these reductions are not well known. The purpose of this study was to investigate ankle structure and ankle muscle activation to identify differences which could be related to reduced gait velocity seen in aging. Plantarflexor moment arm (PFMA) was estimated from medial/lateral images of the foot. Fifteen subjects (age = 69.9 ± 4.9) performed a Six-Minute Walk Test while surface electromyography (EMG) was recorded from the right leg. After EMG normalizing to the within trial peak, muscle bias was calculated as the area of medial gastrocnemius EMG over the sum of the area of medial and lateral gastrocnemius EMGs during the stance phase. Relationships between variables of interest (gait velocity, muscle moment arm, and muscle bias) were investigated using correlational analysis. No significant correlations were found between gait velocity and PFMA ($r = -0.20$, $p = 0.4728$) or muscle bias and PFMA ($r = 0.40$, $p = 0.1447$). The sample showed no apparent link between moment arm and gait velocity or muscle bias in elderly. Elderly subjects might not have the ability to modify neuromuscular control similar to what has been shown in young individuals.

Patrick Ross, Health and Exercise Science, Undergraduate

Faculty Mentor: Zach Farris, Health Sciences

Coauthor(s): Patrick Ross, Brandon Semel, Tamby Nasaina Ranaivoson, Giovanni Walters, Shannon Reynolds, Zach J. Farris

CAPTURING AND ESTIMATING MADAGASCAR'S VANISHING WILDLIFE: FIRST SURVEY AND ESTIMATES OF DARAINA'S CARNIVORE COMMUNITY

Madagascar comprises less than 0.004% of earth's land area, yet is home to nearly 3% of all plant and animal species on earth – all of Madagascar's terrestrial mammals are found nowhere else. The Daraina region is a poorly studied, but highly unique, biodiverse, biogeographic transition zone. I spent three months conducting the first photographic survey and provide the first population assessment of Madagascar's terrestrial fauna across the Loky-Manambato Protected Area, NE Madagascar. I established 61 camera stations across dry, moderate, and wet forest types and sampled for an average of eight days per site. We used these data to provide the total number of captures and estimates of relative activity (trap success) for a wide range of taxa (carnivores, small mammals, and terrestrial birds), as well as the first estimates of detection and occupancy for native and exotic carnivore communities across this threatened landscape, including Madagascar's top predator the fosa (Cryptoprocta ferox). Additionally, we explored a wide range of co-occurring species, habitat, and landscape variables to determine factors influencing these threatened wildlife. This study provides conservation managers with the first population estimates for several taxa, and extends the global range of multiple threatened and endangered species. These data will be critical to ensuring continued protection of the threatened forests within the Daraina region and the unique biodiversity that they contain.

David Schumacher, Health and Exercise Science, Graduate

Faculty Mentor: Herman Van Werkhoven, Health Sciences

Coauthor(s): Wilton J. Norris, Alan R. Needle, Jeffrey M. McBride, Herman van Werkhoven

RELATIONSHIP BETWEEN MUSCLE COACTIVATION AND RUNNING SKILL LEVEL

The purpose of this study was to determine the effect of runner skill level on ankle musculature coactivation during the pre-stance and stance phase of running. Previous studies have shown a negative correlation between lower extremity muscle coactivation levels and both running metabolic efficiency and speed. However, it is not known whether runner skill level affects lower extremity muscle coactivation. Three groups of runners participated in this study: elite (n = 9), recreational (n = 10), and novice (n = 8). Electromyographic data (EMG) was collected from the lateral gastrocnemius and tibialis anterior while participants ran on an instrumented treadmill for 30 seconds at a speed of 3.0 m/s. An ankle muscle coactivation index (CAI) was calculated for the pre-stance phase (100 ms prior to stance) and stance phase using a ratio of the area under the muscle activation-time curve for each muscle. Data were analyzed using a factorial analysis of variance. There was no significant running skill level by phase interaction effect for CAI ($p=0.167$, $\eta 2=0.144$) or a main effect of phase for CAI ($p=0.618$, $\eta 2=0.144$). Runner skill level did not seem to influence ankle muscle coactivation in the pre-stance and stance phase significantly. However elite runners did appear to have higher coactivation during the pre-stance phase specifically (large effect size). This could indicate that trained runners better control joint stiffness during landing preparation.

Megan Staley, Health and Exercise Science, Undergraduate

Faculty Mentor: Christopher Seitz, Health Sciences

Coauthor(s): Justin Kearley, Rachel Bowmen, Lauren Wright, Celeste Phillips, and Christopher Seitz

COLLEGE STUDENTS WHO SHARE E-CIGARETTES: AN EXPLORATORY STUDY.

BACKGROUND: The prevalence of e-cigarette use among college students has been studied, however, it remains unknown if college students share e-cigarettes with other people. As such, the purpose of this study was to explore various aspect of e-cigarette sharing among college students.

METHODS: During the spring of 2019, student research assistants surveyed participants in designated lounge areas at Appalachian State University. The questionnaire's items asked participants about demographic information, e-cigarette use, and e-cigarette sharing behaviors.

RESULTS: A convenience sample of 99 students completed the survey. Of those, 38 had shared e-cigarettes with others every day or some days. The most common people that students shared e-cigarettes with were friends, acquaintances, and strangers. The most common settings where students shared e-cigarettes were at social gatherings, at students' homes/dorms, while driving, and while studying. When sharing e-cigarettes, most (56%) shared with one to two people, while 43% shared with three or more people. Juul was the most common e-cigarette brand that was shared.

CONCLUSIONS: The study's findings indicate that e-cigarette sharing behavior is common among college students. The findings strongly indicate that there is a need to educate students about possible bacterial and viral infections that can be transmitted through saliva as a result from sharing e-cigarettes with other people.

Nick Stevens Jr., Health and Exercise Science, Undergraduate

Faculty Mentor: Kym Fasczewski, Health Sciences

Coauthor(s): Hannah Michels, Kym Fasczewski, Jennifer Howard

A CASE STUDY ON THE IMPACT OF A BOXING INTERVENTION ON QUALITY OF LIFE IN AN INDIVIDUAL DIAGNOSED WITH PARKINSON'S DISEASE

Parkinson's Disease (PD) is a chronic neurodegenerative disease affecting the central nervous system, most commonly resulting in tremors, difficulty speaking, and loss of coordination, balance, fine, and gross motor control. Treatment modalities include medications to control symptoms, diet modifications, physical therapy, and physical activity (PA). The physical benefits of PA on PD symptoms are well-researched across several exercise modalities, including boxing, aerobics, and dancing. The goal of this project was to examine the impact of long-term group boxing program participation on one individual's overall quality of life (QoL). The program consists of 30 minutes of boxing followed by 30 minutes of a rotating activity (weights, spin, yoga, Zumba, or Tai Chi) with individuals participating 1-3 times per week. The participant, a 79 year old male who was diagnosed with PD approximately 20 years prior, had been attending the boxing program regularly since its inception three years ago. Results from a semi-structured interview indicated that the participant perceived positive impacts on his overall QoL resulting from improved functionality, slowed PD progression, increased self-efficacy, and valuable social connections for both himself and his caregiver. Future research should continue to explore program benefits that extend beyond physical outcome measures, such as enhanced social, psychological, and emotional outlook of the participants.

Nick Tocci, Health and Exercise Science, Undergraduate

Faculty Mentor: Marco Meucci, Health Sciences

Coauthor(s): Nicholas Tocci, Devin Adell, Daniel Ellis, Rachel Smith, Ellen Weaver, Marco Meucci

THE EFFECTS OF GENDER DIFFERENCE AND BODY COMPOSITION ON MAXIMAL AEROBIC CAPACITY

Maximal oxygen consumption (VO2max) is considered the gold standard measure of aerobic capacity. Absolute VO2max is typically higher in males than females due to greater body weight (BW) and fat free mass (FFM). To account for body size, values are normalized by BW; however, normalization by FFM may provide a more accurate assessment of aerobic capacity. The aim of the study was to compare VO2max normalized by FFM between male and female adolescents. Methods: Twenty-two individuals (13 females, 9 males; age 16.5±0.7 years) performed a cardiopulmonary exercise test on a cycle ergometer with a 15-watt per minute incremental protocol. Standard maximal effort criteria were used to determine if VO2max was reached. Respiration was analyzed breath-by-breath using the COSMED K5. Using the Bod Pod, body composition was expressed as percentages of fat mass and FFM. Results: Males had a significantly higher percent FFM than females (83.3±8.0% vs. 72.6±5.4%, p=0.001). Absolute VO2max was significantly higher in males than females (2343.8±553.6 mL/min vs. 1792.4±249.9 mL/min, p=0.005). This difference was maintained after normalizing VO2 by BW (33.5±6.1 mL/kg·min-1 vs. 30.6±5.5 mL/kg·min-1, respectively). VO2max normalized by FFM indicated females had higher VO2max values than males (41.4±8.0 mL/FFM·min-1 vs. 40.1±5.7 mL/FFM·min-1). Conclusion: When normalized by fat free mass, female adolescents appear to demonstrate higher aerobic capacity than males during maximal effort exercise.

Katlin Travis, Health and Exercise Science, Undergraduate

Faculty Mentor: Zachary Farris, Health Sciences

Coauthor(s): Katlin Travis, Brittian Francisco, Mamadou Kane, Zachary Farris

SPOTTING THE SPOTTED HYENAS (CROCUTA CROCUTA): FIRST POPULATION ASSESSMENT ACROSS NIOKOLO-KOBA NATIONAL PARK, SENEGAL

Spotted hyenas (Crocuta crocuta) are experiencing population declines throughout their African range. Senegal represents the westernmost extension of their range and populations there are poorly studied or understood. Through a collaboration with Senegalese wildlife managers, I am conducting a population level assessment of threatened spotted hyenas across Senegal's most important protected area: Niokolo-Koba National Park. In 2013, our collaborators conducted photographic surveys at two sites: Linguekountou (n = 28 cameras) and Niokolo (n = 27 cameras). These surveys, which ran for an average of 76 nights, provided more than 5,000 photos per survey. We used captures of spotted hyenas to estimate relative activity (trap success) for Ling (0.20) and Nio (0.04). Additionally, we calculated naïve occupancy (spatial distribution, not accounting for imperfect detection) for both Ling ($\tilde{\Psi}$ = 0.47) and Nio ($\tilde{\Psi}$ = 0.37). Hyena populations at Ling had higher detection rates (p = 0.20 ± SE 0.06) compared to Nio (p = 0.09 ± SE 0.02). We were able to estimate hyena occupancy at Ling (Ψ = 0.63 ± SE 0.15), but low capture rates at Nio prevented occupancy estimation. Our results reveal that spotted hyena populations are widespread across this protected area landscape and this generalist predator could potentially serve as an umbrella species for other threatened wildlife occurring within its range. These estimates are being used by managers to protect wildlife across this region.

