Fiscal year 2021

RESEARCH

RESEARCH ABSTRACTS
College of Arts and Sciences

FY2021 Research Abstracts
**ART, GRAPHIC DESIGN AND ART HISTORY**

**Tulipmania: Mosaic Virus Silkscreen Wallpaper Installation**
The *Tulipmania* project involves development of serigraphy facilities to enable creation of a large-scale immersive silkscreen-printed artwork. The artwork’s design will reference 17th century Dutch Golden Age still life paintings of Semper Augustus tulips. This artwork will reshape and recontextualize art-historical depictions of the natural world to investigate cultural, ecological, and anthropological attitudes embedded in both print and digital media.

**Sponsor:** Office of the Vice President for Research  
**PI/PD:** Mary Claire Becker

**Visualizing Household Health: Medieval Women, Art, and Knowledge in the Régime du corps**
This book project focuses on several illustrated manuscripts of the late medieval health guide known as the *Régime du corps*, a text influenced by established academic medicine but intended for lay readers. These richly illuminated books depict a wide range of practices used within elite homes for the management of health and wellbeing. Their abundant scenes of household care boldly visualize the prevalence of female-dominated expertise within the domestic sphere.

**Sponsors:** International Center for Medieval Art, Oklahoma State University College of Arts and Sciences  
**PI/PD:** Jennifer Borland

**Ingenious Materiality: The Intersections of Medicine, Food, and Art in Medieval Life**
This project aims to explore the multifaceted nature of substances—spices, for example, or domestic animals—to argue for the interconnected nature of visual culture, household living, traded goods, and wellness during the later Middle Ages. Sustenance, healthcare, and artistic production were all facets of lived experience that relied upon many of the same materials. It explores how these substances connected disparate realms, linking production of medicine and art with everyday lived experience across social strata.

**Sponsor:** University of Pennsylvania Library, Oklahoma State University Office of Vice President for Research  
**PI/PD:** Jennifer Borland

**Mudhouse Residency in Crete, Greece**
Traveled to Crete, Greece, to create a contemporary interpretation of Carpeaux's masterpiece "Ugolino and His Sons" to respond to the hunger felt by millions globally due to the pandemic. Teckemeyer’s version is composed of five wolves in similar body postures as the original human figures. The sculpture was exhibited in a public exhibition in Agios Ioannis on the island of Crete. Additionally, the residency was an opportunity to network, which led to exhibiting at Spring Break Art Fair in New York City.

**Sponsor:** College of Arts and Sciences Research (ASR) Program  
**PI/PD:** Jessica Teckemeyer

**Centrifugal or Processional: Divine and Mundane Power in Ancient Chinese Urban Grids**
Taking an interdisciplinary approach between Chinese religious studies and urban planning, this project compares two different types of Chinese grid: one emphasizes the center in the grid as the representation of divine power (Buddha, the Heaven, etc.). The other emphasizes the procession and deepening of space in an urban grid, to protect and deify the mundane power (emperors, the noble classes, etc.).

**Sponsor:** College of Arts and Sciences, HAD Grant  
**PI/PD:** Shaoqian Zhang
Representing a Four-Dimensional Universe: Terraces at the Temple of Heaven in Beijing
By focusing on the terrace system of the Temple of Heaven in Beijing, this article explores two essential ways in which these terraces were used during annual religious ceremonies.
Sponsor: College of Arts and Sciences, HAD Grant
PI/PD: Shaoqian Zhang

The Temple of Heaven as Calendar: The Paradox of Time Tracking and Time Telling in Late Imperial China
Focusing on the Temple of Heaven as a calendar, this project explores the inherent paradox within the function and symbolism of this ritual architectural complex from the perspective of the understanding and representation of time.
Sponsor: College of Arts and Sciences, HAD Grant
PI/PD: Shaoqian Zhang

The Human Head in Torture Images: Visualizing Chinese Physical Punishment in Export Paintings, Photography and...
Based on the primary images from the Guangdong Museum’s collection, this project focuses on the Chinese export paintings produced during the Qing Dynasty (1644-1911) on the theme of judicial torture and punishment.
Sponsor: Oklahoma Humanities Council, Individual Research Grant
PI/PD: Shaoqian Zhang

East Asian Art in a Transnational Context, Lecture Series
This project examines Chinese and Japanese art from the perspective of cross-cultural interaction. There are five scholars giving public lectures on diverse topics.
Sponsor: Oklahoma Humanities Council, Opportunity Grant
PI/PD: Shaoqian Zhang

From Streets, to Galleries, to Virtual Space: Defining “Contemporary Museum Space” in Chinese Art Exhibitions
Since China opened its market in 1978, Chinese experimental art sought out non-official and non-conventional venues for exhibition. The transformation of the exhibition landscape at home clearly demonstrates that the long journey of Chinese art’s adjustment to Western markets and domestic politics is far from over.
Sponsor: College of Arts and Sciences
PI/PD: Shaoqian Zhang

CCAN 2021 National Juried Competition
This project involved the exhibition of a mixed media work which explores the idea of creating origin stories and myths. This nationally juried show was curated by Liz Trosper
Sponsor: Center for Contemporary Arts. Abilene TX
PI/PD: Molly Kaderka

Cimarron Works on Paper
This project involved the exhibition of a mixed media work which explores the idea of creating origin stories and myths. This nationally juried show was curated by Liz Trosper
Sponsor: Gardner Gallery. Oklahoma State University. Stillwater OK
PI/PD: Molly Kaderka
2021 Annual Art Show Exhibition
This project involved the online exhibition of a mixed media work which explores the idea of creating origin stories and myths. The work that was exhibited received the Second Place Jurors Prize.
**Sponsor:** Idaherma Museum Foundation. Princeton NJ  
**PI/PD:** Molly Kaderka

12th Annual Drawing Discourse
This project involved a publication and the online exhibition of a mixed media drawing. This nationally juried publication/show was curated by Pamela Phatsimo Sunstrum.
**Sponsor:** University of North Carolina Asheville. Asheville, NC  
**PI/PD:** Molly Kaderka

Artist Fellowship Grant
This fellowship provides financial support to visual artists living in Somerville.
**Sponsor:** Somerville Arts Council. Somerville MA  
**PI/PD:** Molly Kaderka

CHEMISTRY

Approaches to Reduce Nutrient Loadings for Harmful Algal Blooms Management
The objective of the research is to develop a novel technology for sustainably and economically preventing harmful algal blooms in watering ponds. The approach is based on the sorption of plant nutrients from ponds or fertilizer run-off using a sorbent/fertilizer that allows for the absorbed nutrients to be used as a time-release fertilizer. This will provide a sustainable solution for the prevention of hazardous algal blooms while also reducing the environmental and financial costs associated with the decontamination of ponds and the production of fertilizers.
**Sponsor:** Environmental Protection Agency  
**PI/PDs:** Allen Apblett, Nicholas Materer

Surface Coatings Measurements
This work involves the characterization and understanding the basic chemical and physical properties of superhydrophobic coatings. We are interested in how the coatings behavior depends on the kinds of particles used, the amount of silane on the superhydrophobic particles, and the particle loadings. The coatings are studied by a variety of techniques including contact angle, electron microscopy, dynamic mechanical spectroscopy, infra-red and others as needed.
**Sponsor:** Dry Surface Coatings  
**PI:** Frank D. Blum

Marine Composites with Improved Toughness and Thermal Stability
This work involves the characterization and understanding the basic chemical and physical properties of composites made to enhance the properties of additives used in marine applications.
**Sponsors:** Oklahoma Center for the Advancement of Science and Technology (OCAST) and MITO Material Solutions  
**PI/PDs:** Frank D. Blum (OSU lead), Ranji Vaidyanathan, Bhishma Sedai (MITO)
SBIR Phase II: Tough polymer composite materials through "iLAMB," or interlaminar modifications through master batching
This work involves the characterization and understanding the basic chemical and physical properties of composites and scaling the processes up so nanoadditives can be used as additives for interfacial applications.
**Sponsor:** NSF
**PI/PDs:** Ranji Vaidyanathan (OSU Lead), Frank D. Blum, Bhishma Sedai (MITO)

Reinforced Recycled Polymer Composites
Recycled carpets and water bottles will be converted to useful composites for structural and acoustic applications.
**Sponsor:** REMADE Institute funded by Department of Energy
**PI/PDs:** F. Blum (PI), R. Vaidyanathan (Co-PI), R. Singh, J. White, T. Nelson

Selective C-C Bond Formation Mediated by Modularly Assembled Catalysts
Catalysis is a key element to innovation in synthetic organic chemistry. The proposed research’s focus is on bifunctional catalysts. Analogous to natural systems, these catalysts contain two functional groups for organising and orienting two reacting molecules, thus controlling both the direction as well as the manner in which they react. Instead of preparing these complex catalysts by conventional synthesis, we utilize known reversible reactions (e.g. disulfide coupling and exchange) which allow these catalysts to form by self-assembly when the two components are mixed. Overall, this fragment-based approach allows the efficient adaption (“evolution”) of the desired catalysts for targeted transformations and C-C bond formations. Additionally, this method offers exciting opportunities to explore new types of bifunctional catalysts and compounds which could perform novel reactions and thereby enable the synthesis of materials currently inaccessible by conventional methods.
**Sponsor:** American Chemical Society-Petroleum Research Fund
**PI/PD:** Jeanne L. Bolliger

Development of Novel Stationary Phases for Liquid Phase Separation Techniques
The need for solving many separation problems in the life sciences is an urgent and current research topic for further progress. This entails the development of separation media of high resolving power that will apply to a variety of compounds including biological substances and natural products. The constituents vary in molecular size ranging from small ions and molecules to large macromolecules. These are usually complex mixtures of various origin such as body fluid, food matrices and environmental samples. The separation platforms are liquid chromatography, electrochromatography and electrophoresis.
**Sponsors:** Food and Agricultural Products Center-Oklahoma State University
**PI/PD:** Ziad El Rassi
Modeling Matter and Improving Aqueous Transfer Processes with Molecular Distributions
Molecular modeling is a rapidly growing area of science that provides an atomic-level view and unprecedented insight into the driving forces in chemical systems. A key objective of this project is to advance classical molecular modeling by developing an approach for modeling matter using molecular distributions. Molecular Distribution Modeling uses sets of simple functions to describe and formulate ideal liquid mixtures that encode how molecules change in response to their local environments. This project also includes a research synergistic education effort to bring new experiences with molecular systems to children, students, and the general public through interactive physical model development.

Sponsor: National Science Foundation
PI/PD: Christopher Fennell

Solvation Modeling for Next-Gen Biomolecule Simulations
This collaborative project, with Stony Brook University and the University of Ljubljana, is focused on reformulated modeling of protein solvation and of protein-protein interactions. Achieving fast, accurate, and scalable modeling of solvated proteins requires a team that can innovate from four largely non-overlapping research communities: atomistic protein dynamics, protein-protein docking, protein-colloid liquid-state theory, and water statistical mechanics. Combining these approaches is needed for big advances toward fast and accurate computer modeling on biologically relevant time and space scales, with proper statistical mechanics. The OSU component of this effort is focused on developing 'super-fast' water models for solution equilibria and dynamics.

Sponsor: National Institute of General Medical Sciences of the NIH
PI/PDs: Christopher Fennell
Stony Brook University: Kenneth Dill, Evangelos Coutsias, Dmytro Kozakov, Carlos Simmerling
University of Ljubljana: Barbara Hribar-Lee

Application of Raman and Infrared Microscopy for the Forensic Examination of Automotive Clear Coats and Paint Smears
To further enhance the general discrimination power of clear coats, Raman spectroscopy and pattern recognition techniques will be investigated as a potentially better solution to the problem of extracting investigative lead information from clear coats. A procedure to simulate the type of paint smear generated in vehicle-vehicle or vehicle-pedestrian hit-and-run collisions was also developed as part of this research.

Sponsor: National Institute of Justice
PI/PD: Barry K. Lavine

Collaborative Research: Overcoming Challenges near the Limit of Determination
The goal of this research is to advance statistical and mathematical methods when employing hand-held chemical sensors for rapid classification of samples. In particular, this project focuses on optimizing models when the observed differences between two or more classes of interest are small compared to the natural noise within the instrumental measurements and on determining statistical confidence values from which to judge the reliability of inferences derived from each model.

Sponsor: National Science Foundation
PI/PD: Barry K. Lavine
Chemometric Modeling of Spectroscopic Data from a Hydrocarbon Database
A suite of chemometric methods will be applied to spectra (ultra-violet visible absorbance, near infrared, mid-infrared, Raman, and NMR) from a hydrocarbon database to extract information related to specific physical or chemical properties from refined petroleum products.

**Sponsor:** Phillips 66  
**PI/PD:** Barry K. Lavine

Molecular Driving Forces of Peptide-based Biomaterials
Peptide-based biomaterials offer many appealing properties for high technology materials including high strength-to-weight ratio and self-healing capabilities. The goal of this project is to better understand the molecular-level driving forces behind the assembly of small dipeptides to aid in the design of these materials. This goal is broken down into three sub-aims: 1. Developing multiscale simulation methods and protocols to allow for better connection between experiment and simulation, 2. Perform multiscale simulations of these systems to understand their self-assembly mechanism and 3. Perform infrared spectroscopic measurements on the assembly of these materials to understand their behavior and tie to simulation. We have made progress on all three aims including a publication in aim 2, a book-chapter in press that covers aspects of aims 1 and 2, and a manuscript in preparation for aims 1 and 3. Follow-up projects from this work will be to look at self-assembly in non-aqueous solvents and of covalently modified peptides.

**Sponsor:** W911NF-17-1-0383  
**PI/PD:** Martin McCullagh

Chemical Sensing: Linking sequence, mechanisms and inhibition
Lepidopteran moths use insoluble fatty acid derivatives as sex odor for communication between sexes within the same species leading to mating. The project goal is to understand the structural mechanism underlying the perception of the female secreted sex odors/pheromones by the Lepidopteran male moths, Ostrinia furnacalis and Ostrinia nubilalis. Molecular Biology, biochemistry, computational chemistry, as well as various biophysical techniques, such as circular dichroism (CD), fluorescence spectroscopy, small angle X-ray scattering (SAXS), and high-resolution solution NMR spectroscopy, will be used to build a model of PBP-pheromone complex of the two Ostrinia species. Since designing an inhibitor to irreversibly block the pheromone transport requires the three-dimensional (3D) atomic resolution structure of the binding protein, we propose a detailed analysis of PBP and its complex with pheromone. Our long-term goal is to understand the detailed structural and functional significance of these proteins both in vitro and in vivo in pheromone signal activation with a goal for the development of innovative and environmentally-sound inhibitors/pheromone mimetics to manage these agriculturally-important plant pests.

**Sponsor:** National Science Foundation  
**PI/PD:** Smita Mohanty

It's Polymer Life: Polymers of Everyday Life Summer Academy
This summer academy builds on the partnership with Retention Initiative for Student Excellence (RISE) program within the Division of Institutional Diversity at OSU. High school students will be introduced to chemistry, history of polymers and laboratory safety. These students will make polymers, measured and observed properties of polymers, explored the interactions of dyes with different types of polymers, and investigated the polymers’ properties effect on the dyeing process and baking.

**Sponsor:** Oklahoma State Regents of Higher Education  
**PI/PDs:** Toby Nelson and Jovette Dew
**Melanin-Inspired Antimicrobials for Diesel Fuel**

Fuel stations have a problem with microbes in their diesel/biodiesel fuel tanks that contaminates the fuel, corrodes the fuel tank and leads to damage of their customers’ vehicles. The current treatments available on the market are inadequate and over time, the level of microbes in the fuel grows to a level that causes the fuel to contaminate customer’s vehicle engine. When this happens, there is a $20,000 cost to clean the diesel storage tank, a cost to repair and clean the customer’s vehicle engine and tank, a reduction in the brand image of the fueling station and lost revenue due to repeat sales. The proposed project is to complete an assessment of diesel and biodiesel blend microbial problem, and then further develop the OSU novel melanin-inspired antimicrobial as a viable solution for fuel stations’ contaminated fuel storage problem.

**Sponsor:** Cowboy Technologies  
**PI/PD:** Toby Nelson

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**Detection and Recognition of Airborne Chemicals Onboard (DRACO) a Small Unmanned Aircraft System (SUAS)**

This project focuses on the development a small unmanned air system capable of operating in confined spaces while detecting and recognizing airborne chemical compounds. All the obstacle avoidance, flight control, chemical detection, and chemical recognition are done onboard the small unmanned vehicle, in real-time, providing rapid feedback to the operator. The Detection and Recognition of Airborne Chemicals Onboard (DRACO) a Small Unmanned Aircraft System (SUAS) will provide first responders the ability quickly determine potential hazards, facility information, and items of interest using its onboard suite of sensors from a safe standoff distance.

**Sponsor:** Air Force (STTR with RPX Technologies)  
**PI/PD:** Toby Nelson

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**Cheap, Safe, and Clean Synthetic Chemistry of Petroleum Hydrocarbons Facilitated by Copper Complexes**

Homogenous catalysis using earth-abundant metals is a powerful strategy to reduce the societal dependence on precious metals in synthetic chemistry. The necessity to replace these metals is driven by their low abundance, environmental costs of mining, and difficult removal from organic products. The earth-abundant metal complexes, however, are often prone to deactivation and achieving efficient catalysis using them requires rational design of coordination environments. The goal of the proposed research is to demonstrate that metal-ligand bifunctional systems can be developed using copper bound to pincer CNC ligands and to show their reactivity towards acceptorless dehydrogenation (AD) of saturated hydrocarbons. This fundamentally important transformation results in simple removal of hydrogen gas from substrates. It also affords an efficient and atom-economical synthetic methodology when the product of the initial dehydrogenation undergoes further reactions.

**Sponsor:** College of Arts and Science at Oklahoma State University  
**PI/PD:** Laleh Tahsini

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**Catalytic Acceptorless Dehydrogenation Facilitated by Molecular Nickel- and Copper-Phosphorous Complexes**

The average composition of hydrocarbons in petroleum is made of over 80% saturated hydrocarbons and around 10% aromatics as suitable raw materials for chemical syntheses. The increasing societal demand for value-added products requires useful strategies for the conversion of cycloalkanes and heterocycles to their aromatic forms. In our research, we aim to rationally design catalysts for the selective and efficient conversion of petrochemicals to valuable chemicals. We synthesize and characterize Ni- and Cu-phosphine complexes, establish their dehydrogenative reactivity, explore the
mechanism, and elucidate the structure and reactivity relationship. We then demonstrate a direct method to convert petrochemicals to more value-added products using our catalysts.

**Sponsor:** American Chemical Society-Petroleum Research Fund  
**PI/PD:** Laleh Tahsini

**The Development of Novel C–F Functionalization Reactions for Access to Multifluorinated Arenes and the Development of Novel Selective Dicot Herbicide**

This project follows two plans that will synergistically elevate the field of agrochemistry in the US. The first is focused on the development of novel C–F fragmentation reactions. Organofluorines make up at least 25% of all agrochemicals and yet their synthesis represents a poorly solved problem. Arguably, C–F functionalization of multifluorinated arenes is an attractive approach, since the difficult to install C–F bond, is already installed. However, C–F functionalization is still a fledgling strategy. In 2014, we introduced the photocatalytic hydrodefluorination reaction and subsequently photocatalytic C–F functionalizations. While these are powerful transformations, the C–F fragmentation selectivity is electronically controlled by the substrate. In this proposal, we outline plans to develop mechanistically novel strategies that give alternative selectivity. Achieving this objective, will significantly advance the field of C–F functionalization, which is central to agrochemistry, by extending the types of accessible motifs and decreasing the synthetic effort required to synthesize fluoroarenes.

Auxin mimic herbicides are being actively studied by major agrochemical companies. The second objective surrounds the development of a novel selective dicot herbicide discovered by our group as a direct result of our efforts to access new fluorinated chemical space.

**Sponsor:** American Chemical Society-Frasch Foundation  
**PI/PD:** Jimmie Weaver

**Contra-Thermodynamic Catalysis and Fluorine Sculpting; Two Counter Cultural Approaches to Synthesis**

The objectives of this proposal are two-fold and include the development and conceptual advancement of **contra-thermodynamic catalysis** and **fluorine sculpting**. The realization of both objectives will elevate the field of synthesis and positively impact human health through the development of tools for synthesis and chemical biology. While at first blush the directions appear disparate, they both rely heavily on visible light photocatalysis. However, they deviate from one another in the manner in which the excited state photocatalyst is quenched. One by triplet sensitization (Dexter energy transfer), and the other by SET to or from an excited state catalyst. Traditional catalysis has the effect of lowering energy barriers and facilitating reactions but ultimately does not alter the thermodynamics (or spontaneous direction) of the reaction. Our long term objectives are to develop strategies to realize a system that makes formerly impossible, or endergonic, synthesis possible in addition to enabling exergonic synthesis. Achieving this objective, will result in new tools for the study of large molecules, new synthetic methods. Achieving this objective will require the development of reactions which are not subject to the principles of microscopic reversibility, i.e. irreversible reactions that can serve to pump energy into the system, and the ability to harness and store the energy thermodynamic currency that can be used to drive reactions. More tangibly we seek to leverage the cis-to-trans photoisomerization of cycloalkenes to: identify energy pumping reactions, define an energetic currency, and develop strategies to spend the energetic currency to drive reactions that would be otherwise impossible. Realizing these objectives is expected to both enable synthesis via the development of new endergonic (neglecting the photon energy) reactions and methods as well as the development of biological tools that capitalize on the available energy and the spatio-temporal controlled associated with light activated processes.

The second direction of this proposal also involves an unorthodox approach to synthesis. Like no other element, fluorine has the ability to modulate the properties of a molecule and its behavior within the...
human body. Fluorine incorporation into pharmaceuticals has seen exponential growth in recent years, and yet our synthetic capability to obtain organofluorines is surprisingly limited. Owing to fluorine’s location on the periodic table, the selective installation of C–F bonds are exceptionally challenging. Fluorine sculpting is an alternative approach to organofluorine synthesis that begins with a low cost perfluoroarene and selectively carves out the desired high-value organofluorine. It has shown great promise; providing rapid access to organofluorines. Our long term objective is to advance the concept of fluorine sculpting and provide expanded access to organofluorines of unprecedented structural complexity. This newfound ability is expected to result in greater understanding of the role fluorine plays in molecules of interest to human health.

**Sponsor:** National Institutes of Health General Medical Sciences

**PI/PD:** Jimmie Weaver

**Contra-Thermodynamic Catalysis and Fluorine Sculpting; Two Counter Cultural Approaches to Synthesis**

This is a supplemental instrument grant proposal for a limited submission through the NIH. It is intended to help support the lab of the NIH grantee recipients. The request is for a Shimadzu gas chromatograph mass spectrometer, GCMS-QP2020 NX. Currently, there is a single aging GCMS within Chemistry department’s shared instrument facility. While it has served well, its sensitivity is decreasing as it reaches the end of its life expectancy. In addition, we and several other groups rely heavily on it and the number of users results in long wait times and regularly cross-contamination leading to further research delays. Given our research groups’ heavy dependence on this instrument and its enabling nature, it makes sense to acquire our own. This will positively impact both the Weaver research group as well as other synthetically oriented groups in the Chemistry department who will see reduced demand on the shared instrument and have access to an additional instrument, if the need should arise.

**Sponsor:** National Institutes of Health General Medical Sciences

**PI/PD:** Jimmie Weaver

**CAREER: Cross-Couplings Made Easy by One Electron Addition (Covid Supplement)**

With this CAREER Award, the Chemical Synthesis program is supporting fundamental research of Professor Weaver at Oklahoma State University. Professor Weaver will study the use of electron transfer as a means of activating halogenated arenes, heteroarenes, and polyfluorinated arenes towards C–C bond forming reactions. This will provide both fundamental understanding of the reactivity of these transiently generated species as well as new methods for the construction of important chemical motifs in shorter, more efficient manners and allow the syntheses of previously inaccessible structures, providing new opportunities. In addition, Professor Weaver will integrate the research and educational components of this project by providing a nontraditional based lab experience which exposes undergraduates to cutting edge research, as well as an outreach program aimed at stimulating curiosity in science among elementary students, and providing a database of relatively inaccessible, but important, information regarding relevant electrochemical properties of molecules in an easily accessible online platform.

In this research, new methods will be developed for the synthesis of alkylated, arylated, and alkenylated arenes, heteroarenes and polyfluorinated arenes. Since changes to the leaving group, the electronic structure of the arene, and photocatalyst all factor into the nature of the reaction, a number of mechanistically distinct reactions will be developed. This research will facilitate 1) the design of safer reactions as they do not involve highly reactive chemicals, 2) use of less expensive and more abundant reagents since little to no prefunctionalization is needed, and 3) the development of reactions with excellent chemoselectivity and functional group tolerance since the reactive species is generated only transiently.

**Sponsor:** National Science Foundation, Chemical Synthesis

**PI/PD:** Jimmie Weaver
Energetically Feasible Carbon Capture—an Application of Contra-thermodynamic Photocatalysis

In this project, we will investigate the use of contra-thermodynamic isomerization of amines that possess an alkene embedded within them to alter the geometry of the molecules. Furthermore, we will investigate the propensity of these isomers to capture (or form a bond with) CO₂, and their propensity to release the CO₂. We will synthesize new analogs.

**Sponsor:** National Science Foundation, EpScor-REU

**PI/PD:** Jimmie Weaver

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**MRI: Acquisition of the First 800 MHz NMR Spectrometer with a Cryogenically Cooled Probe in the State of Oklahoma for Interdisciplinary Research and Training**

This award provided funds to purchase an 800 MHz NMR spectrometer equipped with a cryo-probe with state-of-the-art capabilities. NMR, or nuclear magnetic resonance, is a technique which exploits the magnetic properties of nuclei to determine the structure of molecules and to probe their internal motions (dynamics). Currently, the highest-field instrument in the facility is a 21-year-old Varian 600 MHz. This is the only high field instrument available for biomolecular NMR in the State. This instrument cannot provide useful data on routine/advanced 3- or 4-dimensional NMR experiments, which are necessary for structure-function studies of large molecular complexes, such as membrane proteins (MPs) solubilized in detergent micelles/mixed lipids or large globular proteins or nucleic acids and their complexes. Large macromolecules exhibit slow molecular tumbling that results in fast transverse relaxation leading to increased line widths and reduced sensitivity. A higher magnetic field with a cryogenically cooled probe (with modern electronics), in conjunction with TROSY version of experiments for large biomolecules (such as membrane proteins embedded in micelles or billels or nanodiscs), would increase the sensitivity by a factor of at least four and would reduce the data collection time by a factor of 16. The concentration of samples analyzed would be in low micromolar range (as opposed to millimolar range for current instrument) allowing the structural characterization of macromolecules that are notoriously difficult to produce in milligram quantities. The aging Varian instrument has served its useful life for the NMR community in Oklahoma and the surrounding region. Unfortunately, at present, this instrument is the only high-field magnet (> 500 MHz) available in Oklahoma for solution-state biomolecular NMR.

**Sponsor:** National Science Foundation

**PI/PDs:** Smita Mohanty, Jimmie Weaver, Andrew Mort, Wouter Hoff, Susan Schroeder

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**Long-Chain Linear Oligogermanes and Polygermanes with Tunable Optical and Electronic Properties: Steps Toward the Design of Tailored Molecular Electronics**

Oligogermanes are of interest due to their inherent σ-delocalization that results in interesting optical and electronic properties that can be tuned by varying their composition. We developed a method for the rational synthesis of these molecules using the hydrogermolysis reaction and have prepared a wide variety of oligogermanes. We endeavor to synthesize a diverse array of long-chain linear oligogermanes in order to ascertain if these new molecules will exhibit useful optical and conductive attributes akin to their polygermane analogues. We have found that long-chain oligogermanes exhibit thermochromic and luminescent properties and these attributes will be investigated and correlated with the composition of the molecules. DFT computational studies will also be carried out for these molecules in order to determine the origin of their luminescent behavior.

**Sponsor:** National Science Foundation

**PI/PD:** Scott Weinert
CAREER: Unraveling the Cluster Chemistry of Chalcogenide Semiconductor Nanoparticles

Binary chalcogenides are some of the most well studied nanomaterials due to their applications as light emitting diodes, biolabels, catalysts, and as electro-optical and medical devices. Synthetic strategies with remarkable control over the composition, size, and morphology have been achieved and-with this-exquisite control over the resulting properties. The composition, size, shape, and the crystalline phase of the nanoparticles are interdependent, however, and the underlying synthetic mechanisms driving the outcomes of these parameters are not always clear. Obtaining control over these variables at the molecular level, therefore, continues to be one of the main challenges in the field. In this NSF CAREER proposal, the PI seeks to generate fundamental knowledge on the role of intermediates, such as chalcogen ionic clusters, and their effect on the composition, size, shape, and crystal structure of the resulting chalcogenide nanocrystals in solution. Low-temperature solution methods are known to form the Wurtzite and Zinc Blende polymorphs, but little is known about how the structure of the intermediates directs the formation of the polymorph. The PI proposes to determine the role of catenation and formation of ionic chalcogen clusters as structural intermediates in the formation of the Wurtzite versus Zinc Blende crystal structures. Additionally, the robustness of the chalcogen lattice makes post-synthetic modification of the composition of chalcogenide nanomaterials possible through anion and cation exchange reactions. Cation exchange reactions have been explored in CdSe, where reacting with Ag⁺ results in Ag₂Se. Anion exchange reactions, however, have not been explored to the same degree. The PI will use hard-soft acid base theory to determine the anion exchange capabilities of binary chalcogenide semiconductors. It is expected that these materials will be able to undergo a complete compositional transformation with morphological retention if cation and anion exchange reactions can be done sequentially. Finally, because of their stability, chalcogen clusters can be utilized as templates to generate more complex materials in such as chalcophosphates. The PI will explore the post-modification of chalcogenide nanoparticles as templates to synthesize complex nanoscale chalcophosphates.

Sponsor: National Science Foundation
PI/PD: Yolanda Vasquez

MRI: Acquisition of a High-Resolution Confocal Laser Scanning Microscope (CLSM) for the Advancement of Materials and Biological Research at Oklahoma State University

An award is made to the Oklahoma State University (OSU) to acquire a confocal laser scanning microscope. The instrument will provide advanced imaging capabilities to support research from faculty, postdoctoral researchers, graduate students and undergraduate students in over 10 departments from OSU Stillwater campus, Tulsa campus, and other institutes in Oklahoma. The proposed microscope will become part of the array of equipment that the OSU Microscopy Lab uses for public outreach and engagement, including STEM education at the K-12 level. This project is also embedded in the OSU research mission and provides support and training opportunities to students from groups that are traditionally underrepresented in the sciences. This project will have an immediate impact on 62 individuals from underrepresented groups. Acquisition of this instrument will not only impact research and research training but will also play an important role in development of a diverse, globally competitive STEM workforce by advancing research at OSU and assisting in the recruitment of underrepresented minority students.

Sponsor: National Science Foundation
PI/PDs: Yolanda Vasquez, Josh Ramsey, Heather Fahlenkamp, Shitao Li
COMMUNICATION SCIENCES AND DISORDERS

Talker Variability in Spoken Language Comprehension
The effect of talker variability from speaker’s sex, dialect, and native language background on spoken word recognition is investigated in real-time processing of speech by normal and hearing-impaired listeners with English and Mandarin Chinese as their mother tongue, respectively.

Sponsor: College of Arts and Sciences
PI/PD: Yu Zhang

Deaf Experience, Deaf Expression
The project aims to share the social, linguistic, relational, and educational experiences of deaf and hard-of-hearing people from their own perspectives. Our growing collection of video interviews in speech and sign language will become an educational resource for parents, teachers, and health care professionals as they make decisions about assistive devices, speech therapy, sign language, and school options for young children with hearing loss. Our participants' stories provide missing information for families about the effects of early choices on their children’s quality of life -- and reassurance that there is more than one path to success.

Sponsor: Arts & Sciences Research (ASR) Seed Grant
PI/PD: Valerie Freeman

Community-based multidisciplinary program for people with Parkinson disease: A 2-year comparison.
The project includes longitudinal outcomes of participants with Parkinson disease attending multiple community-based programs during a 2-year period.

Sponsor: FY 2020 Community Grant Parkinson’s Foundation. Grant no.: PF-CGP_2044_Stillwater
CANe Project (Communication, Arts, Nutrition, Exercise) for People with Parkinson Disease.

PI/PDs: Sabiha Parveen
College of Education and Human Sciences: Tim Passmore
College of Education and Human Sciences: Gena Wollenberg

Perception of Parkinson-related symptoms and perception of unmet needs among different groups (including individuals with PD, families, and young adults).
The project includes findings about perception about Parkinson disease symptoms, attitudes, current met and unmet needs, and barriers of service delivery for people with PD and their families.

Sponsor: FY 2020 Community Grant Parkinson’s Foundation. Grant no.: PF-CGP_2044_Stillwater
CANe Project (Communication, Arts, Nutrition, Exercise) for People with Parkinson Disease.

PI/PDs: Sabiha Parveen
OSU Counseling Center: Cindy Washington
Effects of COVID-19 on Different Population Groups in Oklahoma
The project includes findings based on interviews with practicing speech-language pathologists and people with communication disorders and their families, based in Oklahoma, about impact of COVID-19 on providing services and receiving services.
**Sponsor:** Department of Communication Sciences and Disorders, Oklahoma State University (Utilized Dr. Parveen’s existing travel funds)
**PI/PDs:** Sabiha Parveen, Bayleigh Miller, Danae Stidham, Sherri Norton, Valerie Freeman, and John Tetnowski

Benefits of Recreational Therapy and Speech Therapy Among Participants with Parkinson disease: Findings from a 12-month study
The project includes outcomes for physical, cognitive, and speech functioning among participants with Parkinson disease who attended multiple community-based programs based in Stillwater.
**Sponsor:** FY 2020 Community Grant Parkinson’s Foundation. Grant no.: PF-CGP_2044_Stillwater CANe Project (Communication, Arts, Nutrition, Exercise) for People with Parkinson Disease.
**PI/PDs:** Sabiha Parveen
College of Education and Human Sciences: Tim Passmore
College of Education and Human Sciences: Gena Wollenberg

Findings from a Community-Based Educational Event for Individuals with Parkinson disease and their families
The project includes outcomes from a community-based education event for individuals with Parkinson disease and their families.
**Sponsor:** FY 2020 Community Grant Parkinson’s Foundation. Grant no.: PF-CGP_2044_Stillwater CANe Project (Communication, Arts, Nutrition, Exercise) for People with Parkinson Disease.
**PI/PDs:** Sabiha Parveen
College of Education and Human Sciences: Tim Passmore
College of Education and Human Sciences: Gena Wollenberg

**COMPUTER SCIENCE**

The Research Experience for Undergraduates (REU) site on big data analytics at Oklahoma State University (OSU) (NSF)
This is a ten-week summer program that seeks to recruit ten undergraduate students from colleges with limited research capabilities and high concentrations of underrepresented minority populations such as African Americans and Native Americans in Oklahoma and neighboring states. The participants will engage in research projects in big data analytics under faculty mentors' mentorship and guidance and allow students to participate in interdisciplinary research that crosses a variety of fields. By the end of the program, the students should acquire skills that will lead to rewarding professional careers in science and technology, specifically in data science.
**Sponsor:** National Science Foundation
**PI/PD:** Esra Akbas

Graph compressing for expediting graph analysis (Internal- A&S ASR+1)
This project aims at developing novel graph compression (summarization) methodologies that facilitate efficient analysis of large graphs and advancing a wide spectrum of graph-related applications. Graph compression aims to create a smaller graph from a massive graph. Compressing graphs achieves several
benefits, including but not limited to 1) significant speed-up for current graph mining algorithms, 2) memory space and communication cost reduction, 3) improved data privacy, 4) more effective graph visualization. This project will provide research opportunities to graduate students, especially female and underrepresented students, in graph mining and its real-life applications.

**Sponsor:** ASR+1; College of Arts and Sciences

**PI/PD:** Esra Akbas

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**Design of a Shape Modification App to support cyber-manufacturing activities**

The emergence of 3D Printing as well as IoT and Cloud technologies are transforming the manufacturing practices worldwide. As part of an NSF project in cyber manufacturing, Dr. Cecil is exploring the design of a 3D Shape Modification App (for Android platforms) which can run on smart phones; the general idea is based on the recognition of the fact that most designs today are variations of existing designs. Such an app will allow casual users, Makers and other hobbyists to modify designs quickly using their smart phones rather than use expensive CAD tools.

**Sponsor:** NSF

**PI/PD:** J. Cecil

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**A Human Centered Computing (HCC) design based Mixed Reality User Interface for Astronaut Lunar Activities**

This project involved OSU student teams participating in the 2021 NASA SUITS Design Challenge mission, which was to design and develop an innovative user interface for the NASA’s Exploration Extravehicular Activity Mobility Unit (xEMU). The xEMU will be used by astronauts as part of the 2024 Moon Mission. The OSU team’s design was selected as one of 10 designs for the final round of testing at JSC Houston. The Mixed Reality design was based on Human Centered Computing and Software Engineering principles and implemented on the HoloLens 2 platform.

**Sponsor:** NASA

**PI/PDs:** J. Cecil, senior personnel: Shelia Kennison, Rittika Shamsuddin, R. Krishnamurthy, B. Mayfield

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**NSF REU Site Project Activities in Information Centric Engineering**

REU Activities for undergraduate students focus on introducing undergraduate students to research activities in Information Centric Engineering, focusing on 3 facets of modeling, simulation and exchange of information. These include creation of VR/AR based simulation environments for manufacturing, space systems and surgical training.

**Sponsor:** NSF

**PI/PD:** J. Cecil

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**Virtual Learning Environments to support STEM learning**

This project involves designing Virtual Reality based Learning environments to support learning of STEM concepts for autistic elementary, middle and high school students. Assessment activities is focusing on studying the impact of such environments to help children with special needs learn science and engineering.

**Sponsor:** OCAST

**PI/PD:** J. Cecil

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**RAPID: A Virtual Reality simulator to train first responders involved in health care efforts related to the COVID-19 virus outbreak**

This project involves the design of a Virtual Reality based simulation environment to support training of nurses in hospitals to respond more effectively to the recent COVID-19 outbreak. By creating a Virtual
Reality simulator for such training, this project will accomplish two objectives: (i) increase the pool of first responders involved in COVID-19 testing (ii) develop a more effective process to train and prepare such first responders. This project explores the role of Human Centered Computing (HCC) principles and factors (such as affordance and cognitive load) on the design of the simulation based training environments.

**Sponsor:** NSF  
**PI/PD:** J. Cecil

**IRES: Track 1: International Research Experiences in Design of Next Generation VR Simulation based Training Approaches**

The research activities focus on designing advanced 3D Virtual Reality simulation approaches based on Human Centered Computing (HCC) principles, incorporating algorithm based planning methods with application contexts in smart health and manufacturing. The design approach takes into consideration participatory design, perception and cognitive attributes, which will lead to more efficient and user centric simulation environments.

**Sponsor:** NSF  
**PI/PD:** J. Cecil

**EAGER/Cybermanufacturing: CYMAN: A CYber MANufacturing and Entrepreneurship Initiative to Foster Global Manufacturing**

This project focuses on the design of cyber manufacturing and cyber-physical approaches for various domains. A key part of this project involves exploring the accomplishment of collaborative cyber-physical activities using web/IoT based technology. As part of project activities, student teams proposed and developed specific cyber-physical applications to demonstrate feasibility of such next generation principles; this included the design of a cloud based smart refrigerator.

**Sponsor:** NSF  
**PI/PDs:** J. Cecil and Blayne Mayfield

**GEOGRAPHY**

**Mapping invasive *Lespedeza cuneata* using airborne imaging to detect its spread and determine its ecological and economic impacts**

*Lespedeza cuneata* (sericea lespedeza; hereafter “sericea”) is an invasive species brought to the U.S. from East Asia in the 1890s to be used as forage. However, it has now become a growing ecological and economic threat in grasslands of several states in the U.S. southern Great Plains including Oklahoma, Kansas, Missouri, and Nebraska. Our ultimate goal is developing an operational and cost-effective monitoring system to facilitate effective management of grasslands for sericea control or eradication while maintaining ecosystem services and biodiversity. We will use airborne remote sensing data, coupled with ground validation, to map spatial distribution of sericea and determine its ecological impacts. These information will then be used to evaluate economic impacts of sericea invasion on the local community.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Hamed Gholizadeh, Omkar Joshi, Henry Adams

**Leveraging multiscale airborne and spaceborne imaging spectroscopy to monitor grassland plant diversity under different management practices**

Only about half of natural grasslands (also known as prairies in the U.S.) remain, making them among the most endangered ecosystems. This transformation of grasslands to other cover types comes at the
price of losing biodiversity, which is the foundation of ecosystem function and underpins human well-being. Given the far-reaching negative impacts of grassland biodiversity loss, developing operational monitoring systems to understand the status of biodiversity in grasslands is critical. This work will help develop such systems by increasing our understanding of (1) the ability of remote sensing to detect grasslands plant diversity across multiple spatial resolutions and (2) the mechanisms (i.e. vegetation biochemical, physiological, and structural traits) underlying spectral diversity.

**Sponsor:** NASA

**PI/PD:** Hamed Gholizadeh

**FY19-20 Oklahoma Landmarks Inventory and National Register Website**

This project is a continuation of support for storing, maintaining, and updating, via computerization, the Oklahoma Landmarks Inventory (OLI) database and Oklahoma’s National Register of Historic Places website. The information about the state’s historic buildings, districts, structures, sites, and objects will be accessible to its many users. Work will continue on removing erroneous and duplicate records in OLI 8-12 additional counties beyond the 15+ that have already been completed. Software upgrades and new development include improvements to processing for historic bridges and updates portable database for SHPO contractors to use during survey work. The new portable database was completed and delivered to the SHPO. Also, development of a new automated process to detect record duplication was initiated.

**Sponsors:** Oklahoma Historical Society, Oklahoma State University

**PI/PDs:** Allen Finchum, Michael Larson

**FY20-21 Oklahoma Landmarks Inventory and National Register Website**

This project is a continuation of support for storing, maintaining, and updating, via computerization, the Oklahoma Landmarks Inventory (OLI) database and Oklahoma’s National Register of Historic Places website. The information about the state’s historic buildings, districts, structures, sites, and objects is accessible to its many users. Work began on a new integration of the National register and OLI Databases to go along with development of a 106 Project input system so users outside of the SHPO and OSU can directly enter data on new projects impacting historic sites and potential new sites that are found during planning for a project can also be directly entered. This effort is being undertaken to modernize the SHPO databases with a system similar to those being developed in other states throughout the US, and will include an online mapping function for inputting the location of new projects and to aid in the identification of impacted sites listed in either the National Register or OLI Databases.

**Sponsors:** Oklahoma Historical Society, Oklahoma State University

**PI/PDs:** Allen Finchum, Michael Larson
Development of an Interactive Spatial Agrometrics Tool for the Calculation of Livestock (Cattle, Swine and Poultry) Populations in the United States at the County and Parish Level
The goal of this project is to develop a dynamic, interactive, web-based agrometrics tool for the calculation of cattle, swine, and/or poultry populations relative to their proximity to a point of interest (e.g., NAHLN member laboratory or index case in a disease outbreak) and independent from state borders. The developed tool is expected to provide regional data that assists NAHLN in test capacity and capability management, regional surge capacity estimation, resource allocation, and potentially help identify a geographic region with unmet diagnostic needs.

Sponsors: USDA Animal and Plant Health Inspection Service
PI/PDs: Hongbo Yu
Agricultural Economics: Amy Hagerman, Derrell Peel
OK Animal Disease Diagnostic Laboratory: Emily Cooper, Akhilesh Ramachandran

Participatory Approaches to Agroecosystem Resilience in Times of Drought (ARID): An Example from the Southern Great Plains FY2018-2023
Persistent drought, dwindling groundwater resources, and climate variability in western agroecosystems require anticipatory management. Developing short and long-term management strategies that are proactive rather than reactive are essential for maintaining ecological, social, and economic resilience. Using quantitative land-use and land-cover analyses in the Southern Great Plains in conjunction with qualitative key-informant interviews and household surveys of residents across three counties (Union County, NM, Cimarron County, OK, and Las Animas, CO), we will identify how individuals make land and groundwater management decisions. Based on the premise that sustainable management solutions are more effectively developed and more likely adopted using participatory approaches including citizen science, our research and extension teams will foster the co-production of knowledge and disseminate this information in formal and informal programs and educational materials.

Sponsor: USDA-NIFA-AFRI
PI/PDs: Caiti Steele (NMSU) Jacqueline Vadjunec (OSU), Todd Fagin (OU), David DuBois (NMSU), Rossana Sallenave (NMSU), Kate Zeigler (Zeigler Geologic Inc.)

The funding supports ongoing collaboration with Oklahoma State Parks. Project personnel support the statewide dissemination of digital map data to State Park Managers and other personnel by way of a web map viewer. The project involves the collection of geographic data (with GPS, digital cameras, unmanned aerial vehicles, etc.) at Oklahoma State Parks, integration of the collected data into the current geographic database, performing map analyses within specific parks, and carrying out additional small research projects as necessary. Further, the project creates and edits comprehensive written Resource Management Plans (documents) for one or more designated State Parks annually.

Sponsors: Oklahoma State Parks, Oklahoma Tourism and Recreation Department
PI/PD: Alyson Greiner

FY20-21 Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience in Oklahoma
The people of Oklahoma are facing complex problems at the intersection of land use, water availability and infrastructure, and this project aims to answer whether an approach combining atmospheric and land sciences with social science can generate sustainable solutions. This project is a social science-led, multi-disciplinary collaboration among social, physical, biological, engineering and computational scientists from institutions across the state. The research incorporates perspectives of competing social
narratives in order to find answers and practical solutions to weather, water, land and infrastructure issues facing Oklahomans.

**Sponsor:** National Science Foundation Established Program to Stimulate Competitive Research  
**PI/PDs:** Kevin Wagner, Yuting Zhou

**FY20 -21 StateView Program Development and Operations for the State of Oklahoma**

Remote sensing, especially satellite remote sensing, has been used to study crop inventory and yield at the regional scale to indicate food availability. With improving spatial and temporal resolutions, remote sensing has become more popular in helping farmers to gather site-specific information for decision-making. However, the lack of awareness of the potential of remote sensing technology as well as the availability of data greatly hinders the farmers’ adoption of remote sensing in their agricultural operations. This project aims to develop a peer-reviewed fact-sheet on the potential and availability of remote sensing technologies, data, and services to help farmers in Oklahoma better adopt remote sensing in their daily operations.

**Sponsors:** U.S. Geological Survey, AmericaView  
**PI/PD:** Yuting Zhou

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**GEOLOGY**

**Field Evaluation of the Caney Shale as an Emerging Unconventional Hydrocarbon Play, Southern Oklahoma**

The Caney Shale is a dark-colored mudrock that produces oil and gas in southern Oklahoma. The Caney Shale, though partially time equivalent to the Fayetteville and Barnett shales that produce in thousands of wells, is an emerging play with production limited to a tens of wells. Caney reservoir characterization includes evaluating geological, petrophysical, geochemical, and geomechanical properties. Economic analysis includes assessing current well-production performance and borehole economics. Other research addresses hydraulic fracture propagation and proppant embedment. Based on the results of this research, a field development plan and best practices manual will be developed for the Caney Shale.

**Sponsor:** U.S. Department of Energy  
**PI/PDs:** Jim Puckette, Mike Grammer, Jack Pashin  
**College of Engineering:** Mileva Radonjic, Geir Hareland, Prem Bikkina  
**Lawrence Berkley National Lab:** Jonny Rutqvist, Christine Doughty  
**Oklahoma Geological Survey, University of Oklahoma:** Abbas Seyedolali, Brian Cardott  
**University of Pittsburg:** Andrew Bunger  
**Continental Resources:** Andy Rihn, Adam Haecker, Barry Dean

**Chemical characterization of produced water using NMR analysis to identify compound classes.**

The objective is to improve the chemical characterization of produced waters by increasing knowledge about the presence, sources, and concentration of inorganic components and organic functional groups and compounds. A novel combination of spectroscopic and chemical analyses is proposed to characterize organic compounds in produced waters, including nuclear magnetic resonance spectroscopy and elemental analysis. This project also aims to constrain the analytical techniques to quantify detection limits and standardize methods, to develop a rigorous analytical methodology that can be used to characterize the organic compound composition of produced waters at the compound-class level for a range of salinities.

**Sponsors:** Oklahoma Water Resources Board, National Research Consortium  
**PI/PD:** Tracy Quan
**GP IN: Developing a water research, assessment, and networking ecosystem (WRANE) for informal geoscience instruction on water resources**

The objective is to increase the exposure of high school and community college students to the geosciences and improve the diversity and quality of geoscience education by establishing an informal geoscience-learning program. WRANE will establish teacher-lead out-of-school-time groups, with an emphasis on recruiting underrepresented minorities and women. Participants will participate in water-related citizen science research projects, with PIs providing necessary project materials and assisting with experimental design, sampling and analytical training, and interpretation of results. This project will also sponsor a summer networking and research symposium for students to present research and network with other students, educational, and industry partners.

**Sponsor:** National Science Foundation ICER-GEOPaths  
**PI/PDs:** Tracy Quan, Ashley Burkett, Ahmed Ismail, James Puckette  
**College of Education and Human Sciences:** Toni Ivey

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**A new dolomite filtration technology to remove heavy metals and NORM from produced water**

To enable the integration of petroleum produced water (PW) into agricultural and industrial uses, the goal of this research project is to quantify the potentiality of removing heavy metals and naturally occurring radioactive materials (NORM) from PW by using filters made of compressed powdered dolomite. The potentiality of the proposed PW treatment method is on the following scientific and practical considerations: 1) dolomites represent a superior sorption capacity for heavy metals in high salinity waters than other natural and synthetic sorption materials, and 2) high purity dolomites are abundant in the Arbuckle Group of Oklahoma and Kansas.

**Sponsor:** USGS 103(b) Program  
**PI/PD:** Javier Vilcaez

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**Pore-scale machine-learning modeling of flow and transport properties of carbonate rocks**

**Sponsor:** NSF, Hydrologic Sciences Program  
**PI/PD:** Javier Vilcaez

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**Establishing an Early CO₂ Storage Complex in Kemper County, Mississippi: Project ECO₂S (Phase III)**

This project is designed to develop a zero-emission power facility and CO₂ storage hub in east-central Mississippi. This research project includes the drilling and coring of three wells for geologic characterization, and the wells will ultimately be used for injection and monitoring of CO₂ in the subsurface. Advanced core analysis, geophysical logging, CT imaging, and geological interpretation will be performed to develop geologic models of candidate geologic CO₂ storage sinks and seals.

**Sponsors:** U.S. Department of Energy through Southern States Energy Board  
**PI/PD:** Jack Pashin, Devon Energy Chair of Basin Research

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**Southeast Regional CO₂ Utilization and Storage Acceleration Partnership (SECARB-USA)**

SECARB-USA is a regional partnership program to advance carbon storage in the southeastern US. The effort at OSU partnership includes Oklahoma and South Carolina and will assess CO₂ storage and enhanced oil and gas recovery potential in saline formations, conventional oil and gas reservoirs, and unconventional oil and gas reservoirs. Machine learning technology will be developed and applied to evaluation and risk assessment of storage and enhanced recovery opportunities.

**Sponsors:** U.S. Department of Energy through Southern States Energy Board  
**PI/PDs:** Jack Pashin, Camelia Knapp, James Knapp, Priyank Jaiswal
**SECARB Offshore Partnership**
The SECARB Offshore Partnership is evaluating the CO₂ storage potential of offshore strata in the Central and Eastern Gulf of Mexico. This research is using 3D seismic surveys, well data, and production data to quantify the CO₂ storage resource and the potential for enhanced oil recovery in the continental shelf and upper continental slope, where many of the nation’s most prolific oil and gas reservoirs are located. A machine learning system is being designed and developed to assist in the evaluation and screening of storage objectives and assessment of the geologic risks associated with offshore geologic CO₂ storage.

**Sponsors:** U.S. Department of Energy through Southern States Energy Board  
**PI/PD:** Jack Pashin, Devon Energy Chair of Basin Research

**Establishing an Early CO₂ Storage Complex in Kemper County, Mississippi: Project ECO2S (Phase III)**

**Sponsors:** U.S. Department of Energy through Southern States Energy Board  
**PI/PD:** Jack Pashin, Devon Energy Chair of Basin Research

**SECARB Offshore: Evolution of a Gas Hydrate-Bearing System and its Temporal and Spatial response to Natural Perturbations: Woolsey Mound, Gulf of Mexico**

This study on the evolution of a gas hydrate-bearing system and its temporal and spatial response to natural perturbations is focused around the Woolsey Mound in the Gulf of Mexico (GOM). Woolsey Mound is a cold seep hydrate system (CSHS) where hydrocarbon fluids (mainly methane gas) are transferred from the lithosphere into the hydrosphere, accounting for the major source of hydrocarbons in seawaters. Results will provide fundamental numerical parameters of the development and evolution of a gas hydrate-bearing system and its response to natural perturbations over a time window comparable to human scale processes. This analysis is relevant to risk assessment in connection with offshore infrastructure related to petroleum extraction activities and carbon sequestration.

**Sponsor:** Department of Energy  
**PI/PDs:** Camelia Knapp and James Knapp

**HISTORY**

**Indigenous Women and Education in Early America**
This project investigates the role of Indigenous women in shaping Indian education in early America. Considerations are given to the effects of both Indigenous and Anglo education models on issues of Native sovereignty and women's citizenship status within their tribal nations and the United States.

