

## 2019 RECAPP - List of Abstracts

**Maryam Ahmed, Associate Professor, Biology**

### **Oncolytic Vesicular Stomatitis Virus for Cancer Immunotherapy**

Viruses are increasingly being developed as anti-cancer agents. This is due to their natural ability to target and kill cancer cells while also stimulating anti-cancer immune responses. We are investigating the mechanisms by which vesicular stomatitis virus (VSV) interacts with cancer and immune cells as a means of understanding the complex interactions between oncolytic viruses and the tumor microenvironment. Our studies of breast, cervical, and prostate cancer have shown that a mutant strain of VSV, rM51R-M, induces cancer cytopathology, both directly and through stimulation of cancer-fighting dendritic cells and macrophages of the innate and adaptive immune systems. The immune-stimulatory role of rM51R-M virus results from its ability to trigger the type I interferon (IFN) antiviral pathway in infected cells. Therefore, rM51R-M virus may not only revert the well-known process of tumor immunosuppression, but may also enhance the efficacy of other forms of immunotherapy. Current studies in our lab are focused on the mechanisms by which both wild-type and immunostimulatory strains of VSV alter tumor-associated macrophage (TAM) profiles in the context of a simulated tumor microenvironment. TAM densities predict poor clinical outcomes and thus represent promising therapeutic targets. Results indicate that VSV strains may halt the progression of disease by directly destroying and/or disarming the tumor-promoting properties of TAMs. Therefore, the basic and applied concepts arising from these studies have the potential to lead to the development of new therapeutics options for aggressive forms of cancer.

**Pia A. Albinsson & Lubna Nafees, Professor, Marketing & Supply Chain Management**  
**Factors Influencing Collaborative Consumption Usage in the US Market: An Exploratory Study**

Given the popularity of the sharing economy, businesses are increasingly seeking to develop collaborative consumption-based (CC) models. To capitalize on opportunities, they must understand what drives and deters consumers' CC participation. Using consumer panel survey data (N=410) we examine how users and non-users' attitudes towards CC, perceived sustainability, trust, materialism, risk propensity, and generosity affect CC usage. Stepwise discriminant analysis indicates that attitudes towards CC and sustainability, trust, and generosity predict CC usage. Theoretical and practical implications are briefly discussed.

**Andrew Bellemer, Assistant Professor, Biology**

### **Sensory neuron sensitivity in *Drosophila melanogaster* is regulated by translation initiation factors**

Millions of Americans suffer from chronic pain each year, and pain symptoms are the leading cause of hospitalization and long-term disability. A significant hurdle for our understanding of pain syndromes is an incomplete appreciation of the cellular, molecular, and genetic factors that contribute to their pathogenesis. To understand the pathogenesis of chronic pain, we must identify the mechanisms that control the sensitivity of somatosensory neurons under basal conditions as well as the plasticity mechanisms that allow somatosensory neurons to become sensitized following injury or environmental insult. The induction and maintenance of long-term

plastic changes in neurons requires precise regulation of gene expression. One mechanism for accomplishing this is tight regulation of protein synthesis. My lab investigates these processes using the fruit fly, *Drosophila melanogaster*, as a model organism. Our work focuses on the overarching hypothesis that precise regulation of translation initiation controls sensory neuron sensitivity. We have recently found that translation initiation factor proteins are required to regulate the sensitivity of larval sensory neurons of *Drosophila* to noxious thermal stimuli. Additionally, these factors are also required for changes in sensory neuron sensitivity after the larvae experience tissues damage. These results suggest a model where translation initiation factors regulate the synthesis of proteins required for baseline sensory neuron function and also for changes in sensory neuron function following injury. Our ongoing work investigates the cellular and molecular mechanisms by which these translation initiation factors are activated during development and following injury to maintain appropriate sensory neuron sensitivity.

**Adam Booker, Assistant Professor, Hayes School of Music**  
**Seven Last Words**

Seven Last Words is the newly completed recording project by Dr. Adam Booker. The format of this recording is novel, in that it features the double bass in both the jazz and classical idioms, juxtaposing the classical work, *Seven Last Words From the Cross*, by UK composer, David Heyes, and *Missa Brevis*, a suite of jazz tunes written by Dr. Booker based upon the format of the Ordinary Mass. It is also notable in that there are very few jazz recordings based upon liturgical themes. The project, funded by a URC grant, was recorded over the summer of 2019, utilizing the talents of Dr. Pavel Wlosok, Director of Jazz Studies at Western Carolina University on piano, and Goeff Clapp, formerly of the Ellis Marsalis Trio, on drums. In support of this work, I have been invited to the UK to perform in Scotland, Somerset, London, and Italy, where I will be recording a live CD at the Boccherini Institute. This presentation would be a hybrid performance in that selected movements from *Seven Last Words From the Cross* will be performed live, and selected video of a live performance of the jazz mass, recorded at the end of my teaching and performance tour in Europe on October 14th, 2019 at the Boccherini Institute in Lucca, Italy. This multimedia lecture-recital will also include brief background history on the project and its significance in relation to the modern world of double bass performance, as well as commentary on the creative process.

**Karen Caldwell, Professor, HPC**  
**Integrative Health Coaching: Qualitative Results from a Randomized Controlled Pilot Study**

Few studies have reported on direct observation of what integrative health coaches do in practice and it is unknown how exactly coaches help patients to step into a more active learning model rather than the typical patient role of receiving information, advice or treatment in a passive manner. This qualitative study uses verbatim transcripts of medical patients' first few integrative health coaching sessions to identify the actual process that coaches use to help patients fully embrace this more active learning role. Themes that emerged from the coding process included: (1) describing the health coaching process -- coaches initially described the coaching process to their patients; (2) using key procedures for designing the future action planning -- coaches used an optimal health future-self visualization exercise, the Wheel of

Health, and an exploration of the gap between current and desired states to help patients set goals for themselves; (3) supporting action and building momentum -- coaches guided the creation of action steps and then followed up on progress with frequent reinforcement of self-efficacy; and (4) active listening and inviting the patient to articulate learning -- coaches' active listening process included clarifying questions, turning patient questions back to the patients, highlighting values, identifying potential barriers and resources, and inviting patients to articulate what they were learning. This study is one of very few studies that utilize verbatim transcripts from coaching sessions and offers direct sampling of these healthcare interactions.