Elise Witwer, Health and Exercise Science, Undergraduate

Faculty Mentor: Rebecca Kappus, Health Sciences

Coauthor(s): Caroline Rushing, Anna Carmichael, Rebecca Kappus

THE EFFECTS OF RESISTANCE TRAINING ON CARDIOVASCULAR FUNCTION

PURPOSE: Chronic hypertension is associated with arterial stiffness: a recognized risk factor for stroke and coronary artery disease. During resistance exercise, there is an increased pressure load, with systolic blood pressure increasing up to 400 mmHg. Although chronic hypertension results in arterial stiffening and decreased cardiovascular function, the acute elevation of pressure with resistance exercise has not been consistently shown to be detrimental to cardiovascular function. Although regular aerobic exercise results in improved arterial compliance, the effects of long-term resistance training is unclear. The purpose of this study is to compare blood pressures and arterial stiffness in males who consistently strength train (≥ 3 days/week) versus males who do not strength train to determine if regular strength training results in stiffer arteries or elevated pressure. METHODS: Thirteen (7 trained, 6 untrained) young males underwent measurements of central and peripheral blood pressures and arterial stiffness (carotid beta stiffness). RESULTS: Untrained males had significantly higher brachial, carotid, and aortic diastolic blood pressures compared to strength trained males. CONCLUSIONS: Trained males had significantly lower diastolic pressures compared to untrained males. Arterial stiffness measurements were not significantly different between trained and untrained males. This indicates that the acute hypertension associated with resistance exercise does not lead to detrimental effects on cardiovascular function.

Killian Wustrow, Health and Exercise Science, Graduate

Faculty Mentor: Caroline Smith, Health Sciences

Coauthor(s): Martin Root, Nelson Vinueza, Emiel Den Hartog, Scott Collier, Caroline Smith

DETERMINING DERMAL ABSORPTION OF A NON-CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON VIA INTRADERMAL MICRODIALYSIS

Firefighters are exposed to hazardous byproducts of incomplete combustion during fire suppression that are linked to increased incidence of multiple types of cancer. Despite wearing protective turnout gear and self-contained breathing apparatus, evidence suggests exposure to these byproducts, polycyclic aromatic hydrocarbons (PAHs); however, focus has been on respiratory rather than dermal exposure routes. Microdialysis (MD) is an intradermal sampling technique allowing bidirectional exchange of substances between the MD fiber and interstitial fluid, depending on concentration gradient and pressure. To determine if a noncarcinogenic PAH, anthracene, can be dermally absorbed and sampled via MD, multiple MD fibers were inserted into the ventral forearm and a 2.0% anthracene solution was applied over the sites. Dialysate from the MD fibers were sampled over 4 hours at a rate of 1 µl/min. The dialysate was measured using fluorescence and gas chromatography mass spectrometry. A series of standard curves were created for a baseline for the samples containing anthracene and an equation was derived to determine the amount anthracene in the dialysate. An estimation of 18.5 and 15.5 ppb of anthracene were found in samples one and two, respectively. These data demonstrate dermal absorption of PAHs measured via MD, with important future applications for determining dermal PAH absorption in firefighters following live burns and assessment of their protective gear to reduce cancer risk.

HUMAN DEVELOPMENT AND PSYCHOLOGICAL COUNSELING

Kaitlin Clancy, Human Development and Psychological Counseling, Graduate

Faculty Mentor: Geri Miller, Education

Coauthor(s): Emily Proctor, Geri Miller, Ben Asma, Jaime Dean, Andrea Marsh, Jennifer Kline, and Fumie Abe

OPIATE ADDICTION AND PAIN MANAGEMENT: OVERVIEW OF COUNSELING APPROACHES

Kaitlin Clancy and Emily Proctor, two students obtaining the certificate in addiction counseling through the Department of Human Development and Psychological Counseling (Clinical Mental Health Counseling track), along with their faculty mentor, Dr. Geri Miller, presented at the American Counseling Association Conference. The conference was held March 28-31, 2019 in New Orleans, Louisiana. Their presentation, titled "Opiate Addiction and Pain Management: Overview of Counseling Approaches," provided an overview of treating individuals for opiate addiction who have chronic pain. Clancy and Proctor argued three main points for counselors' consideration when treating this population:

- Learn to practice self-care
- Create realistic hope
- Understand cultural values

Kelsey Fish, Human Development and Psychological Counseling, Graduate

Faculty Mentor: Geri Miller, Education

Coauthor(s): Geri Miller, Glenda S. Johnson, Mx. Tuesday Feral, William Luckett, and Madison Ericksen

THE USE OF EVIDENCE-BASED PRACTICES WITH OPPRESSED POPULATIONS

Kelsey Fish, a recent graduate of the Department of Human Development and Psychological Counseling, co-authored an article published in the American Counseling Association's Counseling Today on December 3, 2018. The article, titled "The Use of Evidence-Based Practices with Oppressed Populations," reviews effective counseling interventions for individuals experiencing marginalization. These individuals include those with low socioeconomic status, rural adolescent substance abusers, and transgender clients. Evidence-based approaches found to be appropriate with these populations include solution focused brief therapy (SFBT), motivational interviewing (MI), and transgender-affirming cognitive behavior therapy (CBT). Inherent to each of these approaches is the embodiment of a strengths-based therapeutic approach. The authors argue that while evidence-based practices are important to a counselor's work, it is imperative that counselors adjust their interventions on the basis of the unique identity of the client.

INTERDISCIPLINARY STUDIES

Gracie Bowling, Interdisciplinary Studies, Undergraduate

Faculty Mentor: Kristan Cockerill, Arts & Sciences

BREADMAKING IN THE EARLY-CHILDHOOD, MONTESSORI CLASSROOM

This project is a supplemental curriculum grounded in developmentally appropriate practice and designed for use in an early-childhood, Montessori classroom. It centers around the theme of breadmaking and is intended to engage children with the topics of food systems, agricultural cycles, and global cultures.

Montessori classrooms around the world practice food-preparation to develop practical life skills like measuring, slicing, stirring, and peeling and to encourage multi-sensory exploration. Breadmaking in the Montessori classroom provides these same developmental opportunities while also offering a connection to and understanding of a food that unites the vibrantly different cultures of the world with the combination of grain and water. This supplemental curriculum includes a series of "classroom works," based on Montessori's didactic material; a list of topical children's books; and an activity plan for making a loaf of bread.

The methodology for this project includes the creation of an annotated bibliography of scholarly sources focusing on the rationale behind and effective techniques for teaching food-preparation skills to young children, the conclusions of which have informed the development of the supplemental curriculum.

Expected results of the use of this supplemental curriculum include an enhanced multi- and interdisciplinary understanding of and appreciation for bread and breadmaking as well as the development of valuable food-preparation and practical life skills.

LANGUAGES, LITERATURES AND CULTURES

Emma Lynch, Languages, Literatures and Cultures, Undergraduate

Faculty Mentor: Beverly Moser, Arts & Sciences

LEARNING AND TEACHING GERMAN HISTORY

Joachim Rudolph, interviewed by faculty member Beverly Moser, helped to dig a tunnel underneath the Berlin Wall in 1970, bringing 29 people into West Berlin. During his three hour interview with Dr. Moser, he discusses his flight from an area of Poland that was controlled by Germany until the end of World War II, the sudden implementation of the Berlin Wall, the practical details of building the tunnels, the constant surveillance of the Stasi in East Berlin, and how the tunnel system helped refugees. His extensive first-hand knowledge easily translates into valuable knowledge for German students, especially upper-level German students whose access to materials that will improve their knowledge is limited by the amount of material available. By translating this interview and creating exercises from the material that would help me as a student, I will be able to improve the overall learning for German students at Appalachian State, not only by creating material that exposes them to more in-depth aspects of German history and the Cold War, but also allows them to experience conversation with a genuine German resident. I have created worksheets based on things I didn't understand while working on the translation project, which will help other upper-level students learn from my mistakes, and help professors understand what their students might have difficulty with.

MATHEMATICAL SCIENCES

Sydney Singleton, Mathematical Sciences, Undergraduate

Faculty Mentor: Ross Gosky, Arts & Sciences

USING RECRUITING RANKINGS AND RETURNING TEAM MEASUREMENTS TO PREDICT COLLEGE FOOTBALL TEAM SUCCESS

This paper proposes and compares a set of models of college football team performance for teams in major conferences during the years of 2006 – 2018. The outcome measure of team performance is the team's standardized Sagarin Ranking at the end of the season after the postseason bowl games and, in recent years, playoff games are complete. Potential predictor variables include several variables taken from the team recruiting rankings at the website www.rivals.com, and other attributes of the team compiled from an annual college football prediction magazine. Models considered include models screened via traditional forward, backward, and stepwise model selection methods, as well as a regression tree model. These candidate models are first compared using a season-based cross-validation technique, and the predictive accuracy of the candidate models are compared after these successive comparisons. We find that the model chosen via stepwise selection performs the best according to the error metrics, but all the models are comparable. We further consider refinements of the stepwise selection model with quadratic and piecewise terms. Our findings from these analyses suggest that teams with higher recruiting rankings are predicted to perform better in a given season, but that other factors about the team are also significant predictors of performance.

MUSIC

Elizabeth Derrick, Music, Graduate

Faculty Mentor: Christine Leist, School of Music

AN EXPLORATION OF MUSIC THERAPY FOR RELATIONSHIP COMPLETION IN INDIVIDUALS RECEIVING HOSPICE CARE: A MULTIPLE CASE STUDY

The purpose of this study was to explore the role of music therapy for relationship completion with individuals receiving hospice services at a long-term care facility. Types of relationships explored included relationships with a spouse, a family member, caregiver, self, and the music therapist. A variety of music therapy interventions were used, including receptive music listening, clinical music improvisation, songwriting, song dedications, music-assisted relaxation, the iso-principle, song discussion, and life review. Data were collected by means of patient self-reports, reports of staff members at the skilled nursing facility (SNF), and the documented observations and interpretations of the attending music therapist. Pseudonyms have been used to protect the identity and confidentiality of patients and individuals involved in the case studies discussed. One client, who was receiving hospice services for late stage Parkinson's disease, experienced an increase in social engagement with her spouse and caregivers. A second client also experiencing the later stages of Parkinson's, experienced an increase in over-all quality of life (QOL). A third patient, who was receiving end-of-life services for late stage dementia, experienced an increase in communication throughout the music therapy implementation period. This study suggests that music therapy can be an effective therapeutic approach for relationship completion in hospice care.

Lisl Doughton, Music, Graduate

Faculty Mentor: Victor Mansure, School of Music

THE ELEMENTS OF ART AND MUSIC IN THE ORGANIZATION OF THE CREATIVE PROCESS

Although visual art and music are based on different raw materials, the creative processes of visual artists and composers show significant parallels. This study, centered on the Elements of Art and Music, is the first to quantitatively compare the creative process across those two disciplines. To determine which Elements of Art and Music are used or experienced in similar ways, a Google Forms survey in two versions (one for artists and one for composers) was distributed through e-mail to 10 artists and 15 composers representing a variety of interests, backgrounds, and careers.

The survey provided a list of the standard elements of art (such as color, line, and shape) or music (such as melody, harmony, and rhythm), plus subject/narrative and text. The central questions asked artists and composers which element(s) most often (1) provide them with a spark of inspiration; (2) flow unconsciously; (3) require conscious manipulation; (4) develop as a result of other elements; and (5) are their chosen resource for conveying emotion.