**Sponsors:** OSU College of Arts and Sciences, Newberry Library  
**PI/PD:** Kallie M. Kosc

**Meade at War**
In March 2020, I received a Research Scholar Grant from the Oklahoma Humanities Council and a matching award from the College of Arts and Sciences. This money was earmarked to supplement the final research trips for my second monograph, a biographical study of Civil War (Union) general George Meade tentatively titled *Meade at War*, to be published by Osprey Press. This summer, a limited amount of relevant archival facilities finally opened after COVID-19 closures and I was able to visit two facilities: the New Hampshire Historical Society (Concord, NH) and the Historical Society of Pennsylvania (Philadelphia). While not entirely the research agenda that I had intended to complete with these funds (because many archives remained closed even through this summer), I was able to gain useful information for the Meade monograph. Research yielded from these two trips will be included into upcoming conference presentations at the Society for Military History and the Society of Civil War
Historians as well as information to share with various community groups in my active public speaking agenda.

**Sponsors:** Oklahoma Humanities Council; College of Arts and Sciences

**PI/PD:** Jennifer M. Murray

**A New Home on the Range: Addiction, Treatment, and Punishment in the American West**

This project traces the history of drug addiction and treatment in the American West during the mid-twentieth. It is the first in-depth study of the Fort Worth Narcotics Farm, the only federally-funded drug treatment center that operated west of the Mississippi River between the 1930s and 1970s. This project examines the intertwined nature of treatment and punishment at the Narcotics Farm, as well as the ways in which drug use patterns shifted during the middle decades of the twentieth century. Ultimately, it will shed light on the development of modern addiction treatment therapies, and how these affected using communities.

**Sponsor:** Jack and Nancy Farley Distinguished Visiting Scholar, Simon Fraser University (Canada)

**PI/PD:** Holly M. Karibo

**Selling Work’s Rewards in the Postindustrial Age**

This book traces the motivational strategies developed by managers and their allies in American and British workplaces since 1970. Developing lines of analysis advanced in my first book, *Work Better Live Better: Motivation, Labor, and Management Ideology* (University of Massachusetts Press, 2020), the research charts changes in motivational strategy by management in both countries amid the rise of informational and service-based work. Through archival research on the computer and tech industries and management consultancy, the research will explain the relationships between these new motivational strategies and labor market dynamics that have resulted in economic precariousness and declining protections for workers.

**Sponsor:** OSU Department of History

**PI/PD:** David Gray

**Taxation and the Economic Foundations of Early Mesopotamia**

This monograph seeks to illuminate evolving taxation policies in the 400 years between about 2400-2000 B.C. in ancient Mesopotamia. The intended research trip to Yale’s Babylonian Collection to examine previously unpublished taxation records written on cuneiform tablets has not yet taken place, as they remain closed to outside visitors until Jan. 2022. While that work remains on hold, many parts of the book outlining the basic economic forces driving their cycles of prosperity and crisis have been written.

**Sponsor:** Dean’s Spring Travel Grant (awarded, not used)

**PI/PD:** T. M. Sharlach
Responses of Bumble Bees to Grassland Management Practices and Landscape Characteristics.
Numerous studies have indicated that pollinators are declining worldwide due to factors such as habitat fragmentation and loss, invasive species, disease, and pesticides. The overall goal of this project is to evaluate how grassland management practices and landscape characteristics influence bumble bee populations. We will evaluate the abundance and diversity of bumble bees, as well as the body size and pollen load diversity of bumble bee foragers. Collectively this information will provide insights into how bumble bees are responding to management practices and landscape characteristics.

Sponsor: The Nature Conservancy
PI/PD: Kristen Baum

Assessing Honey Bee Health and Crop Productivity Across a Gradient of Land Uses.
Many agricultural producers rely on managed honey bees to provide pollination services for crops. The overall goal of this project is to assess how managed honey bee respond across a gradient of land cover types, and to compare data obtained from remote monitoring systems to visual assessments. Honey bee colonies will be evaluated across a gradient of land cover types that differ in the amount of crops used by honey bees, crops not used by honey bees, pasture/grassland, and developed land.

Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PD: Kristen Baum

Status of the Regal Fritillary in Oklahoma.
The regal fritillary historically occurred from Oklahoma to North Dakota and east to the Atlantic Coast, but is now being considered for listing under the Endangered Species Act. Little is known about the population trend of regal fritillaries in Oklahoma. This project will assess the current status, geographic range, and habitat needs for regal fritillaries in the tallgrass prairie region of Oklahoma, with a focus in counties where regal fritillaries have been previously documented.

Sponsor: Oklahoma Department of Wildlife Conservation
PI/PD: Kristen Baum

Document project outcomes and, if necessary, help refine the implementation of conservation practices for the monarch butterfly and other pollinators.
The monarch butterfly has experienced population declines in recent years and is being considered for listing under the Endangered Species Act. Current conservation efforts are focused on increasing habitat for monarch butterflies and other pollinators, but additional information is needed to evaluate different methods for assessing the quality of monarch habitat. This project will compare several methods of habitat evaluation at sites where conservation practices have been implemented in the Midwest and Southern Great Plains.

Sponsor: Natural Resources Conservation Service
PI/PDs: Kristen Baum
Monarch Joint Venture: Alison Cariveau, Wendy Caldwell

Effects of Multiple Stressors on Pollinator Health in the Southern Plains.
Bees provide important pollination services in both agricultural fields and more natural habitats. Both honey bees and native bees are in decline, and more information is needed to identify how stressors interact to influence bee populations and communities. The overall goal of this project is to evaluate how multiple stressors influence the abundance, diversity, selection, and quality of floral resources for honey bees and native bees. This project will evaluate how nutrition, agrochemicals, and
parasites/disease influence managed honey bee colonies and native bee populations and communities in the wheat/canola/managed grassland agroecosystem.

**Sponsors:** Foundation for Food and Agriculture Research, Syngenta  
**PI/PDs:** Kristen Baum, Shawn Wilder, Jason Belden  
College of Agricultural Sciences and Natural Resources: Kristopher Giles, Samuel Fuhlendorf

**Implications of Landscape, Crop, and Insect Diversity for Agroecosystem Functionality.**  
Long-term sustainability of agroecosystems depends on the maintenance of ecosystem services, including pollination and pest control. Agroecosystem diversity likely influences resource availability for beneficial insects and availability of insect-mediated ecosystem services. Ecosystem services may also interact, such as when landscape resources allow increased parasitism of crop pests, which leads to increased parasitism of pollinators. Management activities may modify the outcome of these interactions and the availability of ecosystem services. The goal of this project is to evaluate the effect of landscape (including crop) diversity on beneficial insects (pollinators and natural enemies) and associated ecosystem services.  
**Sponsor:** USDA-NIFA-AFRI  
**PI/PDs:** Kristen Baum  
College of Agricultural Sciences and Natural Resources: Kristopher Giles, Eric DeVuyst  
USDA, ARS: Norman Elliott

**Development and testing of a mesocosm design for conducting developmental toxicity test on amphibians native to North America.**  
Ideally, developmental toxicity tests with amphibians would be performed on species native to the area of concern. However, due to the dependence on both terrestrial and aquatic environments during development and a relatively long developmental stage, these tests are challenging. Thus, there is a current need to develop better approaches for developmental toxicity testing of native amphibians. The objective of this project is to design and build a natural outdoor mesocosm suitable for testing of contaminant effects on amphibian development.  
**Sponsor:** Syngenta Crop Protection  
**PI/PDs:** Jason Belden and Scott McMurry

**The Toxicity of Pesticide Mixtures to Bees – A Review and Synthesis of Current Literature with Respect to Accepted Mixture Modelling Approaches and Risk Assessment**  
Pesticide exposure typically occurs as a mixture of pesticides rather than a single active ingredient. As pesticide risk assessment is frequently conducted based on single active ingredients or single formulations, there has been concern that pesticide mixtures may cause environmental harm that would not be expected from the initial risk assessment. The objective of this project is to review current literature describing the toxicity of pesticide mixtures to bees and determine the frequency that toxicity can be modelled using available approaches as compared to the frequency where synergy occurs.  
**Sponsor:** Syngenta Crop Protection  
**PI/PD:** Jason Belden

**Grand River Dam Authority and Oklahoma State University Collaborative Water Quality Research Program**  
A collaborative agreement between Oklahoma State University Investigators and the Grand River Dam Authority Ecosystems & Education Center promoting jointly conducted water quality research. This program funds graduate student research assistantships at OSU who will conduct research at the GRDA Ecosystems & Education Center. This agreement will further nurture relationships that support
watershed quality, and to provide opportunities for graduate students to conduct important research on watershed quality in connection with their graduate studies at OSU.

**Sponsor:** Grand River Dam Authority Ecosystems & Education Center  
**PI/PDs:** Jason Belden, Andy Dzialowski, Puni Jeyasingh, Noha Yousef

**Environmental and Endocrine Factors Underlying Behavioral Plasticity in Response to Adversity**

Early life adversity can reprogram the developing brain and endocrine system with consequences for behavior. However, only some individuals are vulnerable to early adversity, whereas others are resilient. The differential sensitivity hypothesis proposes that resilient and vulnerable individuals differ in their degree of developmental plasticity. The goal of the proposed research is to test how three factors contribute to differences among individuals in developmental plasticity: (1) prior environmental conditions, (2) physiological reactivity to stress, and (3) glucocorticoid receptor concentrations.

**Sponsor:** National Institutes of Health, Eunice Kennedy Shriver Institute for Child Health and Human Development  
**PI/PD:** Jennifer L. Grindstaff

**The rules of life were made to be broken – connecting physiology, evolutionary ecology, and mathematics to identify a Growth Rate Rule.**

Are there mathematically consistent and empirically verifiable rules that link the biochemical properties of cells to dynamical processes in ecosystems? This project will use the foundation of ecological stoichiometry to assess if the tripartite connections among growth rate, RNA allocation, and carbon:nitrogen:phosphorus stoichiometry constitute a Rule of Life (the Growth Rate Rule, GRR) and to evaluate conditions under which the GRR might be broken. The collaborative project will evaluate the GRR with intensive physiological, evolutionary, and ecological work on various model organisms, including the crustacean *Daphnia pulex* - the central focus of the OSU portion.

**Sponsor:** National Science Foundation, Division of Environmental Biology (NSF award # 1930736).  
**PI/PD:** Puni Jeyasingh

**Social Structure Contributes to Sound Localization Ability in Mammals**

The variability in hearing ability, specifically sound localization ability, in different rodent species with varying social structures across Oklahoma will be measured.

**Sponsor:** College of Arts and Sciences ASR, Oklahoma State University  
**PI/PD:** Elizabeth McCullagh

**Natural Resource & Environmental Services, Kirtland AFB, NM**

This project focuses on assessing the population and habitat use of several species of wildlife on Kirtland Air Force Base (KAFB) in New Mexico. Several species of birds, cougars, and Desert Massasauga rattlesnakes are monitoring on KAFB throughout the year. Data are used to help base personnel develop and revise management strategies for resident wildlife. In addition to wildlife assessments, part of this project focuses on the restoration of Coyote Springs, the main wetland feature on base and a site of significant cultural importance.

**Sponsor:** Army Corps of Engineers, Department of Defense  
**PI/PDs:** Scott McMurry, Loren Smith

**Ecosystem Service and Economic Trade Offs of USDA Conservation Programs**

This project focuses on assessing the economic values and tradeoffs for various ecosystem services (e.g., carbon storage, pollinators, flood water retention) in playa wetlands throughout the western High Plains and Rainwater Basin of Nebraska, as influenced by the dominant land uses around wetlands (grassland,
cropland, and USDA conservation practices). These data can be used to inform program managers as to the efficient use of conservation dollars for implementing programs and practices that best support ecosystem service provisioning throughout the High Plains and Rainwater Basin.

**Sponsor:** United States Department of Agriculture/Natural Resources Conservation Service

**PI/PDs:** Scott McMurry, Loren Smith

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**Linking metal nanoparticle chemical modifications at the luminal/intestinal epithelia interface to intracellular alterations of essential metal homeostasis**

Nanoparticles are microscopic particles with at least one dimension less than 100 nanometers. Due to the improved material properties occurring at the nanoscale, nanoparticles are used in several consumer products and can be found almost everywhere in our day to day life, from paint to toothpaste. However, besides the technological advancements they bring about, the boom in nanoparticle production also raises questions about their potential impact on human health and the environment. Using a model of the fish intestine, we propose to study the absorption, toxicity and bioreactivity of two highly used nanoparticles: titanium dioxide and silver nanoparticles.

**Sponsor:** National Science Foundation (NSF)

**PI/PI:** Matteo Minghetti

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**Understanding Large-Scale Patterns of Ecomorph Evolution**

In this project, we develop an integrative approach to explore fundamental questions about the evolution of ecomorphs (species with similar ecology, morphology, and behavior), using frogs as a model system. The approach combines data on evolutionary relationships, ecology, body form, functional performance, and geographic distribution. This study will provide the first exploration of how these different factors explain large-scale patterns of ecomorph evolution across a major group of organisms. The project supports training of diverse students, including a summer undergraduate research experience.

**Sponsor:** NSF

**PI/PI:** Daniel Moen, Associate Professor, Integrative Biology

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**CAREER: Macroevolutionary Biomechanics: Integrating Morphology, Mechanical Models, and Phylogenetic Comparative Methods to Understand the Evolution of Swimming Performance in Frogs**

Biomechanics has contributed a rich understanding of the physical principles that dictate organismal form and function, but the field has been slow to incorporate study of the evolution of mechanical diversity. In this project, the PI will combine experiments on live organisms, computer modeling, and statistical analyses of the evolution of species differences to understand the evolution of diversity of body form and movement. The project will also focus on developing secondary education in scientific research and evolutionary concepts in Oklahoma, integrating research training into undergraduate laboratories, and training young researchers in evolutionary analysis workshops.

**Sponsor:** NSF

**PI/PD:** Daniel Moen, Associate Professor, Integrative Biology
Quail Ecology and Management II
Bobwhite quail populations have experienced a long-term decline. Arthropods are a key food for growing quail chicks and adult females that are producing eggs. The goal for the invertebrate component of this project is to examine how habitat types and land management affect the quantity and nutrient content of arthropod prey available to quail.

Sponsor: Oklahoma Department of Wildlife Conservation
PI/PDs: Shawn Wilder
College of Agricultural Sciences & Natural Resources: Craig Davis, Samuel Fuhlendorf, Dwayne Elmore, Laura Goodman

EAGER: Combining Elemental and Biochemical Measures of Prey to Improve Predictions of Trophic Transfers of Nutrients
This project is testing if macronutrients, such as lipid and protein, provide a better measure of prey quality for predators than measures of the nitrogen and carbon content of prey.

Sponsor: National Science Foundation
PI/PD: Shawn Wilder

This project is testing how spiders affect the flow of nutrients through ecosystems using the Negev Desert in Israel as a case study.

Sponsor: Binational Science Foundation
PI/PDs: Shawn Wilder
Hebrew University of Jerusalem: Dror Hawlena

The Effects of Environmental Heterogeneity and Movement on Ecological Dynamics
The change of coexistence patterns between species with different movement strategies will be studied in a laboratory system with nematode Caenorhabditis elegans.

Sponsor: University of Oklahoma
PI/PD: Bo Zhang

The Study of Drought and Management Interactions on Invasive Species
The effect of climate change on altering the optimal control strategy on Johnsongrass will be studied in a mesocosm study.

Sponsor: University of Oklahoma
PI/PDs: Bo Zhang, Lu Zhai
Texas-Oklahoma Representations and Automorphic Forms Conference (TORA)
This is a collaborative conference series among Oklahoma State University, University of Oklahoma and University of North Texas. Ten conferences have been held to date. TORA XI is supported by this grant. It was scheduled to be held at OSU in Spring 2020 and has been postponed to a later time due to Covid-19.
Sponsor: National Science Foundation
PI/PDs: Mahdi Asgari, Roger Zierau

Moduli Spaces and Galois Theory in Arithmetic Dynamics
A function defined on the complex plane may be interpreted as a geometric transformation of the plane. Repeated application of a function yields a dynamical system, and one hopes to understand the trajectories obtained by iterating these functions from a given starting point. A fundamental example is the notion of a periodic point—a point which eventually returns to its initial position. Arithmetic dynamics is the mathematical field that applies algebra and number theory to better understand these processes. This project involves the development and study of families of arithmetic dynamical systems, focusing particularly on those with specified periodicity behavior.
Sponsor: NSF
PI/PD: John Doyle

Algorithmic recognition of 3-manifolds and tangles
A central problem in any field is to try and identify the basic objects in the field up to equivalence. In 3-manifold topology, these problems have been largely solved. However, fast and effective algorithms to identify and distinguish 3-manifolds remains an elusive goal. This project will improve upon existing 3-manifold identification schemes and implement new algorithms in the field. Finally, these improvements in 3-manifold recognition will be applied to construct an atlas of tangles, which will serve as a breeding ground for new questions in the 3-manifold topology and related fields.
Sponsor: Simons Foundation
PI/PD: Neil R Hoffman

Distinguished Women in Mathematics Colloquium Series
This program establishes a series of department colloquia and public lectures given by prominent women in mathematics, which would also serve to provide networking opportunities for our graduate students and other early career mathematicians.
Sponsor: Oklahoma State Foundation - President's Fellows
PI/PDs: Neil R Hoffman, Bella Tobin

The Mathematical Inquiry Project: Faculty Instructional Change for Enhanced Student Learning and Success in Entry-Level Mathematics
The Mathematical Inquiry Project (MIP) at Oklahoma State University aims to enhance the adoption of inquiry-oriented, student-centered instructional practices across all levels of undergraduate mathematics by fostering a statewide collaboration among mathematics departments at the 27 public institutions of higher education in Oklahoma. The MIP focuses on increasing the use of three elements of mathematical inquiry: active learning techniques, incorporation of meaningful applications of mathematics, and development of academic success skills.
Sponsor: NSF
PI/PDs: William Jaco, Michael Oehrtman, Michael Tallman, John Paul Cook, Allison Dorko
Investigating Student Learning and Sense-Making from Calculus Video Lessons
This project involves the development of instructional videos to better promote students’ conceptual learning of single-variable calculus. Students’ use of, engagement with, and learning from the developed videos will be investigated using eye-tracking technology, interview methods, and assessment data. This project investigates the impact of various ways of structuring the video-watching experience on students’ learning. In doing so, this project generates new knowledge about the effectiveness of various design features of instructional videos for supporting students’ learning of foundational calculus concepts and their real-world applications.

Sponsor: NSF
PI/PDs: Michael Tallman
Ithaca College: Aaron Weinberg
University of Central Arkansas: Jason Martin

Three and Four Dimensional Triangulations, Mathematical Visualization
A triangulation is a subdivision of a space into tetrahedra. There are many ways to triangulate a topological object. However, different triangulations are related to each other by sequences of simple, local moves. One of the central goals of this project is to better understand how useful properties of triangulations change as we alter them by these moves. Another aim is to generalize results from three-dimensional to four-dimensional triangulations. Another goal centers on mathematical visualization to aid in research, pedagogy and outreach. This includes finding effective ways to visualize mathematical objects using technologies including 3D printing, virtual, and augmented reality.

Sponsor: NSF
PI/PD: Henry Segerman

Ternary cubic forms and commutators
The study of polynomial equations and Diophantine sets is a classical subject in number theory. The group theoretic analogue of this study is the study of group equations and verbal subsets. In the case of arithmetic groups, both definitions coincide and verbal subsets in arithmetic groups are also Diophantine sets in the usual number theoretic meaning. The works of Makanin, Razborov, Rips and Sela describe the solutions to group equations and the structure of verbal subsets in free and torsion free hyperbolic groups. On the other hand, very little is known about verbal subsets in higher rank arithmetic groups. The main objective of the research is to study verbal subsets in higher rank arithmetic groups by applying a combination of number theoretic and group theoretic techniques. The focus is on the commutator word \([X,Y]\), which is one of the most studied words, and on higher rank arithmetic matrix groups over rings of S-integers. In this case, the study of the corresponding verbal subset is closely related to the study of the Markoff equation and many number theoretic tools are available.

Sponsor: Simons Foundation
PI/PD: Amit Ghosh

Stabilizing Phenomenon for Incompressible Fluids
This project intends to understand an important universal stabilizing phenomenon concerning several incompressible fluids. New analytic tools and approaches will be developed to solve several open stability problems arising in the modeling of buoyancy-driven fluids and electrically conducting fluids.

Sponsor: NSF
PI/PDs: Jiahong Wu, Nicki Boardman
Collaborations in Partial Differential Equations Modeling Fluids
The funding from this project supports the collaborations of the PI with several leading experts from Princeton and Michigan. The goal of these collaborations is to solve several well-posedness and regularity problems related to partial differential equations modeling fluids.

Sponsor: Simons Foundation
PI/PD: Jiahong Wu

Collaborations in Combinatorial Commutative Algebra
This grant funds several collaborations in combinatorial commutative algebra. The PI and his coauthors, including Mermin and Schweig from OSU, investigate the interplay between problems in algebra and combinatorics. On the algebraic side, the questions involve understanding intricate relations among polynomials, and on the combinatorial side, the research investigates discrete objects like graphs and their higher dimensional analogues. This work also features interactions with algebraic geometry and topology, using algebraic techniques to understand geometric objects and applying topological methods in combinatorics. The PI frequently uses OSU's High Performance Computing resources to explore examples and test conjectures.

Sponsor: Simons Foundation
PI/PD: Christopher Francisco

Topics in Immersed Finite Element Methods
This project consists of two topics. The first is to develop self-adaptive immersed finite element methods for two-dimensional interface problems based on the a posteriori error estimation. The second is the development, implementation, and error analysis of immersed finite element methods for three-dimensional interface problems.

Sponsor: National Science Foundation
PI/PD: Xu Zhang

Adaptive Unfitted-Mesh Numerical Methods for 3D Multi-Physics Problems
This project aims to develop self-adaptive immersed finite element methods for three-dimensional steady-state and time-dependent interface problems. Fast computational algorithms will be developed for 3D interface problems with both stationary and moving interfaces.

Sponsor: Oak Ridge Associated Universities
PI/PD: Xu Zhang

MEDIA AND STRATEGIC COMMUNICATIONS

Mexican and Northern Triangle Perspectives on Migration: Identifying and Assessing Strategic Narrative Alignment
This project provides a comprehensive perspective on migration coming from the Northern Triangle of Central America by investigating the underlying catalysts, structural challenges, associated opportunities, as well as the narrative packaging and surrounding discussions concerning migration.

Sponsors: Boarders, Trade and Immigration (BTI) Institute, Department of Homeland Security (DHS)
PI/PDs: Skye Cooley, Asya Cooley
SMSC: Jared Johnson
Air University: Robert Hinck, Sara Kitsch
Structure, Function, and Regulation of the NDH-1 Complexes in Cyanobacteria
Photosynthetic organisms have specialized mechanisms to extract CO₂ from the atmosphere and concentrate it in the cellular environment of the major carbon fixing enzyme, which has a notoriously poor affinity for CO₂. Understanding these mechanisms is critical for optimizing bioenergy and agricultural production and will be important for the design of biomimetic devices capable of performing artificial photosynthesis and for the development of the next generation CO₂ scrubbing materials. The natural mechanism thus provides a basic scientific template for the development of engineered devices addressing critical national energy goals.

Sponsor: US Department of Energy, Basic Energy Sciences
PI/PD: Robert Burnap

Assembly and Function of the Photosystem II Complex
Photosystem II is the key enzyme of photosynthesis, natural solar energy production, and needs to be understood for food production and for carbon neutral production of energy and chemical feedstocks. Molecular genetic, biophysical, and bioinformatic techniques are being used to understand the catalytic properties of this crucial enzyme. The aim is to understand basic redox enzymology and provide insight for the production of biomimetic devices for future solar energy applications.

Sponsor: National Science Foundation, Molecular and Cellular Biochemistry
PI/PDs: Robert Burnap/Minquan Zhang

Characterization of novel biofilm regulators in *P. aeruginosa*
Biofilms are collections of bacterial cells that team up to protect themselves from their environment, and infections with biofilm-forming species, such as *Pseudomonas aeruginosa*, are often difficult to treat with conventional therapy. This project aims to characterize the roles of two proteins that function in regulating biofilm formation by *P. aeruginosa*. The research strategy includes gene expression profiling and other molecular techniques to achieve a detailed understanding of how the two proteins affect signaling pathways and cell physiology.

Sponsor: NIH
PI/PDs: Matthew Cabeen, Jimmy Ballard

Stress sensing and processing by bacterial cytoplasmic megacomplexes
Bacteria can survive a wide range of environmental insults—including exposure to drugs, disinfectants, and immune responses—due to dedicated systems that detect stresses and quickly activate internal defense mechanisms. A deeper understanding of bacterial stress responses will abet efforts to control unwanted microbial growth. The objectives of this project are to define fundamental principles governing how bacteria sense the presence of environmental stress, process sensory data to enact different dynamic response patterns, and use such response patterns to maximize cell fitness and survival under adverse conditions. The project uses as a model the stressosome of *B. subtilis*.

Sponsor: NIH
PI/PD: Matthew Cabeen

Regulation of *P. aeruginosa* biofilm formation by a DNA-binding protein
Biofilms are collections of bacterial cells that team up to protect themselves from their environment, and infections with biofilm-forming species, such as *Pseudomonas aeruginosa*, are often difficult to treat with conventional therapy. This project aims to characterize the roles of a DNA-binding protein, termed 16550, that when deleted suppresses biofilm formation. Transcriptomics will be conducted to discover
the extent of gene regulation by the 16550 protein and to elucidate how biofilm formation is impacted by the presence of 16550.

**Sponsor:** OCAST  
**PI/PD:** Matthew Cabeen

**Mechanisms of Nutrient Competition in the Intestine**

The major goal of this project is to determine mechanisms of nutrient competition between *E. coli* strains in a mouse model of intestinal colonization. Diversity Supplement to parent project supports the postdoctoral training of Dr. Jerreme Jackson in accordance with the NIGMS Diversity Supplement Program goal to promote diversity in the scientific research workforce.

**Sponsor:** NIH National Institute of General Medical Sciences  
**PI/PD:** Tyrrell Conway

**Discovery and characterization of novel microbial lineages in an early Earth analog sulfur-based ecosystem.**

The overall goal of this proposal is to characterize and identify microorganisms that reside in an anaerobic sulfur-spring in southwestern Oklahoma. The spring represents a readily accessible environment where various locations in the spring correspond to conditions that were prevalent in earlier geological times. Therefore, the spring provides a rare window to examine the type of organisms that flourished in the early earth. Microbial community characterization will be achieved using state of the art metagenomic analysis and metabolic reconstruction, functional genomics approaches, as well as in-silico data mining and comparative genomics strategies.

**Sponsor:** National Science Foundation  
**PI/PDs:** Noha Youssef, Mostafa Elshahed

**PurSUit: Discovery, characterization, and elucidation of the global patterns and determinants of anaerobic fungal (Neocallimastigomycota) diversity in the herbivorous gut**

The purpose of this project is to conduct an extensive global-level diversity survey to characterize the identity and community structure of anaerobic gut fungi on earth. The effort will target herbivores that harbor, or putatively harbor these fungi to fill significant gaps of knowledge regarding their scope of diversity in nature. In addition, the project will provide updated taxonomic framework and characterize multiple novel fungal isolates, establish minimal and recommended standards for novel taxa description and naming, expand anaerobic gut culture collection, and promote initiatives for storage, sharing, and maintenance between laboratories.

**Sponsor:** National Science Foundation  
**PI/PDs:** Mostafa Elshahed, Noha Youssef

**The center for Microbiome and Genome Research: A sustainable research, training, and services-oriented microbial diversity and genomics center at the Faculty of Pharmacy, Cairo University.**

The project will establish a world-class center for microbial diversity and genomics at the Microbiology Department, Faculty of Pharmacy, Cairo University (MFOPCU). The center will enlist the help of two Egyptian-American Professors (Drs. Mostafa Elshahed and Noha Youssef) at Oklahoma State University, USA. The center will act as the premier national research entity for microbial diversity and genomics in Egypt, and will have three main missions: To conduct world-class microbial diversity research; to provide training to a wide range of Egyptian and regional scientists; and to act as a service provider for academic and industrial entities.

**Sponsor:** Egyptian Academy of Scientific Research and Technology  
**PI/PDs:** Ramy K. Aziz (Cairo University, Cairo, Egypt), Mostafa Elshahed, Noha Youssef
Pretreatment of switchgrass by a fungi-bacteria co-culture for effective delignification and improved saccharification for enhanced butanol production.

The overall goal of this project is to investigate the combined role of fungi and bacteria for efficient delignification of switchgrass to economically produce butanol. Flasks containing mineral salts medium, and 5 % switchgrass were inoculated with a mixture of bacteria (Pseudomonas sp. YS-1p, Arthrobacter sp. RT-1 and Alcaligenes sp. 3K), a mixture of fungi (Phanerochaete chrysosporium RP-78, Myceliophthora thermophila M77) and a co-culture of above bacterial and fungal strains. Results showed maximal degradation of lignin occurred in switchgrass inoculated with a mixture of both bacteria and fungi compared to bacterial alone or fungi alone. Proteomic analysis of culture supernatants showed the presence of many lignin-active enzymes in co-culture treated switchgrass compared to other treatments.

Sponsor: OCAST
PI/PD: Babu Fathepure

Bioremediation of toxic produced water from oil and gas production sites by halophilic bacteria

We are exploring the potential of salt-loving microorganisms to bioremediate PW for beneficial uses. We setup microcosms with PW collected from Wilcox formation and Mississippian formation and inoculated with Kuwait culture. The culture completely degraded benzene, toluene, ethylbenzene, and xylenes (BTEX) in PW from Wilcox formation in 9 days and no such degradation occurred in PW from Mississippian formation due to toxicity of the PW. To reduce toxicity, we mixed the PW with raw municipal wastewater at 1:1 ratio. Results showed a complete degradation of BTEX within 5 days suggesting bioremediation of toxic PW can be accomplished by mixing with other wastewaters. The bioremediated PW can be desalinated and used for irrigation.

Sponsor: NSF-EPSCoR
PI/PD: Kevin Wagner

Regulation of MAPKs in development

Atypical MAP kinases (MAPKs) are important for cell growth, differentiation, and movement in humans and other eukaryotes but relatively little is known about the regulation and function of atypical MAPKs compared to typical MAPKs. This project will characterize the regulation of the atypical MAPK homolog in Dictyostelium using the powerful genetic and biochemical tools available in this model organism. This study will provide important insights into the developmental roles of MAPKs and their relationship to genetic diseases.

Sponsor: NIH - NIGMS
PI/PD: Jeff Hadwiger

Heme Iron Acquisition in Mycobacterium tuberculosis

Mycobacterium tuberculosis (Mt), a lung pathogen, is completely dependent on acquiring iron nutrients to successfully colonize the human host and cause disease. However, iron is efficiently sequestered within the host in proteins such as transferrin (Tf), ferritin, and lactoferrin (Lf); or in the form of heme within hemoglobin. Mt secretes siderophores to extract iron from Tf, ferritin and Lf, but the siderophores cannot extract iron from heme or hemoglobin, which store >85% of host iron. Our overarching goals are to understand how Mt captures iron from host heme and determine the importance of heme in Mt virulence and disease progression.

Sponsor: College of Arts and Sciences
PI/PD: Avishek Mitra
**Bacterial Cell Shape: A drug target and new virulence factor**
The long-term goals are to develop a more complete understanding of how cell shape is achieved and how it influences virulence. The overall objectives of this proposal are to determine the molecular mechanisms of bacterial cell shape determinants in achieving cell shape. The central hypothesis is that these cell shape determinants modulate the MreB cytoskeleton by acting as accessory factors for assembly/disassembly, assisting in protein-protein interactions, and/or modulating cell wall synthesis.

**Sponsor:** National Institutes of Health  
**PI/PD:** Randy Morgenstein

**Interactions of Human Pulmonary Macrophage and Dendritic Cell Subsets with Cryptococcus neoformans**
*Cryptococcus neoformans* is an inhaled opportunistic fungal pathogen that disseminates to the brain causing life-threatening meningitis. Host factors that determine fungal killing or survival by pulmonary immune cells remain poorly defined, presenting a major gap in understanding how this pathogen ultimately causes meningitis and death. We hypothesize that subsets of pulmonary immune cells restrict fungal growth through direct intracellular fungicidal activity absent in permissive subsets. We will first characterize the fungicidal response of human pulmonary immune cells and examine roles of fungicidal mediators. We will then identify differentially regulated genes/signaling pathways responsible for fungicidal activity.

**Sponsor:** National Institutes of Health, General Medical Sciences  
**PI/PD:** Karen Wozniak

**GREENWOOD SCHOOL OF MUSIC**

**Shanghai International Piano Festival and Institute**
I was engaged to teach several days of public master classes in July 2021 as a faculty member at the Shanghai International Piano Festival and Institute, one of the largest and most prestigious events for only the most talented and accomplished pre-college pianists in all of China, with over 300 participating students. I also taught at this biennial festival in 2018, when my colleagues were internationally renowned piano faculty from the Moscow Conservatory, Manhattan School, Eastman School, New England Conservatory, the Mozarteum in Salzburg, the Shanghai Conservatory and recent winners of the Chopin Competition in Warsaw and the Sydney Competition.

**Sponsor:** OSU College of Arts and Sciences FY22 Fall Travel Award  
**PI/PD:** Thomas Lanners

**Fifth House Ensemble Virtual Residency**
During a semester-long virtual collaboration with Chicago-based Fifth House Ensemble, OSU string and woodwind students enrolled in chamber music learned how to utilize digital audio workstations to create recordings, as well as to facilitate rehearsing virtually via Zoom. Members of the Fifth House Ensemble met with the students during their virtual residency in a series of masterclasses and workshops, training them in virtual rehearsal techniques, as well as advising how to promote greater connection between performers and audiences in the presentation of contemporary music.

**Sponsor:** Greenwood School of Music  
**PI/PDs:** Meredith Blecha-Wells, Jacqueline Skara

**Greenwood School of Music DEI (Diversity, Equity and Inclusion) Speaker Series (2020-2021)**
Designed to address issues related to diversity, equity, inclusion within the music field of study and performance, the 2020-2021 DEI Speaker Series provided Greenwood School of Music community
members the opportunity to learn from local and national leaders in this field. Speakers included: Michael Yaffe, Rachel Glodo, Mateen Milan (Yale School of Music): Declaration on Equity in Music for City Students; Irissa Baxter, OSU Coordinator of Women’s and LGBTQ Affairs: Music is Diversity—Creating Harmony in the Classroom; Staff from OSU 1is2Many: Consent. Support. Intervene; Jerod Tate: Chickasaw classical composer and pianist; Stanford Thompson, Play on Philly: Cultural Equity; Tami Lee Hughes, The Legacy Show: Classical Music Meets Soul Food: Africlassical Music in Today’s World.

Sponsor: Greenwood School of Music
PI/PD: Laura Talbott-Clark

Greenwood School of Music Mental Health Initiative: Managing Emotions Group Therapy
Through a collaboration with the OSU Psychology Department, this initiative provided a group therapy opportunity for music students, funded by the Greenwood School of Music and led by OSU counseling graduate students. The hope is to expand services each semester, offering more groups, as well as “drop-in” or “by appointment” on-site counseling services, in coordination with the PSC.

Sponsor: Greenwood School of Music
PI/PDs: Nataša Kaurin-Karača, Laura Talbott-Clark
Psychology: Lucia Ciciolla, Stephanie Sweatt, PSC graduate students

OK Violin Symposium
A collaboration between OU and OCU violin faculty, the OKVS is a two-day violin pedagogy workshop for pre-college and collegiate violinists; this includes a continuing education component for public school and private music teachers. The guest clinician was Mimi Zweig, Professor of Violin and Director of Indiana University’s String Academy, Jacobs School of Music, IU.

Sponsor: External funding sources
PI/PD: Laura Talbott-Clark

OSU String Seminar Series
Taking advantage of the benefits of virtual education, the String Seminar Series connected OSU string students with educators and performers from across the country. Weekly events featured the following speakers: Rachel Barton Pine, Noa Kageyama (The Bulletproof Musician), Gregg Goodheart (The Learning Coach), Judy Palac, Minna Chung, Cliff Colnot, Diana Gannett, Hal Grossman, Erin Ellis, Julie Lyon Lieberman, and Sid King.

Sponsor: Greenwood School of Music
PI/PDs: Meredith Blecha-Wells, Jacqueline Skara

Women Composers of the Federal Music Project: The Intersection of Music, and Gender and Reception
Through an examination of the archives associated with the New York Composer’s Forum associated with the Federal Music Project, I hope to uncover unpublished scores by women composers whose work has been neglected by historians and performers.

Sponsor: Oklahoma Humanities Scholar Research Grant 2021
PI/PD: Laura Talbott-Clark

Women Composers of the Federal Music Project: The Intersection of Music, and Gender and Reception
As a result of research about the New York Composer’s Forum associated with the Federal Music Project, I have obtained and edited eleven previously unpublished scores by Mary Howe (1882-1964).
OSU colleagues Dr. Meredith Blecha-Wells, Pi-Ju Chiang, Dr. Erin Murphy, Dr. Jackie Skara, and Dr. April Golliver-Mohiuddin, and I will record a CD featuring these works, to be released in summer 2022.

**Sponsor:** ASR Seed Grant Program 2020, College of Arts and Sciences, OSU

**PI/PD:** Laura Talbott-Clark

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**PLANT BIOLOGY, ECOLOGY, AND EVOLUTION**

**STEM persistence through flexible authentic research opportunities**

Life-science departments seek to increase persistence among majors by transforming introductory science courses into authentic research experiences. In these introductory courses students will design and conduct original research and present their findings in written and oral form. OSU freshman interested in research will be invited to participate in the Life Sciences Freshman Research Scholars program during which they will complete a research course and conduct research with faculty mentors. To encourage students to join the OSU research community, we will host networking events for life-science majors, along with events uniquely designed to encourage the participation of Native American life-sciences students.

**Sponsor:** Howard Hughes Medical Institute Science Education Program

**PI/PDs:** Donald French (OSU Integrative Biology)

John Gelder (OSU Chemistry)

John Gustafson (OSU Biochemistry & Molecular Biology)

Wouter Hoff (OSU Microbiology & Molecular Genetics)

Andrew Doust (OSU Plant Biology, Ecology, & Evolution)

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**IUSE: Transitioning Students to Teacher-Researchers (TSTR)**

This proposal is to develop a model to improve STEM learning and learning environments for undergraduate science majors who are preservice science teachers (PSTs) by providing multiple authentic research experiences prior to entering the teaching profession.

**Sponsor:** NSF

**PI/PDs:** College of Education: Julie Angle

A&S: Andrew Doust, Donald French

Engineering: Carissa Ramming

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**Genetic comparisons of Abscission Zones in Grasses II**

This proposal examines the genetic regulation of spatial and temporal variation in abscission zone formation and its underlying mechanisms across grasses. It incorporates genetic analyses and RNA-seq approaches to understand how a central core regulation system for abscission has evolved across grasses.

**Sponsor:** NSF

**PI/PDs:** Andrew Doust

College of Education: Julie Angle

Donald Danforth Plant Sciences Center, St. Louis, MO: Elizabeth Kellogg

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**Dissecting the effect of photoperiod on branching, height, and flowering time in locally adapted populations of the C4 model grass, Setaria viridis**

We are using *Setaria viridis* to understand photoperiod responses, by dissecting the relationships between branching, elongation, and flowering in plants from populations that are locally adapted to different latitudes. We will assess phenotypic diversity in multiple accessions along a north-south latitudinal gradient, investigate transcriptomic control of flowering in selected accessions in 12 and 16
hour photoperiod regimes, and assess phenotypic and bud and internode transcriptomic differences in common garden experiments at 12 and 16 hour photoperiods. These integrated datasets will allow us to correlate bud, stem, and lifecycle behavior, to understand plant response to differing environments.  
**Sponsor:** Oklahoma Center for the Advancement of Science and Technology (OCAST)  
**PI/PD:** Andrew Doust

**Can Hundreds of Unlinked Loci Really Resolve Recent, Rapid Radiations of Plant Species?**  
This research will demonstrate how to solve difficult phylogenetic problems at the species level in plants by employing improvements in next-generation sequencing techniques, and combining methods for targeted sequencing of hundreds of specific regions of the nuclear genome applied to unusually large within-species sampling. The project applies nuclear gene probes to target 768 genes and substantial amounts of their non-coding flanking regions. Undergraduate and graduate student training in genomics, bioinformatics, and phylogenetics will target participants from underrepresented groups. Project outcomes will be extended through workshops held at scientific meetings, K-12 education modules, and demonstration exhibits at a public botanic garden.  
**Sponsor:** National Science Foundation  
**PI/PDs:** Mark Fishbein  
William and Hobart Smith Colleges: Shannon Straub

**American Crossroads: Digitizing the Vascular Flora of the South-Central United States**  
This project brings together 46 collaborating herbaria to mobilize the data from nearly two million plant specimens collected in the states of Oklahoma and Texas. Because these two states constitute a major crossroads of North American ecological and plant diversity, digitizing their plant specimen data can serve as a key element for understanding ecosystem evolution across the North American continent. The project will include data for species of conservation concern, invasives, and environmental health indicators, thus enhancing species and habitat conservation and management. It will involve as participants members of plant enthusiast organizations (such as native plant societies) in specimen data entry. The project will contribute to a globally competitive STEM workforce through workshops and lectures for its technicians and practical training for undergraduate interns.  
**Sponsor:** National Science Foundation  
**PI/PDs:** Mark Fishbein  
Botanical Research Institute of Texas: Peter Fritsch  
University of Texas at Austin: George Yatskievych  
University of Oklahoma: Abigail Moore, Bruce Hoagland  
Texas A&M University: Daniel Spalink

**A new leucine-rich repeat receptor-like kinase in stomatal lineage regulation**  
Leucine-rich repeat receptor-like kinases (LRR-RKs) play critical roles in plant development, including cell proliferation and cell fate determination processes. This investigation aims to characterize the function of a newly identified Arabidopsis LRR-RK in stomatal lineage formation in the epidermis, its expression pattern, and its effect on organ size. Experimental approaches include genetic and protein-protein interaction studies. Completion of this investigation may significantly advance the understanding of the molecular mechanism regulating stomatal lineage formation. Results from this investigation may also add valuable pieces to the genetic engineering toolbox for creating crops with stomatal densities optimized for water-limiting growth conditions.  
**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PD:** Ming Yang
Theoretical Research in Neutrino Physics
The Deep Underground Neutrino Experiment (DUNE), being constructed at Fermilab and in South Dakota, will search for new phenomena in neutrino oscillations. Babu is involved in theoretical research directly relevant for DUNE which is supported by a collaborative grant involving Dr. B. Dev of Washington University. Issues that are studied include non-standard neutrino interactions, sources of neutrino mass and CP violation, and energy dependence of neutrino oscillation parameters. This research program involves collaborative exchanges between OSU, Washington University and Fermi National Accelerator Lab. Under this program, Ph.D. student P.K., Vishnu and Babu carried out collaborative research with Washington University in St. Louis and Fermi National Accelerator Laboratory.

Sponsors: Department of Energy and Fermi National Accelerator Laboratory  
PI/PD: Kaladi Babu

Enhanced Active Tissue Equivalent Dosimeter (eATED) for Space Crew Dosimetry.
The enhanced Active Tissue Equivalent Dosimeter (eATED) is a compact, low cost tissue equivalent proportional counter for use aboard spacecraft such as the International Space Station (ISS) and Lunar Gateway. A demonstration experiment of eATED is scheduled for flight on the ISS in 2023-24. eATED possesses the capability of discriminating the signal due to secondary neutrons from that due to charged particles, a feature not present on the previous ATED that flew aboard ISS in 2018. eATED also makes use of a redesigned ionization cavity that is able to better maintain electronic equilibrium within the ionization cavity and to minimize the susceptibility of the detector to microphonic noise induced by external vibration. eATED is being developed by graduate student Tristen Lee.

Sponsor: NASA EPSCoR  
PI/PD: Eric Benton

A suite of active radiation dosimeters are being developed for use in suborbital space flight dosimeter and will be flown aboard a Blue Origin New Shepard flight in 2022-23. Detectors under development include the Atmospheric Ionizing Radiation Tissue Equivalent Dosimeter (AirTED), a tissue equivalent proportional counter specifically designed by our laboratory for use aboard aircraft, suborbital spacecraft, unmanned aerial vehicles and high altitude balloons, a number of compact Si PIN diode-based radiation spectrometers including the Liulin produced by the Solar Terrestrial Laboratory: Bulgarian Academy of Sciences, and the HeradoAIR, a personnel dosimeter specially designed for use by pilots, flight attendants and passengers.

Sponsors: NASA EPSCoR, Herado, Solar Terrestrial Laboratory: Bulgarian Academy of Sciences  
PI/PD: Eric Benton

OSU Provided, SET Produced Radiation Detector (OPSRAD).
OPSRAD is a low-cost, compact, battery powered dosimeter based on a pair of Si PIN photodiode detectors that are sensitive to both the electromagnetic and neutron radiation encountered during flight. OPSRAD is meant for permanent installation on high altitude balloons and UAVs, as well as aboard commercial, military and business jets. OPSRAD is being developed by undergraduate researchers Conner Heffernan, Ryan Boyce and Garrett Thornton, together with Benton and graduate student, Tristen Lee.

Sponsors: Space Environment Technologies, LLC, NASA, Niblack Research Scholarship  
PI/PD: Eric Benton
**Low cost ground-based cosmic ray neutron monitors.**
The design of ground-based neutron detectors for use in monitoring space weather has not developed significantly over the past fifty years. A new form of neutron-sensitive Boron and computer model simulations are being used to develop a new, low-cost neutron monitor that will also find application in monitoring soil moisture for agricultural purposes. This research is being carried out by Benton and graduate students Martin Yang and Tristen Lee.

**Sponsor:** OSU Radiation Physics Education and Research Fund  
**PI/PD:** Eric Benton

**Atmospheric Ionizing Radiation Environment Code (AIREC).**  
AIREC is the first compact and easy-to-run computer model able to estimate particle energy flux spectra of primary and secondary GCR in the atmosphere as functions of altitude, geomagnetic location (geographic coordinates) and time (solar epoch). AIREC was developed by Benton and his graduate student, Paul Inman, in collaboration with Dr. Kyle Copeland of the FAA’s Civil Aerospace Medical Institute.

**Sponsors:** OSU Radiation Physics Education and Research Fund, FAA CAMI  
**PI/PD:** Eric Benton

**Computer simulations of electronic stopping power**  
Our research studies the physics of photovoltaic cells. We are interested in mixed-cation based perovskite solar cells which are recently discovered materials with the highest power conversion efficiency (conversion of solar to electrical energy) as thin films. In particular, we want to understand the challenges of using photovoltaic cells in space environments. Ongoing work involves calculating the effects of ion irradiation on the photovoltaic materials and how much energy is deposited by ions into the material, the electronic stopping power.

**Sponsor:** NASA EPSCoR  
**PI/PD:** Mario F. Borunda

**New Physics Searches with the Higgs Boson**  
This research program uses the Higgs boson as a precision handle to search for new physics. We look for possible new sources of CP-violation, probe the Higgs boson properties across different energy scales, apply machine learning techniques to access the Higgs potential, and extend the complementarity program between Large Hadron Collider (LHC) and gravitational wave experiments. This study is carried out by Co-PI Dorival Gonçalves under the umbrella grant “Theoretical and Experimental Research in Weak, Electromagnetic and Strong Interactions”, and involves the PhD students Ajay Kaladharan, Alberto Navarro, and Roshan Mammen Abraham.

**Sponsor:** Department of Energy  
**PI/PD:** Dorival Gonçalves
Searches for new physics with the ATLAS detector and R&D for the ATLAS ITk pixel upgrade
This research uses the ATLAS detector at the CERN Large Hadron Collider to search for vector-like quarks, hypothetical particles predicted by many proposed extensions to the Standard Model. Vector-like quarks, as well as many other possible new particles, are expected to decay to heavy bosons and top quarks that will result in high energy jets in the detector. This research also involves the optimization and calibration of techniques to distinguish high energy jets originating from boosted bosons and top quarks from the enormous background of high energy jets caused by quarks and gluons. Research efforts also include in designing, simulating, and testing parts of the powering and readout system for the ITk pixel upgrade to the ATLAS detector for the high-luminosity Large Hadron Collider.

Sponsor: Department of Energy
PI/PD: Joseph Haley

Timing for Physics Beyond the Standard Model at the Fermilab Short-Baseline Neutrino Program
The application of the nanosecond timing resolution of the Short-Baseline Neutrino program detectors at Fermilab to search for new physics will be investigated. The PI and a graduate student will visit Fermilab to collaborate on studies of timing to discriminate dark matter nuclear scattering from neutrino-induced backgrounds. The project will build long-term connections between Oklahoma State and Fermilab, allowing OSU researchers to contribute to searches for additional forces and interactions at the Short-Baseline Neutrino program and Deep Underground Neutrino Experiment slated to run at Fermilab through the 2030s.

Sponsor: National Science Foundation EPSCoR
PI/PD: Ahmed Ismail

Study of b-quark Identification Performance for Upgraded ATLAS Detector
ATLAS is one of the two major experiments at the Large Hadron Collider (LHC) located in Geneva, Switzerland, aimed at studies of basic constituents of matter and their interactions. By 2025, the LHC experiments will undergo major upgrade that will allow them to operate at a 10 times larger intensity. The new conditions pose a challenge on various aspects of detector operation, including its ability to identify signals due to specific type of particles (b-quarks). The research aims at study and optimization of b-quark identification performance for the upgraded ATLAS detector.

Sponsor: Department of Energy
PI/PD: Alexander Khanov

Novel quantum phase transitions and non-equilibrium dynamics in lattice-confined spinor condensates
This project is targeted towards applying ultracold sodium spinor gases to study the interplay and important applications of superfluidity, strong correlations, and quantum magnetism.

Sponsor: National Science Foundation
PI/PD: Yingmei Liu

Surface Plasmon Polariton Pumped Explosives Sensors
Surface plasmon polaritons will be used to excite electrons in the conduction band of a semiconductor into metastable excited states. It is proposed that these metastable excited states will de-excite upon the adsorption of ammonium nitrate on the surface of the semiconductor. The de-excitation will produce a measurable electrical response. The process and corresponding response will allow for the construction of highly sensitive and refreshable sensors.

Sponsor: Office of Naval Research
PI/PD: David McIlroy
**Particle Physics Beyond the Standard Model**

Theoretical investigations into new physics beyond the Standard Model of elementary particles is being carried out with an emphasis on possible discovery of new particles and interactions at the Large Hadron Collider and at neutrino facilities. New models that address some of the shortcomings of the Standard Model are proposed and their experimental tests outlined. Topics studied include energy-dependent neutrino oscillation parameters, dark matter, non-standard neutrino interactions, Higgs boson properties and grand unification. This research is carried out by Co-PI Babu under the umbrella grant "Theoretical and Experimental Research in Weak, Electromagnetic and Strong Interactions", and involves his PhD students P.K. Vishnu, Ritu Dcruz and Shiyuan Xu.

**Sponsor:** Department of Energy  
**PI/PDs:** Flera Rizatdinova, Kaladi Babu

**Theoretical & Experimental Research in Weak, Electromagnetic, & Strong Interactions**

Rizatdinova is working on the ATLAS experiment at the Large Hadron Collider. Her research includes searches for new particles and precise measurements in the top quark sector. Together with her graduate students and postdocs she is searching for the process where a hypothetical heavy scalar particle X is produced through gluon fusion (similar to the SM Higgs boson) and decays into a pair of scalars, the SM Higgs boson H and another Higgs-like scalar particle S. Rizatdinova and her students lead a measurement of top quark pair production in association with b- and c-quarks production using full Run 2+3 data set (300 fb$^{-1}$). As a service work for the experiment, Rizatdinova works on type-0 services for the ATLAS upgraded Inner Tracker pixel detector.

**Sponsors:** DOE, College of Arts and Sciences  
**PI/PD:** Flera Rizatdinova

**Type-0 services for the ITK pixel detector upgrade**

Rizatdinova is heavily involved in ATLAS tracker upgrade hardware development together with OSU engineers Welch, Beauchamp and Turgut. The scope of work for Type-0 services in this year includes production and testing of the prototypes of flex cables connecting sensors to the rest of the readout system and to the rest of the powering system. Test stands have been set up in the Rizatdinova’s lab, and first tests of the triplet data flexes have been done. After the completion of these tasks, the team will start to work on the design of the new flexible cables that will be compatible with the newly designed readout chip ITkPIX.

**Sponsors:** DOE, BNL  
**PI/PD:** Flera Rizatdinova

**Modification, production and installation of the opto-boxes**

Rizatdinova and her team provide support to the current ATLAS pixel detector. Her group is funded to install new optoboxes into the ATLAS detector and to work on the pixel detector control system. Oklahoma State U. group will develop monitoring of the optoboxes, which automatically adjusts humidity inside them remotely. Test stand developed at Oklahoma State U will be used to measure the expected lifetime of optoboard at various humidity levels. Oklahoma State U group will continue to work on DCS monitoring and diagnostics and on verification of the modified alarm system.

**Sponsors:** DOE, BNL  
**PI/PD:** Flera Rizatdinova

**RII Track 4: Non-Reciprocal Spin-Wave Engineering in Chiral Magnets**

Recent developments in chiral and magnetic meta-materials that facilitate asymmetric spin-wave propagation are promising for creating microwave circulators and diodes based on spin waves. These
spin waves are highly configurable because the magnetic interactions in chiral magnets and asymmetric magnetic multilayers can be tailored, and these materials are highly sensitive to external magnetic fields and laser pulses for further manipulation. The demonstration of such configurable, power-efficient, and versatile microwave components will pave the way towards new high-frequency communication devices, which can be used in various applications, including entertainment, security, and remote patient treatment.

Sponsor: National Science Foundation
PI/PD: Emrah Turgut

MRI: Acquisition of a Wideband Continuous-Wave Characterization Platform
The proposed instrument will enable innovative research in material science, communications, imaging, and electronics. The physics of high-frequency quasiparticle dynamics in chiral and anti-ferromagnetic materials, and resonance spin-wave spectroscopy will be elucidated, advancing the fundamental understanding of quantum materials and leading to faster and more power-efficient computing architectures.