**Sarah Carmichael, Professor, Geological and Environmental Sciences**

**Manganese is the New Black - how Mn biominerals in caves track contamination**

Karst aquifers house a significant portion of the drinking water for the eastern United States, and contamination of these aquifers is a wide-spread and prevalent problem. Methods of tracking and monitoring this contamination are complicated by the channelized nature of groundwater conduits. Biologically produced manganese oxide minerals (Mn oxides) are widespread in cave and karst systems, and our work over the past 10 years suggests that these black mineral coatings can act as indicators of water quality. So far, our group's research suggests that the presence of thick bacterial and fungal biofilms of Mn-oxides in caves commonly occur as a result of eutrophication of these otherwise nutrient limited systems. Questions remain about how local geology, individual mineral surfaces, local hydrologic conditions, or specific types of anthropogenic input (such as sewage, trash, and agricultural runoff) may affect Mn biomineralization and contaminant transport in caves and karst. We use cutting-edge molecular methods to identify the microbial groups (including bacteria, archaea, and fungi) that are involved in Mn oxidation, as well as culture-based methods to isolate environmentally relevant strains of Mn-oxidizing microorganisms and to link microbial function with phylogeny and Mn oxide crystal structure and chemistry. We also use a variety of microscopy techniques (primarily scanning electron microscopy [SEM] and transmission electron microscopy [TEM]) and other geochemical analyses (such as X-ray diffraction and Fourier Transform infrared spectroscopy) to investigate these biomineralization processes in a broader geologic context.

**Jason DeHart, Assistant Professor, Reading Education and Special Education**

**Reflecting on "Why I Press Play:" A Phenomenological Study of Teachers Using Film for Literacy in Appalachian Schools**

This study, which serves as my dissertation work, examines the experiences of teachers in rural, Appalachian classrooms who use film as a text. Film, in this study, was both an ensemble to be used for classroom viewing purposes and a creative writing opportunity for composition. The researcher drew on the methodology of hermeneutic phenomenology, drawing on the work of Merleau-Ponty, in constructing this work. In all, five teachers shared their thinking about how to use film most effectively with reading and writing tasks. These teachers shared a wide range of practices within the structure of their classrooms, and noted their own engagement with film. Popular films, short clips, educational videos, and teacher- and student-created projects were all considered, among other visual practices. Data collection involved an interview at the beginning of the research cycle, followed by teacher audio-recorded and/or written logs, collection of

supplemental teaching documents, and a final interview. This dissertation explores four major themes that resulted from the research process, as well as providing an introduction to frame the conversation, a review of the literature to demonstrate what has already been done with film in reading and writing in specific content areas, and notes on implications for current practice, policy, and research drawn from the study.

**David Dickinson, Professor, Economics**

**Sleep restriction and its effect on prosocial behaviors**

This presentation will share results from two recently published studies supported, in part, by RIEEE. Both studies examined the impact of sleep restriction on prosociality. An understanding of how insufficient sleep affects decisions is critical given that data from many countries indicates that large proportions of individuals do not sleep enough. The first study was a collaboration between economics and psychology and examined how chronic sleep restriction affects decisions in a classic set of simple social decision tasks. We experimentally manipulated and objectively measured sleep in young-adult subjects, who each made decisions in both a well-rested and sleep-restricted state. Sleep restriction was estimated to either directly or indirectly (via an impact on sleepiness) reduce altruism, trust, and trustworthiness. We conclude that commonly experienced adverse sleep states, most notably chronic sleep restriction, significantly reduce prosocial behaviors, and can therefore limit benefits from short-term social interactions. The second study related to the first, but here we examined civic engagement behaviors (most notably, the likelihood of voting) as a real-world relevant type of prosocial choice. In a collaboration between economics and political science, three different methodologies were used to examine our research question: survey data (from both the U.S. and Germany), a regression discontinuity design study that leveraged sleep differences surrounding time zone boundaries, and an online experiment randomizing participants to complete a survey in the afternoon or middle of the night. In all instances, the evidence shows that insufficient sleep is associated with a significant reduction in civic engagement."

**Sarah Evans, Assistant Professor, Department of Geological and Environmental Sciences**

**Water tracks influence hydrologic cycling in upland Arctic Alaska hillslopes**

The flow of liquid water in the Arctic is largely constrained to the ground surface and shallow subsurface above perennially frozen ground known as permafrost. As the Arctic climate warms, permafrost will thaw more deeply, altering the paths along which water is transported from mountains to downstream areas that discharge water into the ocean. One of the primary paths that water flows in the Arctic is along water tracks, curvilinear features on hillslopes that preferentially fill with and route water when snow melts and the soil above permafrost thaws in the summer. Although hillslopes with water tracks cover as much as one third of the Arctic landscape, little is known about how water tracks move water below ground. In this study, we create a three-dimensional subsurface model of an Arctic hillslope with a water track that incorporates field measurements from the North Slope of Alaska, USA. Results indicate that water flows preferentially in the subsurface from adjacent hillslopes into water tracks, especially after large rain storms and in the autumn when the adjacent hillslopes start to freeze. These

results suggest that water tracks may play an important, but complex, role in predicting water budget responses to changing Arctic landscapes.

**James Fenwick, Professor, Computer Science**

**Vote Extractor for iClicker-based voting**

Faculty Senate replaced manual vote tallying with an iClicker-based system that works more smoothly. The iClicker system records vote data in an extensible markup language (XML) format that is human readable but not easily understood. Since the secretary must still report member votes for the minutes, this presents a barrier. iClicker provides a utility that converts XML into a comma separated values (CSV) format accepted by Excel. However, even this must be edited by the secretary to eliminate unnecessary and redundant information, extracting out the relevant and salient data. Using my understanding of the XML and CSV formats coupled with expertise in programming, I developed the VoteExtractor application that accepts as input the iClicker XML file and outputs the precise CSV file needed by the Faculty Senate secretary. This eliminates a secretary task that is tedious and error-prone. Faculty Senate has used VoteExtractor successfully for over a year for a dozen meetings and scores of votes. VoteExtractor is deployed as a standalone Java JAR file and executed directly from a command window prompt. A graphical user interface (GUI) application was also developed (in part as a student project) to gather required inputs and invoke the standalone JAR application itself thereby simplifying the use of the VoteExtractor. The GUI uses the JavaFX platform for a robust visual desktop application that works across all computing operating systems. The VoteExtractor has applicability for any voting scenario; for example, committees, clubs, classes, etc. It is publicly available under the MIT License on GitHub.

**Khadija Fouad, Visiting Assistant Professor, Biology**

**Novel Method for Teaching the Difference and Relationship between Theories and Laws to High School Students**

Students do not come to class as blank slates. Students' prior conceptions interact with new material presented in class to produce new knowledge. Understanding the difference and relationship between scientific theories and laws can impact understanding of biological evolution and other science topics. Unfortunately, this is one of the most commonly misunderstood nature of science topics. This study examines use of an explicit, reflective method for teaching the difference and relationship between scientific theories and laws to ninth grade students. Students reflected individually and then as a whole class on theories and laws using a Venn diagram both before and after short articles describing features of theories and laws provided an explicit challenge to their naïve prior conceptions. In small groups they chose a theory or law, researched it, constructed a poster, and did a gallery walk. Examination of students' Venn diagrams and answers to a question from VNOS-C given as both a pre- and post-test showed that prior to the lesson, all but one of the students held more naïve views of both the difference between theories and laws and the nature of scientific theories. After the lesson, more than a third had improved their conceptions to more informed, and nearly a quarter understood there is not a hierarchical relationship between scientific theories and laws.