Results showed that a subject or narrative most often provided the inspiration for a project in either discipline. The elements most often used to convey emotion (Color, Harmony, and Timbre/Tone Color/Instrumentation) all contain rich complexities and cultural associations whose parallels are worth examining in future research. The results of this project suggest new directions for research in creativity, perception, and arts education.

Sarah Solberg, Music, Graduate

Faculty Mentor: Christine Leist, School of Music

NEUROLOGIC MUSIC THERAPY TO IMPROVE SPEAKING VOICE IN INDIVIDUALS WITH PARKINSON'S DISEASE

The purpose of this project is to explore the impact of individual Neurologic Music Therapy vocal on speaking voice and quality of life in individuals with Parkinson's disease (PD). According to the National Institute of Health (2010), nearly 500,000 people in the United States have PD with 70%-100% of people diagnosed with PD experience voice changes. Individuals with PD have significantly decreased laryngeal functioning (Smith et al., 1995). Neurologic music therapy techniques have demonstrated the unique ability of music-based interventions to improve maximum phonation time, voice quality, and articulatory control in people with PD (Azekawa, & LaGasse, 2018). Improved communication in people with PD has been shown to improve daily quality of life and increase effective communication. Further research is needed to develop a standardized treatment protocol for singing based therapies. This study is a multiple case study design employing single-group repeated measures for hypotheses testing. Data collection of acoustic measures and self-report measures are being taken before and after the NMT intervention protocol. The study is ongoing, as such, final results have not been obtained. However, singing interventions (Azekawa, & LaGasse, 2018) have been shown to improve functionality of the vocal mechanism for people with PD; therefore, it is expected that this music therapy intervention focusing on phonation will have a positive effect on the client's communication in daily life.

NURSING

Alondra Aguirre, Nursing, Undergraduate

Faculty Mentor: Dana Brackney , Health Sciences

Coauthor(s): Kyle Lepley, Lindsay Tumbleson, and Dwlce Zarraga Acosta

DOES OPTIMAL OXYGEN THERAPY FOR PRETERM NEONATES EXIST? WILL THIS METHOD OF CARE ALWAYS BE A TWO-EDGED SWORD?

The aim of this systematic review is to evaluate the evidence that has been studied in regards to safe oxygen saturation targets and safe oxygen delivery methods for preterm neonates. Although oxygen is the most widely used therapeutic agent in neonatal care, optimal oxygen management remains uncertain. Additionally, there are various opinions on what the standard of care should be and how this care should be administered. There are potential benefits and risks of inducing hyperoxic and hypoxic states when administering more or less oxygen supplementation. In hypoxic states, preterm neonates are at risk for persistent pulmonary hypertension and respiratory distress syndrome. In hyperoxic states, preterm neonates are at risk for retinopathy and bronchopulmonary dysplasia. Therefore, establishing an optimal oxygenation protocol is significant in decreasing the incidence of oxygen-related complications in preterm neonates. An electronic literature search encompassing "preterm neonate oxygen therapy" was performed on the CINAHL database. Inclusion criteria consisted of English language, publishing date of 2014-2019, full text available, peer reviewed, research article and neonate focus. As studies were reviewed, the quality and level of evidence was assessed using the Johns Hopkins Strength of Evidence Hierarchy.

Sarah Allred, Nursing, Undergraduate

Faculty Mentor: Dana Brackney, Health Sciences

Coauthor(s): Lindsay Young, Mari Sweeney, Lyndsey Finkbeiner

EFFECTS OF BIRTH ATTENDANT ON MATERNAL OUTCOMES: MIDWIFE VERSUS PHYSICIAN

With a shift in focus towards a more natural approach to pregnancy and childbirth, midwife-led care for pregnant and laboring women has re-emerged in modern society. The purpose of this study was to evaluate the evidence on maternal outcomes, with midwife-led deliveries and obstetrician-led deliveries. A systematic review was conducted involving women who received midwife-led care or obstetrician-led care during the birthing process to compare maternal outcomes including breastfeeding rates, perineum trauma, postpartum hemorrhage, birth experience, and cesarean section rates. CINAHL and Pubmed databases were used with the keywords. A total of 16 research articles were identified after studies were eliminated for irrelevance and duplication. The four researchers then evaluated each article for quality and level of evidence to compare maternal outcomes in relation to type of delivery. The 16 studies demonstrate that midwife-led care results in positive maternal outcomes in low-risk women, including an increase in breastfeeding rates, and a decrease in postpartum hemorrhage, perineum trauma, and cesarean sections while reporting an overall more positively rated birth experience with a midwife-led delivery. Further research should be conducted comparing neonatal outcomes with method of delivery as well as how midwife-led care affects high-risk deliveries.

Keywords: Maternal health, obstetric delivery, midwifery, outcome

Danielle Boase, Nursing, Undergraduate

Faculty Mentor: Dana Brackney, Health Sciences

Coauthor(s): Haili Lineberry, Alexandra Stivers, Marti Arizona

THE EFFECT OF MEDICATION AND BEHAVIORAL THERAPY IN TREATING PEDIATRIC ATTENTION-DEFICIT/ HYPERACTIVITY DISORDER

A systematic review was completed using CINAHL and MEDLINE on February 6th, 2019; 16 articles were included in the review. The aim of the study was to identify current practices in treating Attention-Deficit/ Hyperactivity Disorder (ADHD) in pediatric patients related to medication and behavioral therapy. Included studies discussed the benefits and disadvantages of medication therapy, the benefits of parental education, and and the benefits of using behavior therapy in addition to medications. While there were studies that showed benefit in using both medication and behavior therapy, the overall data was inconclusive, and because of this, we were unable to determine the best practice to use. There is a lack of research in all of these areas and continued research is indicated before making an evidence-based practice recommendation.

Julie Fulk, Nursing, Undergraduate

Faculty Mentor: Dana Brackney, Health Sciences

Coauthor(s): Coltin Greer, Mark Veckenstedt, Jordan Lockee

IN THE DRUG DEPENDENT POPULATION, ARE HOMEOPATHIC INTERVENTIONS MORE OR LESS EFFECTIVE AT TREATING DRUG ADDICTION THAN METHADONE

This systematic review examines the effectiveness of homeopathic, non-medicinal interventions in managing withdrawal symptoms in drug dependent individuals using the John Hopkins Nursing Evidence Based Practice Research Evidence Appraisal Tool Appendix E© for quality control. A search for articles using the terms “Drug Addiction AND Methadone” and “Drug Addiction AND Acupuncture” were performed in CINAHL and PubMed databases, while a search of “Drug Addiction AND Marijuana” and “Acupuncture AND Methadone” were also performed in CINAHL. Duplicate studies (n = 14) and those not meeting inclusion criteria (n = 85) were removed, yielding 19 articles for use in this analysis. A combination of experimental, quasi-experimental, and qualitative studies have shown that methadone maintenance therapy (MMT) is an effective tool for managing withdrawal symptoms in patients. However, using homeopathic methods such as acupuncture, marijuana, distraction, etc. shows an increase in compliance with MMT by decreasing side effects related to the withdrawal and the methadone treatment itself. There was no data found for this synthesis in which homeopathic methods were compared directly to methadone treatment, but the data acquired indicates that homeopathic remedies should be considered as an adjunct to methadone treatment to improve the withdrawal process and increase positive patient outcomes.

Makayla Pennington, Nursing, Undergraduate

Faculty Mentor: Dana Brackney , Health Sciences

Coauthor(s): Keturah Taylor, Theresa Weeks, Sarah Rogers, Makayla Pennington

THE EFFECTS OF DELAYED VERSUS IMMEDIATE UMBILICAL CORD CLAMPING: A SYSTEMATIC REVIEW

Introduction: This systematic review addresses neonates with uncomplicated deliveries, regarding how hemodynamic status is affected by delayed cord clamping compared to immediate or early cord clamping after birth. Studies in this systematic review compare the need for red blood cell transfusions, time of phototherapy, hemoglobin and hematocrit levels, mechanical ventilation need, and incidence of intracranial hemorrhage.

Methods: A database search was conducted with relevant search terms; articles were included if they addressed immediate hemodynamic effects to the infant. Twenty-four full text articles were reviewed and 15 full text articles qualified for this systematic review.

Results: Of the 15 studies, 10 reported direct positive effects of delayed cord clamping on the hematocrit and hemoglobin levels of newly born preterm and term infants. The other 5 articles found a mixture of positive effects associated with decreased need for blood transfusions, decreased respiratory intervention need, increased red blood cell count, decreased hypothermia, higher blood pressure, improved urinary output, and decreased infant morbidities and mortalities. Seven of the 15 studies did indicate that there was not a foreseen benefit between early cord clamping and delayed cord clamping after 6 months.

Conclusion: The advantages of delayed cord clamping provides adequate reasoning to implement this practice for uncomplicated births.

Ella Clare Phillips, Nursing, Undergraduate

Faculty Mentor: Dana Brackney, Health Sciences

Coauthor(s): Lauren Parker, Maryann Richardson, Alie Burghardt

THE RELATIONSHIP BETWEEN NURSING ASSESSMENT AND PREVENTABLE LIMB LOSS IN PERIPHERAL VASCULAR DISEASE PATIENTS: A SYSTEMATIC REVIEW

This systematic review explores sixteen articles that study present research on nursing assessments, and their relationship to preventable limb loss in peripheral vascular disease (PVD) patients. The motivating factor for this research is to determine strategies that nurses can employ to prevent ischemic damage to peripheral extremities, and limit this ischemic event from reaching the point for limb amputation to be necessary. Synthesis of the information was found on CINAHL and Pubmed databases, including 15 qualitative studies, and 4 quantitative studies. This review found that there is a direct relationship between limb loss and peripheral vascular disease, and most studies reflect on nursing action to educate for prevention, assess for diagnosis, and perioperative care pre and post amputation. However, nursing assessment and intervention in patients with known PVD and ischemic changes is limited and unremarkable in results.

Keywords: Peripheral Vascular Disease, nursing assessment, preventable limb loss

Randi Sparks, Nursing, Undergraduate

Faculty Mentor: Dana Brackney, Health Sciences

Coauthor(s): Elizabeth Long, Miranda Root, Kim Scro, Randi Sparks

NOISE IN CRITICAL CARE ENVIRONMENT: A SYSTEMATIC REVIEW

Intensive care units, by their nature, can be chaotic environments. This chaos accompanies noise levels that may go unregulated for extended periods of time; between ventilators, bed alarms, and vital sign monitoring, noise in critical care settings remains elevated beyond healthy limits. The World Health Organization's recommendations for noise levels state that noise shouldn't exceed 35 dB(A) (A-weighted decibels) at night and 40 dB(A) during the day (Pulak & Jensen, p18, 2016). A recent data review suggests consistent elevations in noise levels of ICU environments, with one example stating that average noise levels in ICU settings may be in elevated ranges of 55-66 dB(A) with spikes up to 85 dB(A), enough to stimulate sympathetic changes in the cardiovascular and endocrine systems (Pulak & Jensen, p18, 2016).