Sponsor: National Science Foundation
PIs/PDs: Emrah Turgut
Electrical and Computer Engineering: John O’hara, Sabit Ekin, Weili Zhang, Wooyeol Choi

Continuous-Wave Terahertz System for Integrated Time- and Frequency-Domain Measurements
The laser-based characterization instrument will enable studies on resonance spin-waves and the fundamental understanding of quantum materials around a few THz frequency region of the electromagnetic spectrum.

Sponsor: Air Force Office of Scientific Research
PIs/PDs: Emrah Turgut
Electrical and Computer Engineering: John O’hara, Sabit Ekin

POLITICAL SCIENCE

Socially-Sustainable Solutions for Water, Carbon, and Infrastructure Resilience in Oklahoma
Science-based solutions for complex (wicked) problems at the intersection of land use, water availability, and infrastructure in Oklahoma will be developed and tested. The science-based assessments will be coupled with feedback from Oklahoma citizens and systematic engagement with opinion leaders to develop sustainable solutions to emerging problems facing Oklahomans. The novelty of the project lies in both its design and vision: a social science-led, multi-disciplinary collaboration among social, physical, biological, engineering, and computational scientists from institutions across the state that incorporates the perspectives of competing social narratives. This approach creates a science-based understanding of solutions for critical problems.

Sponsor: National Science Foundation
PI/PDs: Kristin Olofsson
Sociology: Michael Long
Ferguson College of Agriculture: Dayton Lambert
University of Oklahoma: Hank Jenkins-Smith, Carol Silva, Joe Ripberger, Kuhika Gupta
University of Tulsa: Warigia Bowman
Langston University: Charles Spurlock
Oka’ Institute, East Central University: Susan Paddack
Building Resilience in Rural Communities

Rural issues will be explored in two ways. First, a large dataset will be created that tracks multiple community-level indicators of community well being, such as health, economics, education, and access to natural resources, among others. This data will be gathered for all 77 counties in Oklahoma over 10-20 years and analyzed for trends and patterns that might shed light on the plight of rural Oklahoma. These data will be triangulated in qualitative research in two communities in southwestern Oklahoma, as the researchers work with the rural communities to identify pressing issues and collaboratively develop solutions.

**Sponsor:** VPR Office
**PI/PDs:** Kristin Olofsson
Sociology: Jared Fitzgerald Berry

The U.S. Mayors Survey: Psychological Abuse and Physical Violence – The Longitudinal Perspective

This is a collaboration between academics and nonprofit mayor’s organizations to explore psychological and physical violence against US mayors in cities over 10,000 through the use of a mixed mode survey. The primary questions concern gender and race differences in the frequency of violence and the content of the violence. Burgeoning research suggests that violence against mayors is quite common and that women mayors may experience more than men. This is the second in what is hoped to be a series of studies to explore the problem and help mayor minimize the impact, though both academic research and wider distribution of the findings.

**Sponsor:** Center for American Women in Politics, Rutgers University
**PI/PDs:** Rebekah Herrick
Sue Thomas, Pacific Institute for Research and Evaluation
Heidi L. Gerbracht, Founder, Equity Agenda
Ceri Jenkins, COWS, University of Wisconsin Madison

PSYCHOLOGY

SaTC: EDU: Collaborative: Personalized Cybersecurity Education and Training

The project is a three-year collaborative research grant that aims to improve cybersecurity education by developing personalized messages for users, which are based on personality traits.

**Sponsor:** NSF
**PI/PDs:** Shelia M. Kennison
Loyola University of Chicago: D. Eric Chan-Tin

Linguistic Analysis of Woody Guthrie’s Writing before and after the Onset of Huntington’ Disease Symptoms

The research aims to document the linguistic changes occurring in Woody Guthrie’s personal correspondence before and after the onset of his Huntington disease (HD) symptoms.

**Sponsors:** BMI Foundation & Woody Guthrie Archives
**PI/PD:** Shelia M. Kennison

Long term Outcomes of Genitoplasty in Disorders of Sexual Development

A longitudinal 10 year natural history study involving yearly assessment of surgical, medical and psychological outcomes of children born with a DSD and their parents.

**Sponsors:** National Institutes of Health: National Institute of Child Health and Development (NIH - NICHD)
**PI/PDs:** Larry L. Mullins, Amy Wisniewski
American Indians Into Psychology (INPSYCH)
Federal training grant for recruiting and training American Indian PhD students in Clinical Psychology.
**Sponsor:** Indian Health Service (IHS)
**PI/PD:** John Chaney

Psychology Practicum Experience in Integrative Primary Care
This project places a clinical psychology graduate student in the Payne County Health Department to provide supervised integrated community mental health services.
**Sponsor:** Payne County Health Department
**PI/PD:** Tony Wells

Identifying Concealed Suicide Risk via Implicit Cognition
This project investigates the potential for tasks assessing implicit suicide-related cognition to identify suicidal thinking even when it is concealed.
**Sponsor:** Oklahoma Center for the Advancement of Science and Technology (OCAST)
**PI/PD:** Tony Wells

Prospection and Partnership in Everyday Life (PROPEL)
This study examines how middle-aged and older couples help each other remember. It focuses on the roles that individual cognitive ability, beliefs about one’s own and one’s partner’s memory ability, relationship quality, and physiological stress play in the ability to successfully collaborate on cognitive tasks in middle and late life. It also examines how these influences may change if one partner has a change in cognitive status, such as mild cognitive impairment.
**Sponsor:** National Institutes of Health-National Institute on Aging (NIH-NIA)
**PI/PDs:** Celinda Reese-Melancon
Iowa State University: Jennifer Margrett

Parent-adolescent Training on Neurofeedback and Synchrony
This pilot project is part of a Centers of Biomedical Research Excellence grant (P20 GM121312; PI: Martin Paulus). The goal of the pilot is protocol development and feasibility testing of an approach combining real-time fMRI neurofeedback with hyperscanning in parent-adolescent dyads.
**Sponsors:** National Institutes of Health, National Institute of General Medical Sciences (NIH – NIGMS)
**PI/PD:** Kara Kerr

Technological timescales: Identifying the impact of digital media on the mechanisms of word learning
An examination of the mechanisms of digital media on young children’s word learning, language generalization, and vocabulary growth.
**Sponsors:** National Institutes of Health Child Health and Human Development (NIH-NICHD)
**PI/PD:** Sarah Kucker

Cognitive and Self-Regulatory Mechanisms of Obesity Study (COSMOS)
A randomized clinical trial comparing the effects of two behavioral weight loss treatments on cognitive function, physiology, self-regulation, and behavior.
**Sponsors:** National Institutes of Health National Institute of Diabetes and Digestive and Kidney Disease (NIH - NIDDK)
**PI/PD:** Misty Hawkins
SOCIOLOGY

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PI/PDs: Kristin Olofsson
Sociology: Jared Fitzgerald Berry

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PI/PDs: Rebekah Herrick
Sue Thomas, Pacific Institute for Research and Evaluation
Heidi L. Gerbracht, Founder, Equity Agenda
Ceri Jenkins, COWS, University of Wisconsin Madison
Creating Safe Spaces: Sociopolitical Context, Institutional Characteristics, and LGBTQ Student Groups at U.S. Colleges and Universities
This project drew on a comprehensive database of 1,953 four-year, not-for-profit colleges and universities in the United States to identify political conditions and institutional characteristics that were most conducive to the formation of lesbian, gay, bisexual, transgender, and queer student groups.
**Sponsor:** College of Arts and Sciences
**PI/PD:** Jonathan S. Coley

Pathways to Leadership in Pro-LGBTQ Faith Organizations in the United States
This in-depth interview project examined factors that influenced lesbian, gay, bisexual, transgender, and queer people’s decisions to become leaders of places of worship and other faith-based organizations in the United States.
**Sponsor:** Association for the Sociology of Religion
**PI/PDs:** Jonathan S. Coley

Family-Based, Culturally Centered Diabetes Intervention with Ojibwe Communities
This project is a five-year randomized controlled trial (RCT) of a Type 2 Diabetes (T2D) intervention with a sample of Ojibwe families. The intervention has been adapted from a family-based, culturally grounded intervention designed with Southwestern American Indian communities to prevent T2D among youth. The goals of the research are to a) determine the effectiveness of the intervention for Ojibwe adult diagnosed with T2D and their children; b) identify how coping mechanisms influence intervention effects on targeted physical, mental and behavioral health outcomes among participating adults and children; and c) qualitatively determine multidirectional and multilevel processes of change resulting from the ToD intervention.
**Sponsor:** National Institute of Diabetes and Digestive and Kidney Disorders
**PI/PDs:** Kelley Sittner, Johns Hopkins Bloomberg School of Public Health: Melissa Walls

Indigenous Pathways of Substance Use and Mental Health through Early Adulthood
Indigenous youth engage in earlier onset and more frequent substance use than non-Indigenous youth, but determinants and patterns of Indigenous substance use and mental health problems over time are not clear, particularly as youth transition to adulthood. The overall goal of this 5-year study is to identify trajectories and predictors of alcohol and substance use, psychiatric problems, and recovery and wellbeing among Indigenous young adults.
**Sponsor:** National Institute of Drug Abuse
**PI/PDs:** Kelley Sittner, Johns Hopkins Bloomberg School of Public Health: Melissa Walls

Building Resilience in Rural Communities
Rural communities are increasingly vulnerable in many different ways. In Oklahoma, USA, 33.7% of the population resides in a rural area; it is imperative to understand the nature of the problems facing rural Oklahomans. Access to health care has become difficult due to the closure of rural hospitals and a lack of access to other medical providers. Opportunities for employment are often limited in rural areas owing to a lack of industry, and traditional family-farms have become more vulnerable to being overrun by large factory-farming operations. Poverty rates for rural Oklahomans are higher than urban areas: 18% of rural residents live below the poverty line compared with 14% of urban residents. Additionally, limited access to services such as broadband internet further isolate people living in rural communities.
and create unequal access to opportunities in education, employment, and other important services. These disparities and others interact to create substantial inequities between urban and rural residents. Sustainability thinking may provide a path for revitalization in rural communities. This research explores the relationship between sustainability and rural resilience by developing a model for sustainability based on the UN Sustainable Development Goals (SDG) and applied in Oklahoma, USA. Previous work on sustainability has largely focused on national-level approaches or urban areas. The model used here builds on existing work in sustainability while advancing methods recognizing that rural communities are complex systems that simultaneously work across several different domains and across scale. In addition, the model highlights the importance of rural communities in sustainability thinking as coupled human-natural systems. The project explores the viability of SDG indicators, data availability, data quality, and outcomes in an unconventional setting: rural America. Critical evaluation of SDG conceptualization and indicators in a variety of settings contributes to the development of better models and measuring, while giving voice to rural communities.

**Sponsor:** Rural Renewal Initiative

**PI/PDs:** Jared Fitzgerald

Political Science: Kristin Olofsson
College of Engineering, Architecture, & Technology

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FY2021 Research Abstracts
ARCHITECTURE

Transitioning Students to Teacher-Researchers (TSTR)
The project’s premise is that by learning the nature of science through authentic research experiences, preservice science teachers (PSTs) will strengthen their science literacy skills and be better equipped to engage their future students in science and engineering practices. This project will provide PSTs with multiple opportunities to conduct scientific research during their science methods courses. These new or modified science methods courses will be designed to enhance PSTs’ skills in conducting research and teaching others to conduct scientific research. The PSTs will receive extensive mentoring from faculty and graduate students from multiple science and engineering disciplines across the university.
Sponsor: National Science Foundation
PI/PDs: Carissa Ramming
Education: Julie Angle
College of Arts & Sciences: Andrew Doust, Donald French

CENTER FOR LOCAL GOVERNMENT TECHNOLOGY (CLGT)

Implementing Safe Work Zone Operations Strategies
Oklahoma State University’s Center for Local Government Technology will provide 210 courses including worker courses, management courses and instructor courses over 3 fiscal years to improve operational understanding and planning for flagged, mobile, short duration and short term operations for public, tribal, private and educational sector employees including utilities (public and private), emergency response, towing and insurance personnel.
Sponsor: United States Department of Transportation – Federal Highway Administration
PI/PD: Gary Snyder

Local Technical Assistance Program
Since its inception in 1982, Oklahoma LTAP’s mission has been to provide training, technology transfer and technical assistance to local government agencies responsible for transportation systems. The Center is one of four original LTAP centers in the nation. Oklahoma LTAP addresses four focus areas: Safety, Infrastructure, Innovation, and Accountability. LTAP offers Road Scholar and Core Courses to meet its clients’ needs, covering a wide array of topics such as aggregate road maintenance, testing for soil properties, CDL training, and many others. LTAP also provides a Transportation Intern Program that places student interns with local government agencies in paid summer internships.
Sponsor: Oklahoma Department of Transportation for Federal Highway Administration
PI/PD: Gary Snyder

The Assessor Training and Assistance Program and the County Computer Assistance Program
These programs, authorized by state statute, provide for the Assessor Accreditation Program, training for county Board of Equalization members, and County Computer support and training. CLGT will execute the programs by providing computer software programs, support of software and hardware including installation, maintenance, data management and training, to counties currently using the services previously provided by the State Auditor and Inspector as mandated by legislation. CLGT will also maintain official records for the accreditation program and provide the Oklahoma Tax Commission with pass/fail results so they can issue accreditations to all persons who qualify.
Sponsor: Oklahoma Tax Commission
PI/PDs: Gary Snyder, Scott Warren
CHEMICAL ENGINEERING

Electrochemical Energy Storage
Through this Research Services Agreement, CIC energiGUNE will provide hard carbon materials for Na-ion batteries to OSU for research that is of mutual interest to the sponsor and the university. The material is suitable for Dr. Çapraz’s ongoing work on alkali-ion battery electrodes. The CIC team will benefit from Dr. Çapraz’s preliminary measurements.

Sponsor: CIC Energigune
PI/PD: Ömer Özgür Çapraz

RII Track 1: Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience of Oklahoma – Science-Based Clumsy Solutions for Wicked Problems in Oklahoma
The unifying research question is whether science-based assessment, coupled with systematic and iterative engagement with Oklahoma opinion leaders and input/feedback from members of the Oklahoma public, can result in development of socially sustainable solutions. The project will employ a framework informed by theories of public policy learning to invest in science at the intersections of four key focus areas that are important to Oklahoma: changing subseasonal to seasonal weather patterns, variable and marginal quality water supplies, shifting terrestrial water and carbon dynamics, and sustainable water and energy infrastructure.

Sponsor: National Science Foundation
PI/PDs: Prem Bikkina, Clint Aichele
Civil and Environmental Engineering: Mark Krzmarzick, Rifat Bulut
Arts & Sciences: Babu Fathepure, Yuting Zhou, Michael Long, Kristin Olofsson
DASNR: Kevin Wagner, Rodney Will, Dayton Lambert, Chris Zou, Gail Wilson
OU: Hank C. Jenkins-Smith, Carol L. Silva

Reinforced Recycled Polymer Composites
The technical approach is to mold recycled carpet as a reinforcement with recycled polymer resins from bottling operations to make novel materials. The deliverable materials will include compression and extrusion molded structures for construction applications, reparable pallets as replacements for wood pallets used for automated supply chain management. The pallets will have significant advantages over wood pallets, especially in food and beverage-related facilities.

Sponsor: Sustainable Manufacturing Innovation Alliance Corp. dba REMADE Institute
PI/PDs: J.L. White
Materials Science and Engineering: Ranji Vaidyanathan, Raman Singh

Flow Control Strategies for Protection of Aircraft Passengers and Workers Against SARS-CoV-2
The team proposes to develop modular, low-cost active flow control (AFC) devices that can be retrofitted on existing aircraft seats for controlling airborne transmission of virus-containing aerosols. Using synthetic jet actuators that generate pulsed air jets, commercially-available axial fans and passive 3D printed nozzles, the concept relies on suction-based trapping of aerosols and redirection to exhaust slots near the floor. The proposed AFC device is intended to function within a hierarchy of controls, such that it can be used in conjunction with traditional measures and also incorporate emerging solutions for potential inactivation using ultraviolet light units.

Sponsor: Centers for Disease Control and Prevention
PI/PDs: Yu Feng
Mechanical and Aerospace Engineering: Arvind Santhanakrishnan, Jamey Jacob
**In Situ Characterization of Interfacial Instabilities in All-Solid-State Li-S Batteries**
Solid polymer electrolyte can mitigate undesired polysulfide shuttle effect and improve thermal stability of the batteries. However, solid-solid interactions at the electrode/electrolyte interfaces and large volumetric changes in sulfur and silicon electrodes during battery operations are major factors leading to low capacity retention. These factors also prevent discharging batteries at faster rates. This project proposes utilizing self-healing polymer networks in order to mitigate mechanical instabilities, which will lead to improved lifetime and faster discharge rates required for electrical propellers.

**Sponsor:** Skydweller US Inc. for U.S. Air Force  
**PI/PD:** Ömer Özgür Çapraz

**Predicting Health Endpoints of Inhaled Nicotine/THC-Containing Aerosols in Human and Rat Respiratory Tracts to Optimize the Therapeutic Effects using CFPD-PBTK Models**
Mathematical modeling and computational analysis will result in these deliverables: (1) Virtual diffusion denuder and virtual VitroCell® for studying the fundamental condensation/evaporation of multi-component droplets with different compositions; (2) CFPD-PBTK modeling frameworks of human and rat respiratory systems with instruction manuals; (3) Simulation results of the transport, deposition/absorption, and translocation of nicotine/THC-containing aerosols in human and rat respiratory systems associated with different gas/particle partition inlet conditions; (4) Parametric analysis concerning key parameters influencing deposition/absorption/translocation patterns; (5) Pulmonary targeted nicotine/THC delivery plan by modulating nicotine/THC-containing liquid formulation, puffing pattern, and mouthpiece design of the drug delivery device in vaping system shape.

**Sponsor:** Spectrum Dynamics Research  
**PI/PD:** Yu Feng

**SECARB Offshore Supplemental Funding**
This is a feasibility study on SECARB project-related geophysical, petrophysical, production, and infrastructure data interpretation and visualization using SAS Viya platform for ranking the reservoirs in terms their suitability for CCS and CO2 EOR.

**Sponsor:** Southern States Energy Board for Department of Energy  
**PI/PD:** Prem Bikkina

**Solar-Energy-Combined Desalination Systems**
One graduate student in the Chemical Engineering Program will be the Project Lead. Three graduate students in the Civil & Environmental Engineering Program, the Physics Program, and the Sociology Program will be the Project Members. The student team will construct a solar evaporation and membrane process device. A successful demonstration has the potential to increase water supplies and reduce operational costs, energy consumption, and environmental impacts of wastewater management.

**Sponsor:** United States Environmental Protection Agency  
**PI/PDs:** Seok-Jhin Kim, Clint Aichele  
**Arts & Sciences:** David McIlroy

**Mitigating infection risks to airborne SARS-CoV-2 laden aerosols in a patient room via portable air sanitizers and smart ventilation control**
The goal is to numerically determine the optimal mitigation strategies using a portable air sanitizer to reduce the exposure risks for healthcare providers when closely interacting with COVID-19 patients in the patient room. To achieve the research goal, the team will employ an experimental validated computational fluid-particle dynamics (CFPD) model to predict the generation, transport, filtration,
suspension, and deposition in a realistic patient virtual room, associated with different ventilation conditions of the room and operational conditions of the sanitizer.

**Sponsor:** Southwest Center for Occupational and Environmental Health  
**PI/PDs:** Yu Feng, Jianan Zhao

**Collaborative Research: Selective Flow through Membrane Pores with in situ Change of Wettability**  
The need for membranes or meshes which can allow certain liquids to flow while others do not is high for biomedical and liquid-liquid separations. This function can be achieved by modifying physical (pore sizes, nanoparticles) or chemical (surface coating) characteristics of the membrane materials. These are usually set when prepared or manufactured, unable to change the functionality in situ. Through this project, the team plans to develop membranes for oil-water separation with the selectivity that can be changed in situ utilizing electrowetting provided by surface molecules on the membrane materials.

**Sponsor:** National Science Foundation  
**PI/PD:** Seok-Jhin Kim

**Screening Reservoirs in Oklahoma and Beyond for Enhanced Oil & Gas Recovery Using Novel Nitrogen-Assisted Nanofluid Systems**  
From the preliminary study conducted, it has been evident that the crude oil composition which changes from a reservoir to reservoir, composition of connate water which can also vary in a wide range, surface chemistry of the rock, and the rock-oil/gas-brine interactions dictate the percentage of recoverable oil using nanofluids, for which Nitro-Lift Technologies LLC, of Tishomingo, Oklahoma, is the master distributor in lower 48 states of USA. The objective of this proposal is to scientifically screen reservoirs in and beyond Oklahoma for cost-effective enhanced oil and gas recovery using the nanofluids.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Prem Bikkina, Clint Aichele

**I-Corps Ceramic Membrane Systems for Produced Water Treatment**  
The team developed ceramic membranes that can purify Produced Water (PW) by providing 99.5% salt rejection and total organic carbon (TOC) below 50 ppm, making it suitable for many applications. Through experimental results and industry surveys, the team estimated that cleaning water with the membrane technology would be 60-80% cheaper than what is being spent in industry for the treatment of PW. During the national NSF I-Corps national program, the team plans to perform ~100 customer discovery interviews to understand the requirements of industry better and then use that information to further improve its technology.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PD:** Seok-Jhin Kim
Collaborative Research: Protein Engineering and Processing of Plant Viral Templates for Controlled Nanoparticle Synthesis
This project develops Barley stripe mosaic virus (BSMV) as a novel biotemplate for nanoparticle synthesis. This work will elucidate structural details about how BSMV capsid proteins self-assemble and provide insight into the organic-inorganic interactions involved in metal deposition on biotemplates. Design rules will be established that determine BSMV Virus-Like Particle length scales. The role of specific amino acids in metal mineralization will be interrogated to understand mechanisms of nanoparticle-templating. Residues in the Caspar carboxylate cluster will be identified that are critical for viral assembly to strengthen capsid protein interactions and stabilize the template for nanoparticle synthesis under broader processing regimes.
Sponsor: National Science Foundation
PI/PDs: Shohreh Hemmati
Purdue University: Kevin Solomon, Michael T. Harris, L. Sue Loesch-Fries

Characterization of Catalytic Materials by Advanced NMR Methods
The purpose is to design new and assess existing high-field magnetic resonance methods for non-destructive evaluations of heterogeneous solid-acid or solid-base catalysts. In addition, post-synthetic modifications of catalysts, e.g., temperature, moisture, and cation exchange, will be used to elucidate catalyst structure-function relationships. Catalytically-relevant probe molecules will also be identified for in-situ studies of reactivity, selectivity, and deactivation. The overall experimental protocol will include those previously published by the PI. Actual materials for research will be identified in collaboration with Phillips 66 researchers.
Sponsor: Phillips 66 Company
PI/PD: J.L. White

Elucidating the Link Between Alkali Metal Ions and Reaction-Transport Mechanisms in Cathode Electrodes for Alkali-ion Batteries
The objective is to identify the intrinsic relationship between the role of alkali metal-ions, and electrochemically-driven mechanical stability and kinetic properties of battery materials. The hypothesis is that intercalation of larger alkali metal-ions (Na and K) inevitably alters the coupled transport-reaction processes during battery operation in organic electrolytes, leading to more intensive chemo-mechanical instabilities in cathode electrodes, resulting in rapid capacity fade. To validate the hypothesis, the team will experimentally characterize the reaction-transport processes and governing forces driving the instability of electrode materials in different alkali metal-ion environments. Dr. Capraz will collaborate with Dr. Murugesan at Pacific Northwestern National Laboratory.
Sponsor: Department of Energy
PI/PD: Ömer Özgür Çapraz

Evaluation of COVAS Effectiveness on the Clearance of the COVID-19 Aerosols in a Patient Room and a Restaurant (2nd Phase)
The goal of the 2nd phase of this project is to evaluate the clearance efficiency of the novel COVID air sanitizer (COVAS) of the suspending cough droplets with a much higher mass flow rate than was used in the 1st phase of the project in a COVID-19 patient room, and the effectiveness of the COVAS in a virtual restaurant environment (multiple tables).
Sponsor: Coveng Limited
PI/PD: Yu Feng
Produced Water Treatment Fueled by High Value Product Extraction
The purpose of this project is to transform produced water from a waste to a resource by developing an efficient separation strategy for removing hydrocarbons through the synergy of silica nanoparticles and inorganic membranes while also removing valuable resources including rare earth elements. The first aim will focus on the development of microporous, inorganic membranes to increase energy efficiency and cost savings in oil/water separations. The second aim focuses on testing the silica-modified inorganic membranes in a continuous system using produced water provided by D&B Oilfield Services.
**Sponsors:** Oklahoma Center for the Advancement of Science and Technology, D&B Oilfield Services
**PI/PDs:** Clint Aichele, Seok-Jhin Kim
Civil and Environmental Engineering: Mark Krzmarzick

CAREER: Computation-Enabled Rational Design of Cytochrome P450 for Ionic Liquid Biodegradation
The objective is to close the gap in our scientific understanding of P450-mediated hydroxylation of ionic liquids, which can then be leveraged to engineer cytochrome P450 for ionic liquid biodegradation. The central hypothesis is that the recalcitrant nature of ionic liquids arises due to thermodynamic limitations and/or kinetic barriers to hydroxylation, while kinetic barriers are responsible for limited ionic liquid hydroxylation. Identifying amino acid residues in the P450 binding pocket and substrate access channel that present such barriers to the reaction and substituting residues with those able to lift such limitations will trigger and speed up the ionic liquid hydroxylation.
**Sponsor:** National Science Foundation
**PI/PDs:** Jindal Shah

Development of Open Access Version of Applied Numerical Computing Course
The objective is to develop an open access version of the Applied Numerical Computing course with screencasts and course materials available online for asynchronous learning of course modules by learners beyond the OSU classroom-based course offerings. The open access course will be disseminated as a series of modules on topics including but not limited to solving systems of differential equations, estimating parameters for models using regression, writing manuscripts and dissertations, and developing graphical user interfaces.
**Sponsor:** Computer Aids for Chemical Engineering (CACHE) Corporation
**PI/PDs:** Ashlee Ford-Versypt

Solar Thermal Desalination Technology Development
This project will develop a cogeneration cycle that will utilize harvested heat to power a mechanical vapor compression cycle to desalinate produced water (PW). The heat flux and the energy efficiencies will be compared with the current industry standards. This thermal distillation system is intended to reduce net energy consumption, lower the cost of desalination, and reduce the volume of PW disposal.
**Sponsor:** Nitro-Lift Technologies, LLC
**PI/PDs:** Prem Bikkina
Mechanical and Aerospace Engineering: Khaled Sallam

NASA Oklahoma EPSCoR Research Infrastructure Development: In Situ Characterization of Chemo-Mechanical Instabilities in Solid-State Batteries
The primary objective of the study is to develop a rational basis to design novel solid electrolyte structures that exhibit robust mechanical stability and desirable fast-charging performance required for aviation and NASA space missions. Solid electrolytes offer significant opportunities to advance electrochemical energy storage technologies, however utilization of the benefits of solid electrolytes is limited by the lack of understanding of their operation mechanisms. This project seeks to create a
fundamental understanding of electrochemically-driven mechanical instabilities in electrified solid-solid interfaces.

**Sponsor:** National Aeronautics and Space Administration, Oklahoma State Regents for Higher Education  
**PI/PD:** Ömer Özgür Çapraz

**Continuous, Large-Scale Manufacturing of Functionalized Silver Nanowire Transparent Conducting Films**

The objective is the discovery of reaction conditions in a millifluidic reactor to produce high-quality, low-cost AgNW inks that can be continuously printed onto flexible substrates to create low-cost transparent conductive films (TCFs) for Internet of Nano Things (IoNT) application. To accomplish this, the research aims are: 1) AgNW millifluidic reaction mechanism investigation and synthesis optimization to find the optimum reaction conditions; 2) Large-scale millifluidic synthesis of functionalized AgNW; and 3) Continuous preparation and writing of AgNW inks onto flexible substrates to create TCFs for IoNT.

**Sponsor:** National Science Foundation  
**PI/PDs:** Shohreh Hemmati  
Materials Science and Engineering: James Smay

**Solar Thermal Distillation Technology Development for Desalination and Produced Water Treatment Applications**

The objective is to develop cost-effective high-efficiency solar thermal distillation technology for desalination and produced water treatment: 1) A solar collector coating will be identified for its efficiency of converting incident radiation into heat, cost, ease of application and longevity; 2) A heating surface compatible with the solar collector coating will be engineered to prevent ‘boiling crisis’; 3) A boiling surface that can boil the feed water at very low wall superheat and help prevent boiling crisis will be engineered; 4) A condensing surface that can condense water vapor at the similar rate of water vapor generation will be engineered.

**Sponsor:** United States Department of the Interior, Bureau of Reclamation  
**PI/PD:** Prem Bikkina

**RII Track-4: Deciphering the Role of Polarization on Ion Transport in Ionic Liquid Batteries**

The fellowship will enable the PI to transition to the next level in modeling ionic liquids (ILs) by developing capability in the PI’s research group for conducting first principles molecular dynamics (FPMD) simulations based on density functional theory. As the first step, FPMD simulations of room temperature ILs and IL-IL mixture, and solvation of Li+ ion will be carried out to understand the impact of polarization on the structure and dynamics of ILs. Polarization-induced effects will also be probed by conducting FPMD simulation of ILs under an applied electric field. Pacific Northwest National Laboratory will be the host site.

**Sponsor:** National Science Foundation  
**PI/PD:** Jindal K. Shah

**Understanding the Effects of Sphero-cylinder Drug Particle Shape to Enhance Small-airway Drug Delivery for Better Emphysema Treatment Outcomes**

Dry powder inhalers (DPI) are used to deliver micro-sized medication via pulmonary routes to treat emphysema. However, DPI methods are not as effective as they could be because a large amount of medication deposits in the mouth-throat region. The goal is to develop a computational model to predict particle interactions and transport dynamics, and determine how particle shape features can enhance drug deposition in emphysematous small airways. The hypothesis is that sphero-cylinder drug
particles with high surface roughness and hollow structure can reduce the inter-particulate cohesion, avoid deposition in the upper airway, and reach small airways in a higher dose.  
**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Yu Feng  

### Field Evaluation of the Caney Shale as an Emerging Unconventional Play, Southern Oklahoma  
The Caney Shale is in the oil window, but its resource potential has not been adequately assessed. The Caney reservoir is about 60-300 m thick, is rich in total organic carbon, contains a large oil resource base, and has a strong natural gas drive; however, development has been hampered by high clay content and reactivity of the formation with water. A Caney Shale Field Laboratory will be established to: 1) conduct a comprehensive field characterization, 2) perform field experiments, and 3) validate cost-effective technologies that will lead to a comprehensive and efficient development strategy for the Caney Shale.  
**Sponsor:** Department of Energy  
**PI/PDs:** Mileva Radonjic, Geir Hareland, Prem Bikkina  
Geology: Jim Puckette, Michael Grammer, Jack Pashin  
Lawrence Berkeley National Lab: Jonny Rutqvist, Christine Doughty  
Oklahoma Geological Survey: Brian Cardott, Abbas Seyedolali, Ming Suriamin  

### Optimization of Flow and Disbursement for Green Fire Suppression Agent  
SpectrumFX, in collaboration with the OSU New Product Development Center, will plan, design, test and optimize a new green fire suppressant system that may possibly replace existing systems in a variety of fields. The first effort will model the system, defining optimum operating parameters and physical nozzle configuration. The model results will be used to design a fire suppression system with nozzles matching the model, all of which will then be tested and verified by a Phase Doppler Interferometer. The project will also include the fabrication and field testing of the first prototype system.  
**Sponsor:** Spectrum FX for the Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Clint Aichele  
New Product Development Center: Robert Taylor  
Fire Protection and Safety Technology: Haejun Park  

### MRI: Acquisition of a High Resolution Confocal Laser Scanning Microscope for the Advancement of Materials and Biological Research at Oklahoma State University  
This award will enable acquisition of a Carl Zeiss LSM 880 confocal laser scanning microscope with high resolution and modules for live-cell imaging. The new instrument is needed to meet the requirements of OSU researchers for high resolution scanning, live-cell imaging and 3D reconstruction since the current confocal microscope lacks these capabilities. The LSM 880 will be placed in the OSU Microscopy Laboratory, where the LSM 880 will have a high level of exposure and will be available at low cost not only to all OSU faculty, staff, postdocs, and graduate and undergraduate students, but also to researchers across Oklahoma.  
**Sponsor:** National Science Foundation  
**PI/PDs:** Heather Fahlenkamp, Josh Ramsey  
Chemistry: Yolanda Vasquez  
College of Veterinary Medicine: Shitao Li
Targeted Delivery of a Reactive Oxygen Species Generator for Treatment of Hormone Refractory Prostate Cancer

Glucose oxidase (GOX) and other reactive oxygen species (ROS) forming enzymes are of significant interest as anticancer agents due to the potent cytotoxicity of ROS. A nanoparticle delivery system will be used to target delivery of GOX to prostate cancer cells. A library of copolymers will be screened to identify promising nanoparticle candidates that will be tested in a mouse prostate cancer tumor model. The nanoparticles will be evaluated based on their ability to reduce the tumor volume and remain within the tumor. The immune response will also be characterized to determine which nanoparticles could be used for repeated dosing.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PD:** Josh Ramsey

Unraveling the Link Between Mechanical and Chemical Properties of Deposited Species in Li-O2 Batteries, Using In-operando Techniques

Further mechanistic insights on the interface of the electrode/electrolyte during electrochemical reactions will be provided, which are necessary to develop sufficient design rules for optimized cell components and their interfaces. The design of the cathode and catalyst with desired properties for oxygen reduction/evolution reactions (ORR/OER) depends on understanding of cathode stability in the Li/O2 cell. The project will combine *in situ* surface stress measurement techniques and *in operando* online electrochemical mass spectroscopy in order to characterize the governing surface reaction steps for the surface instabilities by analyzing both solid and gaseous phases of OER products during typical operation conditions.

**Sponsor:** US-Israel Binational Science Foundation  
**PI/PD:** Ömer Özgür Çapraz

DPI In-Silico Modeling – Predict Dry Powder Performance and Subsequent Depositions in a Whole-Lung Model

There is a large gap in fundamental understanding of how design and human factors influence de-agglomeration and agglomeration in dry powder inhalers (DPIs). Thus, an in-silico model utilizing airflow dynamics (Computational Fluid Dynamics) and modeling of drug interactions properties in the flow channels of DPIs will be developed to accurately model, predict and hence improve the performance of DPIs.

**Sponsor:** CIPLA Ltd  
**PI/PD:** Yu Feng

Quantitative Systems Biomedicine and Pharmacology for Multiscale Tissue Damage

Building multiscale computational models for the chemical and biological processes that result in structural addition or depletion of extracellular matrix, which damages various tissues, will increase fundamental mechanistic understanding of human tissues and lay the foundation for advances in disease treatment and prevention. The research addresses the critical need to compile the multiple processes that contribute to the onset and progression of chronic tissue damage into user-friendly systematic computational frameworks capable of taking the interconnected chemical, physical, and biological factors into account in a coupled fashion and in the appropriate magnitudes and sequences to make testable predictions.

**Sponsor:** National Institutes of Health  
**PI/PD:** Ashlee Ford-Versypt
Rational Design of Solar-Energy-Combined Desalination Systems for Treatment of Produced Water
Produced waters (PW) from oil and gas operations pose risks to the environment and must either be treated or disposed of via underground injection. PW often exhibit high levels of dissolved solids (salts) and organic pollutants that must be separated from the water prior to reuse. The goal of the research is to develop novel, energy-efficient solar-energy-combined membrane processes for treating PW to levels suitable for reuse. Research objectives include: 1) Design chemical pretreatment process, 2) Develop solar evaporation and condensation system, 3) Synthesize ceramic membranes for desalination and organics rejection.

**Sponsor:** United States Geological Survey  
**PI/PDs:** Seok-Jhin Kim, Clint Aichele  
**Physics:** Dave McIlroy

Ionic Liquid-Assisted Extractive Distillation for the Removal of Dimethylsilanediol
This project adopts an entirely novel approach using ionic liquids in an extractive distillation process to remove dimethylsilanediol (DMSD) from wastewater consisting of humidity condensate and urine distillate to produce contaminant-free water for recycle and reuse aboard the space shuttle for deep space exploration and the ISS. Our research will be guided by the hypothesis that the presence of ionic liquids will increase the volatility of DMSD over water, enabling the separation of DMSD using distillation. To achieve the objective and test the hypothesis, a complementary approach involving molecular simulation (PI Shah) and experiments (co-PI Brennecke) will be carried out.

**Sponsor:** National Aeronautics and Space Administration  
**PI/PDs:** Jindal Shah  
**University of Texas at Austin:** Joan Brennecke

CAREER: Multiscale Modeling of a Virtual Kidney During the Onset and Progression of Diabetic Kidney Disease
The objective is to predict progression of diabetic kidney disease (DKD) using a realistic computational model of kidney injury. The PI will construct a virtual kidney model for the structural and biochemical components affected during DKD in the glomeruli where most of the DKD damage is focused. The virtual kidney platform will use multiscale computational modeling to connect effects at different length scales from smaller to larger: inside cells, between adjacent cells, across a single glomerulus, and among collections of glomeruli. The virtual kidney will be used like a powerful microscope to detect and monitor damage to the glomeruli.

**Sponsor:** National Science Foundation  
**PI/PD:** Ashlee Ford Versypt

Real-Time Drilling Optimization System for Improved Overall Rate of Penetration and Reduced Cost/Ft in Geothermal Drilling
In this project the objective is to develop a real-time drilling optimization system for geothermal drilling. To reach this objective, the system will couple three individual components while drilling. The first component is a drill stem vibration analysis while drilling, the second component is to analyze mechanical specific energy (MSE) for optimum rotational speed (RPM) and weight on bit (WOB) combinations, and the third component is a detailed polycrystalline diamond compact PDC drill bit model.

**Sponsor:** Department of Energy  
**PI/PDs:** Geir Hareland, Mohammed Al Dushaishi  
**Sandia National Lab:** Doug Blankenship
Self-Diffusion and Interactions of Multicomponent Fluids in Model Reservoir Solids
Model nanoporous glasses with one-dimensional channels, and aluminosilicates with 2D and 3D channels, will be used to create controlled nanoporous hosts with either organic-rich or organic-poor channel walls, and oil-rich versus water-rich fluids will be used to elucidate how diffusion, adsorption, and chemical interactions depend upon the chemical nature of the solid host. Unique to the work is the combination of new experimental capabilities allowing measurements at pressures as high as ca. 1000 atm, and with gradient strengths as high as 2.9 kG/cm.
Sponsor: American Chemical Society Petroleum Research Fund
PI/PDs: Jeff White, Clint Aichele

A 3D Human Tissue-Engineered Lung Model to Study Immune Responses to Respiratory Syncytial Virus
Dr. Fahlenkamp and Dr. Kovats will divide up the work according to their relative expertise. Dr. Fahlenkamp is a tissue engineer and has developed the 3D Human Tissue-Engineered Lung Model (3D-HTLM) to be used. Dr. Fahlenkamp will be responsible for setting up the 3D-HTLM, RSV infection and monitoring responses of epithelial cells. Dr. Kovats will be responsible for procurement of myeloid cells from laboratory or clinical sources, and for characterizing and monitoring innate immune responses of myeloid cells. Drs. Kovats and Fahlenkamp will jointly oversee and evaluate all cellular and molecular analyses of antiviral responses in the project.
Sponsor: Oklahoma Medical Research Foundation for the National Institutes of Health
PI/PD: Heather Fahlenkamp
Oklahoma Medical Research Foundation: Susan Kovats

Mitigating Risks to Hydrocarbon Release through Integrative Advanced Materials for Wellbore Plugging and Remediation
The project aims to advance capabilities for the prevention and remediation of wellbore leakage in offshore wells after the permanent Plugging and Abandonment stage. The fundamental goal is expressed as understanding the trigger of wellbore leakage at deep-water condition, developing the new barrier materials considering material science fundamentals to identify properties critical for long-term integrity, and ensuring adequate placing is achieved. Finally, through rigorous experiments and modeling and simulation, the team will characterize performance of the entire wellbore system and its surrounding subsurface environment, in order to provide prediction of long-term behavior and prevent wellbore leakage.
Sponsor: National Academy of Sciences
PI/PD: Mileva Radonjic

Commercialization of a novel single-use bioreactor
Specific aims include: 1) Design and fabricate a 2 to 200 L, two-chamber bioreactor from flexible, pharmaceutical grade plastic film, 2) Perform a ‘design for manufacturing’ analysis of the bioreactor and incorporate design changes necessary to accommodate large scale manufacturing, 3) Develop an operating procedure and evaluate the performance of the 2 to 200 L bioreactor by growing a Chinese hamster ovary cell line that produces the recombinant protein IgG, 4) Build a manufacturing process to produce multi-chamber bioreactors.
Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PD: Josh Ramsey
New Product Development Center: Robert Taylor
Copper Nanocatalyst as Efficient Heterogeneous Photocatalyst for Continuous Syntheses of Pharmaceuticals through Cross-Coupling Reactions

In this project, the investigator proposes to develop inexpensive, earth abundant and less toxic copper (Cu) based heterogeneous photocatalyst with activity superior to that of traditionally used expensive, rare-earth and toxic homogeneous Pd catalysts for cross-coupling reactions. The project involves two specific aims: 1) Develop an in-operando spectroscopic technique to identify stable Cu nanocatalysts and green solvents for cross couplings, 2) Evaluate the performance of Cu nanocatalysts of different sizes under visible-light irradiation to identify Cu nanocatalysts with activity superior to Pd based catalysts for cross couplings.

Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PD: Marimuthu Andiappan

Collaborative Research: Understanding an Active and Beneficial Role for Water in Solid-Acid Catalyzed Hydrocarbon Chemistry

The collaborative team will address the question of whether water can enhance activity for hydrocarbon reactions in solid-acid catalysts, determine if the phenomenon is general or limited to only a few reagents, and attempt to elucidate the mechanistic origins of water’s active role. A combination of synthesis, in-situ spectroscopy, reactor, and computational experiments will be used to verify how water acts mechanistically as a function of water concentration in the reaction mixture, and if previously proposed proton-hopping or Grotthuss theories, transition-state solvation, or synergistic effects afforded by water-reagent clusters at the active site are operative when activity increases are measured.

Sponsor: National Science Foundation
PI/PD: J.L. White

Evaluation of Surface Wettability as a Parameter in Preferential Separation of Multi-Component Dissolved Gas Systems and Bubble Points of Pure Liquids

This work proposes a systematic experimental investigation on the influence of wettability on pressure-driven bubble nucleation. Experiments will be conducted to determine whether a specific gas can be preferentially liberated from a liquid solution containing multiple dissolved gases. Combinations of gases, aqueous and organic liquid phases will be used to test this hypothesis at a molecular scale using test facilities integrated with gas analysis. Well-controlled experiments will also be conducted to understand the effect of reservoir wettability on required supersaturation levels for bubble nucleation. The basic knowledge derived will be useful to control gas evolution rates from supersaturated liquids.

Sponsor: American Chemical Society Petroleum Research Fund
PI/PD: Prem Bikkina

Advanced Cement Characterization and Modeling to Evaluate Novel Additives to Improve Wellbore Integrity

The main deliverable from this project is to design new cement mixtures with nano-particle sized additives that have superior properties to prevent wellbore leakage. This will be reached by evaluating cement mixtures in the laboratory and incorporating the results in the FEM well integrity design software which can be used to determine the optimum additives for a given well design. The laboratory study will investigate cement slurry properties including dynamic fluid losses and thickening time, as well as advanced characterization of the cement compressive strength and bonding strength to rock and casing, and deformation properties including shrinkage.

Sponsor: National Academy of Sciences
PI/PD: Geir Hareland
Computational Modeling of the Onset of Diabetic Kidney Disease
The primary outcome of the project will be a computational model that incorporates biological uncertainty into the biochemical reaction networks involved in diabetic kidney disease (DKD). Simulation results using the computational model will be useful for understanding the synchrony of key events that lead to glomerular injury in DKD. This improved understanding has the potential to advance treatment options for diabetes and prevent the serious complication of end-stage kidney failure.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology

**PI/PD:** Ashlee Ford Versypt

Generating Nonnative Structures in Binary Ionic Liquid Mixtures for Tunable Phase Equilibria Properties
At present, there is a lack of fundamental knowledge regarding the rules that can be applied to determine a priori if binary ionic liquid mixtures will exhibit molecular structure different from their pure ionic liquid counterparts and how the nonideal behavior manifests itself in the phase equilibria properties of ionic liquid with gases and solvents. This research project seeks to fulfill this gap in the ionic liquid field so that practically limitless opportunities offered by a large number of binary ionic liquid mixtures to design environmentally friendly chemical processes could be taken advantage of. REU supplement funding was also received.

**Sponsor:** National Science Foundation

**PI/PD:** Jindal Shah

FRI Viscous Distillation
The project will quantify the impact of viscosity on mass transfer efficiency. An Oldershaw column will be constructed and operated in order to obtain efficiency data of viscous systems.

**Sponsor:** Fractionation Research, Inc.

**PI/PDs:** Clint Aichele, Sayeed Mohammad, James Whiteley

Resource Recovery from Produced Water using Forward Osmosis and Membrane-assisted Regeneration of Draw Solutions
The objective is to identify and develop novel, feasible, cost effective produced water treatment processes that are comparable in cost to the disposal of produced water by underground injection. Specifically, the research will optimize a newly developed produced water treatment technology based on a Forward Osmosis process to recover valuable materials, purified water and recyclable brine from an integrated operation that can be used as a trailer mounted modular field unit.

**Sponsor:** Frosty Cooling Systems, LLC

**PI/PDs:** Seok-Jhin Kim

Civil and Environmental Engineering: Mark Krzmarzick

Joint Industry Project for the Quantification of Fluid Phase Kinetics in Hydrocarbons Phase 4
Phase 4 will consist of two research aims: 1) Quantify gas evolution in the presence of nucleation, 2) Understand how oil concentration and supersaturation ratio impact gas evolution in emulsions. The gas evolution experiments will be performed over a range of pressures up to 1,500 psia (high pressure experimental setup) and 150 psia (low pressure experimental setup) and temperatures up to 200 °F (90 °C) for both experimental setups. In Phase 4, the team will use ultra high purity methane as the gas phase.

**Sponsors:** Exxon-Mobil Upstream Research Company

**PI/PD:** Clint Aichele
Graduate Research Fellowship for Rabecca Wiseman
This Graduate Research Fellowship was awarded to Rabecca Wiseman, a graduate student in Environment Engineering who is researching automated energy optimization of the aeration process within municipal wastewater treatment. The Graduate Research Fellowship Program recognizes and supports outstanding graduate students who are pursuing full-time research-based master’s and doctoral degrees in science, technology, engineering, and mathematics (STEM) or in STEM education. The GRFP provides three years of support for the graduate education of individuals who have demonstrated their potential for significant research achievements in STEM or STEM education.

**Sponsor:** National Science Foundation
**PI/PD:** Mark Krzmarzick

Develop Acceptance Protocol for the use of Fly Ash
The goal is to develop a protocol for performance evaluation of fly ash to determine critical properties and tests for evaluating fly ash including consideration of alkali-silica reactivity. The deliverable for this project is a guide to evaluating fly ash performance in concrete, which will provide an overview of the tests to evaluate fly ash and how to interpret the results.

**Sponsor:** Minnesota Department of Transportation
**PI/PD:** Tyler Ley

Shrinkage Induced Deformations in Steel Bridges Made Composite with Concrete Deck Slabs – Phase 3 – Modification for Structural Monitoring of the SH-11 Chikaskia River Bridge
This award provides funding to perform Structural Monitoring of the SH 11 Bridge over the Chikaskia River in Kay Co., Oklahoma during FY 2021. The work activities included in this work plan extend and augment the work that has already been performed within SPR 2260.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration
**PI/PD:** Bruce Russell

Analysis of ODOT's Traffic Speed Deflection Device Data for Pavement Structural Evaluation
Traffic Speed Deflection Devices (TSDDs) that measure surface deflection at traffic speeds have recently gained significant popularity among pavement researchers/engineers as well as state highway agencies. TSDDs provide a rapid and continuous picture of the pavement condition, thereby significantly enhancing the amount of information available related to the pavement condition. This project will analyze the TSDD data being collected by ODOT as part of Transportation Pooled Fund Project TPF-5(385) and identify different approaches to integrate the data into ODOT’s pavement management decisions.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration
**PI:** Debakanta Mishra

On-Demand Support of the ODOT Skid Program
This project is to perform on-demand services for the ODOT Skid Program, including: 1) the collection of skid resistance, surface texture, and roadway geometry data requested by ODOT, and 2) analysis of the data sets and delivery of the data summary report to ODOT.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration
**PI/PDs:** Joshua Li, Kelvin C.P. Wang
Long Term Performance and Benefits of Combined Balanced Mix Design and Chemical WMA Technology
The long-term performance and benefits of a combined approach involving Balanced Mix Design (BMD) and chemical Warm Mix Asphalt (WMA) technology are not clearly defined. Thus, the main objectives of this project are: 1) Quantify the long-term benefits associated with a combined implementation approach involving BMD and chemical WMA technology through laboratory binder and mixture testing as well as observed or simulated field performance, and 2) Develop a special provision/specification to facilitate the implementation of a combined approach involving BMD and chemical WMA technology in the state of Oklahoma.
Sponsor: Oklahoma Department of Transportation for the Federal Highway Administration
PI/PD: Debakanta Mishra

SPR-4521: Comprehensive Pavement Patching Tools and Web-based Software for Pavement Condition Assessment and Visualization
The OSU team will develop approaches for the Purdue team to integrate data sets from the 3D data collection van at INDOT so that visual and other pavement condition data are usable by the Purdue team to accomplish the deliverables for part two, a web based cloud information system. The OSU deliverables include methods and software code or Application Programming Interface for the Purdue team to extract datasets collected based on WayLink software at INDOT. The data sets to be included in the deliverables are spatially tagged rutting surveys, longitudinal pavement profiling, roughness measurements, crack severity, and pavement images.
Sponsor: Purdue University for Indiana Department of Transportation
PI/PDs: Kelvin C.P. Wang, Joshua Li, Guangwei Yang

One-Voice Stage 2
After completing Stage 1, the team has moved to Stage 2 grant funding to assist in further developing their technology and plans for commercialization. One-Voice is a cloud-based software that analyzes the quality of the historical sewer systems data and provides quality assurance to the data to yield a unified format. With One Voice, industry stakeholders can be better informed about the condition of sewer assets and become proactive in their asset management and maintenance strategies. The team is working on the prototype based on the developed data quality assurance algorithm and sewer data management and integration tools.
Sponsor: National Collegiate Inventors & Innovators Alliance (NCIIA) d/b/a/ VentureWell
PI/PD: Yongwei Shan

Resilient Analysis and Design of Slab-on-Ground Foundations on Expansive Soils
This project will develop a finite element method based analysis technique that is up-to-date in terms of the current state-of-the-art knowledge and developments for the predictions of stresses and deformations in the structural slab as well as more rational and practical design parameters representing the behavior of the foundation soil in response to applied loads and various climatic conditions. The research work will produce an analytical protocol and a finite element code that can be adopted by various design codes that are in use in the United States.
Sponsor: United States Department of Housing and Urban Development
PI/PD: Rifat Bulut

Center for Native American Environmental Health Equity Research
Dr. Gonzalez Estrella will collaborate with the community to identify sites where open dumping and burning commonly occur and will use his expertise in environmental chemistry, contaminant mobility,
exposure to work with the community and his team to determine the risks posed by micro- and nano-scale plastic contaminants resulting from dumping, degradation, and combustion of waste.

**Sponsor:** The Regents of the University of New Mexico Health Sciences Center for the National Institutes of Health  
**PI/PD:** Jorge Gonzalez Estrella

**Load Testing and Long-Term Monitoring of SH 4 Bridge in Canadian Co.**
Under this work order, the following services will be provided: 1) Perform structural health monitoring for 12 months; 2) Add to the instrumentation package accelerometers to enable the measurement of vibrations, and impact. Assess the Impact Factor, IM that is required in design; 3) Perform static load testing of Spans 9 and 14 on the SH4 Bridge. Stresses, strains, and deformations will be measured and recorded. Data can be used to compare results to current design methods, and for assessing the load rating of PC beams in flexure and shear. The distribution factor for PC girders can also be evaluated.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration  
**PI/PD:** Bruce Russell

**Variation of Shear Wave Velocity due to Moisture Changes**
This study will assess the potential of shear wave velocity data to simulate the climate-related variations in mechanical properties of subgrade soils using SCPTu field equipment. The basic parameters to be measured with depth are shear wave velocity and moisture content.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration  
**PI/PD:** Rifat Bulut

**Reduction and Preliminary Analysis of Instrumentation Data for Advanced Pavement Design and Evaluation**
The goal of this project is to develop a mechanistically validated procedure for the U.S. Army Engineer Research and Development Center (ERDC) to process and analyze the large volume of data available through the Hill Air Force Base pavement instrumentation effort. Development of this mechanistically validated protocol will help ERDC efficiently analyze the large amount of data generated, and extract valuable information from the data to facilitate the design and construction of better-performing airfield pavement systems that can withstand loading from new aircraft types and can include recycled and marginal quality pavement materials.

**Sponsor:** United States Army Corps of Engineers  
**PI/PD:** Debakanta Mishra

**Development of an Apple App for GDOT AASHTOWare Project**
The OSU team will assist Georgia DOT (GDOT) to develop and implement a bar code based concrete sample management app for the Apple operating system that is based on AASHTOWare. This project will provide a working version of the app for GDOT that can be used with the CTAG (concrete TAG) developed at OSU. The CTAG is a specialized label that creates a barcode on the inside and outside of a concrete cylinder mold. The CTAG has a low profile and will not impact the performance of the concrete and will stay bonded on the sample until it is tested.