**Dennis Gilfillan, Postdoctoral Research Scholar, Research Institute for Environment, Energy, and Economics**

**The Appalachian Carbon Research Group**

The Appalachian Carbon Research Group (ACRG) is research cluster that explores impacts of carbon dioxide (CO<sub>2</sub>) emissions. We investigate forest carbon offsets and provide consistent, trusted inventories of emissions through the Carbon Dioxide Information Analysis Center (CDIAC) annual update of global and national emissions. THE ACRG has a sweeping impact, from small forest owners to international organizations. Understanding carbon dynamics is essential to combat climate change, informing decision-making and identifying realistic mitigation efforts. With the international need to avoid consequences of climate change, reducing and offsetting current CO<sub>2</sub> emissions is necessary. One such option in the Southeast is to attract small-scale land owners to participate in forest offset programs. While the potential for climate mitigation on these properties is high, the difficulties are multifaceted; research is needed to understand barriers, suggest solutions, and improve verification. THE ACRG is actively evaluating program viability, but also advances the verification process through incorporating remote sensing with traditional carbon measurements. The CDIAC time series of CO<sub>2</sub> emissions from fossil fuels and cement manufacture is the gold standard CO<sub>2</sub> inventory, providing data back to 1751. The ARCG continues updating this significant dataset. This time series is integral to the global carbon budget, informs international policies, and provides data for the public and researchers. This dataset also stimulates Appalachian State student research, i.e. comparison projects of emissions inventories and characterizing uncertainty. Forest offset research and carbon inventories put the ACRG on the forefront of inventorying CO<sub>2</sub> emissions and strategies to sustainably reduce emissions.

**April Gimlin, Assistant to the Registrar, Registrar**

**Exploring Faculty and Students' Attitudes About Consensual Sexual Relationships and Sexual Harassment on College Campuses**

Over the last several years, there has been an increased awareness regarding consensual sexual relationships (CSRs) between professors and students. Specifically, there has been a growing movement for academic institutions to develop policies addressing, discouraging, and/or prohibiting these relationships due to the potential for sexual harassment cases. Even though the appropriateness of such relationships has been widely debated among the university community, a limited amount of empirical work has examined this issue with the majority focusing on attitudinal studies. The current exploratory study consists of a content analysis of 278 faculty and student responses to the question, "If there is a difference between consensual sexual relationships and sexual harassment, what is it?" Responses indicate that there are several overlapping themes for both faculty and students in how they view these differences, with a large number of responses specifically indicating themes such as "CSR is consensual" while "sexual harassment is one sided." There are also some unique perspectives given by faculty regarding the complexities and acceptability of CSRs, who are generally more specific and nuanced in their answers. Considering the complexities of this issue, it is the recommendation of the current study that much more research fully exploring the attitudes of faculty and students is needed to develop a well-rounded and comprehensive policy.

**Cara Hagan Gelber, Associate Professor, Theatre and Dance**  
**Black Narratives in American Screendance**

A showing of two award-winning short films (6 minutes and 7 minutes respectively) currently traveling the international film festival circuit directed by artist and scholar Cara Hagan. *Cygnus* (2018): Filmed on location on Battle Lake, MN, *Cygnus* invites us to revel in the beauty of the sunrise over calm waters as the moon slips behind the horizon. A celebration of the earth, the body, and their kinship. *Sound and Sole* (2018): Arthur Grimes was born and raised in the Appalachian mountains. He is the only professionally working, African-American clog and buck dancer in Boone, North Carolina. In this short documentary, Arthur recounts his dance journey from eager youth to professional master, gives us a glimpse into his performance experience, and demonstrates his deep love for Appalachian music, dance and history. These are two films which demonstrate a range of practice in screendance, or a genre of filmmaking where the primary communicative vehicle is movement. Different from each other in terms of cinematic approach, theme, and form, these films demonstrate the ways black and brown bodies challenge prevailing assumptions about black art, localities, and stories through encountering these bodies in spaces traditionally reserved for whiteness. Both the natural world and the Blue Grass/Old Time music circuit of Appalachia have been portrayed in mainstream media and through the deliberate erasure of black and brown narratives as devoid of these histories. These films set right these notions and open the doors to wider narrative possibilities in the realm of black and brown arts.

**Abdelbaset Hamza, Assistant Professor, Computer Science**  
**Optical Wireless Communication in IoT**

Optical Wireless Communication (OWC) is a technology in which a light beam from a Laser Diode or an LED is used to transmit data from a transmitter to a receiver. A receiver can be a photodetector or a camera similar to the one built in our smartphones. If a camera is used to capture the light, it is said that Optical Camera Communication (OCC) is being used. With the widespread of LED fixtures and lights around along with the high-quality cameras we carry in our pockets every day, we can establish communication links and realize the vision of the Internet of Things (IoT) in which everything can be connected to the internet. To achieve this goal, a large number of low-cost and low power communication links are needed to connect sensors and devices. In this project, we demonstrate a simple low-cost OCC-based communication system. In this system, a sensor is used to measure temperature and humidity. The measured data are then transmitted using an LED light. The transmitted light is then captured using a simple camera, which reads the data and displays it on a dashboard. Current solutions are either low-cost short distance links ( $\leq 10\text{cm}$ ) or expensive long-range ( $> 3\text{m}$ ) links. Our current link can connect devices that are 1 m apart using low-cost LED and camera. We have also identified several future research directions to improve the quality of the link and to achieve better performance. This work involves two undergraduate students. One journal and two conference papers are in progress.

**Marion Harrison, Associate Professor, RMPE**  
**Postsecondary Inclusion: Effect on Efficacy and Transfer Perceptions**

Currently, there are many thousands of college-aged young adults in the United States with intellectual disabilities (ID). Many of these young adults are without the services that were available prior to leaving high school. One way to support these young adults is by providing a comprehensive postsecondary education (PSE) including: (1) inclusion in university courses, (2) career counseling and vocational skills training including internships (3) development of independent living and self-determination skills and, (4) opportunities to develop social skills and meaningful relationships. The purpose of this study was to examine the effect of participation in a PSE on perceived self-efficacy regarding independent living and academic performance, and perceptions of ability to transition to independent adult life. Additionally, this study examined the influence of parent expectations on student self-efficacy regarding transitioning to adult life. The 12 participants in this study were college students with mild to moderate intellectual disabilities enrolled in a postsecondary education program. The students participated in inclusive university settings. The students ranged in age from 18-25. Eight of the students were male, four were female. Self-efficacy and transition measures were taken at the beginning and end of Fall semesters for each student. Parents filled out a transition measure at program orientation. Analysis indicated a significant difference between pre and post self-efficacy scores. Additionally, a significant positive correlation was found between change in self-efficacy perceptions and change in transition scores. Finally, a significant positive correlation was found between change in self-efficacy perceptions and parent transition scores."