This paper poses the question, how does the regulation of noise as compared to no regulation of noise impact health outcomes for patients in the ICU? The purpose of noise regulation is to combat negative outcomes associated with noise pollution as evidenced by increased incidence of "hypertension, ischemic heart disease, sleep disturbances, and impaired wound healing" (Riemer, Mates, Ryan, & Schleder, 397). This systematic review aims to explore problems and interventions related to noise regulation, and the lack thereof, in the critical care setting of hospitals.

Claire Thomas, Nursing, Undergraduate

Faculty Mentor: Dana Brackney, Health Sciences

Coauthor(s): Lauren Kuperman, Hannah Schott, Taylor Smith

A SYSTEMATIC REVIEW COMPARING PHARMACOLOGICAL AND NON-PHARMACOLOGICAL THERAPIES IN TREATMENT OF ADHD SYMPTOMS IN ADOLESCENTS

The aim of this systematic review was to evaluate the comparative efficacy of pharmacological and non-pharmacological therapies in treating adolescents with Attention-Deficit Hyperactivity Disorder (ADHD). ADHD is a common diagnosis among adolescents, and the maladaptive behaviors that manifest in ADHD patients can continue into adulthood, therefore making it important to know relevant treatment outcomes. The search strategy for this systematic review consisted of two electronic databases, PubMed and CINAHL, with searches for "treatment of ADHD in adolescents". Inclusion criteria was: (1) clinical trial in a randomized control trial; (2) studies on treatment of ADHD symptoms on adolescents between the ages of 13 and 18 years; and (3) studies that focused on outcomes of treatment. Based on the inclusion criteria, eight studies were selected for analysis. Each study was assessed for quality by using the Johns Hopkins Nursing Evidence-Based Practice Appendix E for Research Evidence Appraisal. Evidence favors the conclusion that the presence of ADHD symptoms are decreased with the use of medication in combination with another intervention in adolescents.

Linnea Wennborg, Nursing, Undergraduate

Faculty Mentor: Dana Brackney, Health Sciences

Coauthor(s): Megan Pons, Trevor Gagnon

LONG-TERM HOSPITALIZATION OF ADOLESCENTS AND ITS RELATIONSHIP TO SOCIAL ISOLATION

BACKGROUND

The purpose of this systematic review is to explore the relationship between the long-term hospitalization of adolescents and feelings of social isolation. The research question focuses on this topic by asking "in adolescents who experience long-term hospitalizations, does social support decrease stress levels and feelings of isolation compared to adolescent patients who do not receive social support?"

METHODS

A PRISMA flow chart was used during the selection of articles for this systematic review. Keywords that were searched for included "adolescent", "adolescent development", "hospitalization", and "social isolation". Databases that were utilized during the selection process were CINAHL and PubMed. 74 articles were initially found.

RESULTS

An inverse relationship was found between social support and feelings of isolation. As social support increased, feelings of isolation decreased.

CONCLUSION

After conducting this systematic review, we concluded that social support has an inverse relationship to feelings of social isolation. Higher levels of social support correlate with decreased feelings of social isolation. However, the effectiveness of specific types of social support (peer-to-peer, family support in the home, etc.) are not clear. Also the amount of social support that is needed to decrease feelings of social isolation was not clearly determined during our research.

Laura Dunn, Nutrition and Healthcare Management, Graduate

Faculty Mentor: Kyle Thompson, Health Sciences

Coauthor(s): Melissa Gutschall, Alisha Farris, Morgan Banker, Kyle Thompson

FACTORS INFLUENCING POST-BARIATRIC SURGICAL READMISSIONS WITHIN A HEALTH CARE SYSTEM IN NORTH CAROLINA: A QUALITY IMPROVEMENT (QI) STUDY

Plan: The purpose of this quality improvement (QI) study was to review selected data, including dietary data, from the electronic medical record for patients who received bariatric surgery at any of four bariatric surgical facilities within a single North Carolina health system, and were re-admitted at some time following surgery due to complications, to determine whether the assignment of a clear liquid or protein liquid diet for two weeks following surgery was associated with time (in days) to re-admission, risk level, age, or weight at time of surgery.

Do: A retrospective chart review was conducted of all patients receiving bariatric surgery who experienced a complication requiring re-admission during the 3-month study period at the four facilities (N=32/739, 4.3%). Data were compiled using a tool designed by the study intern. Linear regression analyses and t-tests were conducted using SPSS.

Study: Coefficients of diet type and level of risk were strong predictors of the number of days between surgery and readmission. There was a significant difference in days to readmission between the clear liquid and protein diets (6.00 + 3.279 days vs. 14.1+ 8.885 days, respectively). No significant relationships were found for age or weight at surgery.

Act: Consideration should be given to providing all bariatric surgical patients with a protein liquid diet following surgery to promote a reduced risk of readmission after surgery.

Emily Frymark , Nutrition and Healthcare Management, Undergraduate

Faculty Mentor: Alisha Farris, Health Sciences

FOOD INSECURITY AND THE EFFECT ON COLLEGE STUDENTS: AN ANALYSIS OF FOOD PANTRIES IN A COLLEGE TOWN IN APPALACHIA

Food insecurity is especially prevalent in rural areas, and is a growing concern among college students. In 2017, 46.2% of college students experienced food insecurity in the Appalachia region. Food pantries play a role in limiting food insecurity by providing food at little-to-no cost. Yet, the nutritional and energetic contents available, especially as it relates to college-aged adults, is unknown. This study was conducted to assess and analyze the nutritional content of the foods available to college students from pantries located in close proximity to a college campus in the Appalachia region. Using the Healthy Food Pantry Assessment tool, food pantries were scored (0-100; arbitrary units) based on a visit and discussion with food pantry directors. Additionally, nutritional contents of pantry foods were examined in line with the dietary needs of a typical college student. Food pantry 1 scored 39, pantry 2 scored 59, and pantry 3 scored 60. The food that the pantries provided to their clients was aimed to supplement the client for a duration of 14 days. Overall, the food pantries provided 38% of the total daily calories recommended for a moderately active male aged 20 year for the 14-day period. In general, students who rely on food pantries as their sole source of food do not reach the calorie, micronutrient, or macronutrient recommendations set by the Dietary Guidelines for Americans.

Nadine Gregory, Nutrition and Healthcare Management, Undergraduate

Faculty Mentor: Melissa Gutschall, Health Sciences

Coauthor(s): Nadine Gregory, Melissa Gutschall, Kyle Thompson, Alisha Farris

DIFFERENCES IN ACHIEVING DIETETICS COMPETENCIES THROUGH THE COMMUNITY AND UNIVERSITY SETTING.

Current research supports satisfaction with experiential learning as a part of undergraduate dietetics education. The objective of this study was to compare learning outcomes of undergraduate dietetic students in the Quantity Food Production course in three settings: the interdepartmental faculty meal, the on-campus dining hall, and the Hunger and Health Coalition, a local food recovery program. Upon completing each experience, undergraduate dietetics students answered three questionnaires regarding attitudes towards attaining dietetics, food-systems management and service-learning competencies. A rating scale and 5-item Likert scale were utilized to determine competencies met. A One-Way ANOVA compared differences in groups amongst each setting and competency attained. Students (N = 17) demonstrated significantly higher outcomes for certain food-systems management and dietetics related competencies when examining the faculty meal setting compared to the other settings ($p < .05$). Students demonstrated higher outcomes related to service-learning through the Hunger and Health Coalition compared to other settings. Comparatively, the on-campus dining hall did not offer any additional benefits to learning outcomes. Results suggest that undergraduate dietetics students demonstrate competencies from a variety of settings. Dietetics educators may benefit from further understanding the contributions that various experiential learning opportunities provide to students.

Anna Jackson, Nutrition and Healthcare Management, Graduate

Faculty Mentor: Laura McArthur , Health Sciences

Coauthor(s): Laura McArthur, Melissa Gutschall, Kimberly Fasczewski, and Kyle Thompson

FOOD INSECURE STUDENTS AT APPALACHIAN STATE UNIVERSITY ALSO SHOW HIGH RATES OF MEDICAL AND LEARNING DISORDERS

Rates of food insecurity (FI) and correlates were compared among App State students with and without medical and learning disorders. An online questionnaire measured FI using the USDA Adult Food Security Survey, coping strategies and perceived barriers for food access, academic progress, and identified disorders. Descriptive and inferential procedures were computed. Statistical significance was $p<0.05$. FI students comprised 56.5% of the sample. Two-thirds of FI students had one or more medical and/or learning disorders. Coping strategies for students with and without disorders, respectively, included "brought food back to school" (90.9% vs. 63.0%) and "ate less healthy food to eat more" (77.7% vs. 49.4%). FI students with disorders had significantly more medical expenses ($p < 0.01$), and their barriers for food access included "feel overwhelmed making food choices" (12.7%) and "meal plan runs out" (10.2%). FI correlates for students with disorders included female gender, employed, off-campus residence, receiving financial aid, "good/excellent" perceived health, greater use of coping strategies and more perceived barriers, and suboptimal academic progress, all $p < 0.05$. Findings indicate a need for continued efforts to facilitate food access by FI students, especially for those with disorders.

Katelyn Meaux, Nutrition and Healthcare Management, Graduate

Faculty Mentor: Martin Root, Health Sciences

Coauthor(s): Martin M. Root, Melissa Gutschall, Kyle Thompson

DIETARY PLANT PROTEIN AND THE PROGRESSION OF METABOLIC SYNDROME OVER NINE YEARS

Introduction: Metabolic syndrome is a precursor to many leading causes of death in the United States including cardiovascular disease, stroke, and diabetes. Diet plays a major role in preventing or exacerbating the development of metabolic syndrome. Increasing the percentage of protein from plant sources in the diet may reduce the risk of developing metabolic syndrome. The purpose of this study was to examine the possible relationship between metabolic syndrome progression and percent of protein from plant sources.

Methods: The ARIC dataset was used to compare changes in metabolic syndrome diagnosis during a nine year period to average plant protein versus animal protein consumption for 10,038 Americans.

Results: As hypothesized, quartiles with higher percentages of protein intake from plant sources showed a decrease in metabolic syndrome score (B= -0.039; 95% CI: -0.063, -0.016). Waist circumference was the most significantly influenced metabolic syndrome factor (B= -0.185; 95% CI -0.248, -0.122). A decrease in BMI was similarly correlated with higher intakes of plant proteins (B= -0.159; 95% CI -0.210, -0.108).

Conclusions: These results suggest that a higher intake of plant proteins could be protective against increased BMI and exacerbation of metabolic syndrome and therefore may reduce risk of CVD, diabetes, and stroke.