**Sponsor:** Georgia Department of Transportation for the Federal Highway Administration  
**PI/PD:** Tyler Ley  
CEAT Academic Affairs: Qinang Hu
Evaluation of Pavement Rehabilitation Alternatives for I-15 Sections in Idaho
This collaborative project between OSU and the Idaho Transportation Department (ITD) will involve pavement performance monitoring and structural evaluation of recently rehabilitated sections, as well as identification of suitable rehabilitation methods for pavement sections that have been identified as being problematic. Rather than focusing primarily on commonly used methods, this project will involve extensive review of published literature on different pavement rehabilitation methods. This will result in the development of an extensive rehabilitation selection matrix that can be used by ITD in the future while trying to repair and rehabilitate problematic pavement sections.

**Sponsor:** Idaho Transportation Department for the Federal Highway Administration  
**PI/PD:** Debakanta Mishra

RII Track 1: Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience of Oklahoma – Science-Based Clumsy Solutions for Wicked Problems in Oklahoma
The unifying research question is whether science-based assessment, coupled with systematic and iterative engagement with Oklahoma opinion leaders and input/feedback from members of the Oklahoma public, can result in development of socially sustainable solutions. The project will employ a framework informed by theories of public policy learning to invest in science at the intersections of four key focus areas that are important to Oklahoma: changing subseasonal to seasonal weather patterns, variable and marginal quality water supplies, shifting terrestrial water and carbon dynamics, and sustainable water and energy infrastructure.

**Sponsor:** National Science Foundation  
**PI/PDs:** Mark Krzmarzick, Rifat Bulut  
Chemical Engineering: Prem Bikkina, Clint Aichele  
Arts & Sciences: Babu Fathepure, Yuting Zhou, Michael Long, Kristin Olofsson  
DASNR: Kevin Wagner, Rodney Will, Dayton Lambert, Chris Zou, Gail Wilson  
OU: Hank C. Jenkins-Smith, Carol L. Silva

Developing Deflection Acceptance Criteria for Compacted, Open-graded Aggregate Bases for Permeable Pavements Using Lightweight Deflectometers (LWDs)
The primary objective of this research study is to develop a deflection-based compaction control specification for open-graded base courses for permeable pavements using Lightweight Deflectometers. The research team will adopt an integrated approach involving laboratory testing, numerical modeling, and testing of full-scale pavement sections to achieve the project objectives. The primary outcome will be a specification document that can be used during the construction of open-graded base courses across the world.

**Sponsor:** Interlocking Concrete Pavement Institute Foundation for Education and Research  
**PI/PD:** Debakanta Mishra

Integrating Construction Practices and Weather into Freeze Thaw Specifications
This research will produce improved specifications and advance existing test methods, while improving the underlying understanding of freeze thaw damage. Low-cost data loggers will be used to measure the moisture and temperature changes in a concrete sent to a number of different environments. This information will be combined with new models that account for the rate that concrete reaches a critical degree of saturation. This work will create specifications tailored for different weather conditions and create a useful forensic tool that could be used to determine the loss in the life of a structure if a substandard concrete is placed.

**Sponsor:** Oklahoma Department of Transportation for FHWA SPR Pooled Funds  
**PI/PD:** Tyler Ley
Tran-SET: Smart Battery Management System for Electric Vehicles: Self-Learning Algorithms for Simultaneous State and Parameter Estimation and Stress Detection

The goal is development of a smart battery management system (BMS) with human brain-like complex learning for accurate estimation of the health of the Li-ion battery. This involves significant intellectual challenges related to development of state-of-health inclusive models and real-time learning of highly nonlinear and time-varying dynamics. The research directs towards a unified design and will lead to a significant increase in the safety, capabilities, and autonomy of the BMS for Li-ion batteries. The success of this project will provide the necessary tools for smart BMS design leading to efficient and safe operation of the Li-ion battery in electric vehicles.

**Sponsor:** Louisiana State University and A&M College for the United States Department of Transportation

**PI/PDs:** Samir Ahmed, Avimanyu Sahoo

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Tran-SET: Safety of Road Users in Light-Rail Transit Environment

The goal is to provide transit agencies, state DOTs and local governments with a resource guide of best practices available for improving the safety of vulnerable road users (VRUs) in light-rail transit (LRT) environments. This project objectives are: (1) to survey, review and evaluate the existing body of knowledge and the state of practice regarding VRUs safety in LRT environments; and (2) to synthesize this information and package the results into a Best Practices Resource Guide and companion PowerPoint Training Material that can be incorporated in existing rail safety courses and used in making presentations at schools and public events.

**Sponsor:** Louisiana State University and A&M College for the United States Department of Transportation

**PI/PDs:** Samir Ahmed, Rifat Bulut

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The overarching goal of this research effort is to help ODOT strategically improve its equipment management practices using the data recorded in its equipment fleet management system. The specific objectives of this project are to: 1) Assist ODOT in calculating ownership and operating costs of the selected types of equipment, 2) Develop a model for equipment management decisions, 3) Develop a resource guide to introduce ODOT management to state-of-the-art techniques and practices for equipment management.

**Sponsor:** Louisiana State University and A&M College for the United States Department of Transportation

**PI/PDs:** Yongwei Shan, Samir Ahmed

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One-Voice

Developed through research supported by the National Associations of Sewer Service Companies, the One-Voice technology includes 1) a data quality assurance tool to evaluate and improve the quality of sewer pipeline inspection databases and 2) a comprehensive data management and analysis tool based on the collected inspection databases across the country. The VentureWell Early-Stage Innovator Training Program brings together student science and tech innovators and entrepreneurs for a three-day workshop to dive into topics like business model development, customer discovery, team dynamics, value chains, and intellectual property. The Stage 1 grant will cover expenses to attend the 3-day Pioneer workshop.

**Sponsor:** National Collegiate Inventors & Innovators Alliance (NCIIA) d/b/a/ VentureWell

**PI/PD:** Yongwei Shan
Produced Water Treatment Fueled by High Value Product Extraction
The purpose of this project is to transform produced water from a waste to a resource by developing an efficient separation strategy for removing hydrocarbons through the synergy of silica nanoparticles and inorganic membranes while also removing valuable resources including rare earth elements. The first aim will focus on the development of microporous, inorganic membranes to increase energy efficiency and cost savings in oil/water separations. The second aim focuses on testing the silica-modified inorganic membranes in a continuous system using produced water provided by D&B Oilfield Services.

**Sponsors:** Oklahoma Center for the Advancement of Science and Technology, D&B Oilfield Services  
**PI/PDs:** Mark Krzmarzick, David Lampert  
Chemical Engineering: Clint Aichele, Seok-Jhin Kim

Acquisition of a Full Field Non-contact 3D DIC System for Characterizing Crack Propagation Under Variable Amplitude Loading
This grant award will fund the acquisition of a full field non-contact three-dimensional (3D) digital image correlation (DIC) system in support of DoD-funded research at OSU’s Bert Cooper Engineering Laboratory. The system will be mainly used to support experimental and numerical research focusing on characterizing crack propagation in naval and aerospace structures and designing maintenance and repair procedures for extending the service life of these structures in the presence of fatigue damage. The system will be used for 3D surface profiling, measuring 3D displacements and rotations, and real-time tracking of 3D strains.

**Sponsor:** Office of Naval Research  
**PI/PD:** Mohamed Soliman

Applying Unmanned Systems for Water Quality Monitoring
The goals are to develop a monitoring system for Grand Lake that provides high-spatial resolution datasets of nutrients, sediments, and HAB levels using unmanned systems and provide improved models of the behavior of these constituents. The development of these tools will assist with decision support for various water management activities at Grand Lake. Unmanned systems have potential to reduce the costs of monitoring in addition to providing extensive quantities of spatial and temporal data. The long-term goal is to develop a system to identify, forecast, and respond to nutrient and sediment resuspension and HAB formation events to preserve water quality.

**Sponsor:** Department of Interior, Bureau of Reclamation  
**PI/PDs:** David Lampert  
Mechanical and Aerospace Engineering: Jamey Jacob

Civil Engineering Education Outreach: Transportation Infrastructure Activities
This broad outreach program includes three major activities: K-12 outreach activities, OSU Summer Bridge program (incoming freshmen), and the Oklahoma Summer Transportation Symposium. These program include various levels of service including, but not limited to, face-to-face site visits at OSU and remote site, workshops, camps, and networking opportunities.

**Sponsor:** Oklahoma Department of Transportation for the United States Federal Highway Administration  
**PI/PDs:** Greg Wilber, Joshua Li, Robert Emerson

Laboratory and Field Testing of Geocell-Reinforced Aggregate Layers
The OSU research team will be carrying out laboratory and field testing to study the pressure dissipation (in the lab) underneath, as well as the stiffness (in the lab as well as in the field) of open-graded aggregate layers constructed with and without geocells. Results from this study will help Presto
Geosystems understand the compaction behavior of geocells filled with open-graded aggregates for applications such as those in permeable pavements.

**Sponsor:** Reynolds Presto Products, Inc.
**PI/PD:** Debakanta Mishra

**Investigating Project Bundling Practices for Roadway Construction Projects**
FHWA recently developed a guidebook on project bundling with a focus on bridge projects. However, roadway (such as added travel lanes, resurfacing, intersection improvement, interchange work, shoulder rehabilitation and repair, etc.) construction project bundling was not part of that guidebook. Although many lessons can be learned from bridge bundling, unique aspects may exist in roadway construction bundling and have not been studied thoroughly. This project will include a review and synthesis of state DOTs’ current experiences with project bundling for roadway construction projects. The report will provide a compilation of the documentation including RFPS and sample contracts.

**Sponsor:** University of Colorado-Boulder for the Colorado Department of Transportation
**PI/PD:** Yongwei Shan

**Developing Recommendations for Allowable RAP Contents in Idaho Asphalt Mixes**
The objective is to help Idaho Transportation Department (ITD) determine whether or not a direct correlation exists between the RAP content in an asphalt mix and the performance of a pavement section constructed with this asphalt mix. Additionally, this study will also identify and recommend testing and material processing protocols that need to be adopted to allow different RAP contents in an asphalt mix, considering the performance-based mix design framework. The information and deliverables generated from the project will immediately help ITD decide regarding the feasibility of allowing high RAP contents (higher than 30%) in surface layers for flexible pavements.

**Sponsor:** Idaho Transportation Department for the Federal Highway Administration
**PI/PD:** Debakanta Mishra

**Verification and Correlation of 0.1 mm 3D Safety Sensor with Traditional Texture and Friction Devices**
The project will determine existing practices across the United States used for pavement safety data collection and benefits of using emerging non-contact/non-water based 3D sensors to collect both texture and friction information. The new 0.1mm 3D sensor hardware will be used for correlation and comparison study with traditional texture and friction devices at ODOT (locked-wheel) and OSU (grip-tester and dynamic friction tester). Results of design experiments will be included in the report regarding benefits of using non-contact technology and recommended further work on both hardware and software solutions of using the 0.1mm 3D sensors in Oklahoma.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration
**PI/PDs:** Kelvin Wang, Joshua Li

**Work Order 5: Accelerated Construction Techniques**
The aim of this work is to discuss the science and strategy behind current practices related to deciding when new pavement surfaces can be trafficked and how this can be accelerated when necessary. Deliverables shall include a 58-compliant report that covers the basic information, including case studies, associated with concrete pavement optimal opening to traffic.

**Sponsor:** Iowa State University for the United States Federal Highway Administration
**PI/PD:** Norbert Delatte
Through this subaward, the OSU investigator will be responsible for the following tasks: 1) Statistical analysis of the project data collected in collaboration with Idaho Transportation Department (ITD) engineers. The analysis will focus on unexpected trends observed in Hot-Mix Asphalt production and construction data, 2) In coordination with the Boise State University PI, draft and finalize the final project report summarizing all project findings, 3) Development of statistical training modules for ITD engineers to improve ITD’s Quality Control /Quality Assurance (QC/QA) practices.

Sponsor: Boise State University for the Idaho Transportation Department
PI/PD: Debakanta Mishra

Evaluation of the Effectiveness of Surface Applied Corrosion Inhibitors for Treatment of Reinforced Concrete Substructures in Poor Condition
Patching materials, especially high strength rapid setting materials, tend to shrink resulting in cracks to the new concrete patches potentially compromising the durability of the patch. While the inhibitor products typically do well in the FHWA cracked beam tests, it is questionable whether these products adequately penetrate. To evaluate the penetration, small reinforced concrete beams will be created and then cracked to different sizes. These beams will be treated with typical surface applied inhibitor products. The depth of penetration will be determined by taking small scores and then checking for penetration in the cracks.

Sponsor: Oklahoma Department of Transportation for the Federal Highway Administration
PI/PD: Tyler Ley

Development of Construction Specifications for Cold In-Place (CIR) and Cold Central Plant Recycling (CCPR)
CIR is a process that recycles, in-place, the upper three to four inches of an existing asphalt pavement. CIR is an excellent treatment for rehabilitation of cracked pavements with sound bases. CCPR uses a similar process as CIR but uses existing stockpiles of RAP to produce an asphalt base layer. Both processes are cost effective, sustainable techniques. The project will review agency specifications and trade association best practices for CIR and CCPR, and a draft special provision/specification will be prepared for review and comments by ODOT.

Sponsor: Oklahoma Department of Transportation for the Federal Highway Administration
PI/PD: Joshua Li

Passive Samplers for Monitoring Perfluoroalkyl Substances at Contaminated Sites
The study will determine the equilibrium partitioning relationships for per- and polyfluoroalkyl substances (PFAS) between pore water, sediments and sampling material, including competitive sorption effects between the various phases on the sampling material, and sorption kinetics for the PFAS in the sampler, and demonstrate the technology efficacy at PFAS-contaminated areas in Oklahoma. The research is expected to develop and demonstrate a standard operating procedure to assess PFAS concentrations in soils and sediments to protect water quality. The sampler will also be used to assess PFAS at air force bases and other areas in Oklahoma to infer potential PFAS exposure routes.

Sponsor: United States Geological Survey
PI/PD: Mark Krzmarzick, David Lampert
Work Order 2: Performance Engineered Mixtures (PEMs)/AASHTO PP84-19 and Precision and Bias Statements
OSU will be responsible in supporting the precision and bias testing for fresh and hardened property tests. The fresh property tests include the Super Air Meter, Box Test, and V-Kelly. These will be evaluated in the first year of the study. The research team at OSU will provide technical guidance to this testing. The second year of the project will be to evaluate hardened tests such as the surface resistivity. Again, OSU will provide support for these tests.

**Sponsor:** Iowa State University for the United States Federal Highway Administration

**PI/PD:** Tyler Ley

Evaluation of AASHTO T 324
The AASHTO T 324 Standard Test Method for Hamburg Wheel-Track Testing of compacted asphalt mixtures went through a major revision in 2019. The revision calls for a hardware upgrade. This upgrade is estimated at $20,000 per vehicle and ODOT has two machines for a total of $40,000. This task order will investigate the actual differences between the new method and the method ODOT was using. ODOT has used the previous method for several years and has an extensive database.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration

**PI/PD:** Debakanta Mishra

Sub-mm 3D Laser Imaging for Bridge Deck Surveys
The project includes surveying the outside lane once every 6 months on approximately 50 mainline bridge decks for a section of I-35 extending from Logan County to Kay County while traveling at highway speeds. Using Next-Gen 3D laser imaging technology, the research team will determine a base line deck condition documenting cracks, spalls, patches, and joint condition. The research will demonstrate the feasibility of using sub-mm 3D laser surveys to 1) document cracks, spalls, patches, and joint conditions, 2) determine skid numbers and hydroplaning risk, and 3) evaluate deck smoothness. The research will provide guidance for deck replacements or overlays.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration

**PI/PDs:** Kelvin Wang, Joshua Li

Instrumentation in End Regions of Prestressed Concrete (PC) Bridge Girders
OSU will perform the following work: 1) Purchase instrumentation, multiplexers and data loggers for retrieval and monitoring of the data. Instrumentation will include strain gages for reinforcing steel at prescribed locations, thermocouples and thermistors, and vibrating wire gages. 2) Apply the instrumentation and install data acquisition systems on no more than two prestressed concrete girders. 3) Collect and store data, Analyze the data and provide conclusions and recommendations to the ODOT based on experimental results. 4) Provide reporting as required including both monthly progress reports and a final report.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration

**PI/PD:** Bruce Russell

Evaluating the Expected Life and Recoating of Silane Water Repellant Treatments on Bridge Decks
Tasks include: 1) Increase the number of samples taken from bridges in service with silane coatings, 2) Investigate how cracking, change in w/cm, and different depths of penetration impact performance of silane coatings, 3) Determine the effectiveness of applying silane to extend existing silane coatings, 4) Investigate the performance of unique surface sealers, 5) Develop a decision flow chart for crack sealing and silane application for ODOT specifications. The study will provide an understanding of how silane
sealers perform in multiple environments with multiple concrete qualities, which will help ODOT make sound investments in the long-term performance of its bridges.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration

**PI/PD:** Tyler Ley

### Task Order #01 Track Structure Modeling Support

The objective is for the OSU faculty member, as the contractor, to provide track structure modeling services to support development and evaluation of new inspection approaches and technologies. The investigator will build a track structure 3D element model that includes rail, ties, ballast and subgrade to assess stress and deformation environment under various loads. The model will be used to calculate deflection basins under track loading vehicle on various track support conditions to aid development of comprehensive vertical deflection measurement. The contractor will also provide additional track structure modeling services on an as needed basis.

**Sponsor:** ENSCO Inc. for the United States Department of Transportation Federal Railroad Administration

**PI/PD:** Deb Mishra

### Safety of Vulnerable Road Users (VRUs) in Light-Rail Transit (LRT) Environment

This research will include surveying LRT agencies and synthesizing best practices for reducing crashes involving VRUs in LRT systems. The research will examine the effects of alignment decisions, geometric design features, and risky pedestrian behavior on crash experience. It will identify the most effective traffic engineering treatments, traffic control devices, public education techniques, and ITS technologies that can be integrated into LRT operations to reduce crashes and incidents. A toolkit of best practices will be developed that can be incorporated in transit safety courses/workshops, as well as a slide show for use by ODOT in making presentations at educational events.

**Sponsor:** Oklahoma Department of Transportation

**PI/PD:** Samir Ahmed

### Measuring Transport Properties of Portland Cement Concrete Using Electrical Resistivity

The purpose is to develop a body of knowledge through an exhaustive literature review and experimental program to provide recommendations on the best approach for implementing resistivity testing and/or other means of measuring transport properties in the state of Illinois. The research aims of the study are: 1) Study the effects on resistivity testing of common materials used in the making of concrete mixtures in Illinois; 2) Investigate the existence of correlations between resistivity testing and other known means of characterizing transport properties; 3) Investigate the existence of correlations between resistivity testing and standardized methods for durability testing of concrete.

**Sponsor:** The Board of Trustees of the University of Illinois for the Illinois Department of Transportation for the United States Department of Transportation

**PI/PD:** Julie Ann Hartell

### OSU Task Order Contract – Administrative Support

The work covered under this Task Order includes coordination with ODOT engineers and OSU faculty on the preparation of Task Orders, and management of successfully funded projects in relation to reporting, deliverables and other performance related matters; and promotion of ODOT and OSU research on transportation topics at both state and national levels.

**Sponsor:** Oklahoma Department of Transportation

**PI/PD:** Kelvin Wang
Collaborative Research: Impacts of Metals on Disinfection Byproduct Precursor Formation in Bacteria

Disinfection by-products (DBPs) are formed upon reactions of organic matter with disinfectants during water treatment. The research goal is to characterize how trace metals affect DBP precursor production from biofilms under conditions relevant to chloraminated drinking water distribution networks. The specific research objectives are to: (1) determine the influence of metals on DBP formation potential from bacterial isolates, (2) characterize the effects of metal exposure on changes in the composition and reactivity of biofilm-derived DBP precursors, and (3) determine the underlying mechanisms of increased DBP formation potential in bacterial isolates and biofilms through transcriptomic and proteomic approaches.

Sponsor: National Science Foundation
PI/PD: Mark Krzmarzick

MEGASLAB RSA with S3 Concrete Technologies

A concrete mixture will be completed for slab on grade with different water reducers. The mixture will be completed without additive, with additive + spray, and with additive + fibers + spray. Compression testing, flexural testing, freeze thaw testing, and ion permeability testing will be completed for all three mixtures. Additional tests of the additives and spray will also be conducted, such as testing a concrete beam with spray on only one side, and investigation of the combination of additive and saturated calcium hydroxide solution.

Sponsor: S3 Concrete Technologies, Inc.
PI/PD: Tyler Ley

Screening Tools for Considering Grade Separation of Rail-Highway Crossings in Oklahoma

The Oklahoma Department of Transportation (ODOT) addresses grade crossing safety issues by allocating federal funding through the Railway-Highway Crossing Program. At-grade rail-highway crossings lead to economic losses due to vehicle delays and potential train-vehicle collisions. To consider the need and priorities for grade separation at crossings, data-driven screening methodology and tools are required. The project objective is to develop a data-driven evaluation process for ODOT to identify, evaluate, and prioritize road-rail crossings as candidates for grade separations. Tasks include literature review, screening methodology development, prioritization of crossings for grade separation, and development of a grade separation screening tool for ODOT.

Sponsor: Oklahoma Department of Transportation for the United States Federal Highway Administration
PI/PD: Joshua Li

Four-Step PW Desalination Process with Zeolite and a-Alumina Membranes

Wastewater from oil and gas production, known as Produced Water (PW), has a high level of contamination with a complex chemical composition that depends on the recovery process and the geological formation. The goal of this project is to develop a process to decrease hardness, remove suspended solids, remove oil from PW and prepare it for the last step, which is desalination. The results will be used to assess energy efficiency and cost analysis of this method and compare with conventional PW management methods.

Sponsor: United States Geological Survey
PI/PD: Mark Krzmarzick, David Lampert

Understanding Air Content Measurement Techniques for Durability Prediction

Dr. Ley will provide hands-on training at Oklahoma State University for the Super Air Meter. Additionally, Dr. Ley will provide training for the preparation and evaluation of ASTM C457 samples and
results. Dr. Ley will assist with the evaluation of the data from the field collected samples. He will consult with Kansas State University project personnel and students on the possible re-calibration of Super Air Meter measurements for predicting spacing factor for typical Kansas paving mixtures. Additionally, Dr. Ley can share insights on the latest advancements for screening for accuracy in running the test.

**Sponsor:** Kansas State University for the Kansas Department of Transportation

**PI/PD:** Tyler Ley

**Updating ODOT’s Contract Time Determination System**

Establishing contract time is an integral part of the highway project development process as contract time plays a significant role in determining the expected project delivery date as well as the overall cost of a project. The 23 CFR requires State DOTs to have adequate written procedures for the determination of contract time. ODOT’s existing contract time determination system is no longer functioning because of the upgrade of computer operating systems and software updates as well as personnel turnover. Therefore, there is an urgent need to upgrade and improve the existing system.

**Sponsor:** Oklahoma Department of Transportation for the United States Federal Highway Administration

**PI/PD:** Yongwei Shan

**Contraire: Wastewater Treatment Plant Testing & Aeration Control Services**

Contraire’s control system technology will enable an innovative alternative testing approach to the typical five-day testing method currently used at wastewater treatment plants by providing real-time feedback based off of key wastewater quality parameters and specialized algorithms. A Beta test will be implemented at the Stillwater, Oklahoma wastewater treatment plant.

**Sponsor:** National Collegiate Inventors & Innovators Alliance (NCIIA) d/b/a/ VentureWell

**PI/PD:** David Lampert

**Evaluating the Performance of Existing Reinforcement for Oklahoma Bridges**

Corrosion-related problems generally lead to significant maintenance expenditures. By identifying the optimum reinforcement design considerations, considerable savings in maintenance budgets can be achieved. The proposed activities include: 1) Perform a literature review on field corrosion performance of concrete material, 2) Conduct a detailed investigation of concrete panels reinforced with epoxy-coated rebar sampled from northbound I-35 bridge over Cow Creek.

**Sponsor:** University of Kansas Center for Research, Inc. for Oklahoma Department of Transportation for the Federal Highway Administration

**PI/PD:** Robert Emerson, Julie Hartell

**Use of a Novel Controlled Release Surface Curing Agent for Bridge Decks – Phase 2**

The project will continue to investigate novel curing techniques that can be rapidly applied to the surface of fresh concrete and not cause deformations in the concrete surface. This material should show equal or better curing performance then typical wet curing methods and be sustainable and safe for the environment. Objectives include: 1) Evaluate the importance of timing when applying curing methods on bridge decks, 2) Develop field application methods and assessment of novel curing materials, 3) Develop specifications for quality control and usage of novel curing materials, 4) Work with contractors to implement this technology and evaluate the effectiveness.

**Sponsor:** Oklahoma Department of Transportation for the United States Federal Highway Administration

**PI/PD:** Tyler Ley
Utilizing Pavement Friction and Texture Data for the Reduction of Traffic Crashes and Delays
The objective is to use pavement friction, surface texture, and other data to reduce traffic crashes and delays. The research aims to: 1) integrate pavement condition, road geometry, traffic flow, and crash data into a GIS database; 2) determine statistical significance of this data with roadway crash types; 3) develop friction model for non-contact pavement friction evaluation from raw texture profile using signal processing and deep learning techniques; 4) demonstrate the role of friction and texture data in selection of preventative maintenance strategies; 5) develop a framework on how friction and texture data are considered in pavement maintenance decision making.
Sponsor: Oklahoma Department of Transportation for the Federal Highway Administration
PI/PDs: Joshua Li, Kelvin Wang, Yongwei Shan

Element Data: HDR: Enabling Data Interoperability for NSF Archives of High-rate Real-time GPS and Seismic Observations of Induced Earthquakes and Structural Damage Detection in OK
This project addresses challenges that limit the joint exploitation of real-time GPS and seismic data: 1) assuring gap-free archive quality transmission of realtime data streams from remote stations to the final community archive, and 2) producing precise GPS displacement time series that can be incorporated into the community seismology archive. The project builds on existing capabilities by adding modules to the Antelope Environmental Monitoring System and leverages the NSF investment in seismic data feeds to community archives. These new modules will handle data streams in a manner that is independent of the content and formats of the environmental sensor measurements.
Sponsor: National Science Foundation
PI/PD: Mohamed Soliman

New Steel Connections for Seismic Retrofit and Strengthening of Bridges and Buildings
This project investigates the behavior of steel connections that are both bolted and welded, with the bolts and the welds sharing loads. Steel building connections have traditionally relied on either bolts or welds to transfer forces from member to member. However, for many applications in existing structures it becomes apparent that strengthening can only be accomplished by welding pre-existing bolted connections. This research is in partnership with W&W|AFCO Steel and the American Institute of Steel Construction. The goal is to provide design guidance for realistic configurations of connections employing bolts and welds that may exist in steel buildings and bridges.
Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PDs: Mohamed Soliman, Bruce Russell

Aeration Process Controls to Reduce Energy Costs in Wastewater Treatment Plants
Wastewater treatment plants (WWTPs) use large quantities of energy for treatment. WWTPs often drastically oversupply oxygen in their aeration processes. The problem of excess energy consumption in these facilities is particularly pervasive in rural areas where operational budgets are limited. The long-term goal of the proposed project is to develop a simple, cost effective approach to decrease energy costs in WWTPs using new process control and design technology. The proposed technology has potential commercial viability through the sales of a monthly licensing agreement to ensure compliance and reduce WWTP energy costs.
Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PDs: Mark Krzmarzick, Tyler Ley

Electrical and Computer Engineering: James Stine
Ground Tire Rubber (GTR), (dry process) Experiment Pavement Surface Evaluation  
ODOT will place a GTR test section on a county/state highway in early 2019. This project will gather surface data from both the GTR and control sections of pavement, including but not limited to cracking and surface texture at intervals of pre placement, post placement, 3 months, 6 months and 12 months. 
Sponsor: Oklahoma Department of Transportation for the United States Federal Highway Administration 
PI/PDs: Kelvin Wang, Joshua Li

Transportation Consortium of South-Central States (Tran-SET): Administrative Account  
OSU is a subrecipient in Louisiana State University’s Transportation Consortium of South-Central States (Tran-SET). M. Samir Ahmed is the PI for the project at OSU. Dr. Ahmed is responsible for managing the TranSET UTC projects at OSU, soliciting and getting external reviews for research problem statements, working with the PIs of the selected projects to finalize their projects and budgets, and responding to all inquiries from TranSET.  
Sponsor: Louisiana State University and A&M College for the United States Department of Transportation 
PI/PD: M. Samir Ahmed

An Integrated Framework for Prediction of Fatigue Crack Propagation Under Random Sea Loading Through Coupled Experimental and Numerical Analysis  
The research will include 1) small-scale experimental testing to collect data that can reduce uncertainty in crack growth parameters in marine steels, 2) large-scale testing to characterize the crack growth in stiffened box girders subjected to variable amplitude sea loading, and 3) developing an integrated numerical approach using finite element analysis and fracture mechanics approaches to predict crack growth under realistic conditions often encountered in ships.  
Sponsor: Office of Naval Research 
PI/PD: Mohamed Soliman

Implementation of Prep-ME for Vermont Agency of Transportation (VTRANS)  
The goal of this work is to develop a customized Prep-ME software with traffic module for the Pavement ME Design at VTRANS, and provide technical support for the implementation of Prep-ME in the state.  
Sponsor: State of Vermont 
PI/PDs: Joshua Li, Kelvin Wang

Determining Concrete Patch Locations Other Than Visual  
This project concerns patch locations in concrete and asphalt-on-concrete pavements in Indiana. It is difficult from visual inspection alone to determine the health of an existing pavement patch. Concrete pavement patches are frequently overlain with asphalt, effectively concealing the location until failure is well underway. The research goal is to find methods to locate and classify three types of concrete patches and to deliver a corresponding patching table. The approach will use the 3D imaging system to create a 1 mm resolution image of the pavement surface and develop an artificial intelligence based technique to narrow the patch search area.  
Sponsor: Purdue University for Indiana Department of Transportation 
PI/PDs: Kelvin Wang, Joshua Li
P3 Award: Decreasing the Energy Use in Wastewater Treatment
The technical aims of this P3 student design project are to: (1) construct a lab-scale experiment to analyze the relationships between critical biological process parameters including dissolved oxygen, biochemical oxygen demand, and aeration; (2) build a simple, automated process control to adjust aeration inputs as oxygen and organic levels fluctuate; (3) simulate the lab-scale results using a mathematical model that can be extended to the full-scale facility; and (4) assess the potential energy, greenhouse gas emissions, and cost savings associated with this design using life cycle analysis.

Sponsor: United States Environmental Protection Agency
PI/PDs: David Lampert
Electrical and Computer Engineering: James Stine

Concrete Pavement Mixtures with High Supplementary Cementitious Materials (SCM) Content
The principal objectives of phase I of this project are to first validate/calibrate existing fly ash compositional equations that predict properties of concrete materials for pavements and then extend and/or develop new characterization protocols for high SCM replacement rates of cement (fly ash and slag) available in the State of Illinois. The goal is to have simple characterization and testing protocols that will allow the use of high volume SCMs in concrete pavement without compromising workability, air content, initial setting time, early strength gain, long term mechanical properties, and durability.

Sponsor: The Board of Trustees of the University of Illinois for the Illinois Department of Transportation for the United States Department of Transportation
PI/PD: Tyler Ley

Performance Engineered Concrete Paving Mixtures – TPF 5(368)

Sponsor: Snyder & Associates, Inc. for Iowa State University for Iowa Department of Transportation
PI/PD: Tyler Ley

Complete Biodegradation of Insensitive High Explosive Compounds
The objective is to develop and deploy microbial strategies for the complete biodegradation of Insensitive high explosive (IHE) compounds. The project is being carried out by a partnership of the University of Arizona, University of West Florida, Georgia Tech and Oklahoma State University. The work at Oklahoma State University focuses on the development of molecular tools for genomic and transcriptomic analyses of the isolated bacteria or bacteria in highly enriched IHE-biodegrading cultures. The bioinformatic analyses will elucidate putative genes involved in biodegradation and thus provide testable hypotheses for biodegradation mechanisms and will inform and support all aspects of the project.

Sponsor: The University of Arizona for the United States Army Corps of Engineers
PI/PD: Mark Krzmarzick

Performance Based Classification Methods for Reclaimed Fly Ash
New specifications are needed on the usage of reclaimed fly ash to produce concrete mixtures with long lasting performance. This project will combine advanced material characterization methods,
performance based testing, mechanistic modeling, and machine learning to create engineering tools to classify reclaimed fly ash. These tools will then be used to develop specifications and new AASHTO documents to classify and design concrete mixtures to use reclaimed fly ash from a variety of sources to ensure concrete mixtures that are constructible, durable, and with satisfactory engineering properties. A pilot project will be created to showcase the usage of reclaimed fly ash.

**Sponsor:** U.S. Department of Transportation -- Federal Highway Administration  
**PI/PDs:** Tyler Ley, Paul Tikalsky  
Electrical and Computer Engineering: Guoling Fan

### Developing Standard Definition for Comparable Pavement Cracking Data

In order to unify data reporting, sharing, and evaluation, standardization of pavement cracking definitions is needed. The objective of this project is to develop standard, discrete definitions for common cracking types in flexible, rigid, and composite pavements. The standard definitions shall be used to facilitate comparable measurement and interpretation of pavement cracking. The definitions shall be of sufficient detail to serve as the basis to meet user and system requirements for developing automated cracking software, and for being compatible with both existing and emerging image-based data collection technologies.

**Sponsor:** National Academy of Sciences for the Federal Highway Administration  
**PI/PDs:** Kelvin Wang, Joshua Li

### Collaborative Research: WERF: GOALI: Bioaugmentation-Enhanced Anammox for Mainstream Nitrogen Removal

The project involves collaborative research between the University of Arizona, Oklahoma State University and an industrial partner, Pima County Regional Wastewater Reclamation Department. The university collaboration will combine engineering expertise on nonconventional biological nutrient-nitrogen removal with expertise on metagenomics/transcriptomics to gain insights and biomarkers to improve the process. The project directly addresses the National Academy of Engineering’s grand challenge of improving the management of the nitrogen cycle by developing technology to control the load of excess nutrient nitrogen into the environment.

**Sponsor:** National Science Foundation  
**PI/PD:** Mark Krzmarzick

### Shrinkage Induced Deformation in Steel Bridges Made Composite with Concrete Deck Slabs – Phase 3

The project will further investigate the phenomena of concrete shrinkage and other volume changes, and assess their effects on deflections in steel bridges made composite with concrete decks. Tasks include: 1) ongoing review of relevant research, 2) perform forensic investigation of known bridges, 3) build prototype to test bracing systems for formwork and screeds, 4) build, monitor and test full-sized prototype bridge, 5) laboratory testing, 6) field bridge instrumentation and monitoring, 7) computational analysis of shrinkage and other effects, 8) identify likely causes for excessive or unpredicted deflections, 9) develop and refine design and construction methods for ODOT bridges.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration  
**PI/ PD:** Bruce Russell

### Resource Recovery from Produced Water using Forward Osmosis and Membrane-assisted Regeneration of Draw Solutions

The objective is to identify and develop novel, feasible, cost effective produced water treatment processes that are comparable in cost to the disposal of produced water by underground injection. Specifically, the research will optimize a newly developed produced water treatment technology based
on a Forward Osmosis process to recover valuable materials, purified water and recyclable brine from an integrated operation that can be used as a trailer mounted modular field unit.

**Sponsor:** Frosty Cooling Systems, LLC  
**PI/PDs:** Mark Krzmarzick  
Chemical Engineering: Seok-Jhin Kim

**Load Test Monitoring of I-235 Bridge Repairs**
Based on inspections of grouted post tensioned bridges, ODOT discovered some durability issues with the I-235 bridge. ODOT hired a company to plan and implement repairs. The faculty at OSU have significant experience in structural health monitoring and will help ODOT in the assessment of these repairs by performing an array of nondestructive tests including live load testing, strain monitoring, and acoustic emissions monitoring.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration  
**PI/PDs:** Robert Emerson, Bruce Russell

**Development of Concrete Mixtures to Mitigate Bridge Deck Cracking; Validate Using 3D Bridge Deck Surface Evaluations**
In task one, a workshop over bridge deck cracking technologies will be held at ODOT. In task two, the researchers will investigate concrete mixtures with different technologies to minimize cracking with Oklahoma materials. In task three, the researchers will work with ODOT to construct different spans of a bridge deck that use these technologies. The forth task will use 3D crack mapping technology to follow field performance of these mixtures for three years. In task five, a specification will be authored to implement these technologies on ODOT bridges. The sixth task will be the completion of a final project report.

**Sponsor:** Oklahoma Department of Transportation for the Federal Highway Administration  
**PI/PDs:** Tyler Ley, Kelvin Wang, Joshua Li, Bruce Russell, Julie Hartell

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**ELECTRICAL AND COMPUTER ENGINEERING**

**High-Level Synthesis and Tools for System-On-Chip Design for Space Exploration**
The goal is to develop techniques, tools, and flows for high-level synthesis of SoC platforms in sub-micron CMOS technologies that: 1) provide ability to efficiently integrate embedded memories, processors, hardware accelerators, and communication structures, 2) utilize synthesis and layout information to accurately estimate area, delay, and power from high-level SoC architecture descriptions, 3) facilitate design-space exploration and component reuse in SoC solutions, 4) are well documented, easy to use, publicly available. This will be accomplished by researching/developing high-level synthesis tools and design flows for complete SoC solutions, and using these open-source tools to explore new techniques for power management.

**Sponsor:** Oklahoma State Regents for Higher Education  
**PI/PD:** James Stine
Development of an Unmanned Aircraft Capability for Instrument Landing System Calibration
Jump Aero has partnered with OSU to develop an unmanned aircraft specifically to calibrate airport Instrument Landing Systems (ILS) for the FAA and DoD. In this Phase I project, OSU will demonstrate the utility of a sensor payload capable of calibrating ILS systems on a commercial off the shelf drone platform.
**Sponsor:** Jump Aero Inc. for Air Force Research Laboratory  
**PI/PD:** James C. West, Sabit Ekin  
Mechanical and Aerospace Engineering: Jamey Jacob

Soil Monitoring Through UAV-Assisted LoRa Underground Sensors-REU Year 1
Oklahoma NSF EPSCoR REU awards provide funding that allows undergraduate students to perform research during the summer months. Students benefit from hands-on research experience and guidance from faculty mentors. This award will allow an OSU student to do research around these tasks: 1) develop a UAV-assisted IoT-based wireless underground soil sensing system, including integration of sensors, communication modules, and IoT base station mounted to a UAV; 2) indoor system validation and testing for communications between the IoT sensors and base station mounted on a UAV; 3) perform field testing and performance validation with different soil types, moistures and depths.
**Sponsor:** Oklahoma State Regents for Higher Education  
**PI/PD:** John O’Hara

Electrical Power Resilience Against Ice-Storms-REU Year 1
Oklahoma NSF EPSCoR REU awards provide funding that allows undergraduate students to perform research during summer months. Students benefit from hands-on research experience and guidance from faculty mentors. This award will allow an OSU student to do research to identify techniques for improving distribution grid resilience against ice storms. Research thrusts include: 1) Study the physics of ice-forming and ice-melting on power lines; 2) Study the structure and operation of distribution systems; 3) Propose a set of proactive actions in the distribution system for preventing, reducing or mitigating the impact of ice storms, and preventing the disruption of distribution systems.
**Sponsor:** Oklahoma State Regents for Higher Education  
**PI/PD:** Hamidreza Nazaripouya

0.41-Thz CMOS-based short-range imager for industrial applications
As part of Texas Instruments Foundational Technology Research Program on millimeter-wave and high-frequency microsystems, Wooyeol Choi at Oklahoma State University will investigate methods to realize affordable high-resolution (8.7cm at 5m) short-range (5cm to 5m) imaging systems that can be applied in material defects inspection, moisture content monitoring, inspection through packaging and others. This is one of the fundamental platform technologies that can provide a wide variety of significant opportunities for the integrated circuits industry.
**Sponsor:** University of Texas at Dallas for Texas Instruments  
**PI/PD:** Wooyeol Choi

A Low-Cost and Non-contact Respiration Monitoring Method for COVID-19 Screening and Prognosis
Given the link between human respiration and COVID-19, there is a need for sensing methods that can monitor respiration in a non-contact fashion. This research proposes noncontact measurement of respiration rate using light wave sensing. Simple visible or nearinfrared light sources and photodetectors are used with signal processing to turn slight variations in reflected light power into accurate measurements of respiration rate. Participation in NSF I-Corps Teams will allow the team to 1) better
understand the unmet needs by conducting customer discoveries and interviews, 2) develop a business model, and 3) learn the desired features for developing a compelling product.

**Sponsor:** National Science Foundation  
**PI/PD:** Sabit Ekin

### CNS Core: Small: Non-contact Monitoring of Respiration and Heart Rates Through Light-Wave Sensing

Preliminary studies show that light-wave sensing can measure respiration and heart rates with more than 94% accuracy in practically relevant scenarios. This work will bring this technology into a fully functional and practical architecture. The research thrusts include: 1) Establishing the Fundamental Limits of light-wave sensing; 2) Establishing a Comprehensive Theoretical Model to enable purposeful engineering, design, and tradeoff analyses; 3) Quantifying the Approaches and Benefits of Advanced Signal Analysis, where the team investigates the algorithmic approaches that extract respiration and heart rates from non-ideal measured data, improve system performance, and eliminate noise and spurious signals.

**Sponsor:** National Science Foundation  
**PI/PDs:** Sabit Ekin, John O’Hara

### Stochastic Cable Harness Coupling to Electric Fields in Spacecraft Cavities

OSU will support Robust Physics in performing this NASA STTR Phase II continuation project. The work will be performed the OSU Robust Electromagnetic Field Testing and Simulation (REFTAS) experimental and computational facilities. REFTAS tasks will be divided into two major efforts. The first effort is the development of a computational engine to predict the coupling of electromagnetic fields within an enclosed cavity onto cable bundles passing through the cavity and the transfer of those signals into adjacent cavities. The second major effort will be experimental validation of the computational coupling model.

**Sponsor:** Sonelite, Inc. d/b/a Robust Physics for National Aeronautics & Space Administration  
**PI/PDs:** James West, Chuck Bunting

### Graduate Research Fellowship for Karl Strecker

This Graduate Research Fellowship was awarded to Karl Strecker, a graduate student in Electrical Engineering whose research focuses on the phenomenon of group velocity dispersion in broadband terahertz signals. The Graduate Research Fellowship Program recognizes and supports outstanding graduate students who are pursuing full-time research-based master’s and doctoral degrees in science, technology, engineering, and mathematics (STEM) or in STEM education. The GRFP provides three years of support for the graduate education of individuals who have demonstrated their potential for significant research achievements in STEM or STEM education.

**Sponsor:** National Science Foundation  
**PI/PD:** John O’Hara

### MRI: Acquisition of a Wideband Continuous-Wave Characterization Platform

Research activities in novel material science, wireless communications, imaging, and electronics at OSU and neighboring universities require a high-frequency, wideband, continuous-wave (CW) mm-wave/terahertz instrument with excellent frequency-resolution, and high dynamic-range. To address this need, this award provides for acquisition of a CW characterization instrument covering the 0.11-0.50 THz frequency range with sub-500 kHz resolution and 120 dB dynamic range. This would be a one-of-a-kind instrument in Oklahoma and nearby regions and would enable new science in advanced sensors
with artificial materials, quasiparticle dynamics in magnetic and topological materials, 5G and beyond communications, and mm-wave and terahertz imaging and electronics.

**Sponsor:** National Science Foundation  
**PI/PDs:** John O’Hara, Sabit Ekin, Weili Zhang, Wooyeol Choi  
**Physics:** Emrah Turgut

### Robust and High-Data-Rate Hybrid RF/Optical Communications for Lunar Missions

A space communication network suitable for planned lunar missions requires a new architectural paradigm that is dynamic, scalable, and capable of supporting diverse mission types at unprecedented communication speed with high reliability, continuous coverage, and minimum latency. The team proposes a hybrid approach, incorporating both RF and optical communication elements within a smart networking framework. The theoretical and experimental effort will integrate RF and optical communication systems for small satellites (SmallSats) and will design an encompassing network architecture that leverages this combination among Earth stations, a LEO SmallSat constellation, the Lunar Gateway, and Moon explorers.

**Sponsors:** National Aeronautics & Space Administration, Oklahoma State Regents for Higher Education  
**PI/PDs:** Sabit Ekin, John O’Hara, Wooyeol Choi, Ickhyun Song  
**Mechanical and Aerospace Engineering:** Andy Arena, Jamey Jacob  
**University of Oklahoma:** Ali Imran  
**University of Tulsa:** Peter LoPresti

### Frontier Electronic Systems Corp. Internships

An MOU has been established to provide students with Engineering Internships at Frontier Electronic Systems Corp. The student interns will be responsible for providing technical support to assist Frontier Electronic Systems Corp. engineering staff with testing, troubleshooting, and repairing electronic assemblies and test equipment.

**Sponsor:** Frontier Electronic Systems Corp.  
**PI/PD:** Chuck Bunting

### Pulsed-Laser-Based Radiation Effects Characterization System for Millimeter-Wave/Terahertz Materials and Devices

The research team will set up a pulsed-laser single-event effects (SEE) characterization system for high-frequency electronics, which will be combined with OSU’s existing time- and frequency domain terahertz characterization setups. By adding the two-photon absorption system to OSU’s existing instruments, a wide range of research topics in SEE becomes possible. First, SEE in a variety of circuit building blocks can be investigated. The system will also be used to analyze the benefits or potential weaknesses of radiation-hardening techniques.

**Sponsor:** Air Force Office of Scientific Research (AFOSR)  
**PI/PDs:** Ickhyun Song, John O’Hara
Distributed Protection and Restoration Schemes for Integration of Large-Scale Solar PV Installations and Responsive Loads: Design, Testbed, Proof of Work and Impact Studies
The goal of the project is to prototype SPV integration technologies for distribution systems including microgrids considering demand behavior of associated load or group of loads, such as buildings, campuses or military bases. The integration of the autonomous primary protection and restoration scheme and technology to existing micro-grid and Distributed Energy Resources technologies and Distribution Management Systems includes the validation at the research laboratory, Solar Photovoltaics farms at the participating utility company (OG&E) and the participating National Renewable Research Lab (NREL).
Sponsor: University of Oklahoma for Department of Energy
PI/PDs: Ramachandra Ramakumar, Nishantha Ekneligoda

Soil Monitoring through UAV-Assisted Internet of Things Wireless Underground Sensors
The objective is to develop a proof-of-concept soil monitoring system with wireless underground Internet of Things (IoT) sensors and unmanned aerial vehicles (UAVs). The team will develop and pilot the “Smart Field,” where the smart soil monitoring system can be tested and preliminary data can be collected for future large-scale applications. The study will look at the feasibility of innovative IoT-enabled underground sensors for soil sensing that can improve soil and water management, consequently leading to conservation of water quantity and quality. The project will involve field experiments and software and hardware implementation of UAV and IoT systems.
Sponsor: United States Geological Society
PI/PDs: Sabit Ekin, John O’Hara
Mechanical and Aerospace Engineering: Jamey Jacob
Biosystems and Agricultural Engineering: Saleh Taghvaeian

FAA COE Zone 3 ILS Measurements
The objective is to record the glideslope depth of modulation in Zone 3 for analysis of manned aircraft flight inspection system (FIS) accuracy and to advance development of Unmanned Aircraft Systems (UAS) for ILS facility preparation. A UAS will be instrumented with a lightweight ILS receiver capable of recording both localizer and glideslope depth of modulation (DDM). The UAS will be equipped with an RTK GPS to more accurately track and record position within 5cm laterally and vertically. The UAS position data will be recorded and synchronized with localizer and glideslope DDM.
Sponsor: Federal Aviation Administration Center of Excellence
PI/PDs: Jim West
Mechanical and Aerospace Engineering: Jamey Jacob, Gary Ambrose

Exploration and Design of Low-Power High Performance Secure Computer Architectures
The goal is to research and develop high-level synthesis tools for SoC platforms in nanometer CMOS technologies that 1) specifically target digital system designs for high-performance and low-energy computer architectures, 2) research and deploy efficient arithmetic and architecture designs for security in current computer architectures, 3) combine synthesis and layout information to accurately estimate area, delay, and power from high-level SoC architecture descriptions, 4) facilitate rapid design-space exploration of secure SoC solutions, and 5) are well documented, easy to use, and publicly available for AFRL personnel.
Sponsor: Air Force Research Laboratory
PI/PD: James Stine
Space-borne Antennas and Circuits for Condensed Radars and STEM (SPACERS)
The goal is to provide NASA with updated technologies and processing techniques to help with the move
towards space-borne application of synthetic aperture radar (SAR) systems. Tasks include: 1) The quality
of a waveform used in the SAR algorithms will be analyzed and optimized. 2) NASA’s current
requirements will be reviewed to make recommendations about the hardware design. Previously
collected terrestrial data from surface, airborne, and current NASA space-borne remote sensing
platforms will be studied to provide advice about the radar’s operation for maximum sensitivity. Initial
analysis of any experimental data will be provided at the end of the program.
**Sponsor:** University of Oklahoma for the Oklahoma Space Grant Consortium for the Oklahoma Regents
of Higher Education
**PI/PD:** Jim West

Experiments to Characterize Statistics of the Electric Field in a Spacecraft Payload Fairing
OSU is supporting Robust Physics in performing its NASA STTR project. The work will be performed by
OSU’s Robust Electromagnetic Field Testing and Simulation (REFTAS) personnel. The first task is
fabrication of the test device, which will consist of a cylindrical insert to be placed in a scale-model
rocket fairing. The second task will be electromagnetic measurement of the test structure under various
conditions. Testing will be performed in large, on-site electromagnetic reverberation and anechoic
chambers. REFTAS will perform secondary roles in design of the test article, review and analysis of test
data, and review of the Phase I report.
**Sponsor:** Sonelite, Inc. d/b/a/ Robust Physics for National Aeronautics and Space Administration
**PI/PDs:** James West, Chuck Bunting

FW-HTF-P: Robotic Health Assistants: A New Human-Machine Partnership in Home Healthcare
The long-term goal is to empower home healthcare providers to achieve high productivity and quality of
work life by developing a robotic health assistant (RoHA)-based smart home healthcare system (SHHS).
In a SHHS, AI-powered robotic health assistants interact with homebound older adults and incorporate
health monitoring, and if needed, provide proactive interventions. The objectives of this one-year
planning project are: 1) building the research team and fostering collaboration with industry partners
and stakeholders to develop the research concept of a RoHA-based SHHS, and 2) conducting preliminary
study and test of this concept.
**Sponsor:** National Science Foundation
**PI/PDs:** Weihua Sheng
Human Development and Family Science: Alex Bishop
OU Health Sciences Center: Barbara Carlson

Collaborative Research: SpecEES: Designing A Spectrally Efficient and Energy Efficient Data Aided
Demand Driven Elastic Architecture for Future Networks (SpiderNET)
The goal is to design, characterize, optimize and validate through a state-of-the-art testbed a new
architecture that enables additional degrees of freedom in mobile network design and operation to yield
substantial gains in spectral efficiency (SE) and energy efficiency (EE) while ensuring customizable
Quality of Experience. The idea is to introduce additional degrees of freedom through an intelligent and
adaptive operation to relax the rigid SE-EE tradeoff and thus enable simultaneous enhancement of both
SE and EE. This is done by shifting the pivot of operation from the rigid always on base station centric
cells to user-centric on demand cells.
**Sponsor:** National Science Foundation
**PI/PDs:** Sabit Ekin
University of Oklahoma: Ali Imran
RI: Small: Enabling Sound-based Human Activity Monitoring for Home Service Robots

This project aims to solve a fundamental research problem critical to the application of service robots in complex home environments: human activity monitoring. By proposing an innovative concept called visual-acoustic semantic map (VASM), this project is able to create a bridge between environmental understanding and human behavior understanding, which offers a new theory to realize non-visual, sensor fusion-based monitoring of resident behaviors. The theoretical framework will be verified and evaluated through experiments in robot-integrated smart homes.

**Sponsor:** National Science Foundation

**PI/PD:** Weihua Sheng

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Performance Based Classification Methods for Reclaimed Fly Ash

New specifications are needed on the usage of reclaimed fly ash to produce concrete mixtures with long lasting performance. This project will combine advanced material characterization methods, performance based testing, mechanistic modeling, and machine learning to create engineering tools to classify reclaimed fly ash. These tools will then be used to develop specifications and new AASHTO documents to classify and design concrete mixtures to use reclaimed fly ash from a variety of sources to ensure concrete mixtures that are constructible, durable, and with satisfactory engineering properties. A pilot project will be created to showcase the usage of reclaimed fly ash.

**Sponsor:** U.S. Department of Transportation -- Federal Highway Administration

**PI/PDs:** Guoling Fan

Civil and Environmental Engineering: Tyler Ley, Paul Tikalsky

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CATcare: Cognition Assistive Technology for Dementia Homecare

The goal is to improve the quality and sustainability of dementia homecare via low-cost wearable, personalized and customizable technology. The two aims are: 1) Identify major environmental cueing functionalities essential for individuals with dementia to accomplish in-home activities of daily living (ADLs) and instrumental activities of daily living (IADLs); 2) Develop and evaluate a wearable tool that can be customized by the caregiver to assist the care recipient with relative independence and quality of living at home. The proposed prototype not only encapsulates hardware innovations (smartglass and smartphone) but also advanced software solutions (image processing, machine learning, computer vision techniques).