**Andrew Heckert, Professor, Geological & Environmental Sciences**

**A new short-faced archosauriform reptile from the Upper Triassic (Norian, ~220 Ma)  
Placerias quarry, east-central Arizona**

In 2010 the senior author (ABH) and colleagues at the NC Museum of Natural Sciences began a field program recollecting Triassic vertebrate fossils from the well-known Placerias quarry in east-central Arizona. From 2010-2015 geology students in an ASU paleontology field and museum methods course assisted in excavations. In spite of the fact that collections from this quarry have been known for almost a century, and well-documented for more than 20 years, we uncovered fossils of a new fossil reptile. This animal is distantly related to modern crocodiles, and detailed comparisons to other fossils of similar age reveal that this taxon is important because it shows adaptations that are novel among Triassic reptiles, but foreshadow features that would evolve separately later in the Cretaceous. In addition to classic studies of morphology and gross anatomy, we undertook computed tomography (CT-scanning) and photogrammetry of the specimen, providing information on details of the vasculature and nerves as well as creating virtual models that can be shared electronically, allowing any researcher with an adequate internet connection to observe the fossils and evaluate our conclusions. By the time of RECAPP a manuscript describing the fossil reptile will have been submitted to a major international paleontological journal.

**Chelsea Helms, Assistant Professor, Applied Design**

**A New Approach to Adaptable, Affordable, and Energy Efficient Housing Designed for  
Individuals with Autism**

The autistic community is underrepresented in modern residential design, with only a few user-identified housing options existing nationally intended for the specific and varying needs of the

disorder. Working in partnership with local 501c3, LIFE Village Inc., initiatives to design housing for adults with autism and related disorders to gain independence are proposed for Boone, North Carolina. The goal of the LIFEmpowered homes is to provide energy efficient, adaptable, affordable, client-centered prototypes for individuals on the autistic spectrum. As autism is a spectrum disorder, individuals experience the disorder differently, which provides many opportunities for considering design “solutions” to be versatile for individualized needs. Research included relevant literature and architectural precedent studies, client observations, interviews, visual preference surveys, and spending time with intended users. In order to meet determined needs, design goals, outlined in the acronym “SMART”, were defined: Sensory, Modular, Autonomous, Resilient, Transition. The SMART home provides a whole-home adaptable sensory space, a modular design that could be built quickly and affordably, a home that fosters autonomy, a resilient home that could withstand the local climate and user impact, and a space that would allow for a low-stress transition from dependent to independent living. Designed to meet guidelines outlined by the US DoE Solar Decathlon Design Challenge, the 512 sf home provides environmental performance while providing flexibility for users. The LIFEmpowered homes can be adapted to meet differing climate zones, providing the possibility to deliver homes to individuals living with autism nationwide.”””

**Jennifer Howard, Assistant Professor, Health & Exercise Science**

**Self-Perceived Lack of Recovery From Previous Injury is Associated with Lower Patient-Reported Outcome Scores and Increased Risk of Future Injury**

History of previous injury is frequently cited as a risk factor for injury. However, the use of patient-centered outcomes, such as patient-reported outcomes (PROs), and self-reported symptom resolution to identify individuals at risk for injury has not been well studied. Collegiate student-athletes (n=45) participating without restriction were enrolled prior to the start of pre-season. Participants completed a series of standardized PROs and an injury-history questionnaire, indicating if they felt they had fully recovered from previous injuries. New injuries were then tracked over the course of the season. Differences in baseline PROs, based on injury history and injury resolution, were compared ( $p < 0.05$ ). Risk ratios were calculated to examine the relative risk of injury for those reporting an unresolved previous injury compared to those not. There were no differences in PRO scores between those with a history of injury and those without. Of the 38 individuals reporting a history of previous injury, 13 indicated that they had not fully recovered. Those reporting not fully recovering reported greater levels of disablement as measured by each PRO ( $p = 0.008$  to  $p = 0.049$ ). A total of 17 participants sustained an injury, of which 8 (47%) had reported unresolved previous injuries on baseline questionnaires. The relative risk ratio for any injury during the season for those reporting unresolved injuries was 2.19 (95%CI:1.08-4.41;  $p = 0.029$ ). PROs have the potential to quantify patients’ perceived functional deficits that may remain from previous injuries. It is important to incorporate patient-centered outcomes into evaluating injury recovery and screening for injury risk factors.

**Mary Kinkel, Assistant Professor, Biology**

**Studying Gut Motility using Zebrafish**

Progress in understanding gastrointestinal motility disorders is limited by the challenges of modeling complex diseases. A general model of intestinal motility describes a relay of

information from sensory neurons adjacent to the intestinal lumen, to interstitial cells of Cajal (ICC), and then to intestinal smooth muscle, to regulate coordinated patterns of contraction. To address basic questions of how intestinal motility is coordinated we are using the zebrafish model to 1) Generate spatiotemporal expression maps for gut motility candidate genes, and 2) Test the roles of candidate genes using an in vivo gut motility model. Zebrafish have conserved genetics with humans and we have found that the zebrafish intestine matures in a step-wise manner, similar to humans. We have also found that the larval zebrafish gut tube is a simple, straight tube until after the onset of metamorphosis. Larvae are transparent and we have taken advantage of this to develop a novel assay that allows us to observe gut function in live, intact fish. The assay allows us to detect conditions that impact gut motility such that food passage is increased or decreased relative to control fish. Thus, we have a model that will allow us to study complex intestinal diseases while keeping all body systems intact.

**Ellen Lamont, Assistant Professor, Sociology**

**The Mating Game: How Gender Still Shapes How We Date**

The Mating Game looks at how people with diverse gender identities and sexualities date, form romantic relationships, and make decisions about commitment as they negotiate a changing romantic landscape. While social, cultural, and economic changes have created new pathways to relationship formation and have challenged the notion of distinct gendered behaviors in romantic relationships, desire for gendered dating rituals persists. These competing pressures create a tension for young adults. I ask: How do individuals negotiate courtship in an era of gender upheaval as the traditional patterns of gender difference are called into question? In order to understand how gender norms interact with changing social conditions and economic opportunities, I conducted in-depth interviews with 105 college-educated individuals with diverse sexualities and gender identities in the San Francisco Bay Area. While heterosexual men and women express a desire for equality in their relationships, they continue to crave old-fashioned dating rituals. But although these rituals are viewed as romantic, chivalrous, and fun - and of little consequence - they actually lay the foundation for relationship inequality. LGBQ people tend to construct more creative relationships, questioning these ingrained norms, and their flexibility makes space for more equal relationships in the long run. Amid the current debate over the future of the gender revolution, The Mating Game shows how gender upheaval has only partly done its work, but that deliberately rethinking what we mean by romance can offer a model for challenging the persistence of gendered relationship inequality moving forward."