Miranda Petrone, Nutrition and Healthcare Management, Graduate

Faculty Mentor: Laura McArthur, Health Sciences

Coauthor(s): Miranda Petrone, Laura H. McArthur, PhD, RD, Alisha Farris, PhD, RD, Kyle L. Thompson, DCN, RDN, Kimberly Fasczewski, PhD

USE AND PERCEPTIONS OF A FOOD PANTRY AMONG STUDENTS AT APPALACHIAN STATE UNIVERSITY

Objectives: Assess student use and perceptions of a campus food pantry and characterize the sociodemographic profile of shoppers. Methods: Online questionnaire measured food insecurity (FI) and campus food pantry use, and identified perceptions of the pantry. Descriptive procedures measured outcome variables and compared subsamples. Statistical significance was $p < 0.05$. Results: 215 of 1,000 recruited students (21.5%) submitted complete questionnaires. 124 students (57.7%) were food secure and 91 (42.3%) were FI. 35 FI students (38.4%) were pantry shoppers. Reasons given by FI students for not using the pantry were: "Others need it more than I do" (65.9%) and "Feel embarrassed asking for help accessing food" (40.7%). Frequency of pantry use ranged from "only once" (28.9%) to "once or twice/week" (18.4%). Products most frequently accessed were grain/cereal foods (n = 26), vegetables (n = 22), and snacks (n = 18). Benefits of pantry use included: "able to spent on other necessities" (60%) and "able to perform better on the job" (15%). Shoppers perceived the pantry's physical environment most favorably and food offerings less favorably. Conclusions: Efforts are needed to encourage FI students to shop at the pantry. Shoppers have primarily favorable perceptions of the pantry and find this service helpful.

Whitney Self, Nutrition and Healthcare Management, Graduate

Faculty Mentor: Sandi Lane, Health Sciences

Coauthor(s): Matthew Wilson, Sandi Lane

NURSING HOME VULNERABILITY ATTRIBUTABLE TO PROXIMITY OF FOOD AND WATER DISTRIBUTORS

As the frequency and severity of weather disasters occurring in the southeast US increases, nursing home residents are at high risk due to frailty, multiple ailments, and need for ongoing assistance with ADLs. Resident deaths that occurred during hurricanes Katrina, Rita, and Maria highlighted a need for research aimed at understanding and increasing resident safety, as well as establishing methods to increase preparedness, including access to food and water, to support resident care following disasters. Previous research created a hazard index that indicated the vulnerability of nursing homes according to physical location, environmental hazard level, and sociodemographic factors. A critical component following disasters is the source of food and water. The goal of this study was to identify the major food and water distribution locations in 10 Southeastern US states and how this relates to nursing home vulnerability. Geospatial mapping was used to map food and water distributor locations in relation to the hazard index. Food and water distributors were found to be located throughout the study region, but more were in urban areas with a higher density of nursing homes. With the exception of Florida, food distribution centers were located in areas with low-to-average vulnerability and away from the coastline. Proximity to food and water distributors is another variable that can be used to assess vulnerability of nursing homes located in the southeast United States.

Ashlyn Troutman, Nutrition and Healthcare Management, Graduate

Faculty Mentor: Martin Root, Health Sciences

Coauthor(s): Ashlyn Troutman, Martin Root, Melissa Gutschall, Laurel M. Wentz

SERUM AND DIETARY MAGNESIUM AND POTASSIUM AS PREDICTORS OF TYPE 2 DIABETES

Introduction: Previous studies have shown an increased incidence of type 2 diabetes (T2DM) in individuals with lower serum potassium and lower serum magnesium levels. Few studies have determined an association between dietary potassium and magnesium and the onset of T2DM. This study sought to determine if low dietary and serum potassium and low dietary and serum magnesium are associated with the risk of T2DM, in a sample of 9,632 participants.

Materials and methods: The Atherosclerosis Risk in Communities (ARIC) dataset was used. Individuals diagnosed with T2DM prior to Visit 1 were excluded. Pertinent covariates were also included in the analysis such as body mass index (BMI), physical activity level, and current cigarette smoker status. Binomial logistic regression analyses were used to determine the association between baseline serum and dietary magnesium and serum and dietary potassium and incidence of diabetes at 9 year follow up.

Results: Low serum potassium was found to be significantly associated with a diabetes diagnosis (Odds ratio per mEq/L= 0.756, 95% confidence interval;0.642-0.890). No associations between serum magnesium, dietary magnesium, or dietary potassium and diabetes were found.

Discussion and conclusions: Low serum potassium may hold promise as a predictor for the onset of T2DM. There are 24% lower odds of the development of diabetes if potassium is within normal range.

PHILOSOPHY AND RELIGION

Amanda Pinto, Philosophy and Religion, Undergraduate

Faculty Mentor: Rick Elmore, Arts & Sciences

UNIVERSITY CLASSROOM ACCESS: A CURRICULAR CRIPHYSTEMOLOGY OF ANXIETY

Undocumented disabilities are impairments that are not apparent to the casual viewer or definitively measurable by mainstream medical technologies. Within the university environment, students with undocumented disabilities routinely have their applications for disability benefits denied or cannot utilize the free counseling centers due to lack of trained professionals. These students are presumed to be "hysterical," or unable to make sense, by not being able to justify their symptoms or provide a diagnosis. How is access in the university classroom affected by an anxious university student? Using Mollow's concept of criphystemology combined with Mitchell et al's discussion of curricular cripistemology, this paper demonstrates that university classrooms fail to provide access to students with the undocumented disability of anxiety. Suggestions for the future will be made using Titchkosky's concept of a "politics of wonder."

PHYSICS AND ASTRONOMY

Frances Claire Brown, Physics and Astronomy, Undergraduate

Faculty Mentor: Brooke Hester, Arts & Sciences

Coauthor(s): Jeff Miller, Brooke C. Hester

HEAT REGULATED SAMPLE CHAMBER TO MAINTAIN OPTIMAL THERMAL CONDITIONS FOR BIOLOGICAL CELL MICROSCOPY

Human cells require a temperature of 37 degrees Celsius, body temperature, to remain viable. It is important to keep cells alive while they are studied to acquire useful and accurate data. To achieve a constant body temperature within a closed microscope slide, a feedback circuit is used as a thermostat. This circuit contains an operational amplifier that compares a constant voltage to the voltage from a thermistor. The circuit also consists of a transistor that activates a ceramic heating ring depending on the output voltage of the operational amplifier. The heating ring rests on the glass coverslip of a slide. This will heat the slide to 37 degrees Celsius. A thermistor is used to monitor the temperature of the sample chamber. As the thermistor heats up, its resistance decreases, therefore, increasing the voltage applied to the operational amplifier. As the voltage from the thermistor rises above the constant voltage set point it will cause the operational amplifier to decrease the current to the transistor thereby turning off the heater. Here, a schematic of the circuit as well as applications for the heated slide are presented.

Taylor Foote, Physics and Astronomy, Undergraduate

Faculty Mentor: Jim Sherman, Arts & Sciences

SEASONAL VARIATION OF AEROSOL MASS CONCENTRATIONS, AEROSOL OPTICAL DEPTH, AND AEROSOL LIGHT EXTINCTION

On campus at Appalachian, we observe the aerosol particle mass concentrations at our NOAA and NASA sites. We use these measurements to examine the seasonal differences in surface-level aerosol mass concentrations less than 2.5 microns, near-surface aerosol light extinction, and aerosol optical depth, AOD. The satellite measured AOD is used to estimate surface-level aerosol mass concentrations for air quality and climate studies. The accuracy at which the satellite measured AOD represents surface-level mass concentrations and light extinction depends on some assumptions which may or may not hold true above a particular site. We apply multi-year continuous measurements of the AOD, aerosol light scattering coefficient, and aerosol mass concentrations from our sites to examine along with measurements of other aerosol and meteorological properties. We compute monthly-binned statistics to determine their seasonal dependence. We then investigate factors contributing to differences in their seasonal dependence. The AOD and scattering coefficient are roughly five to eight times larger and two to four times larger respectively in summer than in winter; however, the aerosol mass concentrations show no seasonal dependency. While there has been a decrease in seasonal variations in the AOD and aerosol light scattering coefficient in recent years, it is still key to understand why there is a difference in observed seasonal dependency between the three measurements.

Joe Langston, Physics and Astronomy, Undergraduate

Faculty Mentor: Christopher Thaxton, Arts & Sciences

Coauthor(s): Christopher Thaxton

HISTORICAL AIR MASS TYPES IN THE SOUTHERN APPALACHIAN MOUNTAINS (SAM)

Climate change is normally tracked through changes in surface temperature, precipitation, and cloud conditions, among other data types. Another means of measuring the change in climate is by tracking the types of air masses observed through time. According to Dr. Scott Sheridan at Kent State University, there are a total of 10 air mass types ranging from Moist Tropical Plus to Dry Polar. Sheridan tracks daily air mass types at dozens of locations across North America, including Charlotte (CLT), the Tri-Cities area of Tennessee (TRI), Greensboro (GSO), and the National Weather Service station in Blacksburg, VA (BKW) back to the 1940s. In this project, we plan to average the air mass types from these four locations to represent the evolution of air mass types over Boone, NC, and the Southern Appalachian Mountain (SAM) region for the last 70 + years. In addition, modifications to the Weather Research and Forecasting (WRF) model could be informed by the air mass types present during simulated time periods. For example, if a dry polar air mass is in place, a subroutine could be called within WRF that enhances turbulence, correcting a common error in WRF under those conditions.

Jeff Miller, Physics and Astronomy, Undergraduate

Faculty Mentor: Brooke Hester, Arts & Sciences

Coauthor(s): Claire Brown

DETERMINATION OF ELASTIC MODULUS OF CELLS USING OPTICAL TWEEZERS

The elastic modulus of a cell is a parameter to describe its resistance to elastic deformation. Understanding the elastic modulus of a cell provides insight as to how the cell reacts to forces, and also may provide information about cell health. Measurements of the elastic modulus of cells are achieved in this work with optical tweezers using the indentation method. In optical tweezers, a trapped particle can be modeled as a Hookean system where the spring constant is the trap stiffness, allowing the force displacing the trapped particle to be determined. To measure the displacement, a second laser and a position sensing detector are utilized for high-resolution position sensing. Using the indentation method, the cell on the microscope slide coverslip is raised to axially displace a trapped microsphere from its equilibrium position in the optical tweezers, which causes the bead to indent the cell. During this process, the displacement of the bead is measured. The force exerted onto the bead and the indentation depth are found from the displacement. Using the Hertz Model, the elastic modulus is determined from the force and indentation depth. We present here, an overview of the methods, the instrumentation, and data collected and analyzed with our software written in LabVIEW.

Lucian Murray, Physics and Astronomy, Undergraduate

Faculty Mentor: Brooke Hester, Arts & Sciences

Coauthor(s): Lucian Murray, Caroline Donaghy, Megen Culpepper, Brooke C. Hester

MEASUREMENTS OF PROTEIN BINDING VIA FLUORESCENCE SPECTROSCOPY

The Biophysics and Optical Sciences Facility (BiyOSeF) houses a custom-built fluorescence instrument. In fluorescence, the sample is excited with a narrow range of light wavelengths. We have coupled our fluorescence instrument to a high-resolution low-noise spectrometer to ensure that detected light is within the desired wavelength range instead of excitation light or other unwanted radiation. Using this instrument, we measure fluorescence intensity of only the desired wavelength range. We mix fluorescent flavin mononucleotide (FMN) with FMN reductase (SsuE), and when they bind, the FMN fluorescence is expected to decrease. Fluorescence intensities at varying concentrations of FMN and SsuE and the resulting fluorescence intensity levels are measured and analyzed to determine if binding has occurred. This technique can be used to study, among other things, whether or not the binding of a fluorescent molecule to a large protein occurs. Here, we present our progress on the custom-built instrument and include some fluorescence data collected with the instrument.