**Sponsor:** National Institutes of Health

**PI/PDs:** Guoliang Fan

Human Sciences: Emily Roberts

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Structured Low-Energy High Performance Application-Specific Computer Architectures

The research emphasis is on designing a complex VLSI processor architecture and signal systems using an elaborate design flow or sequence of steps while optimizing constraints for energy, power, and speed given a complex set of OCV issues. Design flows and tools will be created to assist designers in specific computer architectures that are robust, have high amounts of performance, and are considered mobile in that they consume small amounts of power and energy. The objective for these design flows is to create an implementation that outperforms similar architectures in terms of propagation delay, yet produces savings in power consumed.

**Sponsor:** United States Air Force

**PI/PD:** James Stine
Investigation of Focused Ultrasound Mediated Enhancement of Chronic Non-healing Wound Antimicrobial Therapy in Client-owned Dogs

Acute and chronic wounds typically require treatment with a combination of antibiotics administered systemically and locally. They often require extensive surgical debridement, including amputation in patients. The team’s previous studies have shown that focused ultrasound-induced local warming decreases resistance within vascular beds to elevate local intravascular concentration of systemically-administered drugs within the solid tumor. This method has not heretofore been adapted to wound therapy in client-owned dogs. Unlike murine models, canine models replicate the infection profile in humans, and thus a demonstration of focused ultrasound efficacy in a veterinary clinical trial would provide an easier path for human clinical trials.

Sponsor: Focused Ultrasound Foundation
PI/PDs: Daqing Piao
Center for Veterinary Health Sciences: Ashish Ranjan

Optimization and Exploration of Trusted Low-Power High Performance Computer Architectures

This project’s goal is to design, develop, and evaluate hardware support for secure computer architectures at the nanometer level. This will be accomplished by designing complete design flow integration with commercial and open-source Electronic Design Automation tools. The design flow will take a high-level system-level architecture description as inputs along with area, critical path delay, and power dissipation constraints. Based on the SoC architecture description and design constraints, the tools will automatically generate synthesizable HDL models, embedded memories, and custom components to implement the specified VLSI architecture.

Sponsor: United States Air Force
PI/PD: James Stine

Magnetic Hyperthermia Combined Antimicrobial Targeting of Bone Pathogens

The goal is to achieve on-demand rapid, thermally-targeted antimicrobial agent release within infected bone tissue, using a novel dual-platform technology that combines Low Temperature-Sensitive Liposomes (sLTSL) with Alternating Magnetic Field (AMF)-induced mild local hyperthermia, generated using sLTSL loaded with superparamagnetic iron oxide. Such sLTSL permit induced release of liposome-borne antimicrobial agent using mild local elevations in tissue temperature. Therefore, the hypothesis is that localized AMF-induced mild tissue warming combined with microbicide-loaded sLTSL, administered either systemically or locally, can elicit targeted antimicrobial release in a millisecond time scale, permitting synergistic bacterial killing of poorly-accessible biofilm bacteria within bone.

Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PD: Daqing Piao
Center for Veterinary Health Sciences: Ashish Ranjan

A Mobile Platform for Clinical Gait Analysis

There is a need to have an affordable and easy-to-use clinical solution for comprehensive gait analysis that can be operated in a free and natural setting by clinicians and medical professionals without special training. Toward this end, specific aims of the project are: 1) to develop a vision-based real-time navigation system to allow the robot to track a walking subject from behind, side or front; 2) to estimate gait kinematics from depth sequences captured from a walking subject; 3) to evaluate the performance of the proposed mobile platform for gait imbalance assessment by comparing with the gold-standard motion capture system.

Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PD: Guoliang Fan
Aeration Process Controls to Reduce Energy Costs in Wastewater Treatment Plants
Wastewater treatment plants (WWTPs) use large quantities of energy for treatment. WWTPs often drastically oversupply oxygen in their aeration processes. The problem of excess energy consumption in these facilities is particularly pervasive in rural areas where operational budgets are limited. The long-term goal of the proposed project is to develop a simple, cost effective approach to decrease energy costs in WWTPs using new process control and design technology. The proposed technology has potential commercial viability through the sales of a monthly licensing agreement to ensure compliance and reduce WWTP energy costs.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** James Stine  
Civil and Environmental Engineering: Mark Krzmarzick, Tyler Ley

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**FIRE PROTECTION PUBLICATIONS**

**Study of Emergency Services Funding Alternatives**
This cooperative agreement provides funding to study required information updates and revisions to the April 2012 edition of Funding Alternatives for Fire and Emergency Service and incorporate such changes into the document to provide the most up to date information regarding sources of funding for local-level Emergency Medical Services (EMS) and fire departments. The project will allow for development of a comprehensive and informative document that provides information on funding programs and initiatives for local-level EMS and fire departments with the intent of FEMA distributing this information to the appropriate audiences.

**Sponsor:** Department of Homeland Security Federal Emergency Management Agency  
**PI/PD:** Mike Wieder

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**FIRE SERVICE TRAINING**

**AFG - COVID-19 Supplemental to Purchase PPE**
This supplemental AFG grant allowed for the purchase of Personal Protective Equipment (PPE) and supplies to respond to the COVID-19 public health emergency. Fire Service Training worked with Oklahoma Emergency Management to deliver items such as Tyvek suits, N-95 masks, gloves, and sanitation machines to fire departments in the state.

**Sponsor:** Department of Homeland Security Federal Emergency Management Agency  
**PI/PD:** Caroline Reed

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**Total Fitness and Wellness Program**
Fire Service Training in cooperation with School of Kinesiology, Nutritional Sciences, and First Responders Support Services is developing a Total Wellness program for Emergency Responders. The goal is to design a program to address the high risk issues within the following topics areas: physical, nutrition, and mental health. This total wellness program will be designed using the train the trainer method allowing local fire departments to stand up internal wellness programs within their own department that will reduce injuries, address nutritional supplement problems and provide guidance on how to prevent and respond to mental health issues of first responders.

**Sponsor:** Department of Homeland Security Federal Emergency Management Agency  
**PI/PD:** Caroline Reed
AFG to Purchase a Commercial Fire Pumper/Engine
This grant is for the purchase of a commercial fire pumper apparatus. The fire apparatus requested with this grant application is a Commercial chassis, two-person cab, 1,250 gallons per minute, 1,000-gallon water capacity pumper. This project will directly support the delivery of firefighter training throughout Oklahoma with driver operator/pumper training and water supply for live fire training. This unit will provide 12,000 volunteer firefighters training opportunities in locations not available in rural areas.
PI/PD: Caroline Reed

Homeland Security Grant Program – Mobile Pump Station
This grant provides funding for the purchase of a mobile pump station.
PI/PD: Caroline Reed

AFG to Purchase Over the Road Tow Vehicle
The grant is for the purchase of an over-the-road tow vehicle. The tow vehicle requested is a Class A conventional cab commercial highway truck tractor with tandem axle and 44 inch low roof sleeper for storage, with a gross combined weight rating capable of 80,000 pounds. Providing the firefighters of Oklahoma with more localized training is always the goal of Fire Service Training. With this tow vehicle, FST will better serve the firefighters of this state with specialized training at the local level.
PI/PD: Caroline Reed

Susan Harwood Training Grant: OSU Chemical Hazards/Hazardous Communications Project
OSU proposes to build new training capacity by providing Awareness level training and Operations level training on the topic of chemical hazards/hazard communication in agricultural industries. Examples of the training topics include: OSHA regulations for hazardous communications, chemicals used in agricultural settings and their health hazards, what personal protective equipment (PPE) to use and proper use of PPE, what type of monitors to use to monitor for chemical hazards, how to use the monitoring equipment, and how to make decisions based on the information obtained from monitoring equipment.
Sponsor: United States Department of Labor – Occupational Safety and Health Administration
PI/PD: Caroline Reed
Biosystems and Agricultural Engineering: Carol Jones

National Fire Academy State Fire Training Grant
OSU’s Fire Service Training will deliver a series of training programs in cooperation with the Federal Emergency Management Agency (FEMA) and the U.S. Fire Administration’s National Fire Academy (NFA) to enhance the capabilities of the fire service in Oklahoma. Courses for Emergency Responders will be provided throughout the state in both conference settings as well as single course deliveries. The trainings will be provided in rural and metropolitan settings in an effort to bring the training to the responder locally.
PI/PD: Caroline Reed
Public Safety Small Unmanned Aerial Systems Operations Training Baseline Materials & Usage Assessment

The objective of this effort is to develop a curriculum that will address sUAS utilization across all operational settings including structural and wildland firefighting, search & rescue, hazardous material responses, natural disasters, and any other events in which public safety operations would benefit from use of drones.

**Sponsor:** Fire Protection Research Foundation, Inc. for the Federal Emergency Management Agency

**PI/PDs:**
- Dean McFadden
- Mechanical and Aerospace Engineering: Jamey Jacob, James Kidd
- Engineering Outreach and Extension: Ed Kirtley
- Fire Protection & Safety Engineering Technology: Rob Agnew
- Fire & Emergency Management Administration: Haley Murphy

**INDUSTRIAL ENGINEERING AND MANAGEMENT**

Phase VI: An Integrated GIS Application for HazMat Flow Analysis and Risk Assessment to Support Local Emergency Planning and Preparedness in Oklahoma

In previous phases, the team developed a GIS application to visualize HazMat shipment flow, along with a risk assessment methodology for HazMat incidents on Oklahoma roadways. This next phase will focus on making the computer application fully functional and taking it from a lab environment to a web-based application suitable for the end-users in the field. Additional analytics capability will be added to generate customized reports. User-friendly interfaces will be tailored to the needs of specific communities. Quality control tests will be performed. A user guide will be created, and Version 1 of the application will be rolled-out.

**Sponsor:** Oklahoma Emergency Management for the USDOT-Pipeline and Hazardous Materials and Safety Administration

**PI/PD:**
- Manjunath Kamath, Farzad Yousefian
- Biosystems and Agricultural Engineering: R. Scott Frazier

**CAREER: Advancing Mathematical Models and Algorithms for Decentralized Optimization in Complex Multi-agent Networks**

This research is expected to advance the area of distributed optimization over networks, including networks associated with time-varying directed graphs, by innovations in three aspects: 1) Development of an enhanced mathematical modeling framework by utilizing the theory of variational inequalities for the first time, 2) Design and analysis of new classes of iteratively regularized consensus-based algorithms with explicit performance bounds to address the proposed modeling framework, and 3) Explore novel ways to address nonsmoothness in the proposed modeling framework.

**Sponsor:** National Science Foundation

**PI/PD:** Farzad Yousefian
CAREER: Parsimonious Models for Redistricting
Previous models for redistricting do not scale well. Even the best of them begin to struggle on county level instances of redistricting. This is due, in part, to the large number of variables defining these models. In order to satisfy the rigid population-equality constraints, one must redistrict at a finer level of granularity, resulting in an even larger problem. This research will consider new models for redistricting that have the potential to handle significantly larger instances. This is enabled, in part, by the newly proposed Arborescence Models, which exploit planar graph duality to simultaneously achieve small size and remarkable strength.

Sponsor: National Science Foundation
PI/PD: Austin Buchanan

Phase 5: Using HazMat Flow Analyzer and Risk Assessment Tools to Support Emergency Response Planning and HazMat Training Activities in Oklahoma
A working prototype of a GIS application has been developed, which shows (reported) flows of extremely hazardous substances (EHS) on Oklahoma roadways. Ongoing research includes development of risk assessment models that use EHS flow data, HazMat incident data, and accident data for Oklahoma roadways to estimate HazMat incident risk levels for roadway segments. This next phase will enhance the GIS application and risk assessment tool to provide useful planning and training functionality for end-users. Tasks include: 1) Integrating results of the risk assessment models into the GIS application, 2) End-user requirements, feedback, and training, 3) Testing software functionality and output.

Sponsor: Oklahoma Emergency Management for the USDOT-Pipeline and Hazardous Materials and Safety Administration
PI/PDs: Manjunath Kamath, Farzad Yousefian
Biosystems and Agricultural Engineering: R. Scott Frazier

Modeling Worst-case Defender-Attacker Problems as Robust Linear Programs with Mixed-integer Uncertainty Sets
Project objectives include: 1) Study models and algorithms for a base case in which the uncertainty is limited to the cost coefficients and the outer problem contains only continuous variables while the uncertainty set contains continuous and integer variables; 2) Similar to the first objective, explore models and algorithms for a pure integer case in which the uncertainty is not limited to the cost coefficients and both the outer problem and the uncertainty set are represented using only discrete variables; 3) Identify classes of relevant problems that can be solved by the algorithms that are developed.

Sponsor: Office of Naval Research
PI/PD: Juan Borrero
Validating a Clinical Decision Support Algorithm Developed with Big Data to Diagnose, State, Prevent, and Monitor a Patient’s Diabetic Retinopathy

With a growing diabetic population, it is imperative to develop a tool for preventing, diagnosing, screening, and managing diabetic retinopathy to cater to patients living with diabetes. This project lays the foundation for this kind of tool. The research team will finalize and test a clinical decision support algorithm based on a patient’s current lab results to decipher whether a patient has diabetic retinopathy. The algorithm will lead to a new standard of care for diabetic patients. Ideally, primary care physicians will be empowered to assess patient diabetic retinopathy as part of a standard in-office primary care visit.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Tieming Liu  
Center for Health Systems Innovation: William Palva  
Statistics: Ye Liang

Optimization-based Aggregate Master Planning Tools for Bay Valley Foods, LLC

The project focuses on the master planning/scheduling activity, which is a key driver of current operations as it guides production by setting monthly production targets. The goal is to develop analytical approaches for guiding master planning decisions. The objectives are: 1) design and formulate mathematical optimization models that recommend aggregate-level master production schedules; and 2) develop computer implementations of the mathematical models that can be solved using a commercial optimization solver. This integrated approach using costs and revenues to drive the plan while simultaneously considering the various resource constraints can lead to better master planning decisions that result in savings.

**Sponsor:** Big Valley Foods, LLC  
**PI/PDs:** Baski Balasundaram, Austin Buchanan, Sunderesh Heragu

Creating Resilient Manufacturers: Recovery, Reshoring, and Reimagining Manufacturing in Oklahoma

The program will provide pandemic recovery and resiliency evaluation and solutions, engineering technical design and assistance, and workforce development activities aimed at small and medium sized manufacturers. The anticipated outcome is long-term economic resiliency as a result of job stability, increased revenues, strengthened innovation capacity, and improved health and safety of manufacturing employees. The engineering assistance and training components will be guided by the Industrial Engineering disaster preparedness faculty team’s evaluation and recommendations. The program is also a collaboration between OSU and the MidAmerica Industrial Park Automation Resource Center, offering workforce development training and technology application evaluation and research.

**Sponsor:** United States Department of Commerce Economic Development Administration  
**PI/PDs:** Sunderesh Heragu, Katie Jurewicz  
New Product Development Center: Robert Taylor
Collaborative Research: Enhancing Power System Resilience Via Data-Driven Optimization
A new class of data-driven optimization methodologies is proposed to assist power system operations under contingency. This project studies probabilistic modeling of power grid contingency based on meteorological and historical transmission availability data. The data analytics is incorporated in distributionally robust optimization models to (a) conduct risk assessment analysis, (b) harden pre-disaster power grid, (c) take corrective actions during disasters, and (d) conduct post-disaster self-healing and system restoration. Successful implementations of the research can provide data-driven approaches to address critical resilience issues facing the nation’s power system infrastructure.

Sponsor: National Science Foundation
PI/PD: Chaoyue Zhao

Imposing Connectivity Constraints in Large-Scale Network Problems
Previous approaches to solve vertex-centric connectivity problems use additional edge (and possibly flow) variables, which overburden IP solvers, or rely on simple, weak inequalities, leading to the exploration of a large number of branch-and-bound nodes. This research is expected to overcome these limitations and lead to a rich body of knowledge regarding connectivity problems, and, in particular, to faster approaches for solving vertex-centric connectivity problems. The work will likely generalize existing results about edge-centric connectivity and will have consequences for hop-constrained and survivable network design problems. An REU supplement has been received for student support for this project.

Sponsor: National Science Foundation
PI/PD: Austin Buchanan

Collaborative Research: Data-Driven Risk-Averse Models and Algorithms for Power Generation Scheduling with Renewable Energy Integration
The objective is to derive data-driven risk-averse stochastic optimization models and discover strong formulations with efficient decomposition algorithms for the power generation scheduling problems with renewable energy integration, so as to ensure cost effectiveness and system robustness. In this project, an innovative approach will be explored that integrates statistics and optimization methods to derive a reliable and cost-effective power generation scheduling decision. Starting from the historical data, the project team will develop data-driven risk-averse stochastic optimization models and explore efficient algorithms for both system operators and market participants.

Sponsor: National Science Foundation
PI/PD: Chaoyue Zhao
Reinforced Recycled Polymer Composites
The technical approach is to mold recycled carpet as a reinforcement with recycled polymer resins from bottling operations to make novel materials. The deliverable materials will include compression and extrusion molded structures for construction applications, repairable pallets as replacements for wood pallets used for automated supply chain management. The pallets will have significant advantages over wood pallets, especially in food and beverage-related facilities.

Sponsor: Sustainable Manufacturing Innovation Alliance Corp. dba REMADE Institute
PI/PDs: Ranji Vaidyanathan, Raman Singh
Chemical Engineering: Jeffrey White

OLED-based Infrared Sensor
OSU’s work in this STTR project will be to validate the innovative OLED-based infrared sensor structure for the low-cost, large format, high-resolution, and flexible SWIR focal plane arrays.

Sponsor: Ghost Display Technologies for United States Air Force Research Laboratory
PI/PD: Do Young Kim

PETAL, A Sustainable Product to Reuse Aluminum Cans and PET Bottles and Keep Them Out of Landfills
Single use PET plastic bottles and aluminum cans are used extensively but recycled at very low rates (29% for plastic and 50% for aluminum). PETAL will be the market’s first reusable bottle made of at least 90% recycled materials. It will take dozens of aluminum cans and PET bottles out of landfills. The recycling methods are already feasible. PETAL bottles will create a market of upcycling the single use bottle and replace it with a reusable, sustainable alternative. This grant will provide funding to further validate the team’s hypothesis and to demonstrate commercial viability.

Sponsor: National Collegiate Inventors & Innovators Alliance (NCIIA) d/b/a/ VentureWell
PI/PD: Ranji Vaidyanathan

EAGER: Manufacturing of Diamond Nanocrystals for Quantum Applications
The objective is to study manufacturing of diamond crystal arrays by Microwave Plasma Enhanced Chemical Vapor Deposition toward a broader applicability in quantum devices for Quantum Computing, Spintronics, Magnetic Field Sensing, Encryption, and Biolabeling/Transduction. Some applications require small size (nano-meter/nm or micro-meter/μm) diamond crystals containing preferably only one type of N-V defects that are arranged into isolated diamond crystal arrays for greatest sensitivity, individual addressability and applicability. This project will address this challenge of developing manufacturing approaches to synthesize diamond single crystal arrays containing only one type of N-V defect centers that are preferentially oriented along one crystallographic direction.

Sponsor: National Science Foundation
PI/PD: Raj Singh

NASA Oklahoma EPSCoR Research Infrastructure Development Qualification and Certification of Additively Manufactured Metallic Components in Space and Other Industry Applications
This travel grant will enable strategic partnerships that support the activities funded by the Space Mission Directorate at NASA Marshall. Specifically, the team seeks to pursue collaborative research in lightweight structures and additive manufacturing. They also seek
collaboration in developing capabilities related to real-time property prediction during the AM process. This grant will allow interaction with the additive manufacturing group at NASA Marshall Space Flight Center and thus enable identification of primary areas of mutual interest.

Sponsor: Oklahoma State Regents for Higher Education
PI/PD: Ranji Vaidyanathan
Engineering Technology: Hitesh Vora

I-Corps: Infrared-driven Organic Light-Emitting Diode (OLED) Projection Display
This I-Corps project aims to evaluate the commercialization potential of the new cost-effective, highly-flexible, extremely-large display screen technology and to accelerate the translation of this technology into emerging products. Direct conversations with prospective customers will allow for a greater understanding of the team’s customer sub-segmentation and further narrowing of the team’s value proposition. Participation will also help the I-Corp team clarify the direction the business and technology can take going forward such as refining the product development process to target and meet identified specific market needs.

Sponsor: National Science Foundation
PI/PD: Do Young Kim

Structural Supercapacitors for Onboard Energy Storage and Delivery in Manned or Unmanned Surface Vessels
This research effort will investigate the simultaneous enhancement of mechanical and electrical characteristics in polymer matrix composites with the objective of developing structural supercapacitors. These structural supercapacitors are multifunctional materials that provide both load-bearing and electrical-energy-storage capabilities in a synergistic manner. The research focus is on hierarchical modifications of various components of the proposed supercapacitor architectures supported by a fundamental multi-scale and multi-physics investigation of the chemo-mechanics of these materials. Material behavior will be studied across multiple length scales. These materials are expected to lead to energy storage structures that find application in various surface and underwater vessels and vehicles.

Sponsor: Air Force Office of Scientific Research
PI/PDs: Raman P. Singh
Brown University: Pradeep R. Guduru

Analysis of Corrosion Scales in Iron/Steel Drinking Water Distribution Pipes from OKC
In this research services agreement, the composition and microstructure of iron tubercles/scales from six pipe specimens provided by Carollo, will be analyzed. The pipes will be harvested from the distribution system network in Oklahoma City (OKC), OK.

Sponsor: Carollo Engineers, Inc.
PI/PD: Pankaj Sarin
**OLED-Based Infrared Image Sensor**
Being able to sense light over a broad spectrum of light can increase the quality of images and our ability for night vision. For highly specialized applications like military and space missions, there are extremely expensive Indium Gallium Arsenide (InGaAs) image sensors with shortwave infrared (SWIR) wavelength sensitivity. Until now, the applications of these InGaAs SWIR image sensors have been severely limited due to the formidable price. The proposed innovative infrared image sensors, using an inexpensive IR sensitive OLED and a low-cost silicon-based visible image sensor, will be low-cost and have comparable performance to InGaAs sensors.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PD:** Do Young Kim

**Design of Novel Electrocoagulation Systems for Produced Water Treatment**
The project promises a technological breakthrough for electrocoagulation (EC) technology by development of novel, high efficiency but low cost electrodes for produced water treatment. The first project objective is to develop novel electrodes for EC that will have high surface area and will allow for easy removal and/or prevention of the oxide layer formed on the cathode by embedding an electromagnet in the electrodes. The second objective is to identify optimal conditions for electrocoagulation. In particular, conditions to form hydroxychloride Green Rusts (GR(Cl-)) to decrease the Cl- ion concentrations (and total dissolved solids), will be explored.

**Sponsor:** United States Geological Survey  
**PI/PD:** Pankaj Sarin

**CerFoil-High Efficiency Ceramic Propellers for UxS**
The purpose of this research program is to develop a radically new lightweight ceramic composite propeller for use in small unmanned air systems (SUAS) such as commonly known quad-copter drones. The design is constructed of very lightweight high modulus ceramic composites to provide a 10-12 db average reduction in radiated noise compared to the state-of-the-art commercially available hobby enthusiast propellers.

**Sponsor:** Hydronalix, Inc. for the Department of Defense  
**PI/PDs:** Ranji Vaidyanathan, Jim Smay

**Continuous, Large-Scale Manufacturing of Functionalized Silver Nanowire Transparent Conducting Films**
The objective is the discovery of reaction conditions in a millifluidic reactor to produce high-quality, low-cost AgNW inks that can be continuously printed onto flexible substrates to create low-cost transparent conductive films (TCFs) for Internet of Nano Things (IoNT) application. To accomplish this, the research aims are: 1) AgNW millifluidic reaction mechanism investigation and synthesis optimization to find the optimum reaction conditions; 2) Large-scale millifluidic synthesis of functionalized AgNW; and 3) Continuous preparation and writing of AgNW inks onto flexible substrates to create TCFs for IoNT.

**Sponsor:** National Science Foundation  
**PI/PDs:** James Smay  
Chemical Engineering: Shohreh Hemmati

**Engineering Thin Film Solar Cells for Radiation Hardness, Lifetime and Efficiency**
The project will use a combined experimental and theoretical approach for characterization and in depth study of radiation hard multinary halide and chalcogenide solar cells for space applications. The two proposed materials technologies in this project are based on Cu(In,Ga)Se2 (CIGS) and emerging lead halide perovskites that demonstrate a combination of remarkable radiation resistance, high efficiency,
light weight, thin, and flexible solar cell arrays for NASA’s CubeSat and SmallSat applications in which high power, light, low payload systems are highly desirable.

**Sponsors:** National Aeronautics and Space Administration, Oklahoma State Regents for Higher Education, University of Oklahoma

**PI/PDs:** Do Young Kim  
Mechanical and Aerospace Engineering: Andy Arena  
Physics: Mario Borunda

**Marine Composites with Improved Toughness and Thermal Stability**

In this OARS project, MITO Material Solutions, LLC will do research to develop additives that mix easily with polyester and vinyl ester resins. Polyester and vinyl ester resins are commonly used to make marine composites. Marine composites are used to make various types of boats and boat parts. The MITO additives will improve the mechanical properties of these resins and make marine composites tougher. MITO mixed resins will be applied in-between the layers of fiberglass or other fabrics. In this project, the MITO Team will develop new inexpensive formulations as well as scale up the amount of existing MITO products.

**Sponsor:** MITO Materials Solutions for Oklahoma Center for the Advancement of Science and Technology

**PI/PDs:** Ranji Vaidyanathan  
Chemistry: Frank Blum

**Materials Recycling – Promoting Sustainability and a Circular Economy**

Faculty from materials science and engineering, civil and environmental engineering and Spears school of business will set up an experiential graduate level course for graduate students to: 1) understand sustainable practices, 2) develop and evaluate ideas for innovative sustainable practices, 3) generate prototypes and term-papers based on those ideas, 4) test if the idea has commercial potential, 5) apply for scholars programs, 6) generate business plans and elevator pitches, 7) present the pitch to business plan competitions, 8) apply for Venturewell and I-Corps grants, and, 9) create a business based on the idea and bring the product to the market.

**Sponsor:** National Collegiate Inventors & Innovators Alliance d/b/a/ VentureWell

**PI/PDs:** Ranji Vaidyanathan  
Civil and Environmental Engineering: Julie Hartell

**SBIR Phase II: Tough Polymer Composite Materials Through iLAMB, or Interlaminar Modifications Through Master Batching**

During Phase I, the OSU/MITO Material Solutions team demonstrated a toughening additive that can be blended directly into an epoxy resin at concentrated levels to create a “Master Batch,” exhibiting excellent dispersion of the hybrid nanofillers combining graphene oxide and polyhedral oligomeric silsequioxanes in an epoxy matrix. This master batch can be incorporated into the current composite manufacturing process without any process changes to result in significantly enhanced interlaminar fracture in carbon fiber/epoxy composites. In Phase II, new nanofillers/toughening additives will be developed, manufactured and scaled up that can be added to epoxy/vinyl ester/polyester resin systems in Master Batch form.

**Sponsor:** MITO Material Solutions

**PI/PDs:** Ranji Vaidyanathan, Raman Singh  
Chemistry: Frank Blum
Large-Volume Stimulation of Rock for Greatly Enhanced Fluids Recovery Using Targeted Seismic-Assisted Hydraulic Fracturing

This project will develop and demonstrate a new technology for large-volume and targeted comminution of rock in low permeability formations to enhance recovery from unconventional oil and gas resources. This greatly increased rock stimulation, through bulk comminution, is expected to cause significant increase in permeability leading to enhancement of recovery factors for sub-surface fluids. The effort integrates fundamental scientific understanding of dynamic material response under constraint, damage-induced permeability and porosity enhancements at multiple length scales, along with models of comminution due to the local release of kinetic energy associated with high shear strain rate of dynamic deformation.

**Sponsor:** Department of Energy  
**PI/PDs:** Raman P. Singh, Pankaj Sarin

Assessment of Radiation Shielding Properties of Novel and Baseline Materials External to ISS

The project will test and measure the radiation shielding and other properties of the multifunctional materials developed in previous awards. In this project, the materials will be tested in the actual space environment external to the International Space Station.

**Sponsor:** National Aeronautics and Space Administration  
**PI/PDs:** Ranji Vaidyanathan  
Mechanical & Aerospace Engineering: Andy Arena  
Department of Physics: Eric Benton

Innovation Corps Site Program

The vision for the Oklahoma State University I-Corp Site is to increase the number of STEM-related startups and licensing opportunities emerging from the OSU campus. The OSU I-Corp Site will accelerate startup activity on campus not only by providing funding and training to startup teams, but by helping create a faculty and student population that is familiar with the business startup process. It will also provide a pathway for underrepresented students to participate in STEM-related business startups. The grant will provide 90 teams (over a three year period) $3,000 in funding per team along with training in the startup process.

**Sponsor:** National Science Foundation  
**PI/PDs:** Ranji Vaidyana than  
Spears School of Business: Bruce Barringer

Modification of the Coefficient of Thermal Expansion Analysis Suite (CTEAS)

Support from GE Global Research will be used to improve the existing Coefficient of Thermal Expansion Analysis Suite (CTEAS) software developed as a freeware by the principal investigator Dr. Sarin. Some areas for improvement of CTEAS software include: 1) Matlab based GUI interface for the CTEAS software, 2) Ability to install and run the CTEAS without the requirement for a Matlab license, 3) Corrected and updated user manual.

**Sponsor:** GE Global Research  
**PI/PD:** Pankaj Sarin
I-Corps: Device to Deliver Cold Plasma Therapeutic to Wound Sites to Promote Wound Healing
The technology that has been developed delivers cold plasma through a device to promote wound healing while maintaining a level of sterilization to prevent reinfections. The device can be widely manipulated allowing for the treatment of a large variety of wound sizes, although the team is specifically focusing on small animals at first. This I-Corps project will allow the team to conduct customer research to determine whether the veterinary market is receptive to the implementation of this type of technology,

Sponsor: National Science Foundation
PI/PD: Jamey Jacob

New Sounding Rocket Tech
The objective is to support the establishment and execution of a high-tempo cost effective process to rapidly drive technology maturation from conceptual to application to reduce overall lifecycle time by providing impactful data for performance evaluation and model validation. This involves providing a capability to evaluate new technology performance utilizing low-cost research rocket flights, which then can progress to higher fidelity tests on sounding rocket and strategic asset flights.

Sponsor: Honeywell Federal Manufacturing & Technologies LLC for Department of Energy
PI/PD: Jamey Jacob

Black Sage Flight Test Event
OSU’s Unmanned Systems Research Institute (USRI) will provide pilots and aircraft for field flight demos at the Black Sage Flight Test Event.

Sponsor: Berry Aviation
PI/PD: Jamey Jacob

KPN Hole Cleaning Monitoring in drilling with distributed sensors and hybrid methods
OSU and SINTEF will collaborate and develop joint research to improve the understanding of how hybrid methods can improve interpretation of drilling data. The aim is to increase knowledge on how to best use a combination of physics-based modelling and machine learning for real-time interpretation of drilling data with along-string measurements.

Sponsor: SINTEF for Research Council of Norway
PI/PD: Omer San

Development Tasks for Veroplane Manned and Unmanned Vertical Take-Off and Landing Aircraft
This risk reduction task includes design, fabrication, test and analysis of a ducted rotor component test stand. The scope of work includes the Ducted Rotor Test Rig structure, electrical power, instrumentation, and data acquisition and control system. Testing will include evaluation of the ducted and unducted rotor to determine the lift contribution of the wing section duct.

Sponsor: Veroplane Limited
PI/PDs: Kurt Rouser, Jamey Jacob

Simulation of a Tankless Water Heater
An open source platform, OpenFOAM, will be used to create a simulation tool that can be used in designing tankless water heaters. Premixed burners are of interest for Rheem in order to meet strict emission targets (e.g. California 1111 rule for NOx). Expensive premixed flames allow better control of the flame temperature but unfortunately may cause excessive noise. To solve the acoustic problem and
reduce the manufacturing cost, the industry needs to have fast design cycles of furnaces using cheap computational tools. The value proposition of this project is to reduce the cost of furnace simulation by harnessing the capability of open-source OpenFOAM solver to simulate Ultra Low-NOX residential furnaces.

**Sponsor:** Rheem Manufacturing Company  
**PI/PD:** Khaled Sallam

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**Balloon Infrasound Observations of Terrestrial Earthquakes with Applications to Venus**

The team will observe the infrasound generated by terrestrial earthquakes from balloon platforms in the Earth's troposphere and stratosphere to demonstrate the feasibility of detecting and geolocating quakes from one or more balloons at Venus. At present, there is no feasible technique available for investigating seismic activity on Venus and probing its interior. The interiors of Earth and the Moon have been studied in great detail using terrestrial seismology. Surface seismology experiments are being performed on Mars as part of the InSight mission. However, such a study has been denied to Earth's sister planet because of its high surface temperatures.

**Sponsor:** Jet Propulsion Laboratory for National Aeronautics and Space Administration  
**PI/PDs:** Brian Elbing, Jamey Jacob

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**Structural Investigation of Carbon Aerogels Synthesized by Pyrolysis**

Under supervision of Dr. Kalkan, the Functional Nanomaterials Laboratory will conduct a structural investigation of carbon aerogel samples developed by Aspen Aerogels. The investigation will employ X-Ray diffraction and transmission electron microscopy to reveal and characterize different phases and domains in these aerogel materials, such as: graphene platelets of different number of atomic layers and sizes; graphite nanocrystals of different sizes; graphene oxide and amorphous carbon domains; silicon nanocrystals of varying size; silicon carbide nanoparticles of varying size and phase. The goal is to elucidate nucleation and growth of these different domains and phases as a function of pyrolysis temperature.

**Sponsor:** Aspen Aerogels, Inc.  
**PI/PD:** Kaan Kalkan

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**Value of Blending Heat-pumps and Chillers on Multiuse Property**

The objective of this study is to investigate the impact of blending heat pumps and chillers in two multiuse buildings (Office building 1 and Office building 3) in Utica Place, Tulsa, Oklahoma. The monthly kWh and natural gas consumption of an existing blend of hydronics heat pumps, chillers, and air handling units will be analyzed to determine the energy savings impact on each building in the current blended configuration.

**Sponsor:** Utica Place, LLC  
**PI/PD:** Khaled Sallam
Model Validation and Valve Modeling for the Development of a Rotating Spool Compressor
Spoolcomp is a comprehensive model of a novel rotating spool compressor. Spoolcomp has been validated and extensively used to develop increasingly optimal designs of R410A compressors. However, regulatory trends in the HVAC&R industry and the intrinsic attributes of the spool compressor have suggested that lower pressure refrigerants are better suited for the application of the spool compressor. Spoolcomp does not adequately capture the performance of this novel compressor using these refrigerants when compared against experimental data. Therefore, it is necessary to improve this tool. This project aims to improve the predictive capability of Spoolcomp through additional code development and/or re-tuning.
Sponsor: Torad Engineering LLC
PI/PD: Craig Bradshaw

R4I Track-4: Exploiting Thermoacoustic Assonance to Enrich Multifunctional Meta-Structures
The goal is to educe new insights into scaling laws and structure-performance relationships for thermoacoustic meta-structures (TAMS) aiding design, analysis and evaluation advances that enable development of impactful solutions for multifunctional applications. The project will lead to development of a new, computationally-efficient, multiphysical model combining thermoacoustic and vibroacoustic elements within the ZKTL framework capable of rapid design optimization iterations for TAMS-based acoustic liners. Correlation with experiments on prototypical TAMS-based acoustic liners will yield new insights into scaling laws and structure-performance relationships emanating from assonant mechanisms. Intellectual property related to structural material configurations for core liners is expected to be generated.
Sponsor: National Science Foundation
PI/PD: James Manimala

Enhanced Design Tools for Ground-Source Heat Pump Systems
Ground heat exchanger design programs have been focused on sizing of regular configurations for building systems, after the building heating and cooling loads are determined. However, there is significant room for improved designs in two areas: borefields that take advantage of irregular geometries, and simultaneous optimization of the building envelope, system, and ground heat exchanger. Existing methods for computing g-functions don’t adequately support these types of designs. This project will further improve the methodology used to calculate g-functions, by speeding up the underlying calculation and utilizing regression or machine learning to come up with equation fits to the reference calculation.
Sponsor: Various Private Sponsors
PI/PD: J.D. Spitler

Development of a Semi-Empirical Compressor Model Accounting for Modulation and Extrapolation to Expedite System Development
Traditional development of modulating compressor systems requires large experimental datasets and heuristic design iterations that are slow and expensive. With the critical addition of fast, accurate, compressor models that can extrapolate beyond trained bounds, Oklahoma-based AC and HP manufacturers have an opportunity to create a competitive advantage during the development of their next generation products. This project will accomplish this by developing a predictive modeling platform specifically for expediting compressor selection. The development will focus on enhancing the speed and flexibility to expedite the addition of new features and modulation in future products.
Sponsor: Various Private Sponsors
PI/PD: Craig Bradshaw
Low GWP Refrigerant Evaluation for Fin-tube Coils: Differences in Coil and Simulation Model Performance
Fin-tube evaporators are a staple in unitary equipment. Regulatory changes will require utilizing new refrigerants in the short-term, resulting in unknown changes in thermal performance. This project will address these issues by determining the effect of a member-selection of low GWP A2L drop-in refrigerants onto fin-tube evaporators’ performance relative to a R410A (GWP: 2088) baseline. The team tentatively plans to evaluate both A2L R32 (GWP: 675) and A2L R454B (GWP: 466) in the first year of the project. The objective is generating an improved understanding of the implication of low GWP fluid changes onto fin-tube heat exchanger performance.

Sponsor: Various Private Sponsors
PI/PDs: Christian Bach, Craig Bradshaw

Development of an Unmanned Aircraft Capability for Instrument Landing System Calibration
Jump Aero has partnered with OSU to develop an unmanned aircraft specifically to calibrate airport Instrument Landing Systems (ILS) for the FAA and DoD. In this Phase I project, OSU will demonstrate the utility of a sensor payload capable of calibrating ILS systems on a commercial off the shelf drone platform.

Sponsor: Jump Aero Inc. for Air Force Research Laboratory
PI/PDs: Jamey Jacob
Electrical and Computer Engineering: James C. West, Sabit Ekin

NASA Oklahoma EPSCoR Research Infrastructure Development: Ionization Radiation Studies in SiC Based Components for Lunar Missions
The goal is to evaluate the performance of 4H-SiC based metaloxide-semiconductor field-effect transistor (MOSFET) devices in heavy-ion radiation environment. with high electrical performance in single-ion events. This travel grant will facilitate the visit to the NASA Space Radiation Laboratory (NSRL), Brookhaven National Laboratory, where the single ion radiation studies will be conducted. The device fabrication will be conducted at OSU. The focus of the device design will be to modify gate dielectrics in the MOSFET devices to enhance ionization radiation resistance. The travel will facilitate the interaction of the PI and graduate student with the experienced scientists at NSRL.

Sponsor: Oklahoma State Regents for Higher Education
PI/PD: Ritesh Sachan

NASA Oklahoma EPSCoR Research Infrastructure Development: Numerical Simulation and Flight Test Validation of Prandtl-D Lift Distribution
Improved aerodynamic performance and more efficient air vehicle structure are achievable using the bell span-load compared to a purely elliptical load distribution. The research will investigate these benefits with the following: 1) Design a flying wing configuration unmanned vehicle with a twist distribution set to match the bell span-load using design tools based on low-order aerodynamics, 2) Analyze the resulting configuration using a commercially available computational fluid dynamics (CFD) software package, 3) Compare the results from the low-order aerodynamics model and CFD, 4) Construct the designed vehicle, and 5) test fly the vehicle to verify the predicted proverse yaw characteristics.

Sponsor: Oklahoma State Regents for Higher Education
PI/PD: Ryan C. Paul

2020/2021 Aerospace Propulsion Outreach Program (APOP): Low Loss Ducted Inlet - Phase 1
The 2020-2021 Aerospace Propulsion Outreach Program (APOP) research activity requires undergraduate students, working as a team, to research and develop a compact, S-Duct inlet for the JetCat P100-RX. This
inlet will better allow the engine to be integrated with a future airframe, as most platforms mount the engine of the airframe centerline but have a ducted inlet on the sides or bottom. The goal with this project is to design a new inlet that ducts the flow from a single inlet that is 6 inches from the centerline of the JetCat engine.

**Sponsor:** ARCTOS Technology Solutions, LLC for Air Force Research Laboratory  
**PI/PD:** Kurt Rouser

**Raman spectral characterization of carbon aerogels obtained by pyrolysis at different temperatures**
Aspen Aerogels will provide Professor Kalkan’s laboratory with samples of carbon aerogels for conducting Raman spectroscopy. The samples will belong in three groups: 1) fragments from carbon aerogel monoliths; 2) micron-sized carbon aerogel beads; and 3) micron-sized carbon aerogel beads with additional elemental silicon dispersed in their bulk. The samples will share a common polymeric precursor, but they will have been obtained by pyrolysis at different temperatures, therefore the type of carbon is expected to range from amorphous to graphitic. Raman spectroscopy is ideally suited for the characterization of those carbons in terms of their crystallinity, ordering and overall quality.

**Sponsor:** Aspen Aerogels, Inc  
**PI/PD:** Kaan Kalkan

**Center for Integrated Building Systems**
The Center for Integrated Building Systems (CIBS) is an industry/university cooperative research center at OSU. CIBS’ membership includes several Oklahoma-based companies and manufacturers. CIBS has a mission to serve its membership by providing tangible outcomes and manpower to improve the integration of components, systems, and the built environment through an exploration of the fundamental mechanisms of interaction from component to building scales. The Center develops research projects based on the recommendations of its advisory board, composed of representatives of the member companies.

**PI/PDs:** Craig Bradshaw, Dan Fisher

**Toward Optimal Secondary Furnace Heat Exchanger: Modeling of Furnace Combustion Gas Condensation**
This project will create a computational fluid dynamics (CFD) using Siemens’ STAR-CCM+ software to simulate condensation and heat exchange in a secondary heat exchanger (SHX). In year one, the model will be used to generate a dataset of results for a range of inlet temperatures, inlet water concentrations, tube diameters, tube lengths, and tube internal wall enhancements. In parallel, a simple test apparatus will be created that will generate a validation data set for the CFD simulation. Validated CFD results will provide confidence for extension of the model to different tube diameters and shapes along with variation in inlet conditions.

**Sponsor:** Various Private Sponsors  
**PI/PD:** Christian Bach  
**Engineering Technology:** Aaron Alexander

**A Smart Skin to Treat and Prevent Pressure Ulcers**
In this study, the researchers will develop a smart skin to treat and prevent pressure ulcers. The smart skin will act as an adaptive pressure off-loading device by continuously and autonomously redistributing the skin contact pressure. This goal will be achieved by harvesting the unique mechanical properties of
liquid crystal elastomers. Pressure triggers a reorientation of their microstructure, which, in turn, leads to a change in shape and in mechanical properties.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Aurelie Azoug, Jerome Hausselle

**UAS Combat Flight Inspection Project Plan**  
Oklahoma State University will leverage unique UAS programmatic past performance and experience with emerging UAS capabilities to develop a market survey of current and anticipated UAS that are capable of performing the OCONUS flight inspection mission. This will be generally contained within group 2 and group 3 systems deployable by air shipment and operated with minimal manned footprint.  
**Sponsor:** Federal Aviation Administration Center of Excellence  
**PI/PDs:** Rick Gaeta

**Real-time Weather Awareness for Enhanced Safety Assurance in UTM**  
This project addresses emerging needs in real-time weather forecasting to improve the safety of low altitude aircraft operations through the integration of real-time observations from autonomous systems with numerical weather prediction and flight management and safety systems. By including diverse disciplines, this project will provide manned- and unmanned aircraft improved situational awareness to enhance safety and efficiency, particularly for unmanned traffic management, urban air mobility, and airport operations.  
**Sponsor:** National Aeronautics and Space Administration  
**PI/PDs:** Jamey Jacob, Brian Elbing, Imraan Faruque, Nicoletta Fala

**DARPA CRANE AFC Design & Integration**  
Oklahoma State University (OSU) will serve as a subcontractor to the Georgia Institute of Technology (GT) in support of the Defense Advanced Research Program Agency (DARPA) and the Control of Revolutionary Aircraft with Novel Effectors (CRANE) Program. OSU will lead an Integrated Product Team (IPT) to accomplish a full scale Hardware-in-the-Loop (HiL) experiment. The HiL experiment will consist of using a robust subsonic fixed wing UAS as a test bed for aerodynamic effectors to demonstrate flight control authority.  
**Sponsor:** Georgia Institute of Technology for Defense Advanced Research Projects Agency  
**PI/PDs:** Rick Gaeta, Imraan Faruque

**Support for an Online Ground-Source Heat Pump Design and Techno-economic Evaluation Tool**  
The scope of work builds on the design tool and g-function calculation methodology developed in 2019-2020. The automated design tool takes loads calculated by EnergyPlus along with some additional information provided by OpenStudio to select a ground heat exchanger configuration, size it, and return the details, including the g-functions to OpenStudio, so that a detailed analysis can be done with EnergyPlus. The current version of the design tool can size square and near-square borehole configurations. This project is intended to improve the capabilities of the automated design tool to size ground heat exchangers that better fit the available land area.  
**Sponsor:** U.T.-Battelle, LLC for Oak Ridge National Laboratory  
**PI/PDs:** J.D. Spitler

**Robust and High-Data-Rate Hybrid RF/Optical Communications for Lunar Missions**  
A space communication network suitable for planned lunar missions requires a new architectural paradigm that is dynamic, scalable, and capable of supporting diverse mission types at unprecedented communication speed with high reliability, continuous coverage, and minimum latency. The team
proposes a hybrid approach, incorporating both RF and optical communication elements within a smart networking framework. The theoretical and experimental effort will integrate RF and optical communication systems for small satellites (SmallSats) and will design an encompassing network architecture that leverages this combination among Earth stations, a LEO SmallSat constellation, the Lunar Gateway, and Moon explorers.

**Sponsors:** National Aeronautics & Space Administration, Oklahoma State Regents for Higher Education  
**PI/PDs:** Andy Arena, Jamey Jacob  
Electrical and Computer Engineering: Sabit Ekin, John O’Hara, Wooyeol Choi, Ickhyun Song  
University of Oklahoma: Ali Imran  
University of Tulsa: Peter LoPresti

**Speedfest XI**  
Speedfest is an exciting, high-speed aircraft design/build/fly curriculum and final competition that is intended to foster enthusiasm for aviation and STEM in general. There are two flight competition classes: Alpha Class is the Advanced class for collegiate-level teams. India Class is the invitational class that consists of high school teams and teams of K-12 teachers from across the state of Oklahoma.  
**Sponsor:** Oklahoma Aeronautics Commission  
**PI/PDs:** Andy Arena

**Apollyon**  
OSU will provide support for the Apollyon research event.  
**Sponsor:** Torch Technologies, Inc. for the United States Army  
**PI/PD:** Jamey Jacob

**Development and Testing of Small Capacity Positive Displacement Refrigerant Pumps for Heat Exchanger Tests**  
This project will develop refrigerant pumps to be used for various HVAC&R small scale heat transfer experimental setups. For this, several capstone design project teams will design, build, test positive displacement pumps. These pumps will be used in a follow-up senior design project that will develop a small capacity refrigerant calorimeter for testing of heat exchanger samples.  
**Sponsor:** American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.  
**PI/PDs:** Christian Bach,  
Engineering Technology: Ilchung Park

**Low-Cost Rocket-Assisted Take-Off (RATO) System of Unmanned Aircraft: Phase 2**  
During Phase 1, a quad RATO system was developed for Kratos. During Phase 2, final testing with an actual Firejet and development of an in-house, low-cost solid rocket motor will proceed with a capstone design project to RATO launch a 1/6th scale turbojet powered F-18 to reduce technical risk. Students have been recently mixing and casting sorbitol-based solid rocket motors, using a 500-lb thrust capable mobile test stand to measure performance. This project will entail a similar development for solid rocket motors with a peak thrust around 600 lbs, and average thrust around 550 lbs using a 2000-lb thrust stand.  
**Sponsor:** Kratos Unmanned Aerial Systems, Inc.  
**PI/PDs:** Kurt Rouser, Jamey Jacob

**INTERN Support for the Center for Integrated Building Systems at Oklahoma State University**  
The Center for Integrated Building Systems (CIBS) will place 5 high-talent undergraduate students per year onto project teams within the center. The interns will be placed onto funded CIBS projects, aligning
them with both a faculty and graduate student mentor. This will maximize the students’ experience, add value to the projects, and introduce our industrial members to high-talent students to recruit. The CIBS projects and interns will also support the commercialization of the next generation building systems products for the industrial partners.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Craig Bradshaw, Dan Fisher

**Aircraft Engine Design System Analysis Software Development – NOZZLE, COMPR & TURB**

The overall goal is to develop, validate and document conversion of AEDsys Aircraft Engine Design System Analysis Software from VB6 to VB.net with ComponentOne graphic support software. The goal of this specific project is to finish development of three AEDsys component executable programs (NOZZLE, COMPR and TURB) in VB.net, using existing VB6 versions of the programs.

**Sponsor:** Practical Aeronautics, Inc.  
**PI/PD:** Kurt Rouser

**Collaborative Research: Operator Theoretic Methods for Identification and Verification of Dynamical Systems**

This work aims to establish a framework for learning problems in nonlinear dynamical systems theory. This work will interface mathematicians, computer scientists, and engineers for the development of new tools that can harness data obtained from unknown black-box and partially known gray box dynamical systems in a manner that is robust to both noise and uncertainties. The developed tools will be validated by solving verification and control problems in unmanned ground, air, and underwater systems.

**Sponsor:** National Science Foundation  
**PI/PD:** Rushikesh L. Kamalapurkar

**Flow Control Strategies for Protection of Aircraft Passengers and Workers Against SARS-CoV-2**

The team proposes to develop modular, low-cost active flow control (AFC) devices that can be retrofitted on existing aircraft seats for controlling airborne transmission of virus-containing aerosols. Using synthetic jet actuators that generate pulsed air jets, commercially-available axial fans and passive 3D printed nozzles, the concept relies on suction-based trapping of aerosols and redirection to exhaust slots near the floor. The proposed AFC device is intended to function within a hierarchy of controls, such that it can be used in conjunction with traditional measures and also incorporate emerging solutions for potential inactivation using ultraviolet light units.

**Sponsor:** Centers for Disease Control and Prevention  
**PI/PDs:** Arvind Santhanakrishnan, Jamey Jacob  
**Chemical Engineering:** Yu Feng

**NASA Oklahoma Space Grant Consortium**

Oklahoma Space Grant Consortium (OKSG) consists of ten academic affiliates and five business, government and museum organizations. Each affiliate has been strategically chosen so that overall, the consortium has the diversity necessary to address and adapt to both state and NASA challenges. OKSG’s structure and approach to funding supports each institution in developing NASA mission-based programs utilizing affiliate strengths, expertise, and resources on their own campus to inspire, engage, and educate students. Fellowship, Internship, and Scholarship opportunities are open to all students majoring in a STEM discipline at an OKSG affiliate.

**Sponsor:** National Aeronautics & Space Administration  
**PI/ PD:** Andy Arena
**Collaborative Research: Joint Space Muscle Fatigue Model and Integration into Full Body Motion Prediction for Repetitive Dynamic Tasks**

Objectives are to develop: (1) a new joint space muscle fatigue model for repetitive dynamic tasks; (2) a new joint space predictive simulation method considering fatigue; and (3) the fatigued joint torques are decomposed into fatigued muscle forces. The project will deliver novel and feasible advanced tools toward solving large-scale optimization problems for dynamic motion prediction considering muscle fatigue. The outcome will be the first full body biomechanics human model considering muscle fatigue for repetitive dynamic tasks. The methods and associated numerical tools will be applicable for broad occupational health and safety design.

**Sponsor:** National Science Foundation  
**PI/PD:** Yujiang Xiang

**FLIR IBAC SkyRaider Wind Tunnel Testing**

FLIR is using testing services from Oklahoma State University to provide access to a wind tunnel due to the unique capabilities of that facility for simulating atmospheric conditions, angle of attack, and horizontal motion of the aircraft.

**Sponsor:** FLIR Detection, Inc. for Advanced Technology International for Department of the Army  
**PI/PD:** Jamey Jacob

**Analysis of Residential Refrigerators**

This ASHRAE Undergraduate Program Equipment Grant will support capstone design project teams as they evaluate various performance parameters of refrigerators, including the energy consumption as well as component level analysis for the compressor, condenser, and evaporators. To support the project, Whirlpool Corporation will contribute two French-door refrigerators as well as technical expertise for the students to complete the project successfully.

**Sponsor:** American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); Whirlpool Corporation  
**PI/PDs:** Christian Bach, Ilchung Park

**Applying Unmanned Systems for Water Quality Monitoring**

The goals are to develop a monitoring system for Grand Lake that provides high-spatial resolution datasets of nutrients, sediments, and HAB levels using unmanned systems and provide improved models of the behavior of these constituents. The development of these tools will assist with decision support for various water management activities at Grand Lake. Unmanned systems have potential to reduce the costs of monitoring in addition to providing extensive quantities of spatial and temporal data. The long-term goal is to develop a system to identify, forecast, and respond to nutrient and sediment resuspension and HAB formation events to preserve water quality.

**Sponsor:** Department of Interior, Bureau of Reclamation  
**PI/PDs:** Jamey Jacob, David Lampert

**Collaborative Research: Data-Driven Variational Multiscale Reduced Order Models for Biomedical and Engineering Applications**

To develop reduced order models (ROMs) that are accurate in realistic, under-resolved regimes, the ROM closure problem needs to be solved, i.e., the effect of the discarded ROM modes on the ROM dynamics needs to be modeled. This project puts forth a new data-driven ROM paradigm that centers around the hierarchical structure of variational multiscale (VMS) methodology and uses machine
learning and numerical and observational data to dramatically increase the ROM accuracy at a modest computational cost. The novel data-driven VMS-ROM framework aims at transforming ROMs into general and robust computational tools for applications across engineering, science, and medicine.