**Cameron Lippard, Professor, Sociology**

**War: Contemporary Perspectives on Armed Conflict Around the World**

Drs. Osinsky and Lippard will present their scholarship on studying war through the sociological perspective in their new co-authored book, War: Contemporary Perspectives on Armed Conflicts around the World. This digital presentation presents a broad variety of interdisciplinary and social scientific perspectives on the causes, processes, cultural representations, and social consequences of the armed conflicts between and within nations and other politically organized communities. It will also provide theoretical views of armed conflict and its impact on people and institutions around the world.

**Jennifer Luetkemeyer, Assistant Professor, LES**

**The Creativity Collaborative: A/R/Tography in Action**

The Creativity Collaborative is an interdisciplinary research cluster established in 2017. This poster will share The Creativity Collaborative's ongoing work where we disarticulate and relocate our teaching and research through a/r/tography. A/r/tography is a type of practice-based research involving the arts and education. Like Gouzouasis et al. (2013), we believe that "arts-based research adds to the diversity and complexity inherent in understandings about education and pedagogy" (p. 1). Our exploration of a/r/tography has been enacted through traditional scholarly inquiry approaches combined with arts-based research methods and pedagogy, specifically visual journaling. In our cluster, we seek to broaden repertoires of praxis to promote creative, inclusive, and equitable learning cultures in higher education that incorporate arts-based practices.

**Greg McCandless, Assistant Professor, Hayes School of Music**

**Songwriting for Television Broadcasts**

This presentation will provide an overview of the unique processes involved in the creation of songs for television broadcasts. Unlike the typical style of songwriting we associate with recording artists, songs for TV—especially those used as background music under dialogue—do not often feature lyrics, and avoid frequencies that clash with SFX and voice. Additionally, songs for TV are frequently ready-made compositions that are 2-3 minutes in length at the submission stage; however, the broadcasts make use of 15s, 30s, and 1m clips from within the submissions, and the songwriter needs to account for potential edits of this nature by "futureproofing" the music as much as possible. I will discuss the technologies and songwriting strategies used in this music, demonstrating my own works that have been featured in broadcasts of NCAA football and March Madness basketball games, as well as PGA Tour golf tournaments and Big3 events on CBS and CBS Sports. In addition to showing clips of CBS broadcasts that have used my music, I will delve into the problems, revisions, and surprises I dealt with in each song's journey from concept to on-air realization.

**Cathy McKinney, Professor, Hayes School of Music**

**Health Outcomes of a Series of Bonny Method of Guided Imagery and Music Sessions: A Systematic Review**

Background: The Bonny Method of Guided Imagery and Music (GIM) is a music-centered approach to exploring consciousness for personal growth and transformation. Applications have been reported in a variety of clinical and nonclinical contexts. Objective: The purpose of this study was to review evidence that a series of Bonny Method of GIM sessions may promote positive psychological and physical health outcomes in adults. Methods: This systematic review examined randomized and nonrandomized controlled trials and repeated measures designs that reported psychological or physiological outcomes following a series of at least six individual Bonny Method of GIM sessions. Researchers assessed each study for risk of bias and computed effect sizes for outcome variables that were measured in more than one study. Results: Of 270 nonduplicate titles retrieved, nine remained after full screening, and the final review includes the eight studies that the researchers found to be of moderate or low risk of bias. These studies included 275 participants ranging from 18–78 years of age representing a

variety of populations. More than one study measured anxiety, depression, mood disturbance, interpersonal problems, quality of life, sense of coherence, and psychiatric symptoms and six studies included physiological measures. Conclusions: A series of Bonny Method of GIM sessions is effective for improving both psychological and physiological health markers in a broad range of populations and is therapeutically indicated for adults seeking treatment for medical, mental health, and nonclinical reasons. Further research is needed to explore the relationship between psychological and physiological healing processes in GIM."

**Zack Murrell, Professor, Biology**

**Celebrating 15 years of SERNEC: Where we've been, where we are, and where we are going**

SERNEC (SouthEast Regional Network of Expertise and Collections) is a consortium of 233 herbaria in the Southeast USA. We were supported from 2006-2012 by the National Science Foundation as a Research Coordination Network. Over this period of time we engaged 165 herbaria scientists in workshops and training sessions to mobilize the community and promulgate best practices in biodiversity informatics science. We focused our efforts on building state level structure by developing a "hub and spoke" model for each state, with smaller collections in each state partnering with the larger or more active collections to increase efficiency of information flow and resource allocation. We were funded in 2014 by the NSF ADBC program as a Thematic Collections Network. This project is entitled "Digitization TCN: Collaborative Research: The Key to the Cabinets: Building and sustaining a research database for a global biodiversity hotspot" (NSF Award #1410069). The goal of the SERNEC - TCN project is the development of an imaged and databased set of over 4.5 million specimens from 106 herbaria in the southeastern U.S. In this project we partnered with GEOLocate, Symbiota, Notes from Nature, the Adler Museum, and the Texas Advanced Computing Center to build a data pipeline to gather data from herbaria in the SE USA, expose these data to portals to empower SERNEC to put our community skillset to work using the latest photographing and information capture tools. We utilized the SERNEC scientists to engage citizen scientists and students to assist in transcribing and georeferencing this large dataset.

**Alan Needle, Associate Professor, Department of Health & Exercise Science**

**Treating a Sprained Ankle by Targeting the Brain**

Ankle sprains are the most common injury in physically active populations, contributing to long-term decreases in physical activity and health-related quality of life. The impact of these seemingly benign injuries is confounded by high rates of recurrence and instability following injury. Our previous research has identified changes in the central nervous system that contribute to degraded movement, potentially placing these individuals at risk for subsequent re-injury. Given this improved understanding, we aimed to determine interventions capable of modifying central nervous system activity, and subsequently improve health outcomes in individuals with chronic ankle instability. Our approach has implemented therapeutic techniques including balance training, immobilization, and non-invasive brain stimulation in subsets of healthy individuals and those with chronic ankle instability, while assessing outcome measures including neural excitability, balance, muscle activation, and patient-reported function. Our findings have demonstrated the efficacy of transcranial direct current stimulation in conjunction

with rehabilitative eccentric exercise in improving neural excitability in individuals with chronic ankle instability, while limited effectiveness have been observed with immobilization or balance training. Further, we observed that increases in neural excitability translated to improvements in balance, muscle activation, and ultimately decreases in perceived disablement. This research is the first to provide evidence that addressing neuromodulatory interventions that target the brain may be an effective strategy in correcting joint instability.