Forrest Myers, Physics and Astronomy, Undergraduate

Faculty Mentor: Brooke Hester, Arts & Sciences

Coauthor(s): Brooke Hester, Greg Rapp

OPTICAL TRAPPING OF VARYING NUMBERS OF GOLD NANOSHELLS

Light exerts a force on an object as it scatters from the object. If that object is small enough, the force effects can be very influential in its motion, and the particle can be quickly accelerated or held in place. This effect can be especially strong when light scatters or reflects from a metal/dielectric interface, such as with an object like a gold nanoshell. As more nanoshells enter the optical trap, the forces seem to increase nonlinearly. The strength for confining the nanoshells in place can be measured based on the motion of either the single nanoshell or cluster of nanoshells. This strength is known as the trap stiffness and is dependent on particle size, material, laser color, temperature, and viscosity of surrounding fluid. Here we compare the trap stiffness of varying numbers of trapped gold nanoshells.

Caroline Piephoff, Physics and Astronomy, Undergraduate

Faculty Mentor: Carla Ramsdell, Arts & Sciences

SOLAR CONCENTRATION STRATEGIES FOR EVACUATED TUBES: APPLIED TO WATER PURIFICATION

This research project investigates two different solar concentration methods for evacuated tubes. Two identical evacuated tubes are equipped with either a linear Fresnel lens or a compound parabolic reflector to concentrate sunlight and heat the water both tubes have been filled with. The temperature of the water is monitored in each tube and the time is recorded for the water to reach 80°C. This temperature was chosen because it is well above the 65°C necessary to kill Hepatitis A, the most heat resistant virus, in contaminated water. Solar cookers consisting of a compound parabolic reflector and evacuated tube are commonly used as a hobby for cooking without using alternative fuel. The hope of this research is to bring this technology into the solar water pasteurization field, inspired by a students research in the previous year with a parabolic reflector and evacuated tube. This method was criticized as being impractical for implementation in developing countries, so this current study aimed to make a more practical and more efficient system with the use of an enclosed box with Fresnel lens to concentrate irradiance on the evacuated tube. The expected results are that the Fresnel lens system will be more efficient than the reflector system, and more practical for applying these results to solar water pasteurization.

Greg Rapp, Physics and Astronomy, Undergraduate

Faculty Mentor: Brooke Hester, Arts & Sciences

Coauthor(s): Scott Hancock, Brooke Hester

TEMPERATURE DETERMINATION OF OPTICALLY TRAPPED PARTICLES

Optical tweezers use a focused laser beam aligned through a microscope which allows the user to apply piconewton forces to suspend microscopic objects. When an object is suspended in optical tweezers, the object will heat up due to the light-material interactions of the particle. Optical tweezers are commonly used to perform medical and biophysical research. As biological material is critically temperature sensitive, knowing the increase in temperature of the biological material caused by the laser is critical to interpreting data acquired by optical tweezers. Using a custom built LabView program that can measure the temperature of a trapped particle via automated methods, we are able to quantify the temperature increase caused by the trap laser. Here we present our work on the temperature determination of an optically trapped particle.

Ross Robertson, Physics and Astronomy, Graduate

Faculty Mentor: Brooke Hester, Arts & Sciences

Coauthor(s): Claire Brown, Brooke C. Hester

ALIGNMENT OF A DUAL OPTICAL TWEEZERS APPARATUS FOR INVESTIGATING PICO-NEWTON FORCES

Optical tweezers use high-powered, highly focused laser light to trap nano to micro-sized objects. These objects include cells and microspheres. Optical tweezers have been influential in discoveries that include force measurements of DNA and proteins that interact with actin. These discoveries typically consist of a single optical trap with one end of the protein connected to a microsphere in the trap and the other end connected to the slide or a micropipette tip. This can limit the scope of studies possible. Instead, trapping two microspheres allows us to manipulate both ends simultaneously with a dual optical tweezers setup. This apparatus utilizes two beam splitters, one to split the trapping laser beam into two independent beams, and the other to steer the two beams along the same path so that the two beams do not become one beam again but remain two propagating in the same direction with independent manipulation capabilities. This system is more complex than a single optical tweezers system because both beams require their own alignment in the same path and significantly more data analysis as the two forces on the two beads are correlated. I present the approach we take to align our dual optical traps, how we analyze the data obtained from the dual traps, and how our dual traps expand what we are able to study.

Natalie Sanford, Physics and Astronomy, Undergraduate

Faculty Mentor: Chris Thaxton, Arts & Sciences

Coauthor(s): Chris Thaxton

IDENTIFYING SURFACE ROUGHNESS FOR REGIONAL ATMOSPHERIC MODELING IN THE SOUTHERN APPALACHIAN MOUNTAINS

This study addresses inaccuracies in the Weather Research and Forecasting (WRF) model [1] for the Southern Appalachian Mountains (SAM). The terrain and climate of the SAM produces unique turbulent conditions within the planetary boundary layer (PBL) across all seasons. PBL parameterization schemes in WRF should include the effects of local terrain features that can be represented via "surface roughness." Surface roughness engages at a sufficiently high Reynolds number. In order to approximate roughness, the ArcMap Geographic Information System (GIS) was used to generate Digital Elevation Models (DEM) and several scaled slope files. The filtered results were analyzed based on patterns in the topography toward a distributed roughness parameter. Current investigation involves auto-correlation analysis of the slope files to estimate horizontal distance between peaks and ridges. This research allows for augmented weather and climate modeling at regional and local scales for the SAM.

Taylor Warnock, Physics and Astronomy, Undergraduate

Faculty Mentor: Brooke Hester, Arts & Sciences

Coauthor(s): Kyle Gorczynski, Taylor Warnock, Dr. Brooke C. Hester

THE DESIGN OF AN OPTICAL TWEEZERS APPARATUS USING SUSTAINABLE METHODS AND MATERIALS

An optical tweezers apparatus utilizes a highly focused laser beam to trap micro to nano-sized objects. This instrument can provide a versatile method to evaluate force and relative motion of trapped objects. The objective is to engineer an optical tweezers system using sustainable methods. The first step in building an optical tweezers apparatus is to establish a path for the beam to be aligned and expanded by a telescope before entering a microscope. The objective lens of the microscope causes the laser to have a tight focus in order to trap objects. After the path is established and properly aligned, the laser is tested on microbeads to ensure trapping capabilities. The next step is to add a position detection laser to the system. This laser is combined into the path of the trapping laser with a dichroic mirror before the objective lens. After the microscope, the trapping laser is filtered out and the position sensing laser is steered to position sensing detector. To validate the functionality of the system, single microbeads are trapped, and position data is collected analyzed for expected signals. We present here the methods used to build an optical tweezers apparatus along with our progress on the implementation of the instrument.

PSYCHOLOGY

Jessica Chambers, Psychology, Graduate

Faculty Mentor: Twila Wingrove, Arts & Sciences

Coauthor(s): Twila Wingrove, Caroline Webb

ATTITUDES TOWARD A CRIMINAL CASE: HOW DOES FRAMING RAPE AS AN ACT OF INTERGROUP VIOLENCE RELATE TO CONVICTIONS?

The current study is a replication of Droogendyk and Wright (2014), which investigates the verdicts of sexual assault, specifically rape, framed as a hate crime. Research suggests framing rape as an intergroup crime (i.e., hate crime) rather than an interpersonal crime may lead to more guilty convictions. Using an online survey, a sample of undergraduates were randomly assigned to read a scenario in which they received either an interpersonal definition or an intergroup definition of rape. In addition to manipulating the definition, we also manipulated whether the complainant knew the defendant. Participants then responded to questions regarding verdict, guilt, victim blame, and defendant blame. Gender differences were also examined in relation to verdict outcomes. Data will be analyzed using a 2 (affiliation: stranger vs. acquaintance) x 2 (definition of rape: intergroup vs. interpersonal) x 2 (gender: male vs. female) design to detect differences between conditions. This study has real-world ramifications such that this knowledge will provide the legal system with a better understanding of how framing rape cases might impact jurors' views.

Ashley Clontz, Psychology, Undergraduate

Faculty Mentor: Twila Wingrove, Arts & Sciences

JUROR PERCEPTIONS OF CRIMINAL CASES

Numerous studies have previously been published on the attitudes and perceptions of jurors in court. Many of these studies have centered on the credibility that jurors assign to juvenile witnesses, however, few studies have focused on how jurors perceive a juvenile defendant when that defendant suffered from a mental illness. This study aimed to measure the potential bias that jurors may have when the defendant is a mentally ill juvenile. We expected age and the presence of mental illness to be mediating factors in the perceived responsibility of the defendant. We distributed 9 different vignettes, with each participant only receiving one. Participants were given a vignette of either a 16, 20, or 30 year old male defendant who had either schizophrenia, substance use disorder, or no diagnosed mental illness. This defendant had stabbed his sister while home alone with her. We asked participants to recommend a sentence for the defendant, to choose whether or not he should receive mental health treatment, and to rate how responsible they perceived the defendant from a scale of one to seven, seven being completely responsible. We expect to see that both age and presence of mental illness will have a significant effect on participant's decisions. It is important to understand the implicit and explicit biases that exist around both juvenile offenders and offenders who have a mental illness. These findings could impact the future of jury instruction.

Arina Cotuna, Psychology, Graduate

Faculty Mentor: Kurt Michael, Arts & Sciences

Coauthor(s): Kurt D. Michael, Rebecca Schenk, John Paul Jameson

EVALUATING THE EFFECTIVENESS OF COGNITIVE BEHAVIORAL THERAPY IN RURAL APPALACHIAN SCHOOLS

School mental health (SMH) programs are especially relevant in rural areas, where access is limited (Capps, Michael, & Jameson, 2019). The Assessment, Support, and Counseling (ASC) Center, a SMH program, has provided cognitive-behavioral therapy (CBT) to youth in rural western North Carolina public schools (Capps et al., 2019; Michael, Albright, Jameson, Sale, Massey, Kirk, & Egan, 2013). The purpose of the present study was to examine the psychotherapy outcomes for a sample of adolescents served in the ASC Centers during the 2017-18 academic year.

Participants (N = 70; 40% male) were students enrolled at the ASC Centers between the ages of 14 and 19 (M = 16.31, SD = 1.15) referred for individual psychotherapy treatment during the 2017-2018 school year. Students participated in an average of 12.56 sessions (SD = 6.29) of CBT with an average duration of 34.22 minutes (SD = 5.33). Using Jacobson and Truax's (1991) guidelines for the Reliable Change Index (RCI), 60% (n = 42) were deemed "recovered" at the end of treatment, 20% (n = 14) were considered "improved," 10% (n = 7) were "unchanged," and 10% (n = 7) "deteriorated."