**Sponsor:** National Science Foundation  
**PI/PDs:** Omer San  
Virginia Polytechnic Institute and State University: Traian Iliescu  
Emory University: Alessandro Veneziani

**Operator Theoretic Methods for Data-Driven Control Synthesis**  
The goal is to develop novel operator theoretic techniques for data and model-driven synthesis of control policies through synthesis of control Lyapunov functions (CLFs) and solution of optimal control problems. The technical tasks focus on the use of trajectories (i.e., time-series) as the fundamental unit of data for the resolution of control synthesis and certification problems in dynamical systems. If successful, the efforts in this project will lead to mathematically rigorous methods that admit efficient linear and/or quadratic programming based numerical approximations for construction of CLFs and solution of optimal control problems using data-driven black-box and gray-box models.

**Sponsor:** Air Force Office of Scientific Research  
**PI/PD:** Rushikesh Kamalapurkar

**Public Safety Small Unmanned Aerial Systems Operations Training Baseline Materials & Usage Assessment**  
The objective of this effort is to develop a curriculum that will address sUAS utilization across all operational settings including structural and wildland firefighting, search & rescue, hazardous material responses, natural disasters, and any other events in which public safety operations would benefit from use of drones.

**Sponsor:** Fire Protection Research Foundation, Inc. for the Federal Emergency Management Agency  
**PI/PDs:** Jamey Jacob, James Kidd  
Engineering Outreach and Extension: Ed Kirtley  
Fire Protection & Safety Engineering Technology: Rob Agnew  
Fire & Emergency Management Administration: Haley Murphy  
Fire Service Training: Dean McFadden

**Speedfest X**  
Speedfest is an exciting, high-speed aircraft design/build/fly competition that is intended to foster enthusiasm for aviation and STEM in general. There are two flight competition classes: Alpha Class is the advanced class for collegiate-level teams. India Class is the invitational class that consists of high school teams, and teams of K-12 teachers formed from across the state of Oklahoma.

**Sponsor:** Oklahoma Aeronautics Commission  
**PI/PD:** Andy Arena
Group 3 Unmanned Airborne Systems UAS Design (Project 117)
The OSU investigator will provide an acoustic assessment of a baseline fixed-wing VTOL UAS platform and then proceed to design and integrate a sound attenuation plan for a new Group III fixed-wing VTOL USA platform. OSU’s team will design and fabricate a ground based mock-up test rig for the motor/propeller/fuselage section of the platform in order to test design choices. OSU’s team will assess and provide input to the VTOL rotors in an effort to reduce their noise signature. The results of the test rig measurements and assessment will feed into the final design of a prototype aircraft.

Sponsor: Cambridge International Systems, Inc. for the General Services Administration
PI/PD: Rick Gaeta

Atmospheric Gravity Wave Radiosonde Field Campaign for Eclipse 2020
OSU will collaborate with the University of Montana on the planning, design, implementation and demonstration of scientific research investigating the atmospheric responses to a total solar eclipse. This will include development and testing of observation and data acquisition systems, including balloons, sensors, radiosondes, telemetry, tracking and ground station systems. The project includes international travel to the eclipse site to conduct research including 24+ hours hourly balloon launching, ground station control, data collection and site monitoring.

Sponsor: Montana State University for National Science Foundation
PI/PD: Jamey Jacob

Pistol Pete’s Propulsion Posse
Pistol Pete’s Propulsion Posse is competing in the C3 Challenge to further develop the concept of turboelectric propulsion and power for unmanned aerial vehicles (UAVs). The turboelectric system will power small UAV (<55lb) platforms in demonstration flight tests, which will show the versatility and scalability of the system. In addition, electrical systems and subsystems will be designed and developed to address integration/vehicle level considerations. Deliverables include 5 kW, 7 kW and 9 kW turboelectric systems in the Proof of Concept phase and UAVs integrated with turboelectric system in the subsequent System Integration phase, including fixed-wing and multi-rotor platforms.

Sponsor: Wichita State University for Department of Defense
PI/PD: Kurt Rouser

Tools and Methods for Fatigue Behavior in Surface-Modified Metallic Structures
This research is aimed at developing tools and methods to support aircraft gas turbine engine repair activities. The project focuses on fatigue behavior in metallic structures, including a study on the effect of surface treatments and coatings on fatigue and life-limiting mechanics. The goal is to develop an understanding of fatigue behavior to improve structural analysis associated with the repair of metallic structures. The project will enable advancements in gas turbine engine repair development and predictive engine life management for maintenance, repair and overhaul activities. The results will lead to reduced engine life cycle costs and increased engine readiness levels.

Sponsor: United Technologies Corporation – Pratt & Whitney Division
PI/PDs: Kurt Rouser, Sandip Harimkar, Shuodao Wang

Soil Monitoring through UAV-Assisted Internet of Things Wireless Underground Sensors
The objective is to develop a proof-of-concept soil monitoring system with wireless underground Internet of Things (IoT) sensors and unmanned aerial vehicles (UAVs). The team will develop and pilot the “Smart Field,” where the smart soil monitoring system can be tested and preliminary data can be collected for future large-scale applications. The study will look at the feasibility of innovative IoT-enabled underground sensors for soil sensing that can improve soil and water management, consequently leading to
conservation of water quantity and quality. The project will involve field experiments and software and hardware implementation of UAV and IoT systems.

**Sponsor:** United States Geological Society  
**PI/PDs:** Jamey Jacob  
Electrical and Computer Engineering: Sabit Ekin, John O’Hara  
Biosystems and Agricultural Engineering: Saleh Taghvaeian

**Research and Sounding Rockets**  
The objective is to support the establishment and execution of a high-tempo cost effective process to rapidly drive technology maturation from conceptual to application to reduce overall lifecycle time by providing impactful data for performance evaluation and model validation. This involves providing a capability to evaluate new technology performance utilizing low-cost research rocket flights, which then can progress to higher fidelity tests on sounding rocket and strategic asset flights.  
**Sponsor:** Honeywell Federal Manufacturing & Technologies, LLC for Department of Energy  
**PI/PD:** Jamey Jacob

**Online Policy Synthesis for Unmanned Air Vehicles: A Model-aware Reinforcement Learning Approach**  
The goal is to develop online model-aware reinforcement learning (RL) algorithms for nonlinear systems in continuous time and space that can tolerate large modeling errors and maintain closed-loop stability during the learning phase. Model-based RL can be realized in continuous time and space through simulation of experience, however, simulation of experience requires a predictive model that is accurate over the entire domain of operation. Methods for online real-time learning that are robust to modeling errors and abrupt changes in the dynamic models will be developed via integration of model validation, model-free RL, and MBRL techniques in a model-aware RL framework.  
**Sponsor:** Air Force Research Laboratory  
**PI/PD:** Rushikesh Kamalapurkar

**NRI: INT: Safe Wind-Aware Navigation for Collaborative Autonomous Aircraft in Low Altitude Airspace**  
The objective of this project is to validate the hypothesis that knowledge of 'in-time' or 'real-time' wind field, communicated effectively to a pilot, can enhance safety, efficiency and robustness of future autonomous aircraft operations in low altitude airspace. Towards this objective, the team will develop a framework that integrates turbulence modeling, navigation, control, and pilot-aircraft interface to enable autonomous and remotely piloted aircraft to navigate through the Atmospheric Boundary Layer with improved predictability and increased endurance.  
**Sponsor:** National Science Foundation  
**PI/PDs:** He Bai, Jamey Jacob, Rushikesh Kamalapurkar, Kursat Kara  
Aviation Science: Matt Vance
FAA COE Zone 3 ILS Measurements
The objective is to record the glideslope depth of modulation in Zone 3 for analysis of manned aircraft flight inspection system (FIS) accuracy and to advance development of Unmanned Aircraft Systems (UAS) for ILS facility preparation. A UAS will be instrumented with a lightweight ILS receiver capable of recording both localizer and glideslope depth of modulation (DDM). The UAS will be equipped with an RTK GPS to more accurately track and record position within 5cm laterally and vertically. The UAS position data will be recorded and synchronized with localizer and glideslope DDM.

Sponsor: Federal Aviation Administration Center of Excellence
PI/PDs: Jamey Jacob, Gary Ambrose
Electrical and Computer Engineering: Jim West

Integration of Efficient Small Scale Propulsion (ESSP) into USSOCOM MQ-27B and RQ-23 Platforms
OSU shall serve as a subcontractor to Baker Engineering, LLC. For an Air Force Research Laboratory Phase II program, Improved Turbo/Superchargers for UAS/UGS Application. OSU shall provide technical management for an AFRL engine integration program onto USSOCOM Group 1 and 3 Small UAS platforms.

Sponsor: Baker Engineering LLC for the United States Air Force Research Laboratory
PI/PD: Rick Gaeta

OSU Support
This is a follow-on award to provide sUAS pilot/engineering support for MFIX June/July 2021.

Sponsor: Torch Technologies, Inc.
PI/PD: Jamey Jacob

Infrasound Observations and Demonstration of Real-Time Tools
The project aims to demonstrate the potential value of infrasound technology by co-locating an infrasound array with a Weather Surveillance Radar—1988 Doppler (WSR-88D) site, decreasing uncertainty due to sound propagation by deploying mobile infrasound sensors during severe storms, correlating flow-field metrics with infrasound measurements, and demonstrating processing algorithms to enable real-time analysis. At the completion of this project, the team expects to have demonstrated how infrasound data can enhance tornado threat prediction via correlations between the radar and infrasound metrics and demonstrate improved algorithms for real-time processing and analysis to operational meteorologists.

Sponsor: National Oceanic and Atmospheric Administration
PI/PDs: Brian Elbing, Imraan Faruque
University of Nebraska-Lincoln: Matthew Van Den Broeke

Validation of Radar-Based Detect-and-Avoid System
This project is a research, development and testing partnership between OSU and Vigilant Aerospace Systems, Inc. to develop a radar-based detect-and-avoid unmanned aircraft system vehicle collision avoidance system, which will be commercialized into a product to enable safe and efficient access to the US National Airspace by unmanned aircraft. The project will build on existing aircraft and radar technologies and research while pioneering new innovations in integrated systems, radar integration, aircraft and systems autonomy, airspace safety, ground and air-based systems management, vehicle avoidance algorithms and other technologies.

Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PD: Jamey Jacob
**Space-borne Antennas and Circuits for Condensed Radars and STEM (SPACERS)**
The goal of the SPACERS effort is to provide NASA with updated technologies and processing techniques to help with the move towards space-borne application of synthetic aperture radar (SAR) systems. Tasks will include: Radar Fairing Design, Flight Experiments, and Data Collection. A fairing is needed to mount the radar on an aircraft in Oklahoma. The production fairing will be constructed using a multilayer composite fiberglass skin, with Kevlar ribs and spars for support and reinforcements near the fuselage interface as needed. A detailed finite element analysis of the structural loads will be performed.

**Sponsor:** University of Oklahoma for the Oklahoma Space Grant Consortium for the Oklahoma Regents of Higher Education  
**PI/PD:** Jamey Jacob

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**Collaborative Research: The Leaky Rake to Solid Plate Transition on Flow Through Biological Filtering Structures**
Numerous small organisms that swim, fly, smell, or feed in flows at the intermediate scale (mesoscale), where inertial and viscous forces are balanced, rely on using branched, bristled and hairy structures. Such mesoscale structures (e.g., filtering appendages) can augment underlying biological function (e.g., particle capture) by moving in a manner to transition from acting as solid surfaces to leaky/porous rakes at Reynolds number close to one. This research will elucidate the fundamental fluid dynamics of biological and bioinspired filtering arrays at Reynolds number and Peclet number close to unity.

**Sponsor:** National Science Foundation  
**PI/PD:** Arvind Santhanakrishnan

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**Engineering Thin Film Solar Cells for Radiation Hardness, Lifetime and Efficiency**
The project will use a combined experimental and theoretical approach for characterization and in depth study of radiation hard multinary halide and chalcogenide solar cells for space applications. The two proposed materials technologies in this project are based on Cu(In,Ga)Se2 (CIGS) and emerging lead halide perovskites that demonstrate a combination of remarkable radiation resistance, high efficiency, light weight, thin, and flexible solar cell arrays for NASA’s CubeSat and SmallSat applications in which high power, light, low payload systems are highly desirable.

**Sponsors:** National Aeronautics and Space Administration, Oklahoma State Regents for Higher Education, University of Oklahoma  
**PI/PDs:** Andy Arena,  
Materials Science and Engineering: Do Young Kim  
Physics: Mario Borunda

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**NASA Oklahoma EPSCoR Research Infrastructure Development**
This NASA award will provide Oklahoma EPSCoR with three years of funding to be able to award up to four Travel Grants a year and up to three Research Initiation Grants (RIGs) per year. Each travel grant will average $3,000 to support travel for Oklahoma researchers and their undergraduate/graduate students to spend up to three days visiting with researchers at NASA Centers to explore projects of mutual interest. Each RIG will average $36,000 and are intended to develop experience and research capability to help awardees be competitive for follow-on research with NASA Centers and NASA EPSCoR Implementation and ISS awards.

**Sponsors:** National Aeronautics and Space Administration, Oklahoma State Regents for Higher Education  
**PI/PD:** Andy Arena
OK NASA EPSCoR: Space-borne Antennas & Circuits for Condensed Radars and STEM (SPACERS)
The goal is to combine recently developed digital radar techniques with new and innovative, adaptive radar hardware to help NASA move towards space-borne applications of new radar systems. A key component of the work will serve to bridge the critical design elements and engineering requirements of the hardware design with the encompassing needs of the scientific community focused on ecosystem dynamics in relation to critical drivers including weather, climate, and available water resources. By training students in the classroom and lab, the students will learn about new technologies and go on internships at the NASA Goddard Space Flight Center.

Sponsors: National Aeronautics and Space Administration, Oklahoma State Regents for Higher Education
PI/PD: Andy Arena

Collaborative Research: Transfer Printed, Single-Crystalline Si Nanomesh Thin Films
The project aims to establish a new unique electronic materials paradigm – Si nanomeshes – for next-generation stretchable electronics. On the basis of strong preliminary results from the PIs’ team, the PIs hypothesize that with tailored nanomesh geometries and engineered sidewall surface states, Si nanomeshes can achieve simultaneously large stretchability, high mobility and high reliability that are needed for high-density stretchable electronics. Through both theoretical and experimental investigations, this project aims to investigate and establish the interrelationship of structure-processing-properties of Si nanomeshes for stretchable devices.

Sponsor: National Science Foundation
PI/PDs: Shuodao Wang
Northeastern University: Hui Fang

Comprehensive Model Development for a Rotating Spool Compressor
Since development of Spoolcomp, a model of a novel rotating spool compressor, it has been validated and used to develop designs of R410A compressors. However, regulatory trends in the HVAC&R industry and intrinsic attributes of the spool compressor have suggested that lower pressure refrigerants such as R134a, R1234ze(E), R1234yf, and blends of these are better suited for the application of the spool compressor. Spoolcomp does not adequately capture the performance of this novel compressor using these refrigerants when compared against experimental data. This project will improve the predictive capability of Spoolcomp by addressing deficiencies in the model platform’s current version.

Sponsor: Torad Engineering, LLC
PI/PD: Craig Bradshaw

CAREER: Determine the Roles of Material Heterogeneity and Thickness Variability on the Stability of Thin Membranes
The objective of this CAREER project is to test the hypothesis that a higher degree of heterogeneity in thin membranes reduces the critical buckling loads. The research approach is to experimentally measure and compare the buckling loads of a set of thin membranes of various degrees of heterogeneity ranging from highly heterogeneous to homogeneous. Fluorescence stereo microscopy and inverse finite element analysis will be combined to extract the material property distributions and thickness variability, and then a theory-guided numerical model will be developed to identify a quantitative degree of heterogeneity and elucidate how it is related to reduced buckling loads.

Sponsor: National Science Foundation
PI/PD: Shuodao Wang
Insect Group/Swarm Behaviors and their Relation to Individual Feedback Models
New insect kinematics analysis techniques will be applied to extract the strategies insects use in aerial maneuvering in dense, high traffic environments, including swarm behaviors. By applying new tools from control theory, dynamics modeling and system identification, and leveraging significant recent improvements in aerial multi-insect tracking capabilities, the PI will simultaneously quantify the instantaneous feedback control targets and time histories of individual organisms’ neural function during group and swarm behaviors. The outcome will be an understanding of the foundational mechanisms by which insects provide computationally lightweight swarm behaviors, which will be a strong foundation for design of computationally-limited autonomous swarms.

Sponsor: Office of Naval Research
PI/PD: Imraan Faruque

Acoustic Metastructures for Next Generation Aircraft Liners
In light of recent proof-of-concept achieved at OSU for a metastructural approach to significantly enhance acoustic performance in liners especially for lightweight, compact, broadband, low-frequency applications, for which there are currently no practical solutions, OSU and Spirit AeroSystems, Inc. propose to conduct a joint R&D project to commercialize this technology for developing new acoustic liners for the next-generation of commercial aircraft. Based on prior research, an acoustic metastructural solution combining innovative core geometries such as 3D folded and phased cores with potentially incorporating acoustically nonrigid elements with advanced aerospace materials and fabrication processes is proposed to be developed.

Sponsor: Oklahoma Center for the Advancement of Science and Technology
PI/PDs: James Manimala, Rick Gaeta

Planning IUCRC at Oklahoma State University: Center for Sustainably Integrated Buildings and Sites (SIBS)
OSU is a new SIBS site, joining the site at University of North Carolina, Charlotte. SIBS-OSU will generate transformative research that addresses lack of integration between building and environmental thermal systems components, equipment, and buildings. The site will address the lack of physical/cyber-physical models for integrated building systems as well as reduced-order models and datasets for building and environmental thermal systems equipment and components, and disseminate the outcomes to the building design process. OSU’s research in thermal systems as well as sensing, model-predictive control and physics-reinforced machine learning positions the site to address the integration of building equipment and systems.

Sponsor: National Science Foundation
PI/PDs: Craig Bradshaw, Christian Bach, Dan Fisher, Jeffrey D. Spitler

Collaborative Research: Musculoskeletal Model for Dynamic Manual Material Handling to Prevent Injury
Objectives are to: 1) derive a general dynamic strength model and validate the model parameters from experiments; 2) introduce and experimentally validate a lumbar spine muscle model; and 3) implement these models with a nonlinear programming algorithm to optimize the dynamic lifting motion during manual material handling for minimum injury and experimentally demonstrate proof-of-concept. Muscle intra/inter-joint coupling will be modeled and the lumbar spine area will be added, thereby generating a musculoskeletal model to measure lumbar stresses for back pain in the dynamic lifting process.

Sponsor: National Science Foundation
PI/PD: Yujiang Xiang
Development of a Novel Peristaltic Compressor for Air-Conditioning and Refrigeration Applications
This project addresses the limitations of the previous work on peristaltic compressors by independently developing expertise on the thermodynamic advantages and the electromechanical actuation mechanisms and combining that expertise to inform appropriate compressor applications. This development will be split into two major thrusts. The first thrust, will quantify the thermodynamic advantage by developing a model of the volumetric flow characteristics of the peristaltic compressor using data from a prototype peristaltic compressor. The second thrust will develop models for various electromechanical actuation technologies and inform the most appropriate HVAC&R applications for the peristaltic compressor.
PI/PD: Craig Bradshaw

Support for Navy SBIR Phase II – Human Computer Interfacing (HCI) for Autonomous Detect and Avoid (DAA) Systems on Unmanned Aircraft (UAS)
Dr. He Bai at Oklahoma State University (OSU) shall provide research and development support for the SBIR Phase-II program to UtopiaCompression Corporation (UC). Dr. Bai will hire a student at OSU to provide support in the R&D for a period of two years. The deliverables are: 1) DAA Manager formulation, 2) Module to solve DAA Manager formulation, 3) Command blending model and module implementation, 4) Experiment results to show utility and performance of DAA Manager and command blending.
Sponsor: UtopiaCompression Corporation for United States Navy
PI/PD: He Bai

Develop Design Criteria for Psychrometric Air Sampler and Mixer Apparatus for Use in ASHRAE Test Standards
The objective is to provide: 1) Design recommendations for measuring bulk air conditions (a) “samplerless” RTD grids, (b) Sampling trees, and (c) Air mixers to provide uniform air conditions for the above; 2) Methods for validating performance of a sampler and mixer combination that would provide the most accurate bulk temperature and humidity measurement at indoor air inlet and indoor air outlet. The project covers developing the testing methods for the mixers, developing new mixers and air samplers, developing their performance, and evaluating overall in-situ performance of the newly developed devices with coil tests.
PI/PDs: Christian Bach, Omer San

Identification of the Physical Mechanism Responsible for Tornado Infrasound
The objective is to identify and test physically-reasoned correlations between infrasound and tornado flow-field properties, which will suggest potential fluid mechanisms for the infrasound production. The central hypothesis is that infrasonic emissions from tornadoes are unique and directly related to core pressure, wind speed, forward speed, and overall size. Three specific goals to test this hypothesis are: 1) Identify infrasonic events associated with severe storms, 2) Characterize flow-fields of identified infrasonic events, and 3) Develop a physically-reasoned empirical model. At the project’s completion, we expect to have identified correlations between tornadic infrasonic signatures and the tornado circulation and size.
Sponsors: United States Department of Commerce National Oceanic and Atmospheric Administration
PI/PD: Brian Elbing
Physics-reinforced Machine Learning Algorithms for Multiscale Closure Model Discovery
At the conclusion of the project period, we will have a computational toolbox that generates and takes large turbulence data sets as input and extracts functional and structural closure models without assuming any phenomenological assumptions on turbulence physics. Development of such physics-reinforced learning algorithms and architectures, which are a core strength of the research, will provide a basis to generate predictive technologies for a broad spectrum of engineering and science applications including pattern classification and scale bridging of hierarchical climate simulations.

**Sponsors:** Department of Energy  
**PI/PD:** Omer San

Non-contact, in vivo Measurement of Hyper-Elastic Response of Bio-Membranes for Predicting Traumatic Injuries
The objective of this work is to develop a novel non-contact, in vivo testing framework for measuring the hyper-elastic mechanical properties of soft bio-membranes. The PI proposes to use full-field three-dimensional (3D) fluorescent technique in connection with high-speed microscopic photography to detect the deformation of bio-membranes under bulge pressure loading. An inverse problem methodology will be adopted by combining finite element method (FEM) simulation and numerical iterations to obtain the bio-membrane’s full-field response so that a full ‘map’ of localized biomembrane properties can be obtained.

**Sponsors:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PD:** Shuodao Wang

Assessment of Radiation Shielding Properties of Novel and Baseline Materials External to ISS
The project will test and measure the radiation shielding and other properties of the multifunctional materials developed in previous awards. In this project, the materials will be tested in the actual space environment external to the International Space Station.

**Sponsor:** National Aeronautics and Space Administration  
**PI/PDs:** Andy Arena  
School of Materials Science & Engineering: Ranji Vaidyanathan  
Department of Physics: Eric Benton

Application of Raman and Infrared Microscopy for the Forensic Examination of Automotive Clear Coats and Paint Smears
Current approaches by PDQ, the largest forensic automotive paint database, to identify clear coats have been unsuccessful because the FTIR spectra of clear coats are too similar to generate accurate hit lists by searching clear coat FTIR spectra alone. Recent studies of pattern recognition methods applied to FTIR spectra of clear coats show that information about the line and model of the vehicle can be obtained from these spectra. To enhance the discrimination power of clear coats, Raman spectroscopy and pattern recognition techniques will be investigated as a solution to the problem of extracting investigative lead information from clear coats.

**Sponsor:** U.S. Department of Justice  
**PI/PDs:** Kaan Kalkan  
Arts & Sciences: Barry K. Lavine

Reducing Time to Market for Commercial AC Equipment through Development of a Simulation Platform for Multi-Circuit Evaporator Coil Performance
The research focuses on the development of a new heat exchanger simulation model for multi-circuited heat exchangers. This model will include consideration of cross-fin conduction for multi-circuited coils.
The new model will be implemented into Johnson Controls International’s (JCI’s) simulation platform to allow usage for coil design with graphical user interfaces. The model will allow JCI a more competitive product development process.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Christian Bach, Craig Bradshaw

**Collaborative Research: The Roles of Inter-limb Jets and Body Angles in Metachronal Paddling**  
This project examines how small-scale interactions between adjacent limbs of crustaceans coalesce with large-scale flow past the body. Recent robotic models show the formation of suction and expulsion jets between adjacent paddles due to their time-varying geometry that is dictated by the phase difference in motion. Self-propelling metachronal swimming robots will be developed to examine swimming of individuals and aggregates. The findings will provide insight into crustacean foraging, and how schooling behavior in krill is influenced by hydrodynamic cues. Understanding functional roles of pleopod kinematics and body shape on swimming performance will identify biomimetic design principles for autonomous underwater vehicles.

**Sponsor:** National Science Foundation  
**PI/PD:** Arvind Santhanakrishnan

**Fundamental Study of the Ultra Precision Machining and Near Surface Damage Evolution in Single Crystal Fluorides for Advanced Optics**  
The objective is to test the hypothesis that degradation in optical performance of single crystal calcium fluoride that has been finished by ultra-precision machining is directly related to the nature and extent of the near surface damage introduced. The research will utilize specially designed cutting experiments on single crystal calcium fluoride to investigate the crystal response to machining with single crystal diamond tools. Three cutting geometries will be considered. After surface generation, the resulting subsurface damage will be investigated with Rutherford backscattering spectrometry and cross sectional transmission electron microscopy. Changes caused by machining to transmissivity and birefringence will be quantified.

**Sponsor:** National Science Foundation  
**PI/PD:** Don A. Lucca

**Effect of Inlet Duct and Damper Design on ASHRAE 37/116 Fan Performance and Static Pressure Measurements**  
The objective of this project is to develop an inlet duct design guideline for inclusion into the AHRI and ASHRAE testing standards. This guideline will reduce the risk of false testing failures and lead to a higher integrity of the testing results across different laboratories. The guideline will reduce the design space towards a set of configurations and report the resulting performance differences relative to reference configuration.

**Sponsor:** American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.  
**PI/PDs:** Christian Bach, Omer San
Experimental Validation of Refrigerant Charge Models in Coils for Residential Split Systems
The goal of the project is to provide high quality data for oil retention and refrigerant charge in fin-tube heat exchangers. The objectives are: 1) Develop a test methodology for measuring both oil retention and refrigerant charge of round tube, plate fin (RTPF) heat exchangers, 2) Obtain oil retention and refrigerant charge data for several sets of 3-ton indoor/outdoor heat exchangers and reduce the results such that it can be used for validation of simulation models, 3) Determine local vapor-liquid fractions in subsections of the heat exchanger.
PI/PDs: Christian Bach, Craig Bradshaw

SNM: Roll-to-Roll Nanoimprint Manufacturing of Metasurfaces for Photonic and Optoelectronic Applications
Roll-to-Roll Nanoimprint Lithography is expected to overcome many limitations of current batch imprint techniques, including large area and high throughput patterning, easy demolding and lower cost. The potential for creating engineered surfaces leading to new products is significant, such as wire-grid polarizers, anti-reflective surfaces, and nanogratings for novel color filters for use in displays. This potential will be demonstrated in this project by manufacturing metasurfaces known to be useful in optical communication, information processing, laser systems and to improve the efficiency of LCD displays.
Sponsor: National Science Foundation
PI/PDs: James K. Good, Don Lucca

Modification of Near-Wall, High-Reynolds Number Velocity Profiles with Polymer Solution
This project experimentally examines how drag-reducing polymer solutions modify the near-wall region of a high-Reynolds number turbulent boundary layer. While this has been thought to be well understood for decades, recent numerical and experimental data show significant deviation from the classical view. Available data shows a non-universal behavior when the drag reduction is above 40%, which can only be partially explained by a Reynolds number effect. Consequently, the behavior must be dependent on polymer properties. Thus this project measures the near-wall region at various values of drag reduction, Reynolds number and polymer properties (Weissenberg number, viscosity ratio, and length ratio).
Sponsor: National Science Foundation
PI/PD: Brian Elbing

Inflatable Structures Feasibility Studies
OSU shall perform tasks in support of the development of inflatable structures on a scale model to evaluate and develop deployment, and control methods.
Sponsor: Toyota Motor Engineering & Manufacturing North America (TEMA)
PI/PD: Jamey Jacob

Enhancing the Oklahoma Alliance for Manufacturing Excellence with Applications Engineers in Rural Areas
The Applications Engineering Program works to increase the competitiveness of existing small and medium sized rural manufacturers by providing on-site, focused engineering assistance and technology transfer services. By placing a staff of engineers across the state, the program provides manufacturers with direct access to the latest in technology including access to the resources of Oklahoma State University’s engineering faculty. The program is a cooperative effort between the University and the Oklahoma Manufacturing Alliance.
R2I Track-2 FEC: Unmanned Aircraft System for Atmospheric Physics
Small Unmanned Aircraft Systems (SUAS) have the potential to become an invaluable diagnostic tool for atmospheric science and operational meteorology. However, many scientific, technical, societal, and regulatory challenges must be solved before this can happen. The team of four universities across three EPSCoR jurisdictions, including atmospheric scientists, meteorologists, engineers, computer scientists, geographers, and chemists, will develop integrated smart unmanned aircraft technologies including advanced sensing and imaging, robust autonomous navigation, enhanced data communication capabilities, and data management tools. The team will also address public policy challenges related to adoption of UAS technology and integration of unmanned aircraft into the NAS.

Fundamental Studies on Sintering of Amorphous Alloys, Composites and Coatings
This work investigates basic phenomena associated with spark plasma sintering (SPS) of Fe-based amorphous alloys. The theme of the work is that the unique mechanisms of SPS sintering, including Joule heating at the particle contacts under the simultaneous influence of pulsed direct current and uniaxial pressure, will help retain amorphous structure in the sintered compacts without undesirable crystallization. A plan is proposed to overcome the challenges associated with conventional solidification processing through innovative approaches: 1) SPS of bulk amorphous alloys, 2) SPS of in-situ (crystallization induced) and ex-situ (particulate reinforced and laminated) composites, and 3) SPS of amorphous composite coatings.

Photolytic Nanoconjugate Fuel Generators
The long-term goal is to develop a novel fuel-generating (H₂ and CO from water and CO₂) photoelectrochemical (PEC) device, which consists of a metal oxide semiconductor nanowire decorated with metal nanoparticles. The investigator hypothesizes electronic, electrostatic and plasmonic mechanisms, which are unique to the nanoconjugate device structure and materials. These hypothetical attributes will be verified and elucidated by designed experiments. Based on encouraging preliminary results using sol-gel prepared vanadium oxyhydrate nanowires coated with nanogold (5.6% light-to-hydrogen efficiency with H₂ to O₂ ratio of 2.0 under 445 nm radiation), the project aims at high conversion energy and stability.

NASA Oklahoma Space Grant 2015-2019
The NASA Oklahoma Space Grant Consortium includes numerous affiliates in the state including eight universities, two community colleges, two industrial affiliates, two informal science education affiliates, research center affiliate, and city government affiliate. The affiliates use NASA funding to develop programs for students to meet NASA goals. Some of the programs at OSU that receive this funding
include Speedfest, Mission to Planet Earth, X-Hab, and OSU American Institute of Aeronautics and Astronautics High-Power Rocketry Team.

**Sponsor:** University of Oklahoma for NASA  
**PI/PD:** Andy Arena

### EnergyPlus Whole-Building Modeling and Simulation Software Development

EnergyPlus is a key part of DOE’s building energy-efficiency strategy. In its ongoing program implementation and technical management efforts, the National Renewable Energy Laboratory (NREL) requires the assistance of OSU to provide technical support for new features development and for software defects resolutions.

**Sponsor:** Alliance for Sustainable Energy, LLC for National Renewable Energy Laboratory  
**PI/PDs:** Matt Mitchell, Dan Fisher, Jeff Spitler

### Collaborative Research: Manufacturing of Complex Lenses for Thermal Imaging, Night Vision and Surveillance Systems

The objective is to test the hypothesis that when diamond milling brittle materials, the material response and character of the resulting surface and subsurface depends not only on the geometry of the tool-workpiece interaction, but also on the non-steady state nature of the process. Because of the effect on material response, some materials that are not practically diamond turnable can be machined by diamond milling. Research tasks include: 1) Design and construction of a simplified milling configuration, 2) Generation of machined specimens, 3) Surface and subsurface characterization. The outcome will identify conditions for more productive diamond milling of materials.

**Sponsor:** National Science Foundation  
**PI/PD:** Don A. Lucca

### Determining the Environmental Flows Needed to Support the Federally-threatened Arkansas River Shiner Notropis Griadi and Associated Assemblage

Objectives include: 1) Develop relationships between flow regime and fish diversity and abundance using existing assemblage data across the Southern Great Plains, 2) Identify the discharge(s) that maintains channel complexity under current channel morphology, 3) Determine the relationship among habitat connectivity and flow and identify refuge habitats that persist during low-flow periods.

**Sponsor:** U.S. Fish and Wildlife Service  
**PI/PDs:** Jamey Jacob  
Natural Resource Ecology and Management: Shannon Brewer  
Biosystems and Agricultural Engineering: Garey Fox

### Certification, Validation and Safe Integration of Turboelectric Aircraft Distributed Power and Propulsion Systems

Over the past decade, hybrid electric aircraft concepts with distributed power and propulsion have emerged to improve aircraft efficiency, reliability and maintainability with reduced need for hydraulic, mechanical and pneumatic systems. Previous studies in aircraft hybrid electric propulsion have addressed conceptual design and analytical modeling; however, there is a critical need to address practical considerations for integration of electrical generation, distribution, control and storage. This study will develop practical recommendations for certification, validation and safe integration of turboelectric aircraft distributed power and propulsion systems, providing data to address safety implications of electrical system components associated with MEA and FEA concepts.

**Sponsor:** United States Department of Transportation – Federal Aviation Administration  
**PI/PDs:** Kurt Rouser, Rick Gaeta
sUAS Radio Solutions
The Unmanned Systems Research Institute shall research and propose a solution for a sUAS ground control station and sUAS airborne radio in accordance with the sponsor requirements.
Sponsor: Torch Technologies, Inc for the United States Army
PI/PD: Jamey Jacob

Low-Cost Rocket-Assisted Take-Off (RATO) System of Unmanned Aircraft: Phase 1
Kratos is interested in low cost Rocket-Assisted Take-Off (RATO) for use with unmanned aerial vehicles for domestic and international military customers. The OSU team will design and build a Firejet (MQM-178) RATO Bracket and a Firejet Launch Rail Trailer. The OSU team will also design and build a Firejet RATO Launch Test Simulated Mass.
Sponsor: Kratos Unmanned Aerial Systems, Inc.
PI/PDs: Kurt Rouser, Rick Gaeta, Jamey Jacob

Doctoral Dissertation Research: Spatial Structure of Turbulent Flows in the Atmospheric Boundary Layer
The Co-PI will make 21 two-day trips to collect data across the various ecoregions of Oklahoma that contain Oklahoma Mesonet sites. Data collection near a Mesonet site is important to allow for simultaneous collection of accurate surface conditions.
Sponsor: National Science Foundation
PI/PD: Brian Elbing

US-Germany Cooperative Research: M4 - High Resolution Surface Zone Analysis and Ion Beam Processing
In previous phases of this research, the research team utilized a range of high resolution surface techniques to quantify the mechanical and chemical nature of newly developed mold coatings for use in optical component production. The team found that ion irradiation is an effective means to convert hybrid sol-gel films to their final hardened state. The project focuses on the use of high resolution surface zone techniques to aid in the development of new advanced mold coatings based on ion irradiated sol-gel films, and to enable the near surface mechanical and chemical characterization of both mold surfaces and optical components.
Sponsor: Leibniz Institute for Materials Engineering IWT
PI/PD: Don A. Lucca

Solar Thermal Desalination Technology Development
This project will develop a cogeneration cycle that will utilize harvested heat to power a mechanical vapor compression cycle to desalinate produced water (PW). The heat flux and the energy efficiencies will be compared with the current industry standards. This thermal distillation system is intended to reduce net energy consumption, lower the cost of desalination, and reduce the volume of PW disposal.
Sponsor: Nitro-Lift Technologies, LLC
PI/PDs: Khaled Sallam
Civil and Environmental Engineering: Prem Bikkina

Web Transport Systems
The objectives of this research are: 1) to expand the range of static and dynamic models in WTS to include models for new elements identified by sponsors, 2) to refine the models for viscoelastic effects and web-roller slip effects, 3) to develop new models for the precise control of tension in each section in
a multi-span web transport system, and 4) to develop guidelines for selection of the control algorithms which best meet the defined performance objectives for a given application.

**Sponsor:** Web Handling Research Center  
**PI/PDs:** Keith Good, Karl Reid

**Mechanical Behavior of a Web during Winding**

The objective of this project is to develop algorithms for wound-on-tension for various types of winding in which nips are involved in the winding configuration, to study varying nip winding conditions and parameters so that the mechanics of nip winding can be quantified and incorporated into winding and defect models, and to study and develop models for nip related defects.

**Sponsor:** Web Handling Center  
**PI/PD:** Keith Good

**Web Wrinkling - Prediction and Failure Analysis**

Web quality degradation can occur if wrinkling takes place across the rollers or inside (or upon) wound rolls. This research is concerned with determining how wrinkles form as a function of web line and web material parameters.

**Sponsor:** Web Handling Center  
**PI/PD:** Keith Good

**NEW PRODUCT DEVELOPMENT CENTER**

**ATS Worldwide Regents Business Partnership Excellence Award**

The New Product Development Center faculty and staff will guide a student intern as he/she performs engineering analysis and component selection for a pushback only version of the Airplane Transporting Systems aircraft movement platform. The design process for the pushback only version of the ATS system has just started. The student will be expected to perform stress analysis on the subsurface components of the cart and cart support hardware. The analysis will be used to inform the selection of hardware components to be used for fabricating a prototype system.

**Sponsor:** Oklahoma State Regents for Higher Education  
**PI/PD:** Robert Taylor

**Creating Resilient Manufacturers: Recovery, Reshoring, and Reimagining Manufacturing in Oklahoma**

The program will provide pandemic recovery and resiliency evaluation and solutions, engineering technical design and assistance, and workforce development activities aimed at small and medium sized manufacturers. The anticipated outcome is long-term economic resiliency as a result of job stability, increased revenues, strengthened innovation capacity, and improved health and safety of manufacturing employees. The engineering assistance and training components will be guided by the Industrial Engineering disaster preparedness faculty team’s evaluation and recommendations. The program is also a collaboration between OSU and the MidAmerica Industrial Park Automation Resource Center, offering workforce development training and technology application evaluation and research.

**Sponsor:** United States Department of Commerce Economic Development Administration  
**PI/PDs:** Robert Taylor  
Industrial Engineering and Management: Sunderesh Heragu, Katie Jurewicz
Improving Food Security in the Face of Pandemics / COVID-19: Diversifying Protein via Mechanized High Density Mealworm Farming

The NPDC will test materials, parts and system components and concepts to refine the Insect Production System (IPS) design. The NPDC will evaluate materials and components to determine their best use in the proposed IPS. The team will test various materials to determine the appropriate media for mealworm husbandry. The NPDC will design a fully functional final Phase I Drop model IPS that employs an innovative high density growth area with mechanized harvesting. The NPDC team will fabricate a complete prototype of the IPS, provide testing of the prototype, and provide any design recommendations based on test results.

**Sponsor:** All Things Bugs LLC for United States Department of Agriculture National Institute of Food and Agriculture  
**PI/PD:** Robert Taylor

Accelerating the development and commercialization of a novel helical sign post

The New Product Development Center will be responsible for performing the design analysis for several sizes of helical sign posts using the Finite Element Analysis process in the SolidWorks design package. The design process will include the development of helical sign post models, completing finite element analysis using the required loading conditions for each helical sign post size, design and development of the load sensitive connection between the sign and the helical sign post anchor and the development of manufacturing drawing for delivery to the RamJack manufacturing group. The NPDC will also assist as needed during the in-house testing phase for the helical sign post models and provide comparisons of the test data with the finite element modeling results.

**Sponsor:** Ram Jack Systems Distribution, LLC for Oklahoma Center for the Advancement of Science and Technology  
**PI/PD:** Robert Taylor

Minimally Invasive Animal Sterilization

The NPDC engineering team will improve on the basic dual needle/dual syringe configuration that was developed for the initial testing reported. The goals are: 1) investigate syringe/needle materials that do not degrade under the influence of the chemical compounds in use, 2) improve the dual syringe holder to make it easier for the user to handle, 3) develop a method for producing well bonded dual needle sets. The NPDC engineering team will investigate improved methods for bonding the two needles being used in the injector configuration. The team will also produce needle sets and syringe holders for all test trials.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Robert Taylor  
**College of Veterinary Medicine:** Ashish Ranjan

Commercialization of a novel single-use bioreactor

Specific aims include: 1) Design and fabricate a 2 to 200 L, two-chamber bioreactor from flexible, pharmaceutical grade plastic film, 2) Perform a ‘design for manufacturing’ analysis of the bioreactor and incorporate design changes necessary to accommodate large scale manufacturing, 3) Develop an operating procedure and evaluate the performance of the 2 to 200 L bioreactor by growing a Chinese hamster ovary cell line that produces the recombinant protein IgG, 4) Build a manufacturing process to produce multi-chamber bioreactors.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Robert Taylor  
**Chemical Engineering:** Josh Ramsey
Optimization of Flow and Disbursement for Green Fire Suppression Agent
SpectrumFX, in collaboration with the OSU New Product Development Center, will plan, design, test and optimize a new green fire suppressant system that may possibly replace existing systems in a variety of fields. The first effort will model the system, defining optimum operating parameters and physical nozzle configuration. The model results will be used to design a fire suppression system with nozzles matching the model, all of which will then be tested and verified by a Phase Doppler Interferometer. The project will also include the fabrication and field testing of the first prototype system.

**Sponsor:** Spectrum FX for the Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Robert Taylor  
Chemical Engineering: Clint Aichele  
Fire Protection and Safety Technology: Haejun Park

Establishing a Working Prototype Development Program
OSU’s New Product Development Center (NPDC) assists Oklahoma’s industry, inventors, and entrepreneurs with their product and process development, technology commercialization, and technical needs. NPDC clients often lack the resources to develop working prototypes. With this Economic Development Administration grant, NPDC will launch a working prototype development center at the OSU Institute of Technology, allowing NPDC clients to have all the necessary resources for a successful path from concept to commercialization.

**Sponsor:** U.S. Department of Commerce Economic Development Administration  
**PI/PD:** Robert Taylor

Oklahoma Inventors Assistance Service
The Inventors’ Assistance Service (IAS) provides information, education, and assistance to Oklahoma inventors navigating the process of transitioning an idea into a product. The IAS provides clients with one or more of the following: 1) an assessment of the technical viability of the proposed product or process; 2) an evaluation of competing products; 3) a review of relevant patents and intellectual property; and 4) a defined scope of work that outlines additional engineering product and process design assistance. A complete manufacturing drawing package will be provided to each client who successfully enters the engineering design stage.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Robert Taylor, Jessica Stewart

**PROFESSIONAL DEVELOPMENT**

MSA Customized Fire Suppression Systems Inspection, Testing, and Maintenance Training
The Scope of Work is for CEAT Professional Development to deliver a 2-day (20 hour) Customized Fire Suppression Systems, Inspection, Testing & Maintenance training course, and a 2-day (20 hour) Customized Fire Alarm Systems Inspection, Testing & Maintenance training course for the MSA Testing Services Firefighters.

**Sponsor:** Mission Support Alliance, LLC for the Department of Energy  
**PI/PD:** Brandy Mays

Highway Construction Materials Technician Training & Certification Program
The College of Engineering, Architecture, and Technology (CEAT) at OSU is partnering with the Oklahoma Department of Transportation for the administration, management and delivery of the Training and Certification Program (HCMTP) for the Oklahoma Highway Construction Materials Technician Certification Board. This program serves ODOT, the Oklahoma Turnpike Authority, and the
transportation construction industry. OSU CEAT assumes responsibility for all aspects of HCMTP training and certification including program training, certification, program administration, record keeping, and equipment upkeep and maintenance.

**Sponsor:** Oklahoma Department of Transportation  
**PI/PDs:** Brandy Mays

**OSU as an Authorized OSHA Training Institute Education Center**

OTI Education Centers are a national network of non-profit organizations authorized by OSHA to deliver occupational safety and health training to private and public sector workers, supervisors, and employers on behalf of OSHA. The OTI Education Centers Program supports OSHA’s training and education mission through a variety of safety and health programs.

OTI Education Center courses include OSHA standards and Outreach Training Program trainer and update courses. The OTI Education Centers offer more than 50 courses on various safety and health topics including recordkeeping, machine guarding, confined space, electrical standards, ergonomics, safety and health management, and fall protection.

**Sponsor:** United States Department of Labor – Occupational Safety and Health Administration  
**PI/PD:** Clayton Moorman

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**DIVISION OF ENGINEERING TECHNOLOGY (TECH)**

**An Examination of Household Risk Assessment Judgments and Protective Action Decisions During Tornado Threats**

In this subaward, Dr. Murphy will help develop the experimental design with regard to residents in Texas and Washington. This will include developing the Qualitative Methods Guide, which will help observers consistently code interaction between household members during the experiment, as well as developing the evolving tornado scenario using DynaSearch. She will also assist in participant recruitment, data collection, data analysis, and final analysis.

**Sponsor:** University of North Texas for National Science Foundation  
**PI/PD:** Haley Murphy

**Micro Computer Integrated Rifle w/UAS Control Capabilities STTR Phase II**

OSU will support Casey Corp Defense, LLC in performing its Phase 2 STTR project. Dr. Vora will fabricate the prototype using 3D printing in the ENDEAVOR lab. Tensile and impact tests will be conducted for the prototype using ENDEAVOR material testing equipment.

**Sponsor:** Casey Corp Defense LLC for Department of Defense  
**PI/PD:** Hitesh Vora

**Performance of Flame Mitigation Device**

The objective of this project is to check if a jet fire occurs when portable gas containers (PGCs) are tilted while being exposed to an external ignition source with and without a specifically designed Flame Mitigation Device (FMD) installed. Only one size of PGCs (5 gal) is subject to the experiments.

**Sponsor:** Midwest Can Company  
**PI/PDs:** Haejun Park, Rob Agnew
Oklahoma Shared Clinical and Translational Resources: Assessment of Residual Polycyclic Aromatic Hydrocarbons (PAHs) Exposure on Turnout Gear and Biomarkers between Volunteer and Career Firefighters in Oklahoma
Co-PI Agnew will be responsible for: Recruiting local career and volunteer fire departments into the study; Recruiting members within those departments to participate in the Study; Co-developing the informed consent documentation and receiving IRB approval for human subject research; Co-developing the questionnaire used to collect data from subjects; Attending regular calls and meetings related to the project; Reviewing the results of the data collection and the manuscript(s) for publication/presentation.
Sponsor: Board of Regents of the University of Oklahoma Health Sciences Center for National Institutes of Health
PI/PD: Rob Agnew

Flammable Gas Detector Testing
OSU will perform a testing scheme for the soon to be introduced KANARY Scout, following the sensor manufacturer’s specifications as described in the NevadaNano “Molecular Property Spectrometer™ (MPS™) Flammable Gas Sensor User Manual, as modified to accommodate the geometry of the KANARY Scout (calibration jar).
Sponsor: KANARY Alert
PI/PDs: Rob Agnew, Haejun Park

Rural Energy Assessment Center (REAC) at Oklahoma State University
The mission of REAC is to provide energy assessment/audit (at no cost to the client) to small rural businesses and agriculture producers of the state of Oklahoma that will help reduce energy and waste and increase productivity, while educating and training the next generation of energy, waste, and productivity professionals.
Sponsor: United States Department of Agriculture
PI/PD: Hitesh Vora

Toward Optimal Secondary Furnace Heat Exchanger: Modeling of Furnace Combustion Gas Condensation
This project will create a computational fluid dynamics (CFD) model using Siemens’ STAR-CCM+ software to simulate condensation and heat exchange in a secondary heat exchanger (SHX). In year one, the model will be used to generate a dataset of results for a range of inlet temperatures, inlet water concentrations, tube diameters, tube lengths, and tube internal wall enhancements. In parallel, a simple test apparatus will be created that will generate a validation data set for the CFD simulation. Validated CFD results will provide confidence for extension of the model to different tube diameters and shapes along with variation in inlet conditions.
Sponsor: Various Private Sponsors
PI/PD: Aaron Alexander
Mechanical and Aerospace Engineering: Christian Bach

Cotton Bale Fire Retardant Testing
OSU FPST will perform an initial (small scale) assessment as to the efficacy of PeteFireX (agent) for use in the prevention of cotton bale fires. The obtained information will be used to design full-scale field tests.
Sponsor: Triangle Insurance Company Inc.
PI/PD: Haejun Park
RAPID: Understanding Evacuation, Sheltering, and Reentry Decisions During the Dual Threat of Hurricane and the COVID-19 Pandemic
In this subaward, the OSU investigator will help develop the Interview Protocols and Surveys with regard to emergency managers and residents in Texas and Louisiana. This will include participant recruitment, data collection, data analysis, and final analysis.
Sponsor: University of North Texas for the National Science Foundation
PI/PD: Haley Murphy

NASA Oklahoma EPSCoR Research Infrastructure Development Qualification and Certification of Additively Manufactured Metallic Components in Space and Other Industry Applications
This travel grant will enable strategic partnerships that support the activities funded by the Space Mission Directorate at NASA Marshall. Specifically, the team seeks to pursue collaborative research in lightweight structures and additive manufacturing. They also seek collaboration in developing capabilities related to real-time property prediction during the AM process. This grant will allow interaction with the additive manufacturing group at NASA Marshall Space Flight Center and thus enable identification of primary areas of mutual interest.
Sponsor: Oklahoma State Regents for Higher Education
PI/PDs: Hitesh Vora
Materials Science and Engineering: Ranji Vaidyanathan

Development and Testing of Small Capacity Positive Displacement Refrigerant Pumps for Heat Exchanger Tests
This project will develop refrigerant pumps to be used for various HVAC&R small scale heat transfer experimental setups. For this, several capstone design project teams will design, build, test positive displacement pumps. These pumps will be used in a follow-up senior design project that will develop a small capacity refrigerant calorimeter for testing of heat exchanger samples.
PI/PDs: Ilchung Park
Mechanical and Aerospace Engineering: Christian Bach

RAPID: A Multinational Analysis of Factors that Determine the Effectiveness of COVID-19 Warning Messages
Local governments that issued an order of lockdown could face a dilemma of exhausting its limited resources to contain the toxic virus with an increasing demand for essential public services. The official information sources also suffered from an adverse situation balancing timeliness and accuracy due to understaffing. In the meantime, the public can develop unpredictable stakeholder perceptions due to the conflicting social cues and official information sources. This study explores the roles of emergent norms as a moderator of the relationship between the information conflicts and public perceptions of government stakeholders.
Sponsor: National Science Foundation
PI/PDs: Xiangyu (Dale) Li, Tony McAleavy, Haejun Park

Tran-SET: Smart Battery Management System for Electric Vehicles: Self-Learning Algorithms for Simultaneous State and Parameter Estimation and Stress Detection
Efficient and safe operation of Li-ion batteries in electric vehicles requires an intelligent and smart battery management system (BMS) capable of learning the health degradation for accurately estimating the state-of-charge (SOC) and the state-of-health (SOH). This will add autonomy to the BMS in health-conscious decision making such as fast charging, discharging, cell balancing, and optimal power and
energy management. The design of smart BMS will require the development of 1) an enhanced SOC and SOH dependent parameter-varying dynamical model of Li-ion battery and 2) real-time learning algorithms to learn the parameter-varying model.

**Sponsor:** Louisiana State University and A&M College for the United States Department of Transportation  
**PI/PDs:** Avimanyu Sahoo  
Civil and Environmental Engineering: Samir Ahmed

**Next Generation Smart Heatsinks**  
Heatsinks are a ubiquitous requirement for electrical components to dissipate the heat created. These products are oftentimes limited by the available space and allowable weight. The partnering firm, Moog Inc., is a defense and aerospace supplier that must frequently supply components that are space and weight limited while maintaining performance and proper heat dissipation. Providing components that meet the performance requirement while reducing the weight and occupied space will strengthen Oklahoma’s manufacturing and aerospace industry. This OARS project links innovative design, highly efficient additive manufacturing, and suitable material systems to create the tailored performance needed in next generation smart heatsinks.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI/PDs:** Hitesh Vora, Aaron Alexander, Ilchung Park

**Analysis of Residential Refrigerators**  
This ASHRAE Undergraduate Program Equipment Grant will support capstone design project teams as they evaluate various performance parameters of refrigerators, including the energy consumption as well as component level analysis for the compressor, condenser, and evaporators. To support the project, Whirlpool Corporation will contribute two French-door refrigerators as well as technical expertise for the students to complete the project successfully.

**Sponsor:** American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); Whirlpool Corporation  
**PI/PDs:** Ilchung Park  
Mechanical and Aerospace Engineering: Christian Bach

**Safe Quantity of Open Medical Gas Storage in a Smoke Compartment**  
Although NFPA 99 allows medical gas up to 300 ft³ to be stored outside of dedicated storage, it is not clear how to determine the volume of gas remaining in the gas cylinder or the cylinder size itself. To provide a requirement as low as reasonably practicable, fire risk assessment associated with the medical gas amount is necessary. The research aims to identify risk associated with the medical gas (normally pure oxygen) and its stored amount based on thorough literature review. Based on this, a guidance to enhance understanding on the fire hazards of the medical gas is proposed.