### **IlaSahai Prouty, Associate Professor, Art**

#### **A Social Construction**

A Social Construction combines an interactive exhibition with social events that together prompt an unfolding of the complexities of race, in opposition to the reductive and retrenched conversations in our culture. I engage people in thinking about how we use words to describe, imply and evaluate race, to ask them to reflect on how they see their own skin tone and the skin tones of others, and to present race as a social, as opposed to scientific, construction. This socially engaged art project has five phases: Development/ Community Engagement; Site- and community-specific design; Exhibition/Artist Talk Paper Bag Test. People are invited to interact with and write reactions and comments on several paper bags that have been opened flat, coated with colors that reference skin tones, and labeled with words used to describe race.

In the Artist Talk, I intentionally use my physical presence and personal stories to help people access the complexities of race. Reconstitution Reading Performative Workshops: Small groups read and rework arrangements of comments collected through previous Paper Bag Test exhibitions. A devised sequence, with group members editing and editorializing the script, performing short interpretations, and acting as audience for one another. Public Performance: A group creates a public performance building on the Reconstitution Readings. Documentation – ReReading. Artists books compile individual responses from the Reconstitution Readings. This project is on-going in Boone, NC and Bard College, NY and will begin in Gloucester, MA, and Kinston, NC in 2020."

### **Damiana Pyles, Associate Professor, Curriculum and Instruction**

#### **Collaborating Across Spaces and Places: Publishing a New Book about Digital Literacies**

Soon after starting at Appalachian State, Damiana Pyles participated in a collaborative of early-career scholars working in the rural Southeast called the Southern Places Digital Spaces Collaborative. Stemming from this collaboration, Pyles and faculty from two other institutions, Ryan Rish from the University at Buffalo and Julie Warner at the federal level, co-edited a book as part of a book series in AERA's Media, Culture, and Learning Special Interest Group. This book entitled *Negotiating Place and Space Through Digital Literacies: Research and Practice* brings together scholars from around the world, including those in the U.S., Asia, Europe, and the UK to re-envision digital literacies and place. As lead editor, Pyles worked with the other editors through a rigorous selection process for chapters, deciding a focus and direction for the book, which is discussed in depth in the preface they co-wrote, and providing feedback to chapter authors both in her section and in others, guiding many through several revisions. Not only does this book build bridges of collaboration with scholars in the U.S. through the editing team itself, this book also opened up opportunities for scholars at Appalachian State, with two book chapters from faculty in the Reich College of Education. This book contributes timely

knowledge about cutting edge ways that digital literacies are being fostered both online and in face-to-face settings in new ways globally with children, teens, and adults in multiple places and spaces.

**Matthew Robinson, Professor, Government and Justice Studies**

**Theories of Justice in the Constitution of the Republic of South Africa**

Starting in 1910, the Union of South Africa (under British dominion) instituted segregation by race as the official policy of government. In 1948, the Afrikaner Nationalist Party instituted Apartheid (from the Afrikaans word meaning “apartness” or “separateness”) by law. Facing intense domestic and international pressure, the country’s leaders reluctantly agreed to negotiate with oppositional leaders (including Nelson Mandela, who was imprisoned in Robben Island for convictions related to revolution and sabotage against the oppressive government in 1964). Mandela was released from prison in 1990, and in 1994, he was elected President of the Republic of South Africa in the first free election open to all in the history of the country. Two years later, the Constitution of the Republic of South Africa was adopted and certified. Theories of Justice in the Constitution of the Republic of South Africa introduces four major theories of or approaches to justice and presents an analysis of the Constitution of the Republic of South Africa—virtue based theories, libertarianism, egalitarianism, and utilitarianism. The poster defines the four approaches to justice. Then, the poster illustrates how each theory of justice is included in the Constitution, with specific references to the chapters and sections of the document that pertain to each theory. The primary purposes are to document what justice means to people in South Africa and to identify the implications for and expectations of government that stem from these conceptions of justice. The poster ends with major challenges confronting the current government of South Africa.

**Martin Schoenhals, Instructor, University College**

**Challenging Inequality and Divided Communities with Anthropological Research**

My presentation reports the results of over ten years of research I have carried out as a cultural anthropologist. The topic, unfortunately, is all too timely--inequality, nationalism and toxic hatred. I explore how anthropology, other social science research, and biology can be used to challenge racism, sexism, social class inequality, homophobia, xenophobia and more. This research has just been published by Routledge in my book entitled Work, Love, and Learning in Utopia: Equality Reimagined. My argument is an optimistic one. I show that the story of human evolution from humans' first appearance until about 10,000 years ago demonstrates the human potential to live cooperatively, equitably and without warfare. I will discuss my own research on human emotions to suggest that happiness evolved to reinforce prosocial relationships. Inequality and negative sociality, on the other hand, lead to anxiety and depression, for both those on the bottom AND those on the top. Thus, general human happiness comes from promoting equality. Our legacy as cooperative foragers, and evidence from chimpanzee research, shows this is a feasible goal. Although my research is wide-ranging, I am experienced at describing it in shorter public presentations. In the spring I was interviewed by 18 radio stations around the country about my research, in interviews ranging from 10 minutes to 100 minutes. I am a new faculty member at Appalachian and I would appreciate the opportunity to discuss my research and connect with other scholars here.

**Anastacia Schulhoff, Assistant Professor, Sociology**

**We are like Family: Social and Cultural Capital in Tribal Nursing Homes**

The care demands of older adults is an ever-pressing social and health issue around the country. This is especially true for Native American families, communities, and tribes. The service demands of Native American older adults will increase threefold over the next few decades. The number of American Indians and Alaska Natives (AI/AN) is projected to increase by 280% between 2010 and 2050 (U.S. Census Bureau 2015). AI/AN aged 65 and older, specifically, is projected to rise to 1,137,000, up from 274,000 elders in 2015. Therefore, it is important that our knowledge-building efforts understand how tribally-owned nursing homes operate within the current demographic, social, cultural, political, and economic contexts. This research project explores how CNA's cultural and social capital intersects with the institutional culture of a tribal nursing home. Data was collected through twenty-two semi-structured interviews with CNAs during a year and a half long ethnographic study of a tribal nursing home and the identities and culture within. Data were analyzed using Atlas ti™, with repeated reviews to develop domain analysis, a narrative inventory, and themes. Three themes identified – 1. We are like family with a subtheme of Protecting family from outsiders; 2. We Work Together (Teamwork); 3. Learning caring from culture and family. Findings show that Tribal Nursing Home CNA's identify the importance of social and cultural capital of the residents, coworkers, administrators, and family members. This research begins to fill the gap in the gerontological and sociological literature about Native American elders, their caretakers, and tribal nursing homes.