The results of the current study revealed significant improvements in mental health symptoms for approximately 80% of youth who underwent CBT-based treatment as part of the ASC Center. These data mirrored the results of previous studies (e.g., Kirk, Michael, Bergman, Schorr, & Jameson, 2018; Michael et al., 2016) that suggest CBT is an effective intervention paradigm for youth in schools.

Abbey Feather, Psychology, Undergraduate

Faculty Mentor: Lisa Curtin, Arts & Sciences

Coauthor(s): Lisa Curtin, Brittany Kirshner

THE THERAPEUTIC ALLIANCE IN THE CONTEXT OF A BRIEF MOTIVATIONAL INTERVENTION FOR COLLEGE STUDENT ALCOHOL USE

The therapeutic alliance (TA) is considered an important part of most efficacious psychotherapy. Recent research has shown that a stronger alliance is linked with treatment engagement, better retention, early improvements in substance use and distress, and increased self-efficacy. The present study examined TA in the context of a brief computer-aided motivational intervention for college student alcohol use. Undergraduates who were interested in learning about their alcohol consumption signed up for the Brief Alcohol Screening for Intervention for College Students (BASICS; Marlatt, Dimeff, Kivlahan, & Baer, 1999). Participants met with a clinical psychology graduate student for an online assessment of their alcohol consumption, and reviewed their personalized feedback using a motivational enhancement style one week later. Participants completed the Working Alliance Inventory (WAI; Horvath, et al., 1989) after the first meeting and after the second meeting, as well as an assessment of alcohol consumption at a two-week follow-up. Consistent with the hypothesis, WAI scores significantly increased from the first meeting to the second meeting. However, WAI scores did not predict self-reported alcohol consumption at follow up. It is promising that TA is not necessarily predictive of future drinking given the greater number of college students who could be reached with strictly computer-based vs. person-facilitated brief alcohol interventions.

Lauren Francis, Psychology, Graduate

Faculty Mentor: Denise Martz, Arts & Sciences

Coauthor(s): Lauren Francis, Denise Martz, Rose Mary Webb, Amy Galloway

HER OWN WORST ENEMY: THE RELATIONSHIP BETWEEN FAT TALK, WEIGHT TEASING, AND DISORDERED EATING BEHAVIOR

Weight teasing is defined as negative remarks about one's weight, while fat talk refers to discussion patterns that degrade the body weight or shape of oneself. Through previous research, weight teasing and fat talk have both been associated with disordered eating behavior. This study assessed the moderating effects of fat talk in the relationship between weight teasing and disordered eating in female college students. We hypothesized the interaction between previous experiences of weight-related teasing and subsequent engagement in fat talk in the context of conversations would significantly increase the likelihood for disordered eating behaviors compared to if only weight teasing, or only fat talk was reported. A simple moderation analysis was conducted using model one of the PROCESS macro (Hayes, 2013). Female college student participants (N = 174) were recruited from our psychology subject pool. Results indicated that only fat talk accounted for a significant amount of variance in disordered eating behavior when considering each variable individually, $t(169) = 2.78$, $b = 5.49$, $p = .006$. Further, fat talk was not found to be a moderating variable in the relationship between weight teasing and disordered eating behavior. These results are positive from a treatment perspective as fat talk is a behavioral variable that can be changed through prevention or treatment interventions. Future research will want to determine if intervening on fat talk also prevents eating disorders.

Soundarya Kanthimathinathan, Psychology, Graduate

Faculty Mentor: Shawn Bergman, Arts & Sciences

Coauthor(s): Troi Robinson-Moss, Haley Driest, Ashley Tollefsrud, Chris Tosto, Hope Ugboro

NEEDS ASSESSMENT TO IDENTIFY SKILLS GAPS WITHIN THE NORTHWEST PROSPERITY ZONE OF NORTH CAROLINA

In North Carolina, the issue of employers being unable to find labor with desired knowledge and skills has been extensively researched. Research conducted by the Labor and Economic Analysis Division (LEAD) of the North Carolina Department of Commerce suggested that there was not a growing skills "mismatch" between the labor force and the labor market. Rather, the labor market is becoming less efficient at matching job seekers to job openings. There has been no recent research done on the gap between employee skills and organizational needs in the Northwest Prosperity Zone (NWPZ) of North Carolina – the area including Boone and several surrounding cities. The purpose of this research project is to collect current, localized information for use in developing programs that would serve to meet future workforce needs and create more sustainable workforces in the NWPZ. The data will be collected via survey administered to about 200 companies, each with more than 100 employees, in the NWPZ area. Data collected will include the knowledge, skills, and qualifications that local organizations need and desire within their workforce. The final product of this research will be an informational report on the major skills gaps in the region. The results of this study will allow for local organizations and schools to create development programs addressing the skills gaps made apparent, and it will be the first step in efforts to creating a sustainable workforce in the NWPZ area.

Sidney Murray, Psychology, Graduate

Faculty Mentor: Doris Bazzini, Arts & Sciences

Coauthor(s): Sidney Murray, Alison Cooke, Doris Bazzini, Chris Dickinson, Jessica Udry, Amanda Pepper

THE INFLUENCE OF FEMALE-ATHLETE IMAGES ON SOCIAL PHYSIQUE ANXIETY

Hart et al. coined fearing others' judgments of one's body as Social Physique Anxiety (SPA). Settings highlighting appearance can lead to concern over body presentation, such sports participation. Bodily display and pressure to have the ideal body for a sport may add to to SPA for athletes. Media feeds SPA by promoting body standards. Yet, not all media body portrayals are harmful. Linder and Daniels found that viewing images of female athletes in sport reduced self-objectification compared to sexualized images, and argued that athletic images emphasize competence over beauty.

Given that fitness cues can activate SPA, do female athlete images, whether sexualized or athletic, activate it, or would SPA decrease with performance images? Seventy college women were randomly assigned to view photos of 5 professional athletes performing or in a sexualized pose, and completed the 12-item SPA Scale. Visual fixations were tracked with EyeLink 1000.

An independent samples t-test showed more SPA in the sexual condition ($M = 3.04$, $SD = .67$) than the performance condition ($M = 2.73$, $SD = .60$), $t(68) = 2.03$, $p = .046$, $d = .48$). In the sexual condition, head fixation related to less SPA ($r[34] = -.45$, $p = .006$), whereas torso fixation related to more SPA ($r[34] = .37$, $p = .025$). No relationships emerged in the performance condition. Results fit with past research suggesting that attention to the waist area may involve social comparison. Competence images may neutralize this effect.

PSYCHOLOGY

Taylor Parkins, Psychology, Undergraduate

Faculty Mentor: Yalcin Acikgoz, Arts & Sciences

DEVELOPING A TAXONOMY OF RECRUITMENT AND JOB SEARCH STRATEGIES

Employee recruitment is a critical process in which organizations actively utilize recruitment sources in order to attract the best potential candidates to fill open positions. Previous research into recruitment sources have increased significantly in the past several years but have primarily focused on post-hire outcomes. Research on pre-hire outcomes may lend opportunities for corporate recruiters to be able to predict the quality of potential job candidates before being hired. Drawing on the importance of recruitment sources and pre-hire outcomes, this study investigates the possibility of predicting applicant personality traits from their job search strategies. A total of 226 participants completed an online survey that measured both their personality traits and their job search behaviors. Results found that several job search strategies did indeed correlate with certain personality traits but did not support all hypothesized correlations.

Katherine Quinn, Psychology, Graduate

Faculty Mentor: Amy Galloway, Arts & Sciences

Coauthor(s): Elsa Addessi, Ph.D., Amy T. Galloway, Ph.D., Hadley Brochu, M.A., Arianna Pierantozzi, M.A., Twila Wingrove, Ph.D., J.D., Francesca Bellagamba, Ph.D., Claire Farrow, Ph.D., and *Katherine Quinn, B.A. (*presenting author)

UNDERSTANDING INFANT FEEDING PRACTICES AND IMPLICATIONS FOR DEVELOPMENTAL OUTCOMES IN TWO COUNTRIES

There are diverse ways in which caregivers may introduce complementary foods to their infant. The purpose of this study is to characterize infant feeding practices using an Italian and US sample and to examine whether they predict developmental outcomes. Findings indicate that infant feeding method predicts an important motor milestone.

Rosalyn Rease, Psychology, Graduate

Faculty Mentor: Shawn Bergman, Arts & Sciences

Coauthor(s): Elise Haylett, Stella Arnesen, Yasmin Ayala-Johnson, Scott Kirby, Rosalyn Rease, Jessie Harris, Shawn Bergman, and Andrea Reubens

THE CHANGING COLLEGE DREAM? DIFFERENCES AMONG STUDENTS' COLLEGE ASPIRATIONS

In American society, level of education is often linked to many positive outcomes. According to previous research, people that pursue higher education may be presented with greater occupational opportunities resulting in a higher quality of life. Students' educational aspirations can be influenced by several factors such as demographics, socioeconomic status (SES) and parental attitudes. GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs) is a federally funded college access program that aims to increase the number of students who are prepared to enter and succeed in postsecondary school immediately after high school. Over the years, GEAR UP has administered multiple surveys to ask high school students questions about demographics, parental involvement in education, the students' belief in their ability to attain college education, as well as their belief in it's importance. The GEAR UP Evaluation team will analyze the survey data collected from 11 school districts in rural North Carolina, in order to observe how demographics, attitudes, expectations, and other factors may affect college aspirations in students. By assessing which factors are most predictive of college aspirations, the GEAR UP Evaluation Team hopes to gain insight as to how early interventions can make the biggest impact and remain beneficial for marginalized and previously underrepresented students.

Samantha Reis, Psychology, Undergraduate

Faculty Mentor: Twila Wingrove, Arts & Sciences

PERCEPTIONS OF JUVENILE OFFENDERS WHO WERE MALTREATED AS CHILDREN

My undergraduate thesis examined the influence of childhood maltreatment on public perceptions of juvenile offenders. Researchers have published a substantial amount of research on the history of child abuse and its influence on juror perceptions and sentencing severity. Overall, it seems that when a study has participants act as mock jurors and experimentally manipulates child abuse, the results are less punitive sentences for offenders with a history of abuse. The purpose of my study was to see if the type of abuse (physical, sexual, or none), as well as type of crime (assault on a classmate or breaking and entering with vandalism), the race of offender (black or white), and the sex of offender (male or female) will influence the punitiveness of sentencing, and perceptions of the offender's intent, responsibility, and blameworthiness for the crime. We are expecting to recruit over 600 participants who will act as jurors, read a short case vignette online, and answer questions about it. We are expecting to see offenders who are abused to be sentenced more leniently, offenders who commit assault to be sentenced more harshly, black offenders to be sentenced more harshly, and to not see any differences in the sentencing between male and female offenders. I plan to present my findings through a poster presentation at this event.