**Sponsor:** Fire Protection Research Foundation  
**PI/PD:** Haejun Park
Industrial Assessment Center Program
The mission of the IAC is to assess energy, waste, and productivity practices with the purpose of enhancing the management of the same within the clients enterprise and to share best practices with other IACs, while educating and training the next generation of energy, waste, and productivity professionals. The IAC will continue to serve clients throughout Oklahoma, Arkansas, Kansas, and north and northwest Texas, including the Texas Panhandle. The latest technology will be employed to perform assessments that focus on energy, waste, and productivity issues in the clients’ facilities.
Sponsor: Department of Energy
PI/PD: Hitesh Vora

Public Safety Small Unmanned Aerial Systems Operations Training Baseline Materials & Usage Assessment
The objective of this effort is to develop a curriculum that will address sUAS utilization across all operational settings including structural and wildland firefighting, search & rescue, hazardous material responses, natural disasters, and any other events in which public safety operations would benefit from use of drones.
Sponsor: Fire Protection Research Foundation, Inc. for the Federal Emergency Management Agency
PI/PDs: Rob Agnew, Haley Murphy
Mechanical & Aerospace Engineering: Jamey Jacob, James Kidd
Engineering Outreach and Extension: Ed Kirtley
Fire Service Training: Dean McFadden

Optimization of Flow and Disbursement for Green Fire Suppression Agent
SpectrumFX, in collaboration with the OSU New Product Development Center, will plan, design, test and optimize a new green fire suppressant system that may possibly replace existing systems in a variety of fields. The first effort will model the system, defining optimum operating parameters and physical nozzle configuration. The model results will be used to design a fire suppression system with nozzles matching the model, all of which will then be tested and verified by a Phase Doppler Interferometer. The project will also include the fabrication and field testing of the first prototype system.
Sponsor: Spectrum FX for the Oklahoma Center for the Advancement of Science and Technology
PI/PDs: Haejun Park
New Product Development Center: Robert Taylor
Chemical Engineering: Clint Aichele
College of Education and Human Sciences

FY2021 Research Abstracts
Human Nutrition, Health and Consumer Issues
The purpose of this project is to manage funds awarded to Human Sciences' faculty investigators who are supported by the Oklahoma Agricultural Experiment Station for the purpose of exploring novel approaches to current issues related to human nutrition and health, as well as safety and consumer issues. (3074)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Christine Johnson

COMMUNITY HEALTH SCIENCES, COUNSELING AND COUNSELING PSYCHOLOGY

Collaborative Research: EAGER: Towards Increasing Native American Engineering Faculty
The purpose of this exploratory research project was to deepen the understanding of factors that support Native Americans' (NA) entry and persistence in engineering faculty careers. There are very few NA engineering faculty and they are critical in attracting NA students into engineering. Using multiple methods (individual interviews, focus groups, quantitative surveys), we collected data from NA engineering faculty and students. We examined individual factors and ecological systems that support pursuit of and persistence in engineering faculty careers. Early results were presented at multiple conferences with final analyses is in process.
Sponsor: National Science Foundation
PIs: Sue Jacobs
University of Minnesota: Sherri Turner

Health Policy Research Scholar
The grant will support the participant's engagement in the Health Policy Research Scholars program. Over the course of the five-year program, the participant will engage in program activities concurrent with and to enhance and enrich the participant's doctoral program. Grant funds, provided over the first four years, will support the participant's successful completion of the program. For example, grant funds may be used for living expenses, registration fees for relevant conferences/workshops, travel, and supplies. The grantee institution agrees that it will verify that the applicant is enrolled and a student in good standing, with at least a 3.0 grade point average, before distribution of funds to, or for the benefit of, the participant.
Sponsor: Robert Wood Johnson Foundation
PI: Julie Croff (Center for Health Sciences)

Iowa Tribe of Oklahoma Native Connections Grant
The Iowa Tribe of Oklahoma’s “Hin kitogle hine ke” project, which means “We Are Going Together” in the Ioway language, seeks to forge a comprehensive and integrated suicide prevention, substance abuse prevention, and mental health promotion system to provide early intervention services to American Indian youth and emerging adults. This system will expand and enhance the current program and provide the foundation for creating prevention prepared communities, tribal mentorship activities with youth, meaningful partnerships that will be created and nourished, and deliver effective, efficient, and culturally appropriate services.
Sponsor: Iowa Tribe of Oklahoma, U.S. Department of Health and Human Services – Substance Abuse and Mental Health Services Administration
PIs: Julie Koch, Xuewei Chen, Carrie Winterowd
Creating Mechanisms for Addressing Negative Experiences for Racial and Ethnic Minority Students: Moving Beyond Grievances to Culture Change
This project explores racial and ethnic minority (REM) students' experiences in doctoral psychology and their knowledge of the grievance process. We will explore the relationship between grievances and broader racial climate issues to address challenges REM graduate psychology student retention concerns. We will do this by recruiting and conducting interviews with up to 60 REM students who have filed or have considered filing a grievance. We will ask about the circumstances that lead them to file a grievance, their experience during the grievance process, and their experiences connected to racist experiences.

**Sponsor:** American Sociological Association  
**PI:** Madeline Brodt

Resources Information Support and Education (RISE) for Telementoring for Health Care in Rural Underserved Populations
The University of Texas Health Science Center at San Antonio will lead a collaborative group of organizations to develop a training and technical assistance program to create or expand technology enabled collaborative learning and capacity building models for health care in rural and underserved areas across the US described as follows.

**Sponsor:** University of Texas Health Science Center at San Antonio, U. S. Department of Health and Human Services – Health Resources and Services Administration  
**PI:** Marshan Oliver-Marick

Practicum Agreement - Payne County Youth Services, One Master's Student
This agreement provides funding for one master’s degree student to have a paid practicum experience with Payne County Youth Services.

**Sponsor:** Payne County Youth Services  
**PI:** Tom Berry

Practicum Agreement - Payne County Youth Services, One Master's Student
This agreement provides funding for two PhD students to have a paid practicum experience with Payne County Youth Services.

**Sponsor:** Payne County Youth Services  
**PI:** Tom Berry

Practicum Agreement - Wings of Hope
This agreement provides funding for two PhD students to have a paid practicum experience with Wings of Hope.

**Sponsor:** Wings of Hope Family Crisis Services  
**PI:** Tom Berry

Practicum Agreement - Payne County Youth Services, PhD Students
This agreement provides funding for four master’s degree student to have a paid practicum experience with Payne County Youth Services.

**Sponsor:** Payne County Youth Services, Inc.  
**PI:** Tom Berry
Practicum Agreement - Payne County Youth Services, One PhD Student
This is a paid counseling practicum for one doctoral student in counseling psychology.
**Sponsor:** Payne County Youth Services, Inc.
**PI:** Carrie Winterowd

**DESIGN, HOUSING AND MERCHANDISING**

**CATcare: Cognition Assistive Technology for Dementia Homecare**
CATcare is a cognitive assistive technology in development to provide two-way assistance to the dementia caregiver and care recipient dyad living at home. CATcare will help improve the quality and sustainability of dementia homecare via low-cost wearable and customized technology and will be tested in the grant funded Human Environmental Factors Lab (HEFL) located in the College of Education and Human Sciences. Currently the HEFL layout represents a living room, dining room, kitchen and bedroom with furnishings and appliances allowing for evaluations of the CATcare system prototype for programming features, system usability, and data collection for activity recognition algorithm development.
**Sponsor:** National Institutes of Health
**PIs:** Emily Roberts
Electrical and Computer Engineering: Guoliang Fan

**Convergence: Laying the Groundwork for Repurposing Distressed Urban Malls Environments for Mixed-Use Dementia Friendly City Centers**
This project lays the groundwork for the Dementia Friendly City Center model, engaging multi-disciplinary participation from four stakeholder groups in order to facilitate design decision-making in adaptive reuse of mall environments for dementia housing, programs and services. Five focus groups have taken place over the past year and four publications from these focus groups have been developed with one in press, one in revision and two in review. A survey is under development based on the findings from the focus groups. Due to COVID-19 delays, this grant term has been extended 6 months to June 30, 2021.
**Sponsors:** NextFifty Initiative, American Society of Interior Designers Foundation
**PI:** Emily Roberts

**Healthy Homes Oklahoma**
The goal of the app is to serve as a tool to reduce housing deficiencies and risks associated with childhood diseases and injuries. As the electronic vehicle for the “Help Yourself to a Healthy Home” tribal publication, the app will provide information that can help educators address housing deficiencies and risks associated with childhood diseases and injuries. The app will be part of an extant, technology-based holistic healthy homes curriculum.
**Sponsor:** University of Missouri, U.S. Department of Agriculture
**PI:** Gina Peek

**Personal Protective Technologies for Current and Emerging Occupational and Environmental Hazards**
As an active member of USDA NC-170 Research Group, the investigator contributed: 1) to develop a Protective Textile and Clothing Laboratory at Oklahoma State University; 2) to characterize the protective and comfort performance of textile and clothing materials using state-of-the-art equipment; 3) to implement statistical and computational modeling techniques to analyze the protective and comfort performance of textile materials; 4) to develop interdisciplinary research collaboration with
eminent professors in the field of protective textiles and clothing; and 5) to disseminate the research on protective textiles and clothing in scientific journals and conferences. (3202)

**Sponsor:** Oklahoma Agricultural Experimental Station

**PI:** Sumit Mandal

**Using Artificial Neural Network Modeling to Analyze the Thermal Protective and Thermo-Physiological Comfort Performance of Oil and Gas Industry Workers' Clothing**

The overall objective of this pilot project is to develop ANN models for the prediction of performance based on fabrics’ physical properties. Our central hypothesis is that by incorporating the sweat moisture and microclimate air gaps, the predictability of the ANN models will be increased. The rationale of this project is that its successful completion would make an original contribution in accurately and realistically predicting the thermal protective and thermo-physiological comfort performance of fabrics using the time- and cost-efficient ANN models.

**Sponsor:** University of Texas Health Science Center at Houston, National Institute of Occupational Safety and Health

**PI:** Sumit Mandal

**Applications of Cotton in the Post-COVID era**

The purpose of this project is to further student understanding and knowledge about cotton fibers, fabrics, and innovation and their role in solving real-world problems in the post-COVID era through student-centered activities directly integrated into the course curriculum. A total of nine courses offered in the department of Design, Housing and Merchandising (DHM) will be included in the yearlong project. In addition, we plan to bring our students to North Carolina to visit both the headquarters of Cotton Inc. as well as other key sites, such as Raleigh Denim and possibly a yarn spinning or knitting mill and a cotton farm to further learn about the nation’s cotton fiber industry. We will also hold guest speaker lectures by invited industry experts from cotton-related fields. The yearlong project will culminate in the Cotton Symposium in which participating students have an opportunity to showcase their cotton project outcomes to students, staff, and faculty in the College of Education and Human Sciences.

**Sponsor:** Cotton, Inc.

**PIs:** Hyejune Park, Semra Peksoz, Sumit Mandal, Aditya Jayadas, Paulette Hebert

**Developing and Testing Innovations (DTI): Native American Middle School Students After-School STEM (NAMSAS) Program**

This project focuses on the design, development, and evaluation of an afterschool program that uses virtual reality, augmented reality and 3D printing. This will hopefully increase the STEM career interests and motivations of Native American middle school students through participation in the education modules.

**Sponsor:** National Science Foundation

**PIs:** Tilanka Chadrasekera

**Educational Foundations, Leadership & Aviation:** Tutaleni Asino

**Oklahoma Water Resources Center:** Nicole Colston
EXTENSION, ENGAGEMENT AND CONTINUING EDUCATION

OK OSU EXCITE Project
The long-term goal is to strengthen immunization education with a special focus on adult vaccination hesitancy around both COVID and other adult immunizations. 
Sponsor: United States Department of Agriculture
PI: Gina Peek

EDUCATIONAL FOUNDATIONS, LEADERSHIP AND AVIATION

Area Health Education Centers (AHEC) Program
Seventy-four of Oklahoma’s 77 counties are designated HPSAs for one or more health professions (primary, mental, dental care), presenting considerable barriers to quality health care in predominately poor counties. OK AHEC will consist of three regional Centers. The targeted trainee population consists of high school, community college, university, and medical school students from rural and underserved areas (RUAs). The goals of the EHA portion are to establish community-based research capacity and evaluation strategies for OK AHEC. 
Sponsor: United States Department of Health and Human Services - Health Resources and Services Administration
PIs: Mwarumba Mwavita
Center for Health Sciences: Jeffrey Hackler

Local Law Enforcement Crime Gun Intelligence Center Integration Initiative
The OSU Center for Educational Research and Evaluation (CERE) will perform an independent evaluation of the proposed Tulsa Crime Gun Intelligence Center (TCGIC). It will: 1) Assess the evaluation plan during the six-month planning period following the award, identifying the program’s logic model through guided discussion with program stakeholders; 2) The evaluation plan will then be developed and will describe the methodology for testing the program’s effectiveness in meeting its objectives, including evaluating implementation fidelity; and 3) Implement the evaluation plan. The attainment of each deliverable will be subject to periodic and ongoing evaluation and review.
Sponsor: City of Tulsa, U.S. Department of Justice
PI: Jam Khojasteh

FAA Center of Excellence for Technical Training and Human Performance
The program management project will seek to align faculty interests, FAA objectives and project goals so that this Center of Excellence will achieve the aims and goals set by the FAA. Quarterly and annual meetings will be attended to collaborate with other COE team members in an effort to develop interdisciplinary approaches to solutions being sought as new technical training models are being developed. The OSU Team will seek opportunities to plug in and offer expertise in areas of knowledge by faculty at Oklahoma State University.
Sponsor: Federal Aviation Administration
PIs: Matt Vance, Jon Loffi

National Research Conference on College Students Who Were in Foster or Other Out-of-Home Care
In February 2020, we conducted a 1.5-day national conference for researchers studying college students who were in foster/out-of-home care during their adolescent years (i.e. foster alumni). The goal was to convene interdisciplinary researchers. To keep a tight tie between practice and research, it also included limited practitioners. Outcomes: Established cross-boundary research relationships and created six
interdisciplinary teams who designed and began original research. All teams will present findings at a follow-up conference at OSU. Thus, a new, interdisciplinary research community is forming to address the complicated social issues that both create and continue to challenge college-level foster alumni.

**Sponsor:** Spencer Foundation  
**PI:** Kerri Kearney

**NRI: INT: Safe Wind-Aware Navigation for Collaborative Autonomous Aircraft in Low Altitude Airspace**  
The overall objective of this project is to validate our hypothesis that knowledge of 'in-time' or 'real-time' wind field, communicated effectively to a pilot, can enhance safety, efficiency and robustness of future autonomous aircraft operations in low altitude airspace. Towards this objective, we will develop a framework that integrates turbulence modeling, navigation, control, and pilot-aircraft interface to enable autonomous and remotely piloted aircraft to navigate through the ABL with improved predictability and increased endurance.

**Sponsor:** National Science Foundation  
**PIs:** Matt Vance  
Mechanical and Aerospace Engineering: He Bai, Rushikesh Kamalapurkar, Jamey Jacob

**STEM Persistence through Flexible Authentic Research Opportunities**  
Life-science departments seek to increase persistence among majors by transforming introductory science courses into authentic research experiences. In these introductory courses students will design and conduct original research and present their findings in written and oral form. OSU freshman interested in research will be invited to participate in the Life Sciences Freshman Research Scholars program during which they will complete a research course and conduct research with faculty mentors. To encourage students to join the OSU research community, we will host networking events for life-science majors, along with events uniquely designed to encourage the participation of Native American life-sciences students.

**Sponsor:** Howard Hughes Medical Institute Science Education Program  
**PIs:** Lucy Bailey  
Biochemistry & Molecular Biology: John Gustafson  
Chemistry: John Gelder  
Integrative Biology: Donald French  
Microbiology & Molecular Genetics: Wouter Hoff  
Plant Biology, Ecology, and Evolution: Andrew Doust

**Enhancing the Capacity for Rural Libraries to Engage the Public in Drought Science, Monitoring, and Adaptation**  
The core research focuses on the design, development, and evaluation of informal science education (ISE) programs and educational media for use in rural libraries in drought prone areas of the Great Plains. The target audiences include public librarians in rural communities of Oklahoma, Nebraska, and Colorado, as well as the general public they serve. The project goals are to leverage the professional skills and community knowledge of rural librarians to support local drought monitoring networks. Our innovative model prepares librarians to introduce citizen science processes and practices within the context of community dialogue and deliberation about drought. The project deliverables include: (1) a professional development workshop series for rural librarians, (2) a drought infographic booklet and poster series, and (3) co-designed library programs for public audiences.

**Sponsor:** National Science Foundation  
**PIs:** Tutaleni Asino  
Oklahoma Water Resources Center: Nicole Colston
STEM Pathways for Native Americans: Bridging Native Knowledge of Earth and Sky with Traditional STEM Programming through the "Native Earth | Native Sky" Program

In the “Native Earth | Native Sky” (NENS) program, we will build culturally-relevant earth-sky STEM programming for middle schoolers in three Oklahoma Native American nations that will increase students’ understanding of and interest in STEM. Our hypothesis is that interweaving native stories and language with STEM principles will aid in students’ understanding of earth-sky STEM topics and will allow the students to better identify with and thus pursue STEM careers.

Sponsor: National Aeronautics and Space Administration
PIs: Kat Gardner-Vandy, Kalianne Neumann
School of Teaching, Learning & Educational Sciences: Juliana Utley, Toni Ivey

Inclusive Biologists Exploring Active Research with Students (iBEARS)
This project focuses on integrating 21st century skills development into workshops to develop technologies in teaching, learning, and mentoring.
Sponsor: Baylor University, National Science Foundation
PI: Penny Thompson

Responding to Student Race-Based Trauma: The Doubled-Edged Sword of Empathy
The purpose of the proposed, mixed-methods study is to identify the personal and transactional factors associated with altruistic responses to students of color experiencing race-based trauma. Specifically, we will collect survey and interview data in seeking to (a) identify factors associated with self- and others-focused emotional responses to student trauma (e.g., burnout, trait mindfulness) and (b) identify behavioral strategies associated with these self- and others-focused emotional responses (e.g., nothing, counseling the student, social activism).

Sponsor: American Psychological Association
PIs: Michael Yough, Mwarumba Mwavita

Reducing Pesticide Exposure among Latino Adolescents through Promotora-Based Interventions
This project implements and evaluates a promotora-based intervention targeted at adolescent farm workers. To date, a total of 73 adolescents have been part of this study. Overall retention for study participants after initial recruitment has been approximately 87%. Additionally, 85% of the adolescent and parents that are recruited to the La Familia Sana pesticide safety program attended all four sessions of the program. Findings show that youth and parents recruited to the 4-week program are maintaining high rates of program completion, with the majority of participants attending all of the program sessions.

Sponsor: University of Texas Health Science Center at Tyler
PI: Michael Merten

Engaging Families and Employers in Latino Construction Worker Injury Prevention
The overall goal of the proposed research is to create capacity for sustained commitment to worker safety among small-scale residential construction contractors employing Latino workers. The project goal will be achieved through a community-based partnership of academic researchers, the Greater Tulsa Hispanic Chamber of Commerce and a translational research project that will accomplish three specific aims: 1) document strengths, weaknesses, opportunities and threats of contractors in small-scale residential construction to enhancing fall prevention initiatives with their workers; 2) describe beliefs held by family members about the risks Latino construction workers encounter on the job, the
modifiability of those risks, and the ability family members have in minimizing those risks; 3) determine
the added impact of a “Lay Health Advisor” (LHA), “employer-enhanced” and “family-enhanced”
intervention strategy in comparison to a control group that receives written safety education alone.

**Sponsor:** Centers for Disease Control and Prevention - National Institute for Occupational Safety and Health

**PIs:** Michael Merten, Isaac Washburn

**Developing Synergistic Approaches to Healthy Weight in Childhood through Positive Relationships, Diet Quality and Physical Activity**

As an active member of the W3005 research working group, the investigator made the following contributions to the W3005 umbrella review: reviewed and edited search strategy, performed full-text reviews, contributed to updated PROSPERO protocol, and conducted quality assessment of final articles. As an active member of the W3005 Extension working group, the investigator participated in the iterative review process that led to the development of the W3005 COPPER rubric and contributed to the development of Qualtrics surveys to collect descriptive data on the wide range of childhood obesity prevention programs in Extension. In her role as W3005 chair, she mentored and monitored working group progress. (3117)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI:** Laura Hubbs-Tait

**Parent-Adolescent Training on Neurofeedback and Synchrony**

The PI will oversee all aspects of the study including recruitment, maintaining positive relationships with families, data collection and coding, the part-time research assistant and student volunteers, and training. She will assist with clinical assessment of participants and data collection. Under the mentorship of Drs. Amanda Morris and Jerzy Bodurka, she will write and submit conference presentations and manuscripts. Dr. Kerr will have weekly meetings with her mentors and the part-time research assistant.

**Sponsor:** Laureate Institute for Brain Research

**PI:** Kara Kerr

**Enhancing Maternal-Fetal Bonding to Promote Healthy Pregnancies and Reduce Adverse Perinatal Outcomes**

Unintended pregnancy (unwanted and/or mistimed pregnancy) heightens the risk for adverse birth outcomes, including preterm birth and very low birth weight (< 1500 grams), which have significant public health costs. The study focuses on rapidly increasing maternal-fetal bonding, a mediator of the relationship between unintended pregnancy and maternal health practices during pregnancy, through a recently piloted intervention, BLOOM (Babies and Moms, connected by Love, Openness, and Opportunity). Specifically, we will 1) examine change in maternal-fetal bonding across pregnancy and implications for change in maternal health behaviors during pregnancy; and 2) determine the efficacy of BLOOM to increase maternal-fetal bonding and reduce adverse perinatal outcomes.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology

**PI:** Karina Shreffler
**The Holistic Assessment of Tulsa Children’s Health (HATCH) CIRCA Project 1**
This project examines how adversity that women experienced in their own childhoods affects their pregnancy and birth outcomes through biopsychosocial mechanisms as well as the protective factors that can reduce risks. The PI is currently examining psychosocial and behavioral impacts of the COVID-19 pandemic.

**Sponsor:** National Institutes of Health  
**PI:** Karina Shreffler

**Maternal, Infant, and Early Childhood Home Visiting Program: A Collaborative Learning Innovation for Addressing Engagement/Retention of Home Visiting Clients 5.0**
Lana Beasley, is a licensed clinical psychologist with specialized training in qualitative research methodology. She will be conducting a qualitative study to examine father involvement within home visiting services. Two-person teams of qualitative researchers will conduct interviews with clients and providers who are familiar with the program’s curriculum. As the PI at Oklahoma State University, Dr. Beasley will oversee all aspects of the qualitative study.

**Sponsor:** University of Oklahoma - Health Sciences Center  
**PI:** Lana Beasley

**Maternal, Infant, and Early Childhood Homevisiting Grant Program**
Oklahoma State University will be conducting a qualitative study to examine father involvement within home visiting services. Two-person teams of qualitative researchers will conduct interviews with clients and providers.

**Sponsor:** University of Oklahoma - Health Sciences Center  
**PI:** Lana Beasley

**3/6 Planning for the HEALthy Early Development Study**
The planning study will link investigators across five research sites who have complementary experience and expertise in the areas that are essential to designing the study. Planning activities are being accomplished using a coordinated set of Working Groups who are working collaboratively to design a sampling and recruitment strategy for a future large-scale study, to identify and recommend strategies for addressing the challenges to ethical recruitment and retention of vulnerable populations, and to develop and test a common protocol for neuroimaging, infant and child assessments, exposure assessment, biospecimen collection, and integration of novel technologies. The larger study, once funded, will examine babies’ brain development over 10 years and will study factors that influence successful development.

**Sponsor:** National Institutes of Health  
**PIs:** Amanda Morris, Lana Beasley, Karina Shreffler  
**Center for Health Sciences:** Julie Croff
Dyadic Inter-Brain Signaling Project (DIBS) CIRCA Project 4
Depression and emotion management problems contribute to significant public health problems in adolescence and adulthood. However, little is known about the impact of parenting on the neurocircuitry underlying adolescents’ emotionality and depressive symptomology. To address these gaps, the current study integrates (a) a developmental approach, (b) functional neuroimaging, and (c) longitudinal clinical research to examine how risk and resilience for depression relate to brain activity in parents and adolescents. Current findings indicate that parent and adolescent brain activity influence mental health, and parents have a strong influence on adolescents’ patterns of brain activity.

**Sponsor:** National Institutes of Health

**PI:** Amanda Morris

System of Care: Strengthening our CreNet (SOC2) - Infant and Early Childhood Mental Health Workforce Development
The Institute for Building Early Relationships (IBEuR) has coordinated an evaluation of a workforce development program. The goal of the evaluation is to assess the impact of the workforce development on the participating clinicians and agencies as it relates to their knowledge, understanding, and comfort level with infant mental health. It will additionally provide information for areas of needed adaptation as the workforce development program continues. OKDMH and IBEuR will collaborate on papers and presentations sharing findings of the evaluation within academic, professional, and other channels. Data collection is complete, and final analyses and report writing are underway.

**Sponsor:** Oklahoma Department of Mental Health and Substance Abuse Services

**PI:** Amanda Morris

Expanding the Cycle of Opportunity: Simultaneously Educating Parents and Children in Head Start
Dr. Morris has worked with Northwestern University staff and project PIs, in partnership with the Community Action Project (CAP) in Tulsa, to oversee data collection of parent interviews and home assessments. Dr. Morris’s primary responsibilities were to (1) oversee and coordinate the parent interviews and data collected via home visits; (2) oversee the project coordinator and temporary data collectors who are conducting the interviews/ assessments; and (3) aid in data analysis and report/manuscript writing. The project is primarily focused on the impact of English classes on parents of children attending Head Start. Findings reveal this program is helping parents navigate the schooling system and is improving their English language skills, particularly among high-risk mothers.

**Sponsor:** Northwestern University

**PI:** Amanda Morris

The Northwestern University Two-Generation Study (NU2Gen) of Parent and Child Human Capital Advancement
Dual-generation approaches – targeting parents and children simultaneously – represent a promising and innovative antipoverty strategy for families. In collaboration with the Community Action Project of Tulsa, Oklahoma (CAP), we conducted a randomized trial on the impact of a dual-generation education program for parents and their children in CAP’s Head Start Programs. This dual-generation program, the Education Pathways Program (EPP), provides education services and career coaching for parents at different levels of education while their children attend Head Start programs. Study findings indicate that the program affects children’s attendance in school and parent’s mental health and job placement in positive ways, providing important evidence for two-generation interventions.

**Sponsor:** Northwestern University

**PI:** Amanda Morris
The Impacts of a Reconciliation Video Podcast on Divorcing Parents Decision-Making Process
This study will investigate the effects of a 10-15 minute video podcast intervention about the option for reconciliation—including accurate information and resources—among parents who have filed for divorce and attended the Co-parenting for Resilience course sponsored by Oklahoma State University. One hundred participants will be randomized into an intervention or control group and data will be collected at pre-intervention, post-intervention, and 9-month follow-up. Ultimately, the aims are to (1) develop and test the feasibility of the video-podcast and (2) determine whether it is effective in altering beliefs and interests in the reconciliation option. Video production is currently in preparation.

**Sponsor:** Fahs-Beck Fund for Research and Experimentation  
**PI:** Nathan Hardy  

**National Core Indicators Adult In-Person Survey – Oklahoma**
OSU conducted the National Core Indicators [NCI] annual Adult In-Person Survey on behalf of Oklahoma Department of Human Services Developmental Disabilities Services (DDS). Data from the Oklahoma NCI Adult In-Person Survey is used to track and compare state performance over time and with other states, establish national benchmarks and validate DDS data in regards to the Home and Community Based Services Final Rule (settings). A random sample of 400 was pulled from all adults receiving Home and Community Based Waivered Services including In-Home Support Waiver-Adult (IHSW-A), Homeward Bound Waiver (HBW), and Community Waiver (CW: residential and non-residential). A representative random sample from IHSW-A, HBW, CW residential and non-residential was achieved. In order to achieve a final sample of 400, oversampling of 436 occurred in order to replace individuals as needed due to refusals, inactives, expirations, and contact failures.

**Sponsor:** Oklahoma Department of Human Services  
**PIs:** Jennifer Jones, Kami Gallus  

**Promoting Self-Determination**
OSU Institute for Developmental Disabilities will conduct Promoting Self-Determination training consisting of 10 training sessions over the course of the period of performance for ODHS DDS participants.

**Sponsor:** Oklahoma Department of Human Services  
**PIs:** Jennifer Jones, Kami Gallus  

**National Core Indicators - Aging & Disabilities (AD)**
The Oklahoma Department of Human Services-Aging Services Division (OKDHS-ASD) and Oklahoma State University (OSU) have joined forces to bring the National Core Indicators-Aging and Disabilities project (NCI-AD) to Oklahoma. Data from the Oklahoma NCI-AD project will span four years and assess national benchmarks related to the Home and Community-Based Services Final Rule (regarding HCB settings). Through this partnership, OSU and OKDHS-ASD join a team of 26 other states contributing to a deeper understanding of critical Home and Community-Based Services and applicable quality measures for home-based care.

**Sponsor:** Oklahoma Department of Human Services  
**PI:** Whitney Bailey  

**Oklahoma and Langston Sustainable Community Project - The United We Can: African American Youth Entrepreneurship Program**
African American youth in North Tulsa are at high risk to drop out of school. This project tests the effectiveness of the United We Can! program to increase academic performance and reduce high-risk behaviors among African American youth. The program includes a six-week family workshop series to
increase family engagement, training in entrepreneurship, weekly one-on-one success coaching, and a Summer Youth Academy.

**Sponsor:** United States Department of Agriculture  
**PIs:** Ronald Cox, Isaac Washburn  
Langston University: Joshua Ringer  

**Oklahoma State University Sustainable Community Project - The Together We Can: Latino Youth Entrepreneurship Program Model for Immigrant Latino Families**
Approximately 88% of U.S. population growth over the next five decades will be due to immigrants and their descendants, most of whom will be Latino. Over 85% of Latino youth born to immigrant parents are U.S. citizens and will constitute a significant proportion of the country’s future workforce. This project tests the effectiveness of the United We Can! (Spanish ¡Unidos Se Puede!) program to increase academic performance and reduce high-risk behaviors among Latino youth. The program includes a six-week family workshop series, training in entrepreneurship, weekly one-on-one success coaching, and a Summer Youth Academy.

**Sponsor:** United States Department of Agriculture - National Institute of Food and Agriculture  
**PIs:** Ronald Cox, Isaac Washburn

**OSU Rural Opioid Technical Assistance Grants (ROTA) TA Project**
Approximately 128 people in the U.S. die every day from opioid overdoses and thousands experience the negative outcomes associated with drug abuse and addiction. To address opioid misuse in Oklahoma the OSU Cooperative Extension Service has partnered with the OSU Center for Wellness and Recovery to develop and disseminate materials related to prevention, treatment and recovery of opioid misuse and to provide training for medical personnel. This partnership combines Extension’s experience to disseminating research-based information with the Center’s expertise on the prevention of opioid misuse to benefit citizens in six rural counties in southeastern Oklahoma communities.

**Sponsor:** United States Department of Health and Human Services - Substance Abuse and Mental Health Services Administration  
**PIs:** Ronald Cox, Matt Brosi  
Center for Health Sciences: Julie Croff

**Reducing Alcohol, Tobacco, and Drug Use among Latino Immigrant Youth: A Preliminary Test of the Unidos Se Puede Program**
Adolescent alcohol, tobacco, and other drug (ATOD) use is a major public health concern, with rates for Latino middle school youth higher than other ethnic groups. One well-established precursor of adolescent ATOD use is psychosocial stress. Among Latino immigrant youth, stress related to migration is associated with ATOD use, depressive symptoms, and anti-social behavior, even after accounting for indicators of socio-economic status. The proposed project examines the preliminary efficacy of Unidos Se Puede program to decrease ATOD use among Latino youth in new settlement areas like Oklahoma.

**Sponsor:** National Institutes of Health  
**PIs:** Ronald Cox, Isaac Washburn
**ConnEC2T: Connecting Emergency Certified Early Childhood Teachers**

The current project aims to increase retention of early childhood teachers with emergency certification through the creation of a support network connecting university faculty from an Early Childhood Education degree-granting program with a cohort of emergency certified early childhood education teachers in their first three years of teaching.

**Sponsor:** Oklahoma State Regents for Higher Education

**PIs:** Ashley Kimble, Larisa Callaway-Cole

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**BEST’s ConnectFirst Family Advocate System Evaluation**

Birth through Eight Strategy for Tulsa (BEST) is a comprehensive, continuous, and integrated approach that focuses on families to break the cycle of intergenerational poverty. Part of BEST involves the creation of a system, called ConnectFirst, which employs Family Advocates who regularly check-in and connect with expectant and new mothers to limit the negative impact that poverty has on child development. They do this in partnership with agencies and social service providers that provide ConnectFirst clients with access to valuable resources, assistance, and beneficial programs. The goal of the project is to work with ConnectFirst leadership to identify where it is working well, where it can use improvement, and to make evidence-based suggestions for system improvement.

**Sponsor:** Oklahoma State University Foundation, George Kaiser Family Foundation

**PIs:** Mike Stout, Martha Zapata

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**Community Impact Core - Center for Integrative Research on Childhood Adversity (CIRCA)**

The Center for Integrative Research on Childhood Adversity (CIRCA) is the nation’s first interdisciplinary center focused on understanding and mitigating the effects of childhood adversity on human health and development, and on the development of more effective and sustainable prevention and intervention strategies to interrupt the cycle of generational trauma and toxic stress. The Community Impact Core supports CIRCA investigators’ translational research needs, and facilitates the creation of a statewide network of cross-sector partners focused on building resilient communities through evidence-informed policy and best practices in trauma-informed programming.

**Sponsor:** National Institutes of Health

**PI:** Michael Stout

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**Logic Model and Program Evaluation for Oklahoma Commission on Children and Youth**

The goal of the proposed project is for the Center for Public Life at OSU-Tulsa (CPL) to work with the Director and key personnel at the Oklahoma Commission on Children and Youth (OCCY) on the development and implementation of agency and departmental mission/vision/values statements, and logic models. The outcomes of this project will provide OCCY with information that can be used to guide future strategic planning and program evaluation activities.

**Sponsor:** Oklahoma Commission on Children and Youth

**PI:** Michael Stout

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**Bright Beginnings Program Evaluation**

The goal of the proposed project is for Dr. Mike Stout to work with key staff from the Parent Child Center in Tulsa, Oklahoma to develop and implement an evaluation of the Bright Beginnings program. The purpose of the program evaluation is to collect data from relevant stakeholders in order to determine potential areas of improvement as the program coordinators prepare for their upcoming work to update and redesign the program.

**Sponsor:** George Kaiser Family Foundation

**PI:** Michael Stout
**Belonging: A Film to Inspire Teaching Social Acceptance in the Classroom**
The Belonging film project has the potential to do something that does not happen easily within the research world, namely to quickly make a direct impact on the lives of children. It has been reported that it takes an average of more than 15 years for research to be implemented in practice (Green, 2008). The beauty of Belonging is that teachers can view the film, and—if they have the “ah-ha moment” we anticipate—implement a change in their classrooms immediately, narrowing the research-to-practice gap significantly.

*Sponsor:* Oklahoma State University Foundation  
*PI:* Amanda Harrist

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**Facilitating Artificially Intelligent technology for the Homebound (FAITH)**
Socially Assisted Robots (SARs) are innovative technological tools that can connect church communities to homebound older adults and vice versa. Such technology has potential to enhance ministerial programming for the older homebound adults. Of central importance is understanding how to design such technology for use by church leaders. Results from a preliminary focus group indicates that SAR technology should be designed to secure private spiritual communication between the minister and older adult, predict the type of religious or spiritual intervention warranted by older churchgoers prior to visitation, and be inclusive of older adults with acute and long-term disabling conditions.

*Sponsor:* Oklahoma State University Foundation – Bartlett Family Grant for Promoting Independent Living among Individuals with Physical Disabilities  
*PI:* Alex Bishop

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**Robotic Health Assistants: A New Human-Machine Partnership in Home Healthcare**
This project aims to empower home healthcare practitioners to achieve high productivity and quality of work life through robot and artificial intelligence (AI) technologies. Preliminary focus group results involving healthcare and community stakeholders from Oklahoma City, Tulsa, and Enid suggest that a future geriatric home health workforce will require a technological device to improve healthcare literacy of home health employees responsible for patient data reporting, translation, and consultation; ensure that older adult patients adhere to the treatment directives of home healthcare providers, and provide environmental and patient monitoring in the absence of an available home health caregiver.

*Sponsor:* National Science Foundation  
*PIs:* Alex Bishop

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**Electrical and Computer Engineering: Weihua Sheng**

**Resources for Coping with Nursing Home Resident Death**
The COVID-19 pandemic has transformed nursing homes from 24-hour rehabilitative geriatric care centers into socially distant facilities where the oldest and most vulnerable residents die alone. Reports indicate that significant deaths have occurred in long-term care facilities across the country. Thus, there is an immediate need for developing informational fact sheets and educational webinars to assist funeral home service providers in effectively communicating and building meaningful bereavement among COVID-19 family survivors who must grieve the loss of loved ones who reside in nursing home.

*Sponsor:* Oklahoma State University Foundation, Funeral Service Foundation  
*PIs:* Alex Bishop, Matt Brosi
Payne County Youth Service Graduate Research Assistantship at OSU
This contract provides funds for two Graduate Research Assistants to practice and apply student learning in marriage and family therapy with clients served by Payne County Youth Services.
**Sponsor:** Payne County Youth Services, Inc.
**PI:** Matt Brosi

Practicum Agreement- Payne County Youth Services, two MFT Masters Students
This agreement provides funding for two master’s degree student to have a paid practicum experience with Payne County Youth Services.
**Sponsor:** Payne County Youth Services
**PI:** Amanda Szarzynski

Oklahoma Good Behavior Game Implementation and Evaluation
The OSU Center for Family Resilience develops and coordinates a support system for implementation and evaluation of the Good Behavior Game (GBG) among participating Oklahoma schools. The vision for the support system is to scale sustainable GBG in schools across the state. The support system will build local GBG capacity by training school personnel as a master training venue, providing mixed-method consultation for successful GBG implementation, and operating a GBG evaluation platform to collect, analyze and report program outcomes.
**Sponsor:** Oklahoma Department of Mental Health and Substance Abuse Services
**PIs:** Brooke Tuttle
School of Teaching, Learning and Educational Sciences: Ryan Farmer

MTSS Training, Evaluation, Technical Assistance for Oklahoma Recovery and Resilience Initiative
The OSU Center for Family Resilience has been contracted to carry out prevention support on the Oklahoma Recovery and Resilience Grant (Disaster Grant). The CFR will initiate their work on this grant by carrying out local needs assessments with sites and then support sites as they identify and select evidence-based programs/practices that best meet the needs of their student population. The goal of this grant is to walk school districts through a planning process that will result in each school delivering an MTSS action plan.
**Sponsor:** Oklahoma Department of Mental Health and Substance Abuse Services
**PIs:** Brooke Tuttle

KINSEOLGY, APPLIED HEALTH AND RECREATION

Assessment of Public Perception of Oklahoma Department of Wildlife Conservation's Shotgun State Shoot Event/Program
This project assessed individuals 18 years of age and older opinions and demographic information who attended the 2020 Oklahoma Scholastic Shooting Sports Program events. Information that was collected included why did the students who they were present at the event to observe initiated participation in the shooting activity, did the student also hunt because of the interest in shooting events, did participation increase time in the out of doors and demographic information of the individual responding and the student the individual was present to observe. The project this year was shortened due to the COVID-19 pandemic; however, the project was still able to provide a summation of event statistics until the cancelation of the program for 2020.
**Sponsor:** Oklahoma Department of Wildlife Conservation
**PI:** Tim Passmore
Stillwater CANe Project (Communication, Arts, Nutrition, Exercise) for People with Parkinson Disease

The purpose of this research project was to assess information from individuals who attended the 2019 Wildlife Expo held by the Oklahoma Department of Wildlife Conservation (ODWC) at the Lazy E Arena in Guthrie Oklahoma. The primary focus was to determine attendees’ knowledge of the ODWC activities on their behalf (e.g. Wildlife Management Areas), demographic information (to determine how the department might be meeting the diversity of Oklahoma residents and their needs), and the attendees’ perception of the Expo. The event was held on September 27, 28, and 29. The research protocol was approved by the Oklahoma State University Institution Review Board in compliance with federal laws.

**Sponsor:** Parkinson’s Foundation  
**PI:** Tim Passmore  
Nutritional Sciences: Gena Wollenberg  
College of Arts & Sciences: Sabiha Parveen

The Clinical Utility of Progressive Resistance Training for Improving Cardiovascular Disease Risk in Post-Menopausal Women

This study is investigating the impact of realistic full-body progressive resistance training on cardiovascular and muscular health in post-menopausal women. We are comparing the effects of resistance training to a moderate-intensity aerobic exercise training program. For 12 weeks, post-menopausal women are enrolled in a resistance training, aerobic training, or control group. Women in the exercise groups train 3-5 times per week. The outcomes of interest are aerobic capacity, vascular function, metabolic markers, inflammation, body fat, and muscle strength/function. Forty-two women have completed the study. We plan to enroll and test the remaining six women over the next year.

**Sponsor:** American Heart Association  
**PIs:** Nathaniel Jenkins  
Nutritional Sciences: Sam Emerson

The Role of Genetic Polymorphisms on the Pharmacokinetics and Pharmacodynamics of Caffeine: Implications for Cardiometabolic Function

Dietary factors have been identified as a primary contributor to Cardiovascular disease (CVD) risk. One such dietary factor is caffeine. Caffeine is the most-widely consumed psychostimulant on the planet, with approximately 80-90% of adults reporting habitual consumption of caffeine containing beverages. Caffeine is also purported to have potent SNS stimulating effects. Consequently, based on the premise that caffeine may increase CVD risk, many epidemiological studies have sought to establish the relationship between habitual caffeine (coffee) consumption and CVD. Thus, we are proposing a two phase study that will assess the influence of genetic polymorphisms in CYP1A2, ADORA2A, and ADORA1 on the pharmacokinetics and pharmacodynamics of caffeine in habitual versus non-habitual caffeine consuming young adult men (Phase 1) while fasting and (Phase 2) in the post-prandial period using physiologically relevant doses of caffeine.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI:** Nathaniel Jenkins
The Effects of a Structured Strength and Conditioning Program on Movement Competency and Functional Performance Among Career Firefighters

This study aims to: 1) assess movement compensations and functional performance deficits among career firefighters 2) assess physical activity habits and their relationships to movement compensations and functional performance deficits among career firefighters 3) assess the impact of current and prior injuries on career firefighter movement and performance 4) determine the effects of a structured strength and conditioning program on movement efficiency and functional performance.

Sponsor: National Strength and Conditioning Association
PI: Jay Dawes

Total Fitness and Wellness Program
This project will provide participants with the fundamental knowledge to create a comprehensive physical training program based on their personal, and fellow firefighter's needs and goals (ie. Health, fitness, occupational performance, injury prevention and stress management).
PIs: Jay Dawes
Nutritional Sciences: Jill Joyce

2021 National Summer Transportation Institute
The Oklahoma State University Summer Transportation Institute will be a two-week, residential program designed to engage and incite interest in transportation related careers amongst students within the Oklahoma City, Tulsa, and Stillwater metropolitan areas. Created with a STEM-focus, this program will target specific service areas that will help motivate, prepare, and expand the future employment aspirations of these students. The Summer Transportation Institute program will take place over the span of two-weeks. During this time, participants will undergo reflective academic renderings regarding the three primary units of transportation systems: land, water, and air.
Sponsor: Oklahoma Department of Transportation
PIs: Taryn Price
Institutional Diversity: Jovette Dew

NUTRITIONAL SCIENCES

Oklahoma Nutrition Education FY20
The OSU Extension Service, Oklahoma Nutrition Education (ONE) SNAP-Ed program, focus on improving outcomes in dietary quality, physical activity, food safety and food resource management. These goals support the overall Oklahoma SNAP goal, “To improve dietary quality within a limited budget and choose physically active lifestyles consistent with the Dietary Guidelines for Americans and the USDA food guidance system in order to prevent obesity.” In addition to targeting low-income individuals with direct education, ONE also provides comprehensive, multi-level interventions in counties where direct education is established. These community efforts will focus on improving access to healthy foods through emergency food sites, food security with community gardens, and school wellness programs enhancing overall health of families.
Sponsor: Oklahoma Department of Human Services
PI: Candance Gabel
Stillwater CANe Project (Communication, Arts, Nutrition, Exercise) for People with Parkinson Disease

The purpose of this research project was to assess information from individuals who attended the 2019 Wildlife Expo held by the Oklahoma Department of Wildlife Conservation (ODWC) at the Lazy E Arena in Guthrie Oklahoma. The primary focus was to determine attendees’ knowledge of the ODWC activities on their behalf (e.g. Wildlife Management Areas), demographic information (to determine how the department might be meeting the diversity of Oklahoma residents and their needs), and the attendees’ perception of the Expo. The event was held on September 27, 28, and 29. The research protocol was approved by the Oklahoma State University Institution Review Board in compliance with federal laws.

**Sponsor:** Parkinson’s Foundation  
**PI:** Gena Wollenberg  
Kinesiology, Applied Health and Recreation: Tim Passmore  
College of Arts and Sciences: Sabiha Parveen

Chickasaw Nation Eagle Adventure SNAP-Ed Outcomes Evaluation

"The purpose of this project is to conduct outcomes evaluation for the Eagle Adventure program. Evaluation will measure intent to change and behavior changes that occurred as a result of the Eagle Adventure program. OSU will enter pre-tests and post-test questionnaire data from in school students, parents, and teachers; analyze data and write evaluation; and work with Chickasaw Nation IRB regarding the Eagle Adventure outcomes."  

**Sponsor:** Chickasaw Nation, Oklahoma State Department of Health  
**PIs:** Janice Hermann, Jill Joyce

Total Fitness and Wellness Program

This project will provide participants with the fundamental knowledge to create a comprehensive physical training program based on their personal, and fellow firefighter's needs and goals (ie. Health, fitness, occupational performance, injury prevention and stress management).

**Sponsor:** United States Department of Homeland Security – Federal Emergency Management Administration  
**PIs:** Jill Joyce  
Kinesiology, Applied Health and Recreation: Jay Dawes

Curbing Obesity in Adair and Muskogee Counties

The purpose is to increase access and utilization of healthy food and physical activity resources in Adair and Muskogee counties, including our Native American citizens. The collaborative efforts of Extension and community partners have implemented safer routes to schools for school age children in Adair County and enhanced active transportation systems in Muskogee County. Evaluated food systems work included distribution of 14,260 Farm to Family food boxes, totaling 324,000 lbs. of food (fresh fruit and vegetables and dairy foods) during the pandemic. To date, $381,000 dollars in leveraged funds total for both counties.

**Sponsor:** Centers for Disease Control and Prevention  
**PIs:** Deana Hildebrand, Barbara Brown, Janice Hermann, Jillian Joyce

Oklahoma - Improving the Health of Americans through Prevention and Management of Diabetes and Heart Disease and Stroke

The purpose of the contract is to support Oklahoma State University, Oklahoma County Extension Services (OSU-OCES) in training county educators in the lifestyle change program and implementing the National Diabetes Prevention Program (NDPP) in prioritized counties of Caddo, Delaware, Hughes, Lincoln, McIntosh, Muskogee, Seminole and/or other counties as agreed upon by both parties.
Extension Educators in the respective counties were trained in November 2020. Collaboration with the OU-Tulsa Department of Medical Informatics Doc2Doc Program is underway to facilitate clinicians’ referral of people with pre-diabetes to Cooperative Extension NDPP and related nutrition education programs.

**Sponsor:** Oklahoma State Department of Health  
**PIs:** Deana Hildebrand, Janice Hermann

**Compliance and Technical Assistance for Child and Adult Care Food Program in Family Child Care Homes**  
The long-term goal of the project is to reduce the prevalence of childhood obesity prior to kindergarten entry. This will be achieved by promoting the health of vulnerable children enrolled in family child care homes (FCCH) across Oklahoma through improved nutritional quality of the foods served in FCCH.  
Extension Educators were trained and successfully pivoted to delivering the interventions virtually to family child care home providers. Wave 2 will continue in a virtual format.  
**Sponsor:** University of Oklahoma - Health Sciences Center, United States Department of Agriculture  
**PI:** Deana Hildebrand

**Cooking for Kids - Culinary Training for School Nutrition Professionals**  
The purpose of the Cooking for Kids: Culinary Training for Oklahoma School Nutrition Professionals is to develop and conduct a comprehensive training program to provide the knowledge, skills and resources needed to support Oklahoma’s school food authorities in effectively implementing the revised United State Department of Agriculture (USDA) meal pattern requirements called for by Healthy and Hunger Free Kids Act, 2010. The project is being conducted with on-going 1 year renewable contracts October through September of each year. In academic year 2020 the program conducted chef consults in 12 school districts and 5 webinars reaching 1000 school nutrition professionals.

**Sponsor:** Oklahoma State Department of Education, United States Department of Agriculture  
**PIs:** Deana Hildebrand  
Spears School of Business: Mark Cochran

**Cooking for Kids: Project FRESH**  
The purpose of the FRESH project is to supplement efforts of the existing Cooking for Kids program to increase capacity of school and child care nutrition programs across Oklahoma to procure and use of local foods. The project will be a multi-agency effort aimed at changing the paradigm of school nutrition in Oklahoma.

**Sponsor:** Oklahoma State Department of Education, United States Department of Agriculture  
**PI:** Deana Hildebrand

**HSOK Student Outcomes Program Evaluation**  
The goal of the contractual agreement is to strategically evaluate the HSOK program with integrity and statistically valid evaluation and applied research methodologies. The objective also serves to assist with the continued and successful implementation of the HSOK program. Annual written reports are provided to the organization and presentations are made to schools and the HSOK Board of Directors as requested.

**Sponsor:** Healthy Schools OK  
**PI:** Deana Hildebrand
**Oklahoma Tobacco Settlement Endowment Trust's Healthy Living Program**

The aims of this study are to 1) provide assessment and evaluation-related training to local grantees, and 2) contribute to analyzing and interpreting data to reflect program outcomes. The 5-year evaluation project, 2016-2020, reflects: a 686% increase in the number of partner organizations with a nutrition policy, a 790% increase in partner organizations with a physical activity policy, and a 516% increase in partner organizations with a tobacco use prevention policy. Partner sectors include businesses, city governments, schools, and community institutions (e.g., child care, congregations, multi-unit housing, etc.). A new 5-year program was initiated July 2020.

**Sponsor:** University of Oklahoma - Health Sciences Center  
**PI:** Deana Hildebrand

**Peer Groups to Improve Feeding Practices and Child Nutrition in Post-Emergency Settlements in Uganda**

Suboptimal child growth remains a public health concern for refugees in northern Uganda. Our peer-to-peer integrated intervention combines nutrition education and social support to improve infant and young child feeding practices. Women (n=380) in their third trimester of pregnancy and their partners were grouped in peer-led care groups. Leaders were trained on key messages related to feeding practices, hygiene, child stimulation, social support and mental health. The primary outcome is timely introduction of complementary feeding. Secondary outcomes being evaluated include breastfeeding and additional complementary feeding indicators, as well as measures of child stimulation and maternal social support and mental health.

**Sponsor:** Nestlé Foundation  
**PIs:** Barbara Stoecker, Joel Komakech, Deana Hildebrand

**EPHI Support for Dual PhD Program in Nutritional Sciences**

This scholarship fund is supporting two Ethiopian Public Health Institute staff members in the completion of a dual-degree PhD program between Oklahoma State University and Addis Ababa University. These two students currently are enrolled in their third semester of graduate courses in the Department of Nutritional Sciences at OSU. They will return to Ethiopia after the end of fall semester, 2020, for approximately a year to collect data for their dissertations. Upon completion of their data collections, they will return to OSU for additional course work, analyses and writing.

**Sponsor:** Ethiopian Public Health Institute  
**PI:** Barbara Stoecker

**Ethiopian Public Health Institute Dual Ph.D. Program**

This scholarship fund supports an Ethiopian student sponsored by the Ethiopian Public Health Institute and Valid International, Inc. The student currently is enrolled in graduate classes toward a PhD program within the Department of Nutritional Sciences. He will return to Ethiopia at the end of fall semester, 2020, for data collection. After approximately one year, he will return to OSU, for additional course work, data analysis and writing.

**Sponsor:** Valid International, LTD  
**PI:** Barbara Stoecker

**Role of the Anti-Inflammatory Interleukin-10 in Attenuating Obesity and Insulin Resistance**

Obesity and type 2 diabetes (T2D) are all major health issues in the US. Chronic inflammation produced by activated immune cells damage many tissues and is implicated in the development of obesity and T2D. This study is investigating the role of the anti-inflammatory molecule interleukin (IL)-10 as well as dietary interventions that will reduce the development of obesity and T2D in mice not producing IL-10.
(knock-out mice). Our findings will help understand the important role of IL-10 in obesity and T2D and help develop prevention and treatment strategies to reduce the impact of these chronic conditions.

(3104)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI:** Edralin Lucas

**Wheat Germ Supplementation Will Improve Markers of Gut Health, Inflammation, and Insulin Resistance in Overweight Adults**

This project is investigating the effects of wheat germ supplementation on gut health and subsequent effects on markers of inflammation and insulin resistance in overweight individuals. This project will highlight the health and economic value of wheat germ, an under-utilized by-product of wheat processing. This study will also place Oklahoma, one of the largest wheat producers in the nation, in a positive spotlight, as the wheat germ that will be used in this study will be sourced locally. Our findings will support the use of wheat germ as a dietary option for reducing complications associated with obesity.