**Clare Scott Chialvo, Assistant Professor, Biology**

**Characterizing the Impact of a Natural Toxin Mix in *Drosophila* Species**

To defend against herbivory, plants and fungi produce a variety of secondary metabolites. While understanding the biological effects of these defensive compounds on plant-insect interactions remains an active area of research, many studies focus on a single compound. However, the potent bioactivity of some compounds is due to their synergistic/antagonistic interactions with other metabolites in their natural matrix. There is a need to characterize plant-insect interactions using complex mixtures that more closely resemble the chemical matrix found in the host. To address this question, we examined how the survival of mushroom-feeding *Drosophila* in the *immigrans-tripunctata* radiation is impacted by the natural suite of toxins found in a proportion of their hosts. Previous work examining toxin tolerance in these flies focused only on the effect of alpha-amanitin; however, the toxic mushrooms contain over 14 known toxins. To assess the impact of a natural toxin mix, we reared the larvae of three tolerant and six susceptible species from the radiation and the distantly related *D. melanogaster* on diets containing differing concentrations of a toxin mix extracted from the host *Amantia phalloides*. We measured several fitness phenotypes, including survival to adult and thorax length. Our results demonstrated that tolerant species exhibit similar patterns of survival to a diet containing a single toxin. We also found that the susceptible species could develop on low levels of the natural toxin mix that are lethal to most other Eukaryotes, including *D. melanogaster*. Thus, this study provides context for future research examining the evolution of toxin tolerance.

**Andrew Shanely, Associate Professor, Health and Exercise Science**

**Whole-body Heat Shock Accelerates Recovery from Impact-Induced Muscle Damage in Mice**

Heat shock proteins (HSPs) are a class of proteins expressed in plants and animals. In animals, HSP activation by whole-body heat shock (WBHS) protects cardiac muscle during a heart attack, attenuates the loss of skeletal muscle mass when a limb is in a cast, and protects skeletal muscle from injury during unaccustomed use. Contusions are a common sports injury that often results in whole muscle damage and loss of strength that takes several weeks to fully recover. **PURPOSE:** To investigate if activation of HSPs, via WBHS prior to a single contusion improves recovery of strength. **METHODS:** Adult male mice were randomized to either the WBHS-contusion (HS-C) or the normal body temperature-contusion group (NT-C). Under anesthesia, skeletal muscle strength was assessed in all mice. Core temperature was then raised to 41°C (HS-C) or maintained at 37°C (NT-C) for 30 min; all mice were then allowed to recover. Twenty-four hours later, all mice were anesthetized and a contusion was induced; all mice were then allowed to recover. Post-injury strength was measured following the assigned recovery time of normal cage activity (2-hr, 2-d, or 5-d). **RESULTS:** HS-C strength, pre- to 5-d, and pre- to 2-d fully recovered ( $p=0.901$ ,  $p=0.090$ ), and the NT-C strength did not recover ( $p<0.0001$ , both). Two hours post-contusion, neither the HS-C nor NT-C strength recovered ( $p=0.001$  and  $p<0.0001$ , respectively); however, strength in the HS-C group was greater than in the NT-C group ( $p=0.048$ ). **CONCLUSION:** Whole-body heat shock prior to a contusion significantly accelerates the rate of recovery of muscle strength.

**James Sherman, Professor, Physics and Astronomy**

**What do 10 years of atmospheric aerosol measurements from the NOAA and NASA aerosol monitoring sites at APP tell us about the effect of changing SE U.S. air quality on regional solar radiation and climate?**

The effects of atmospheric aerosols (haze, dust, smoke) on solar radiation and clouds represent the largest uncertainties in climate models used to predict future temperatures, according to the most recent Intergovernmental Panel on Climate Change (IPCC) assessment. The southeastern U.S. is home to high summertime haze levels, which may have contributed to lack of regional warming during 20th century. Improvements in U.S. air quality in the past 2-3 decades may reduce the cooling effect of aerosols in SE U.S. but there is a scarcity of long-term aerosol measurements needed to evaluate climate models. Appalachian State University (APP) is home to one of the two most comprehensive aerosol monitoring facilities in the U.S. and the only comparable facility relying completely on students to assist the project investigator. Over 50 students have contributed to the long term (10 year) aerosol datasets from the NOAA and NASA network sites at APP, which will be used by the Aerosols Working Group as part of the upcoming IPCC assessment. Aerosol loading has decreased significantly over the 10 years of measurements at APP, leading to a smaller aerosol cooling effect which is most pronounced during summer months. The decreases in light absorption are likely influenced by reductions in diesel emissions. Reductions in aerosol light scattering are consistent with reductions in SO<sub>2</sub> emissions by coal-burning power plants in eastern U.S. Long-term aerosol datasets from APP will be presented, along with results from the first measurement-based study of aerosol direct radiative effect in SE U.S. (Sherman and McComiskey).

**Alexandra Sterling-Hellenbrand, Professor, Languages, Literatures and Cultures**  
**Medieval Literature on Display: Heritage and Culture in Modern Germany**

Medieval Literature on Display is a monograph (currently in press with Bloomsbury, publication date of January 2020) on the role of medievalism in practice of cultural memory and the creation of heritage. The book focuses on two case studies from the time immediately following the reunification of Germany in 1990. Both case studies involve German museums dedicated to medieval literature: the first is the Museum Wolfram von Eschenbach in Wolframs- Eschenbach (1995); the second is the Nibelung Museum in Worms (2001). Largely unknown to wider audiences outside of their geographic regions, these museums deserve greater attention. They reveal how memory, through the lens of the Middle Ages, shapes modern cultural identity and heritage. Medieval Literature on Display demonstrates how the modern communities of Worms and Wolframs-Eschenbach use medievalism in the modern task of making the past present through their displays of German medieval literature as heritage. The case studies show the museums as creative attempts to make the middle ages relevant, even profitable, for local municipalities. Close scrutiny of the processes involved can be used to better understand the cultural productions of other local and regional communities involved in similar projects to reconstruct their past, medieval or otherwise. This book contributes to contemporary conversations about medievalism's role in constructing and affirming cultural identity; in sum, it is a volume on how we conceptualize and find places for the future of the past. A corollary project on medievalism in Austria will be supported by a Fulbright grant in spring 2020."