Mitchell Roberts, Psychology, Undergraduate

Faculty Mentor: Andrew Smith, Arts & Sciences

MOTOR ACTIONS AND THEIR INFLUENCE, OR LACK THEREOF, ON CREATIVITY

Creativity is thought to be influenced by many things. Affective states (e.g., being in a happy or sad mood) can increase creativity, but non-affective states have also been shown to prime creative solutions to problem. For example, one study found that certain arm motions can either bolster or inhibit creative responses. More specifically, they found that arm extension—hand placed face down on a desk and pressing downward—primed concepts of avoidance which decreased creativity whereas arm flexion—hand placed face up underneath the desk and pressing upward—primed concepts of approach which increased creativity. We replicated this study using the same arm-movement manipulation and measure of creativity, but using a sample size approximately four times larger than the original study. In contrast to the previous study, we found that the arm movement had no effect on participants' performance on the creativity task. Follow-up analyses found that measures of mood were related to how well people performed on the task; higher performers were more content, enjoyed the task more, and were less disappointed. This study highlights the need for more research in this area as well as for more systematic replication of previous research findings.

Allison Sams, Psychology, Graduate

Faculty Mentor: Mary Ballard, Arts & Sciences

IS NEWS EXPOSURE RELATED TO ATTITUDES TOWARDS TRANSGENDER INDIVIDUALS?

Previous studies have examined the factors that contribute to attitudes towards lesbian, gay, bisexual, and transgender (LGBT) individuals. However, research specifically on attitudes towards transgender individuals is scarce. Due to the negative mental health outcomes, including high rates of death by suicide among transgender individuals, further research on attitudes towards transgender people is necessary. This study investigated how perceived exposure to affirming and non-affirming news about transgender people relates to attitudes towards this at-risk group. There is no research on how news exposure relates to attitudes towards transgender individuals, but other research indicates that the news influences attitudes towards other marginalized groups. An online survey was conducted using a sample of undergraduate students (N = 250). It was hypothesized that (a) perceived news exposure would be correlated with attitudes towards transgender individuals, with personal contact moderating this relationship and (b) that the news sources used would mediate the relationship between political beliefs and attitudes. The hypotheses were not supported for the sample as a whole. However, perceived news exposure was significantly positively correlated with attitudes towards transgender individuals for males.

Marissa Sariol-Clough, Psychology, Graduate

Faculty Mentor: Twila Wingrove, Arts & Sciences

SPARE THE ROD: PRESCHOOLERS' AND THEIR MOTHERS' PERSPECTIVES OF CORPORAL PUNISHMENT

The use of corporal punishment is a contentious issue in America. Research suggests that corporal punishment results in an increased risk for behavioral and emotional problems in both the short- and long-term for those children who are subjected to it. Adults from the Conservative Protestant religious affiliation view corporal punishment as an acceptable and necessary part of successful parenting largely because of their interpretation of the Bible. This study compares preschoolers' and their mothers' views about the fairness and effectiveness of corporal punishment from within and outside of the Conservative Protestant community. Children ages 4-5 years-old and their primary caregiver heard nine vignettes about preschool characters who commit common physical (e.g., hitting), social conventional (e.g., using your hands to eat) or prudential (e.g., lighting matches) transgressions and answered several questions about the appropriateness of using spanking – the most common form of corporal punishment – as a consequence for each misbehavior. Caregivers also answered a questionnaire about their religious beliefs and parenting practices. I expect the results to indicate an overall negative view of corporal punishment, with Conservative Protestant families having a more favorable view than non-Conservative Protestants. The current study is a first step in exploring mother-child beliefs about corporal punishment within and outside of a religious community that supports it.

Caroline Shriver, Psychology, Undergraduate

Faculty Mentor: Twila Wingrove, Arts & Sciences

AN EXAMINATION OF DRUNKOREXIA: CALORIE REGULATION PRIOR TO ALCOHOL CONSUMPTION AMONG COLLEGE STUDENTS

Due to the rise of underage drinking and disordered eating on college campuses, researchers have labeled the combination of these behaviors as "drunkorexia." It describes excessive weight control methods prior to alcohol consumption. Various studies have explored the popularity of drunkorexia among college students, but few have investigated the relation of this behavior to organizations such as athletics or the Greek community. The purpose of this study was to determine whether a potential relationship exists between Greek affiliation, athletic affiliation, sex, class rank, alcohol consumption, eating patterns, and drunkorexia behaviors. All participants (n = 224) completed an online survey that included demographic questions and questions from the EAT, CLASS, and DMBS. Results indicated that higher levels of alcohol consumption were associated with Greek affiliation and higher levels of drunkorexia were associated with both Greek affiliation and athletic participation. Overall, there were weak gender and class differences for drunkorexia behaviors. The findings suggest that individuals who engage with the Greek or collegiate athletic community are more likely to consume excessive amounts of alcohol and exhibit drunkorexia behaviors. The results of the current study were consistent with previous literature. Implications for this study are to tailor intervention programs on eating and drinking behaviors for at-risk groups to reduce the prevalence of this harmful behavior.

Michael Spencer, Psychology, Graduate

Faculty Mentor: Mary Ballard, Arts & Sciences

Coauthor(s): Mary E. Ballard, Michael Spencer, Megan Kornhauser, Evan Sakrison, T'arah Kindle

HORROR VIDEOGAME SOUND EFFECTS AND SHOOTER BIAS

Videogames have become increasingly popular for entertainment and educational purposes (Lofgren, 2017). This has spurred substantial, sometimes controversial, research about the potential negative and positive effects of gameplay, particularly violent gameplay. Visual and auditory stimuli are crucial elements of horror video games; graphics and sound effects in horror games aim to elicit fear in the player. Most of the extant research has compared violent with non-violent gameplay; many other aspects of gameplay, such as competition, music, graphics, and sound effects, are not well studied. This used a violent horror survival game to examine the impact of sound effects on cardiovascular, affective, and cognitive/behavioral (i.e., shooter bias – towards people of color – in a shooter game) reactions. Hypothesis 1, that shooter bias would be higher among participants exposed to the sound effects, was not supported. Hypothesis 2, that physiological and affective responding (i.e., heart rate, blood pressure, and state hostility) would be higher among participants exposed to the sound effects, was partially supported. Both systolic and diastolic blood pressure were significantly higher after gameplay among participants exposed to the sound effects, but this was not true of heart rate or state hostility. Exploratory analyses showed that participants exposed to the sound effects rated the horror game as significantly scarier.

SOCIAL WORK

Nichole Annas, Social Work, Undergraduate

Faculty Mentor: Emily Dakin, Health Sciences

DEMENTIA CARE AND SOCIAL WORK IN RURAL APPALACHIA

This literature review examines research pertaining to dementia care in rural Appalachia. Dementia involves a complex array of symptoms and can impact people regardless of culture. Dementia in rural Appalachia presents challenges that social workers should be aware of. The caregivers of those suffering from dementia are faced with repercussions surrounding the disorder such as caregiver burden, and depression. The themes that emerged from the literature were the significance of culturally sensitive dementia assessments, scarcity of resources like access to healthcare or transportation, social isolation, and caregivers in rural Appalachia. The reviewed research showed that culture can have an impact on the assessment of dementia. Resource scarcity and unmet patient needs are pressing issues in rural dementia care. Appalachian rural older adults with dementia are at risk for greater cognitive decline if they are socially isolated. Caregiver education is beneficial for future planning of older adult care and reducing stress-related issues. This literature review concludes with recommendations for future policy, research and practice regarding dementia care in rural Appalachia.

SUSTAINABLE TECHNOLOGY AND THE BUILT ENVIRONMENT

Mason Atkinson, Sustainable Technology and the Built Environment, Graduate

Faculty Mentor: Andrew Windham, Fine and Applied Arts

Coauthor(s): Fangxiao Liu, Christopher Schoonover

PERCEPTION OF SCALE IN BIM-BASED VIRTUAL REALITY

Virtual reality allows users to observe virtual environments in greater detail than ever before. It is for this reason that the use of virtual reality has the unique potential to be a valuable design review tool. In order to better understand this potential, it is important to first look into how individuals immersed in the virtual environments perceive their surroundings. This study explores how the scale of a virtual reality (VR) environment might impact subjects' perception of a design. The experiment had subjects assess the design of a retrofitted mechanical room containing a heat recovery unit. The subjects viewed either a physical mock-up or one of three differently scaled VR environments all representing the same mechanical room scenario. The scene each subject viewed was randomly selected in order to keep results unbiased. Results from each of the VR environments will then be compared to the physical mock-up perceptions using an analysis of variance test. This will be done to assess how the scale of the VR environments impacts users understanding of that virtual environment. The subject population selected for this study was composed of individuals from architecture, engineering, and construction industry as well as graduate students from the Building Science Masters Program at Appalachian State University. The results of this study will lay the foundation for further studies into the use of virtual reality for design review.

Rowan Parris, Sustainable Technology and the Built Environment, Graduate

Faculty Mentor: Jamie Russell, Fine and Applied Arts

FEASIBILITY ANALYSIS USING LOAD PROFILE MODELING SCENARIOS OF ACHIEVING PEAK SHAVING USING RENEWABLE ENERGY FOR A SMALL UTILITY

Many people and communities in the United States recognize the need for a drastic reduction in fossil fuel use, and although multiple communities have pledged to work toward 100% renewable electricity, few have been able to achieve a complete transition. Peak demand energy costs are vastly greater than non-peak energy costs, which create unique opportunities for utility-owned, localized renewable energy development. A small, mountain utility's energy supply contract terms have considerable impact on peak demand-related expenses, with annual savings exceeding 40% expected in an upcoming contract transition. Furthermore, utility-scale electrical peak shaving through grid-tied PV systems represent a valuable source of financial savings without necessitating costly energy storage mechanisms. By laying out a proposal for renewable energy integration in the electrical sector of Boone, NC, the feasibility of meeting climate goals in a timely and cost-effective manner is demonstrated. This paper can also serve as a resource to help guide Boone community leaders, as well as other communities, in achieving their own renewable energy goals. Additionally, should the resulting proposal be implemented, much-needed economic savings and security will be generated for local residents and business owners who may otherwise be susceptible to utility price increases in a county where nearly one in four people live below the poverty line.

THEATRE AND DANCE

Sarah Quinn, Theatre and Dance, Undergraduate

Faculty Mentor: Susan Lutz, Fine and Applied Arts

UTOPIA: THE CHOREOGRAPHIC DISPLAY OF AN EXPLORATION OF MODERN AND NEOCLASSICAL DANCE WHICH EXPLORES THE IDEA OF CONTENTMENT

Utopia is a choreographic work of visual art that explores the meaning of contentment through the range of modern and neoclassical dance. The dance investigates, how a choreographer through the abstract language of modern and neoclassical dance, generates the meaning of contentment which can be recognized but at the same time allow for interpretation. In order to create a work reflecting contentment, a range of choreographic processes were employed to construct the movement vocabulary which was framed and interpreted by the performers. The approach to the choreographic process is how to translate an evolving physical language which requires a sophisticated compositional process. The purpose of this investigation is to gain a more informed understanding, through a physical exploration, on ways to communicate the conceptual idea of contentment, through a series of movements. This is a studio-based interactive approach between the choreographer and performers who are willing to explore the physical and emotional parameters of contentment. The findings and understandings that emerged from the process were a result of investigating and implementing the processes that best conveyed the choreographer's intentions and shaped the viewers' experience. The conclusion of this research has resulted in a dance that has been and will again be presented to dance audiences both locally and regionally.

ABSTRACTS