**Robert Swarthout, Assistant Professor, Chemistry and Fermentation Science & Geological and Environmental Science**

**Hunting the source of the longest ongoing oil spill in United States history.**

The toppling of Taylor Energy Company's MC20 oil platform in the Gulf of Mexico following the passage of Hurricane Ivan in 2004 prompted the longest and most complex marine spill response in history, which continues to the present day. The response has included numerous surveys, removal of the platform's deck, nine well interventions using technologies developed specifically for this incident, and installation of multiple subsea containment systems including one in Spring 2019. Despite all efforts and the reduction of the surface sheen volume over time, it is unknown whether the oil currently emanating from the seafloor is from actively leaking wells or some other source, knowledge critical for implementing effective mitigation. Here we present results from observed oil sheen volumes and forensic chemistry of reservoirs oils, sediment, and ocean surface sheens. Our results demonstrate increased sheen volumes largely correspond to periods of sediment disturbances associated with intervention work. Critically, forensic chemical analysis shows significant heterogeneity among hydrocarbon samples demonstrating there are multiple distinct contributors. A theoretical mixing model of potential endmember oils required more than four unique oils to explain the observed heterogeneity. These results offer key insights that should be considered as the response continues and agencies leading the effort should utilize the available data to initiate a national-level study to develop response options, based on the available knowledge and the latest advances in science and engineering.

**Rahman Tashakkori, Lowe's Distinguished Professor, Computer Science**  
**Beemon: A Near Real Time Honey Bee Monitoring and Analysis System**

In recent years beekeepers have faced significant losses to their populations of managed honey bees, a phenomenon known as Colony Collapse Disorder (CCD). Many researchers are studying CCD, attempting to determine its cause and how its effects can be mitigated. Some research efforts have focused on the analysis of bee hive audio and video recordings to better understand the behavior of bees and the health of the hive. To provide data for this research, it is important to have a means of capturing audio, video, and other sensor data, using a system that is reliable, inexpensive, and causes minimal disruption to the bees' behavior. This presentation provides details on the design and implementation of the Beemon system which utilizes a Raspberry Pi. This system automatically captures sensor data and sends it to a remote server for analysis. With the ability to operate continuously in an outdoor apiary environment, Beemon allows for constant, near real-time data collection. The Beemon web interface provides several tools for analysis. Some of the results will be presented and we would like to invite the readers to refer to [cs.appstate.edu/beemon](http://cs.appstate.edu/beemon) for more details.

**Travis Weiland, Mathematical Sciences**

**Investigating Issues of Spatial Justice in the Preparation of Elementary Teachers**

The mathematical education of teachers is crucial for students to have meaningful experiences with mathematics in K-12 school settings. Using design research we employ an epistemological framework rooted in a dialectic ontology of social, historical, and spatial dimensions to create a framework to make explicit the intersecting sociocultural, critical, quantitative, and spatial ways of knowing the world, which are inherent in mathematics education and quantitative learning environments more broadly. We have used this framework to create an instructional unit that has been implemented, refined, and re-implemented over the past two years in elementary pre-service mathematics teacher courses at ASU. The instructional unit has students interrogating the education system through statistical investigations while highlighting sociocultural, critical, spatial, and quantitative ways of knowing the world. We have been investigating how the students' knowledge, practice, and identity are influenced by interacting with the ideas presented in the instructional unit through collecting and qualitatively analyzing student work and discussions. Initial results show students have increased their attunement toward sociocultural and critical ways of knowing, but not as much to spatial ways of knowing, which we hypothesize might be a result of the datasets used in the unit. This work has implications for mathematics teacher education which frequently focuses on quantitative ways of knowing to the exclusion of other ways of knowing which is problematic for teaching mathematics as a subject that can be useful for students to make sense of the world around them which requires multiple ways of knowing.

**James Wilkes, Computer Science**

**The Impact of Technology in Commercial Beekeeping**

We survey the current state of software and hardware solutions available to the commercial beekeeping industry based on ten years of experience with the Bee Informed Partnership in the United States and with Hive Tracks. Apiary management software, hive monitoring through a variety of sensors, hive and super identification, Varroa, nosema, and virus sampling data, and

secondary digital data sources offer potential economic value to a commercial beekeeping operation, but factors such as cost, reliability, and ease of use influence the adoption of these technologies. Each of these factors provide a framework for evaluating technology feasibility based on the specific circumstances and needs of a commercial beekeeping operation. Case study examples illustrate the experience of current commercial beekeeping operations adopting these technology solutions and how they handle the challenges and obstacles of integrating technology into the fast paced and often chaotic commercial beekeeping workflow. While digital technologies directly impact commercial beekeeping operations internally, a number of new economic opportunities are being created at the intersection of beekeeping operations and various stakeholders including honey buyers, pollinator dependent growers, government agencies, and survey takers. A beekeeping operation supported by data can leverage that information to command higher honey and pollination contract prices, meet regulatory and compliance requirements, and participate in ongoing research and development projects. In addition, reliable and trusted beekeeping data will foster the development of new insurance products and smart contracting options that foster commercial beekeeping business security and continuity.

**Kevin Zwetsloot, Associate Professor, Health & Exercise Science**

**Phytoecdysteroids Accelerate Recovery of Skeletal Muscle Function Following In Vivo Eccentric Contraction-Induced Injury in Young and Old Mice**

Phytoecdysteroids are natural plant steroids synthesized by a variety of hardy plants. Previous work by our group has shown that administration of phytoecdysteroids, such as 20-hydroxyecdysone (20E), in old mice can lead to an increase in protein synthesis signaling and skeletal muscle fiber size. To investigate whether phytoecdysteroids enhance skeletal muscle recovery from eccentric contraction-induced damage, young ( $6.1 \pm 0.4$  mo) and old ( $26.5 \pm 0.5$  mo) mice were subjected to injurious eccentric contractions (EC), followed by 7 days of 20E supplementation or placebo (PLA). Mice were anesthetized with isoflurane and then in vivo isometric contractions were performed (Aurora Scientific, 1300A) to obtain torque-frequency relationships (TF) of the anterior crural muscle group (PRE), followed by 150 EC. Following recovery from anesthesia, the mice received either 20E ( $50 \text{ mg} \cdot \text{kg}^{-1} \text{ BW}$ ) or PLA (saline) by oral gavage. Mice were gavaged daily for 6 days and on day 7, TF was re-assessed (7-day). Significant decreases in TF in young and old mice were measured immediately after EC (both  $p < 0.001$ ) and PLA groups remained depressed at day 7 (PRE vs 7-day; Young  $p = 0.048$ ; Old  $p < 0.001$ ). However, 20E supplementation completely recovered TF after 7 days in both young and old mice (PRE vs. 7-day; Young  $p = 0.396$  & Old  $p = 0.383$ ). These findings suggest that 20E may exert anabolic or ergogenic effects in skeletal muscle of male mice that accelerate recovery of in vivo isometric skeletal muscle function following EC-induced injury.