**Sponsor:** United States Department of Agriculture - National Institute of Food and Agriculture  
**PIs:** Edralin Lucas, Winyoo Chowanadisai, Sam Emerson

**Pulse Consumption Improves Gut Health, Metabolic Outcomes, and Bone Biomarkers of Postmenopausal Women**

The objective of this study is to determine the effects of pulse consumption on gut health, and subsequent effects on metabolic outcomes and bone biomarkers in postmenopausal women. We hypothesize that the daily intake of pulse crops, due to its nutrient content and many other bioactive compounds including fiber content, will beneficially affect gut health and subsequently improve metabolic outcomes and bone markers in postmenopausal women.

**Sponsor:** United States Department of Agriculture  
**PIs:** Edralin Lucas, Sam Emerson

**Prebiotic Activity of Tart Cherry and the Immunoregulation of Bone Homeostasis**

Worldwide, osteoporosis continues to be a major public health problem. This project will investigate the extent to which the prebiotic activity of tart cherry is responsible for its potent bone protective effects. These findings will provide new insights into the potential of using natural prebiotics targeting the gut microbiota as a novel therapeutic strategy for osteoporosis. The Admin Supplement goal is to determine the extent to which the prebiotic activity of tart cherry mediates it effects on bone via butyrate-induced alterations in Treg cells.

**Sponsor:** National Institutes of Health  
**PIs:** Edralin Lucas, Brenda Smith

**Tart Cherry Supplementation and Exercise: A Novel Strategy for Osteoporosis Prevention - Phase II**

The combination of dietary prebiotics such as tart cherries and weight-bearing exercise presents a novel strategy for optimizing bone density during skeletal growth and aging. Phase I of this project, we demonstrated that supplementing the diet with tart cherry had a greater effect on bone density than exercise alone or the exercise-tart cherry combination. This response occurred in conjunction with alterations in mesenchymal stem cells within the bone marrow. Thus, in Phase II we are investigating the response of the aging skeleton to this intervention and the mechanism through which these effects are mediated.

**Sponsor:** Cherry Marketing Institute, Research Committee  
**PI:** Brenda Smith
**Anti-Inflammatory Properties of Interleukin-10: A Novel Target to Mitigate Age-related Osteosarcopenia**

The decline in muscle and bone, a condition known as osteosarcopenia, begins in the 4th decade of life. It has significant consequences on health due to the decline in strength, endurance, and risk for chronic disease. Components of the immune system have the capacity to protect against these age-related, musculoskeletal changes. The aim of this project is to determine: 1) how the anti-inflammatory effects of IL-10 protect against osteosarcopenia and the influence of the Western diet on this response; and 2) whether the immunomodulatory effects of short chain fatty acids on T cells within the gut can counter this response. (3105)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI:** Brenda Smith

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**Nutrient Bioavailability - Phytonutrients and Beyond**

This project is to determine the bioavailability of food bioactive components in humans and mouse models. We also will determine the efficacy and mechanisms of action of these compounds in promoting gut health, chronic and acute inflammation, obesity and diabetes, and influenza A virus infection, through omics, physiological, and biochemical approaches. (3120)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI:** Dingbo Lin

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**Xanthophylls in RIG-I-MAVS modulated antiviral innate immunity**

The goal of this project is to determine if xanthophylls increase will lead to lower susceptibility to respiratory infection diseases, such as influenza. This will provide mechanistic as to why some populations are more vulnerable to influenza and associated comorbidities.

**Sponsor:** College of Veterinary Medicine, National Institutes of Health

**PIs:** Dingbo Lin, Edralin Lucas

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**Beta, Beta-carotene 9’, 10'-oxygenase 2 in Acute Respiratory Distress Syndrome**

Influenza virus infection causes damage to the epithelial-endothelial barrier, fluid leakage into the alveolar lumen, and respiratory insufficiency, often leading to acute respiratory distress syndrome (ARDS), a severe respiratory disease with morbidity and low mortality rates. However, it is not well known about precisely how the cellular antioxidant systems are overwhelmed during the infection process. We found that depletion of β, β-carotene9’, 10’ oxygenase 2 (BCO2) causes a moderate mitochondrial oxidative stress, which in turn triggers a low level activation of the host immune cells, leading to the resistance to influenza virus infection.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology

**PI:** Dingbo Lin
Dietary Xanthophylls in Preventing Inflammation and Promoting Gut Health
Dietary intervention of xanthophyll-enriched foods could potentially contribute to digestive health in humans. In this project, we propose to evaluate the anti-inflammatory properties of xanthophylls-enriched salmon via rebalancing of human gut microbiome in obese prediabetic human subjects, and to determine the underlying metabolic mechanism by which xanthophylls, as one of the salmon bioactive compounds, exerts the anti-inflammatory role through regulating certain aspects of gut microbiome growth, metabolism, and function in obese prediabetic mice. The results from this research are expected to have a significant impact on public health by providing new insights into xanthophylls-enriched salmon as a healthy dietary option.

**Sponsor:** United States Department of Agriculture  
**PI:** Dingbo Lin

Watermelon Juice Promotes the Gut Microbiome Homeostasis
The long-term goal of this project is to advance understanding of how watermelon juice consumption promotes the gut microbiome homeostasis and health in type 2 diabetes, and how watermelon lycopene, as potential bioactive compounds exert the protective role in this disease process.

**Sponsor:** United States Department of Agriculture  
**PI:** Dingbo Lin

Impact of P53 Mutations on Cancer Cell Metabolism
The tumor suppressor gene P53 is the most commonly mutated gene in human cancer, but mutations in P53 don’t just result in loss of tumor suppressor function, they can also promote cancer progression by altering cellular iron acquisition and metabolism. The proposed work describes a previously unrecognized type of iron regulation that could be exploited to more effectively target mutant P53. The proposed research is relevant to human health because it is expected to lead to new therapeutic approaches for repressing the oncogenic functions of mutant P53.

**Sponsor:** National Institutes of Health  
**PI:** McKale Montgomery

Determination of Health-promoting Physical Activity Behaviors across Aging: A Pilot Study
Our long-term goal is to advance recommendations for older adults with regard to the dose of physical activity needed to promote healthy aging. The goal of this pilot project is to preliminarily define physical activity habits during older adulthood that are associated with protective health outcomes. Our central hypothesis is that the amount of physical activity that is feasible for older adults and needed to experience protective health outcomes is aging stage-specific and less than general physical activity recommendations for middle-aged adults. To date, we have tested 46 of the needed 60 older adults for this study.

**Sponsor:** Oklahoma State University Foundation - Donna Cadwalader Research and Development Grant  
**PIs:** Sam Emerson, Janice Hermann

The Clinical Utility of Progressive Resistance Training for Improving Cardiovascular Disease Risk in Post-Menopausal Women
This study is investigating the impact of realistic full-body progressive resistance training on cardiovascular and muscular health in post-menopausal women. We are comparing the effects of resistance training to a moderate-intensity aerobic exercise training program. For 12 weeks, post-menopausal women are enrolled in a resistance training, aerobic training, or control group. Women in the exercise groups train 3-5 times per week. The outcomes of interest are aerobic capacity, vascular...
function, metabolic markers, inflammation, body fat, and muscle strength/function. Forty-two women have completed the study. We plan to enroll and test the remaining six women over the next year.

**Sponsor:** American Heart Association  
**PIs:** Sam Emerson  
Kinesiology, Applied Health and Recreation: Nathaniel Jenkins

**OSCTR - Spanish Cove OSU Community Engaged Research Exploration**  
The purpose of this project is to expand and solidify a collaboration between the Department of Nutritional Sciences at OSU and Spanish Cove Retirement Village in Yukon, OK. Regular meetings are being held and ideas generated with the goal of identifying sustainable and mutually beneficial research and outreach opportunities. We aim to utilize this collaboration to compete for future externally-funded grant projects.

**Sponsor:** University of Oklahoma - Health Sciences Center - Oklahoma Clinical and Translational Science Institute, National Institutes of Health  
**PI:** Sam Emerson

**Oklahoma Shared Clinical and Translational Resources - Development of a More Sensitive Screening Tool for NAFLD in Children**  
Screening tools for early detection of non-alcoholic fatty liver disease (NAFLD) are insensitive, and more precise approaches used to diagnose NAFLD (e.g., liver biopsy) are burdensome. Measurement of the post-meal triglyceride response to a simple fat tolerance test has the potential to be a convenient and sensitive approach to early detection of liver fat build-up. In this study, we are comparing post-meal triglycerides in three groups of children: normal-weight controls, obese controls, and children with NAFLD. We hypothesize that the triglyceride response will be greater in children with NAFLD. Nine of the needed forty-eight children have completed the study.

**Sponsor:** University of Oklahoma - Health Sciences Center - Oklahoma Clinical and Translational Science Institute, National Institutes of Health  
**PI:** Sam Emerson

**Validity and Reproducibility of Clinically Feasible Postprandial Testing**  
Our long-term goal is to develop effective strategies for early detection of metabolic aberrations associated with cardiovascular disease and obesity development. Our overall objective is to advance postprandial triglyceride testing procedures to reliably detect metabolic abnormalities in a less laborious and more clinically feasible manner.

**Sponsor:** Oklahoma Center for the Advancement of Science and Technology  
**PI:** Sam Emerson

**Effects of Curcumin on Type 3 Diabetes (Brain Insulin Resistance) by Aging - In Vitro, Preclinical and Human Intervention Studies**  
This project will study the effect of insulin in diabetes and aging, specifically amongst Alzheimer’s community. Furthermore, it will determine the effect of curcumin in in vivo studies.

**Sponsor:** Ottogi Ham Taeho Foundation  
**PIs:** Yoo Kim, Winyoo Chowanadasai

**The Effects of Fermented Red Ginseng (FRG) on Anti-Aging**  
This project will research the effects of fermented red ginseng on anti-aging in animals.

**Sponsor:** BTC Corporation  
**PI:** Yoo Kim
TEACHING, LEARNING AND EDUCATIONAL SCIENCES

2019-2020 NWP i3 Scale-Up Year 3 C3WP Professional Development (Grades 4, 5 & 7-10)
The College, Career, and Community Writers Project is an intensive professional development program that provides classroom teachers with instructional resources and formative assessment tools for the teaching of evidence-based argument writing. Teachers in C3WP typically participate in 45 hours of professional development per year for two years, experiencing instructional materials of the highest quality, learning to analyze student work carefully to determine instructional next steps, and leading their students towards active participation in their communities through argument writing.

Sponsor: National Writing Project
PI: Shanedra Nowell

2020-2021 NWP i3 Scale-Up Year 4 C3WP Professional Development (Grades 4, 5, 7-10)
As in past years, we will schedule a needs/asset analysis that begins with TC’s conducting a model argument writing lesson for teachers to observe. The debriefing of this lesson will begin a dialogue about the teaching of writing. We will collect information about the current writing instruction, connection to literacy instruction and the teachers’ familiarity with argument writing. Teachers will have the opportunity to ask questions about argument writing in response to the model lesson. This also provides an opportunity to gain an understanding of school climate and culture.
We have already met with administrators in the last start district to introduce the lead TC’s and explain a bit about C3WP. We toured the school and asked guiding questions about scheduling, turnover and potential challenges to the PD plan. Administrators were proud to share accomplishments of the students, sport teams, and recent improvements to their buildings and grounds. We’ve found that these conversations are effective in building trust. This year we will schedule the needs/assets visit earlier in the spring. Last year we found that coming very late in the year was stressful for teachers and disorienting for students in the midst of final school events.

Sponsor: National Writing Project
PI: Shanedra Nowell

Pathways to Academic Success
The EIR Pathways Project is funded by the U.S. Department of Education’s Education Innovation and Research Office of Innovation and Improvement. It is a collaborative project among eight National Writing Project sites across eight states. This project links 240 (approx. 30 per NWP site) 7th-11th grade ELA/ELD teachers in ongoing, sustained PD designed to enhance the text-based analytical writing of mainstreamed English Learners (ELs) to help them complete courses in core academic subjects, meet rigorous state standards for ELA, and become college-bound. The Pathway Project intervention was one of only three grant proposals to receive an Expansion grant of ~$15 million dollars from EIR in 2018. The project was selected because of its strong track record of improving student outcomes for English learners.

Sponsor: University of California - Irvine
PI: Shanedra Nowell

Social Justice Lessons in the Heartland: Exploring the Holocaust and Human Rights in Oklahoma’s History
This project is an inquiry-driven, writing-as-pedagogy based seminar for educators of all levels interested in deepening their understanding of the Holocaust. Oklahoma’s diverse ethnic heritage, rich history, and the horrors of the 1921 Tulsa Race Massacre demonstrate the need to teach social justice and tolerance.
within our communities. The Holocaust provides a lens to explore the parallels between our local history and the experiences of oppressed people a world away. With testimony from Holocaust Survivors, advice from experienced Holocaust educators and other guest speakers, as well as field trips, we will think critically about the curriculum and experiences we design for our students to teach social justice and human rights. Field trips include visiting a local synagogue, the Sherwin Miller Museum of Jewish Art, the Greenwood Cultural Center, and the John Hope Franklin Reconciliation Park.

**Sponsor:** The Olga Lengyel Institute for Holocaust Studies and Human Rights

**PI:** Shanedra Nowell

### Writing the Past, Changing the Future: A Century of Learning the 1921 Race Massacre

With leadership from classroom teachers and the OSU Writing Project, Oklahoma youth will learn about the 1921 Race Massacre in Tulsa, OK, and then spend time leading the creation of digital artifacts such as LRNG "TED" Talks, Podcasts, Expeditions, Ethnographies, and Digital Stories to document their experiences in learning about this historic event. Student leaders from participating schools will collaborate to create and host a youth symposium in spring of 2020 for students to share their inquiry projects that highlight their collaborative inquiry projects. Due to COVID-19, this symposium was cancelled. Student populations from several school districts throughout Oklahoma, integrating up to 200 students from diverse backgrounds, thrived within opportunities to learn from one another about social justice, critical thinking, collaborative inquiry, and digital composition in digital spaces. Students created a digital repository, tulsamassacre1921.com, of their digital artifacts as a testament to their learning and for citizens of Oklahoma and beyond to learn more about the impact of the 1921 Race Massacre on the world.

**Sponsor:** United States Department of Education

**PI:** Shanedra Nowell

### Assembly and Function of the Cyanobacterial Photosystem II Complex

This research investigating the hypothesis that the assembly state of the Mn cluster has the ability of self-repair is both a fascinating biological problem that underpins primary productivity and it represents a blueprint for dealing with photodamage to engineered solar photocatalytic energy devices that may be important for carbon neutral energy sources of the future. Immersing high school science teachers in a research environment combined with professional development activities facilitates educator’s ability to develop an explicit view of how scientific knowledge, and thereby strengthen their own science curriculum. During state and national conferences, teachers share their developed curriculum and mentoring skills with other educators.

**Sponsor:** National Science Foundation

**PIs:** Julie Angle

Microbiology and Molecular Genetics: Robert Burnap
Transitioning Students to Teacher-Researchers (TSTR)
Efforts to strengthen science literacy skills and ultimately the STEM workforce starts by placing highly qualified science teachers in every K-12 classroom. This vision begins by strengthening preservice science teachers' (PSTs') understanding of how scientific knowledge is generated, scientific knowledge is disseminated, and standards-based science practices are implemented. The core of our model is the evidence-based, instructional practice of providing PSTs with Course-Based Undergraduate Research Experiences (CUREs). In turn, increasing the quality of future teachers entering the teaching profession may increase receptiveness and aptitude of students for STEM careers and strengthen science literacy skills in future generations of students.

**Sponsor**: National Science Foundation  
**PIs**:  
Integrative Biology: Donald French  
Plant Biology, Ecology and Evolution: Andrew Doust  
Architecture: Carisa Ramming

Epigenetic Effects of Brain and Behavior: Testing the Role of Imprinted Genes
Imprinted Genes (IGs) are highly enriched in placental endocrine cells, and in the developing and adult brain. Our research is testing for effects of placental LOI on mother mice by profiling the behavior, neural transcriptomes and plasma hormone levels of pregnant females, and the behavior of nursing mothers, and measure expression (RNAseq) and DNA methylation in embryonic brain and placenta, and behavior in neonates. These studies will test the hypothesis that imprinted genes regulate the intimate and obligate relationship between mammalian mothers and their young. This work is in conjunction with a Research Experience for Teachers program in evolutionary and reproductive biology.

**Sponsor**: University of California - Riverside  
**PIs**:  
Integrative Biology: Jennifer Grindstaff  
University of California – Riverside: Polly Campbell

Collaborative Research: Genetic Comparisons of Abscission Zones in Grasses
This project is designed to assess how genetic networks evolve over time. We will investigate the time frame over which rewiring occurs (Aim 1), assess the extent of cis- and trans-regulatory change in known networks (Aim 2), and determine whether late-stage gene expression and metabolite production are more conserved than what we have found in the early stages (Aim 3). Part of this work will be done in conjunction with a program for training secondary school teachers in research, lesson planning, and plant biology in Oklahoma (Aim 4).

**Sponsor**: National Science Foundation  
**PIs**:  
Biology: Andrew Doust
CAREER: Macroevolutionary Biomechanics: Integrating Morphology, Mechanical Modeling, and Phlogenetic Comparative Methods to Understand the Evolution of Swimming Performance in Frogs

The proposed project has three key aims. In Aim 1 the PI will examine the evolution of allometry in locomotor morphology, highlighting how an underutilized phylogenetic regression method can best estimate allometric scaling exponents. In Aim 2, he will address the mechanics and scaling of swimming in anurans. He will develop and empirically test a mathematical model of the complete swimming stroke in frogs. Next, he will use the model and phylogenetic comparative methods to explain the scaling relationship between peak swimming velocity and body mass. In Aim 3, the PI will examine the sensitivity of swimming performance to different morphological variables through both mathematical and statistical modeling, and he will test the tempo and mode of morphological and swimming performance evolution as a function of mechanical sensitivity.

**Sponsor:** National Science Foundation

**PIs:** Julie Angle
Zoology: Daniel Moen

Junior Science and Humanities Symposium

The Kansas-Nebraska-Oklahoma Junior Science and Humanities Symposia (JSHS) program is one of 48 regional JSHS across the nation. Sponsored by the Army Education Outreach Program (AEOP), the JSHS program is designed to challenge and engage high school students in STEM research, including designing and executing experiments, collecting and analyzing data, drawing conclusions, and communicating their original research to a panel of judges and an audience of their peers. Our funded JSHS program provides 9th – 12th grade students who conduct original research and prepare a research manuscript, with a venue to present their research to judges who have expertise in students’ area of research.

**Sponsors:** National Science Teaching Association, Department of Defense Army Education Program

**PI:** Julie Angle

Oklahoma State Science & Engineering Fair COVID Support

The Oklahoma State Science and Engineering (OSSEF) is a research competition for 7th – 12th grade students who qualify from one of eight regional science fairs. The OSSEF requested financial support to partially cover the contract cost with the virtual platform vFair. This “Products & Services” contract with vFairs is for a single event license that will provide the OSSEF with a virtual platform where we can host the OSSEF Grand Awards Ceremony, provide a venue for faculty webinars to recruit students into their program, and a venue for student participants to display their research poster and 2-minute research presentation.

**Sponsor:** Society for Science and the Public

**PI:** Julie Angle

Chocata Nation Summer Academy and Showcase

The School of Teaching, Learning, and Educational Sciences will: 1) send 12 interns to Durant for a three week internship in the summer school hosted by the Choctaw Nation of Oklahoma; 2) host an internship showcase; and 3) collaborate with the Choctaw Nation of Oklahoma to conduct research on the effectiveness of the internship and ways to improve the summer school experiences for K-3 students.

**Oklahoma State University Foundation**

**PIs:** Juliana Utley, Sheri Vasinda
Educational Foundations, Leadership and Aviation: Mwarumba Mwavita
Collaborative Research: RET Site: Quadcopter Research Experiences for Tulsa-Area STEM Teachers
The Center for Research on STEM Teaching and Learning (CRSTL) will conduct the evaluation for the University of Tulsa NSF-RET site which addresses the major fields of electrical engineering, mechanical engineering, and computer science through the operation and application of quadcopter unmanned aircraft systems (UAS). Ten Tulsa-area high school teachers will participate in a six-week summer project to conduct research and develop curriculum using the quadcopter UAS that will encourage students to pursue STEM careers and prepare the students for such careers. Evaluation will include formative and summative assessments.

Sponsor: National Science Foundation
PI: Juliana Utley

OSU Math/Science Scholarships (Noyce)
Increasing the number, quality, and diversity of mathematics and science secondary teachers has been identified as critical to future US economic growth and success. This program proposes to produce more highly qualified secondary teachers by encouraging students to earn teacher certification with their 4-year B.S. degree in mathematics or science. The objectives are: 1) encouraging undergraduates majoring in mathematics or science to become teachers through summer recruitment internships and recruitment scholarships, 2) providing need-based scholarships aimed at retention and persistence during the semester of student teaching, and 3) supporting students as they progress through their first several years of teaching.

Sponsor: National Science Foundation
PIs: Juliana Utley, Toni Ivey
Integrative Biology: Kristin Baum
Mathematics: Alan Noell

REU SITE: Multidisciplinary Research Experience for Undergraduates in Physics at OSU
The proposed activity will provide true hands-on research to ten STEM undergraduates. This objective will be achieved by incorporating the student participants into active research groups of faculty affiliated with the Physics Department at OSU. Our department has a tradition of excellence in several research areas including Atomic Physics, Computational Physics, Experimental and Theoretical High Energy Physics, Optical Physics, Optoelectronics, and Quantum Information Sciences. The research environment within the department is broad and dynamic with significant competitive research funding from NSF, DOD, NASA and others. Eleven faculty members will serve as mentors for the ten participants.

Sponsor: National Science Foundation
PIs: Juliana Utley
Physics: Alexander Khanov, Mario Borunda

Collaborative Research: REU Site: Solar and Alternative Technologies
Dr. Jennifer Cribbs, through the Center for Research on STEM Teaching and Learning, is assisting Laura Ford (Principal Investigator at University of Tulsa) with the following: 1) Administer exit slips with REU students during the summer program and provide a summary to the Principal Investigator, 2) Administer pre-post surveys with REU students, perform statistical analysis of data, and share results with the Principal Investigator, and 3) Conduct short interviews with the REU students and provide the Principal Investigator with a summary.

Sponsor: University of Tulsa, National Science Foundation
PI: Jennifer Cribbs
RET Site: Research Experiences in Big Data and Machine/Deep Learning for Oklahoma STEM Teachers

Oklahoma State University (OSU), in partnership with Tulsa Regional STEM Alliance (TRSA), proposes to create a Research Experience for Teachers (RET) focused on conducting research and developing curriculum based on Big Data and Machine Learning/Deep Learning (ML/DL). This RET site aims to utilize computing, math and science concepts inherent in the design of ML/DL algorithms, and the analysis of data to provide Oklahoma teachers with the knowledge and tools to develop innovative and interactive STEM curricula for their own classrooms. Through these computer science focused curricula, participating teachers’ students will be engaged in learning activities that develop their problem solving skills and informed about related career opportunities.

Sponsor: National Science Foundation
PIs: Jennifer Cribbs
Computer Science: Johnson Thomas, Rittika Shamsuddin, Thanh Thieu, Arunkumar Badavathi

Impacts of the 2018 Education Strike Wave on Teacher Activism and Advocacy

In 2018, a wave of education walkouts spread like wildfire across a number of U.S. states and cities, including Oklahoma. The wave introduced hundreds of thousands of educators to collective action and spurred significant policy shifts. Using community-based participatory and oral history research methods, a team of 12 teacher-researchers collected nearly 50 oral history narratives of Oklahoma strike participants, conducted analysis, and are preparing the interviews to be archived and publicly accessible. The project has produced insights into the forms of organization, knowledge production, and identity constructions that were and continue to be mobilized by educators in strike wave states.

Sponsor: Spencer Foundation
PI: Erin Dyke

Oklahoma AWARE

In this collaborative effort with the Oklahoma State Department of Education and the Oklahoma Office of Mental Health, we aim to support three school districts in developing, maintaining and evaluating a multi-tiered system of behavioral and social emotional support. The participating schools will be trained and supported in the implementation of a three-tier model designed to address the needs of students experiencing behavioral or social emotional needs. The primary role of the participating personnel from OSU will be to evaluate the degree of model implementation and the effectiveness of the model.

Sponsor: Oklahoma State Department of Education, Substance Abuse and Mental Health Services Administration
PIs: Gary Duhon, Candace Lane, Brian Poncy

Oklahoma Tiered Intervention Support System (OTISS), FY 2018-2022

The purpose of this contract is to provide external coaches (up to six doctoral graduate students) to support the implementation of the Oklahoma Tiered Intervention System of Support (OTISS) model to specified districts/sites through the Oklahoma State Personnel Development Grant (SPDG) III. External coaches will guide and train site personnel on the development and implementation of the OTISS model, which addresses both academics and behavior.

Sponsor: Oklahoma State Department of Education
PIs: Gary Duhon, Brian Poncy
Osage County Interlocal Cooperative (OCIC) Project ENGAGE, FY21
It is agreed and understood by the parties hereto, that the Practicum Program will be structured as follows: The equivalent of three student positions will be provided. One (1) student filling the position will work a total of 20 hours per week as part of this practicum, and two (2) students filling the position will work a total of 10 hours per week as part of the practicum.

**Sponsor:** Osage County Interlocal Cooperative, United States Department of Education  
**PIs:** Gary Duhon, Candace Lane

**OCIC Project PREPARE**
Per the fully executed agreement, Osage County Interlocal Cooperative provides (OCIC) practicum placement at its facilities for four school psychology graduate students (working 10 to 20 hours per week) between October 2019 and May 2020. School Psychology faculty provide supervision of the graduate students and coordinate the application process and placement process.

**Sponsor:** Osage County Interlocal Cooperative, United States Department of Education  
**PI:** Gary Duhon

**Oklahoma AWARE East**
In this collaborative effort with the State Department of Education and the Oklahoma Office of Mental Health, we aim to support three eastern school districts in developing, maintaining and evaluating a multi-tiered system of behavioral and social emotional support. The participating schools will be trained and supported in the implementation of a three-tier model designed to address the needs of students experiencing behavioral or social emotional needs. The primary role of the participating personnel from OSU will be to evaluate the degree of model implementation and the effectiveness of the model.

**Sponsor:** Oklahoma State Department of Education, Substance Abuse and Mental Health Services Administration  
**PIs:** Gary Duhon

**One Community, One Challenge: Pop-Up STEAM Studios**
This project was originally conceived as a series of science-based and art-infused Pop-up STEAM Studios in which intergenerational teams would engage in mini challenges supporting a broader community challenge. Due to the constraints of COVID, the project has been reinvented to leverage a YouTube phenomenon of “unboxing videos” and digital storytelling to document engagement with Challenge Boxes and team progress toward the community challenge. Scientists, makerspace educators, and art experts will design the Challenge Boxes with a theme determined by a community advisory board. Boxes will be distributed at libraries and other community outlets. The project goals include promoting a participatory culture using “making” and digital storytelling to address community-identified and designed challenges.

**Sponsor:** National Science Foundation  
**PIs:** Sheri Vasinda, Stephanie Hathcock  
Art, Graphic Design, and Art History: Rebecca Brienen

**Reading Ability in Young Adult Literature: Pre-Service Secondary English Teachers as Readers**
This qualitative multiple case study explores disability representations in young adult literature through the reading experiences of undergraduate students enrolled in Midwestern teacher education programs. Participants selected young adult novels featuring characters with visible disabilities and were interviewed about their reading of disability experiences within and beyond program coursework. In the study, the interview conversations involved concerns about disability inclusion and support for teachers in developing curriculum and practices that disrupt ableism due to lack of disability representations in
their coursework. The findings suggest an extension of special education coursework to include physical disabilities and for content area diversity coursework to include authors and characters with disabilities.

**Sponsor:** ALAN Foundation

**PIs:** Sarah Donovan, Rebecca Weber

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**Support and Retention of Emergency Certified Teachers in Secondary Education**

This mentoring program aims to support and retain newly emergency certified teachers in secondary education from high need, urban, and rural districts throughout the state of Oklahoma. The program is designed to improve teaching and thus student learning by providing support, encouragement, and guidance to teachers who are emergency certified. The research component of the project examines teachers’ reasons for continuing or leaving the profession.

**Sponsor:** Oklahoma State Regents for Higher Education - Oklahoma Teacher Connection

**PI:** Joe Terantino

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**Oklahoma/Belize Global Literacy Community**

Global literature has a strong role in the OSU literacy courses from undergraduate to doctoral levels. Our intent with this grant is to purchase children's literature books for use by Brazilian students enrolled in OSU's Doctor of Education in Language, Literacy, and Culture program.

**Sponsor:** Worlds of Words, University of Arizona

**PI:** Suzii Parsons

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**OKYLF Long-Term Outcomes Study**

This project will examine the long-term effects of the Oklahoma Youth Leadership Forum (OKYLF) on OKYLF graduates. Numerous studies have reported on the national postsecondary outcomes of students with disabilities, but few studies have examined the impact of Youth Leadership Forum (YLF), particularly the long-term impact of YLF. This project will contribute to the small but growing body of empirical research regarding the long-term impact of the YLF and also provide information specific to the OKYLF. This project will be completed in collaboration with the Developmental Disabilities Council of Oklahoma.

**Sponsor:** Oklahoma Developmental Disabilities Council, Oklahoma Department of Human Services

**PI:** Penny Cantley

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**Oklahoma Good Behavior Game Implementation and Evaluation**

The OSU Center for Family Resilience develops and coordinates a support system for implementation and evaluation of the Good Behavior Game (GBG) among participating Oklahoma schools. The vision for the support system is to scale sustainable GBG in schools across the state. The support system will build local GBG capacity by training school personnel as a master training venue, providing mixed-method consultation for successful GBG implementation, and operating a GBG evaluation platform to collect, analyze and report program outcomes.

**Sponsor:** Oklahoma Department of Mental Health and Substance Abuse Services

**PIs:** Ryan Farmer

Human Development and Family Science: Brooke Tuttle
NASA STEM Pathway Activities - Consortium for Education (N-SPACE)

**NASA Intergovernmental Personnel Assignment (IPA) - Dixon**
The assignee will work across the LOBs to identify synergies, efficiencies, opportunities for collaboration, and areas for improvement. The Assignee’s primary function will be to lead MUREP efforts to design, develop, and implement education activities that utilize unique JSC human spaceflight content and JSC facilities to reach undeserved populations. Working across the JSC External Relations Office (ERO), the Assignee will build strong MUREP relationships with JSC Programs, NASA HQ, and other NASA Centers to support new and existing education programs and to identify opportunities to develop NASA-unique education opportunities. The Assignee will build both internal and external strategic partnerships that promote STEM literacy and awareness in both formal and informal education settings with an emphasis on underserved audiences.

**Sponsor:** National Aeronautics and Space Administration  
**PI:** Suan Stansberry

**NASA Intergovernmental Personnel Assignment (IPA) - R. Chappell**
The Office of STEM Engagement is strengthening involvement with higher education institutions to ensure that NASA can meet future workforce needs in science, technology, engineering and mathematics, or STEM, fields. Participation in NASA projects and research stimulates institutional capacity, increasing numbers of students continuing their studies at all levels of the higher education continuum and ultimately, those earning advanced degrees in these critical fields.

**Sponsor:** National Aeronautics and Space Administration - Langley Research Center  
**PI:** Susan Stansberry

**NASA STEM Pathway Activities - Consortium for Education (NSPACE) - HUNCH**
Through the NASA STEM Pathway Activities Consortium for Education (NSPACE) project, OSU will promote and deliver NASA’s unique portfolio of experiential STEM educational opportunities, while maintaining a focus to vastly increase the participation of culturally diverse groups and Minority Serving institutions. To fulfill these goals, OSU has partnered with the Texas A&M System; the OSU Center for Sovereign Nations; Langston University; Northern Oklahoma College, an AIANSI community college; the Oklahoma 4-H Foundation; and the Technology for Learning Consortium.

**Sponsor:** National Aeronautics and Space Administration  
**PI:** Susan Stansberry

**NASA STEM Pathway Activities - Consortium for Education (NSPACE) - OE**
Johnson Space Center’s Office of Education (OE) strives to improve STEM education and encourage actions by educators and students to advance human space exploration. Johnson Education is dedicated to inspiring, engaging, educating, and employing the next generation of explorers and innovators by offering experiential activities for students and educators, sharing classroom resources, and collaborating with educational partners. JSC OE leverages its NASA-unique resources on site (astronaut training facilities, mission control, subject matter experts, etc.) to provide high-quality STEM activities nationwide and throughout its designated eight-state region.

**Sponsor:** National Aeronautics and Space Administration  
**PI:** Susan Stansberry
Through the NASA STEM Pathway Activities Consortium for Education (NSPACE) project, OSU will promote and deliver NASA’s unique portfolio of experiential STEM educational opportunities, while maintaining a focus to vastly increase the participation of culturally diverse groups and Minority Serving institutions. To fulfill these goals, OSU has partnered with the Texas A&M System; the OSU Center for Sovereign Nations; Langston University; Northern Oklahoma College, an AlANSI community college; the Oklahoma 4-H Foundation; and the Technology for Learning Consortium.

**Sponsor:** National Aeronautics and Space Administration

**PI:** Susan Stansberry
DIVISION OF AGRICULTURAL SCIENCES AND NATURAL RESOURCES

FY2021 RESEARCH ABSTRACTS
Evaluation of Price and Production Risk Management with Changing Markets and Policies Faced by Producers in Oklahoma and the Southern Plains

Agricultural producers and agribusinesses operate in an environment where risk creates additional challenges. These entities have shown an acceptance to risk mitigation tools as evidenced by increased use of insurance, futures, and options. The rapidly changing landscape of agriculture, which includes advances in technology, detailed data collection, increased environmental and litigation issues, as well as the aforementioned risks, warrants continued, advanced study of these problems. Therefore, the focus of this project centers around the risk management approach, thus aiding the financial stability and viability of agricultural producers and agribusinesses in the Southern Plains. (3029)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: John Michael Riley

Back to Basics: Expanding Best Management Practice Adoption in Small and Mid-Sized Beef Enterprises

Beef production in the Southern Plains is characterized by small and medium-sized cow-calf operations. Strategies to increase the profitability of these enterprises are key to increasing overall profitability for the industry. This project benchmarks producer demographics, selected production and management characteristics, and adoption rates of key production and management practices concerning calf management. The research examines incentives and constraints to beef producer adoption of these research-based recommended management practices. The project ultimately seeks to increase practice adoption rates of critical recommended practices through hands-on workshops and via increasing quality and accessibility of educational materials targeted to current and future beef producers. (3049)

Sponsors: Oklahoma Agricultural Experiment Station, USDA-AFRI
PI/PD: Kellie Curry Raper

Studying Food Security Using Internet Surveys

The U.S. government spends large amounts of money to measure food security across the U.S. When adverse economic conditions arose, it is difficult for them to quickly conduct new surveys to gauge the status of food insecurity. This study developed a fast and inexpensive method of assessing food insecurity. When the COVID-19 pandemic arose this method was used to demonstrate that government assistance programs were sufficient to offset the harms posed by the pandemic, preventing food insecurity from rising. (3058)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Bailey Norwood

The Role of Information and Communications Technologies (ICTs) and Development Policy on Economic Growth and Quality of Life in Rural Communities

This project will assess the economic and social outcomes associated with (1) information and communications technology (ICT) environments, and (2) state and federal development policies, both from a rural context. The primary goal is to understand which ICT environments and economic development policies are having measurable impacts on rural communities. Specific topics to be studied include which broadband characteristics are most associated with positive economic outcomes in rural areas, and understanding determinants of rural business innovation. (3059)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Brian Whitacre
Economic Analysis of Production, Management and Marketing Challenges Facing Livestock and Agri-Food Industries

Agriculture’s market landscape changes constantly, induced by market forces, policy changes, technological innovation, and weather. Food system participants must navigate these changes and the associated management and marketing challenges. Niches in consumer preferences offer opportunities. Upstream production practices may be influenced by downstream firms’ purchasing requirements. Evolution in these market relationships can lead to more cost-efficient production and stronger marketing channels, but the economic feasibility must be considered in the context of the best use of producer resources, including management skills and market accessibility. This research provides an economic analysis of potential responses to these opportunities and associated supply chain behavior. Particular emphasis is placed on value enhancement and implications for livestock producers and processors. (3074)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Kellie Curry Raper

Enhancing Rural Economic Opportunities, Community Resilience, and Entrepreneurship

Rural communities face a wide range of economic growth and development issues ranging from changing the economic structure to public service provision. This project will: (1) increase understanding of the changing determinants of rural prosperity and develop indicators to measure specific community and regional assets and outcomes and (2) identify and analyze policies and strategies contributing to the viability and resiliency of communities in responding to economic and policy changes as well as natural and human-made shocks. (3103)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Brian Whitacre

Enhancing Rural Economic Opportunities, Community Resilience, and Entrepreneurship

The United States Department of Agriculture’s Research, Education, and Economics Action Plan presented a vision to use “Impact-driven agricultural science” to expand economic opportunity through innovation, to promote sustainability and conservation, enhance environmental quality, and improve quality of life for farmers, farmworkers, and society. Three impacts areas outlined in the plan were: 1) Enhancing Local and Global Food Supply and Security; 2) Response to Climate and Energy Needs, and 3) Sustainable Use of Natural Resources. Oklahoma State University’s Division of Agricultural Sciences and Natural Resources indicates nine drivers of change that will impact the economic growth and development of Oklahoma’s rural and urban citizens, the farm sector, and its ability to compete in an increasingly competitive market economy. This project’s objectives integrate the research priority areas identified by DASNR (specifically climate variability, energy, land use and natural resources, market volatility, water, and technology), with the USDA’s REEAP impact areas. Research will be conducted on the rural development impacts of demand for renewable energies and water sources; water and land use, quality, and allocation; and value opportunities added agricultural development. (3125)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Dayton Lambert
The Role of Agricultural Policy on Farm Risk Management and Disaster Mitigation
Science-based information is continually needed to support risk-based policy-making for US agricultural producers. In turn, farmers and ranchers with a better understanding of those policies can improve the resilience of their operations. The proposed research would support both. Topics include farm policy analysis, market and production damage mitigation, animal health and biosecurity, and land use. (3128)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Amy Hagerman

Bilateral Oligopoly and Price Transmission in the U.S. Beef Industry
The proposed research project aims to study market conduct in the U.S. beef industry. One example of research conducted for the period October 1, 2010 through September 30, 2021 examines the potential adverse selection problem in the U.S. cattle procurement market. We hypothesize that the adverse selection problem exists in the cash market due to the uncertainty regarding cattle quality. The adverse selection problem is likely to result in lower cattle quality sold in the cash market than those sold through alternative marketing agreements. Estimation of Heckman’s two-step and the generalized Roy models with cattle transaction data finds the adverse selection problem in the cash market, while the adverse selection effect is statistically insignificant in the alternative market as premiums and/or discounts alleviate information asymmetries and uncertainty in cattle quality. (3154)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Chanjin Chung

Economic and Environmental Impacts of Oklahoma Agricultural Production and Agricultural Technology Information
Although it is difficult to conduct a fully comprehensive evaluation of any emerging agricultural production system, the state-of-the-practice analysis tools have demonstrated their utility in providing producers, researchers, and decision-makers with beneficial information on the impacts of new agricultural technology. Future research will provide even more the basis for initiating comprehensive analysis, is achieved through the use of large-scale databases and increased precision from advances in artificial intelligence. Impacts are being developed for an exciting range of new technologies available to farmers and ranchers from advances in machine learning, robotics and remote sensing. (3160)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jeff Vitale

Economics of Oklahoma Agricultural Production Systems
The goal of this project is to provide economic analyses of alternative production systems in the U.S. Southern Plains. Agricultural producers are confronted with a new production, marketing, and financing methods/technologies. Often these new tools are promoted by parties with a vested financial interest. This project will assess the economic feasibility (i.e., cash flow considerations) and advisability (i.e., economic profitability) of alternative agricultural production practices and where applicable marketing and financial considerations. (3162)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Eric DeVuyst

Developing Information and Decision Support Tools to Increase the Effectiveness of Traditional and Non-Traditional Cooperatives
Over 38,000 producers are members of Oklahoma agricultural cooperatives and those firms purchase more than $1B in inputs and commodities while employing over 1,300 people and paying over $120M in salaries. Agricultural cooperatives face unique challenges do their financial model and governance
structure. As part of that financial structure, profits are passed on to the farmer-member and rural households. It is therefore important to continue to research to improve the effectiveness, efficiency, and management of Oklahoma’s agricultural cooperatives. This research will be accomplished through a wide range of activities including survey research, case study research, and the development of decision aids and best management practices. Many of these activities will focus on financial choices which are an integral part of the profit distribution and equity structure which is unique to the cooperative firm. Because these firms are owned and controlled by agricultural producers, this research will benefit Oklahoma farmers and ranchers. (3165)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Phil Kenkel

**Evaluating Costs, Benefits, and Risks of Insect Control Strategies in Post-Harvest Food Storage and Processing Facilities**

Consumers desire wholesome, insect-free foods. Meanwhile, because of consumer preferences and regulations insecticide options are increasingly limited. To improve the ability of food providers to respond to these conflicting challenges, costs benefits, and risks of alternative insect control methods, including integrated pest management approaches, will be estimated. The focus is on grain storage and food processing facilities. Especially in the food processing industry, limited economic analysis of insect control has been published, especially analysis that considers the risks of alternative strategies. Partial budgeting and economic engineering will be used to analyze costs. (3166)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Brian Adam

**Improving the Efficiency of Agricultural Decisions**

Producers have to make many decisions about production technologies and marketing tools. These include when to sell, participation in crop insurance, and participation in government farm programs. A key to making decisions is having accurate information. Public institutions can also benefit from more accurate information. This research project seeks to provide information to aid in making efficient agricultural decisions. Examples include participation in crop insurance, design of crop insurance, regulation of futures markets, genetic testing of cattle, use of cover crops, and precision nitrogen application. The approach used will primarily be applied to work based on empirical data. New theory and new methods will be developed when needed. Both marketing and production decisions will be evaluated. Cattle, wheat, and forages will receive the most emphasis due to their importance to Oklahoma. If successful, the project will result in a more optimal allocation of scarce resources. (3170)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Wade Brorsen

**Future Challenges in Animal Production Systems: Seeking Solutions through Focused Facilitation**

To contribute to sustainable animal production systems, the feasibility of mixed species grazing to control red cedar was evaluated. Specifically, grazing goats alongside cattle. Goats decrease the encroachment of woody plant species such as cedar trees. This improves rangeland. Goats can also be sold for additional income for the producer without having to decrease stocking rate. Base level economic cost-benefit analysis was conducted to determine if goats could be grazed alongside cattle in a profitable way. (3207)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Courtney Bir
Management and Policy Challenges in a Water-Scarce World
Clean water is essential to public health, ecosystem functions, and economic growth. Oklahoma’s water resources confront complex challenges, including climate change, drought events, pollution, and increasing demand due to expansion of irrigation agriculture, population growth, and economic diversification. Issues defining water scarcity and quality concerns matter to agricultural producers, industries, communities, and leaders. Designing and implementing policies that allocate water to its most productive uses remains a challenge. This project is affiliated with the Multistate project of the same title to quantify water scarcity and its economic impact. (3216)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Lixia H. Lambert

AGRICULTURAL EDUCATION, COMMUNICATIONS AND LEADERSHIP

Using Branding to Engage the Public in Food, Agricultural, Natural Resources, and Human Sciences Issues
Effective branding can improve the relationship between the public and food, agricultural, natural resources, and human sciences (FANRHS) organizations. Branding happens internally (i.e., the organization’s actions that shape the brand) and externally (i.e., what the public thinks of the organization and its communications). Past projects have assessed FANRHS organizations’ brands in their communities, through their online presence, and through public perception research. Upcoming research concerns communicators’ professional development needs. (3072)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Quisto Settle

Exploring the Impact of Entrepreneurship Education on Agricultural and Food Entrepreneurs: Implications for Programming, Training Delivery, and Global Collaboration
The potential for agricultural and food enterprise development and its impact on the economic livelihoods of rural citizens is significant. However, little is understood about agricultural and food entrepreneurs in developing countries or how mentoring and networking relationships with entrepreneurs in developed countries may be activated, maintained, and enhanced. This project will explore the experiences of entrepreneurs from developing countries, including the mentor-protégé and peer-to-peer networks supporting their ventures. The project will examine the impacts of these relationships over distance and time. Policymakers supporting the development of agricultural and food entrepreneurship should be better informed by the project’s results. (3187)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: M. Craig Edwards

ANIMAL AND FOOD SCIENCE

Effects of Oxygen on Non-Enzymatic Metmyoglobin Reduction in-vitro
Previous research in our laboratory has indicated that the presence of light increased non-enzymatic metmyoglobin reduction than dark storage. However, limited knowledge is available on the impact of oxygen on non-enzymatic reduction. The objective of this study was to evaluate the effect of oxygen on non-enzymatic metmyoglobin reduction in-vitro. The current in-vitro research demonstrates inherently present electron donors and carriers can contribute to non-enzymatic metmyoglobin reduction in retail light and oxygen settings and meat pH. (3024)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Ranjith Ramanathan, Gretchen Mafi
Immune Boosting Dietary Compounds for Growth Promotion and Disease Control and Prevention
Subtherapeutic use of antibiotics in livestock production is being phased out. Alternatives to antibiotics are urgently needed to ensure animal health and productivity. We sought to explore the potential for dietary modulation of innate immunity in the control and prevention of important foodborne pathogens using the chicken as an animal model. Such an immune boosting approach is expected to be broadly applicable in the control and prevention of other pathogens in all other food animal species, offering great potential of enhancing animal biosecurity and production efficiency, while minimizing the use of antibiotics and emergence of drug-resistant pathogens. (3025)

Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Center for the Advancement of Science and Technology, USDA-AFRI
PI/PD: Glenn Zhang

Technologies to Reduce Nutrient Excretion and Gaseous Emissions from Swine
The swine industry represents a major source of agricultural income in Oklahoma and the United States. Concerns over water and air quality associated with swine production facilities are topics of considerable debate. Therefore, methods to reduce the amount of nutrients and odors produced from swine facilities are needed. Results of this project suggest dietary strategies can greatly reduce the excretion of nutrients and gaseous emissions from swine facilities. These results give swine producer another option to improve the environmental footprint of their facilities. (3031)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Scott Carter

Differential protein abundance in dark-cutting and normal-pH beef longissimus lumborum muscles
The objective of the current research was to determine the differential protein expression levels with aging in dark-cutting and normal-pH beef longissimus muscles. Mass spectrometry analysis identified 1000 proteins, of which 283 showed significant differential spatiality of aging-related changes between dark-cutting and normal-pH USDA Choice beef. Of the 282 differentially expressed proteins, 95 were up-regulated, and 25 were down-regulated on age day 7. In contrast, 25 proteins were up-regulated, and 49 were down-regulated on day 14 in dark-cutting beef. Overall, our study reveals different aging-related proteolytic degradation mechanisms in dark-cutting compared with normal-pH beef. (3043)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Ranjith Ramanathan, Gretchen Mafi

The Importance of Crystalline and Branched Chain Amino Acids in Regulating Energy Balance of Nursery Pigs
Feed cost and environmental concerns associated with swine production threatens the sustainability of the swine industry. Moderately low protein diets may be used to reduce the feed cost and improve the environmental sustainability; however, these diets decrease the growth performance of pigs. The goal of this project is to assess the importance of supplemented crystalline and branched chain amino acids on energy balance of pigs fed with moderately low protein diets. This together with understanding the mechanisms by which these amino acids influence the performance of pigs may lead us to develop effective strategies to enhance the productivity of swine. (3045)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Adel Pezeshki

Bioelectrical Impedance to Predict Beef and Pork Quality
The overall objectives of this project are to determine if bioelectrical impedance can be used to predict eating quality of fresh beef or pork. This research examined a new hand-held bioelectrical impedance
A machine used in the seafood industry to assess freshness of product. This device was found to be ineffective to predict marbling, eating quality and freshness of beef or pork. (3050)

**Sponsor**: Oklahoma Agricultural Experiment Station  
**PI/PDs**: Gretchen Mafi, Ranjith Ramanathan, Deb VanOverbeke  
Food and Agricultural Products Center: Jake Nelson

**Improving Beef Cow/Calf Enterprise Water and Nutrient Utilization**

Few recent publications are available to document energy requirements, water, and forage intake in modern beef cows. In the meantime, beef cattle have changed dramatically over the past 40 years. The objective of this research is to reduce the carbon footprint in beef production by identifying cattle that make efficient use of forage and water. Our early work has been focused on finding methods to identify these efficient animals without having to conduct extensive feed intake trials. Thus far, an automated system, designed to measure greenhouse gas emissions, has provided reasonably accurate estimates of forage intake. Furthermore, we recently discovered that cows with high forage intake downregulated gene transcription for a peptide known to provide a satiety signal to the brain. (3082)

**Sponsors**: Oklahoma Agricultural Experiment Station, NIFA  
**PI/PDs**: David Lalman, Paul Beck, Ryan Reuter, Andrew Foote

**Argonaut-bound small RNAs and RNA: RNA interactions in livestock genomes**

Small noncoding RNAs (sncRNA) alter the expression of genes and are a critically important aspect of the genome. The interaction of sncRNA and their targets have been inadequately investigated. We are developing new resources and tools to enable researchers to accelerate the discovery of knowledge and improve functional annotation of livestock genomes by identifying mechanisms of gene regulation via post-transcriptional interactions of RNAs. (3099)

**Sponsors**: USDA-NIFA, Oklahoma Agricultural Experiment Station  
**PI/PD**: Darren E. Hagen

**Effects of social rank and dietary modulation on immune, behavior, and well-being of the weaned pig through the finish phase**

An alternative to antibiotic usage that modulates gut-immune interface could significantly improve animal health, well-being, and food security. The goal was to identify an amino-acid enriched diet that would enhance the immune system of the weaned pig during stress and then optimize a feeding strategy that would enhance pig well-being. Early findings indicated pigs fed a tryptophan-enriched diet for 3-weeks had enhanced immune responsiveness and growth, but feeding it longer resulted in negative outcomes. Therefore, studies have been designed to determine the feeding strategy of tryptophan-enriched diets that will provide long-term immune enhancement while minimizing negative effects of stress. (3100)

**Sponsor**: Oklahoma Agricultural Experiment Station  
**PI/PDs**: Janeen Salak-Johnson, Adel Pezeshki, Scott Carter
Enteric Diseases of Food Animals: Enhanced Prevention, Control and Food Safety
Eliminating the use of in-feed antibiotics in livestock production has been a global trend to mitigate antimicrobial resistance (AMR). The overall objective is to develop and evaluate host defense peptide (HDP)-inducing compounds for enhanced production efficiency and gut health in broilers. These compounds will be pursued for their efficacy in promoting growth, health, and bacterial clearance in both healthy and experimentally infected chickens. Successful completion of the project will lead to the development of innovative non-antibiotic approaches for immediate adoption and commercialization in poultry and possibly other livestock, thus mitigating AMR across the food chain. (3112)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-AFRI
PI/PD: Glenn Zhang

Metabolic Relationships in Supply of Nutrients for Lactating Cows
Factors that regulate the metabolism of nutrients are critically important to produce milk and health of lactating cows. The purpose of this research is to improve the nutrient utilization by dairy cows. The specific goals of this project are 1) identifying the association of circulating gut peptides and metabolites with feed intake, milk production, and nutrient utilization efficiency; and 2) the role of pre-weaning gut development in long-term nutrient utilization efficiency and productivity of dairy cows. (3116)
Sponsors: Oklahoma Agricultural Experiment Station, NIFA
PI/PD: Andrew Foote

The role of fat metabolism in beef cattle nutrient utilization efficiency and inflammation
Inflammation of the gastrointestinal tract of growing and finishing beef cattle has been associated with poor nutrient utilization efficiency. Metabolism of fatty acids can produce inflammatory compounds that could be contributing to depressed feed efficiency. The purpose of this research is to improve the efficiency of nutrient utilization by growing and finishing beef cattle. The specific goals of this project are 1) to identify the association of long-chain fatty acids with production traits; 2) to identify the role of fatty acids in eicosanoid production and the inflammatory response in cattle; and 3) to identify the role of dietary factors, including fat source, on rumen fermentation, metabolism, nutrient utilization, and inflammation. (3127)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Soybean board
PI/PD: Andrew Foote

Role of E2F transcription factors in hormone-mediated regulation of ovarian follicular development in cattle
Poor reproductive efficiency in cattle ultimately results in lost income to farmers. Understanding the mechanisms of ovarian follicular growth may help devise ways to increase reproductive efficiency and hence farm profits. During ovarian follicular development, granulosa and theca cell proliferation and differentiation are influenced by the gonadotropins, insulin-like growth factors, fibroblast growth factors, and numerous intraovarian factors as well as external factors such as mycotoxins. The goal of this project is to determine the physiological control of growth factors and their transcription factors and assess the mechanisms by which they act to regulate steroidogenesis and mitogenesis of granulosa and theca cells. It is hoped that new insights regarding techniques to improve fertility in dairy and beef cattle will result from these studies. (3148)
Sponsors: Oklahoma Agricultural Experiment Station, NIFA
PI/PD: Leon Spicer
Supplementation to replace fertilization for stocker calves grazing mixed warm-season and cool-season permanent pastures

Increasing costs of production inputs such as feed, fuel, and fertilizer have put a squeeze on profitability of cattle producers. Providing supplementation to grazing calves can increase total diet quality thereby increasing performance of growing calves. At higher supplementation rates that forage intake is reduced, it is speculated that feeding higher levels of supplementation can offset reduced forage production if fertilizers are not applied. The objectives of these studies were to determine the effects of supplementation of dried distillers grain cubes to steers on forage intake, steer gains and economics of a stocker cattle enterprise. Heifers offered increasing levels of distiller’s grains cubes (0, 2, 4, or 8 pounds per day) had reduced intake of bermudagrass hay with increasing supplementation for each 1% of bodyweight increase in supplementation hay intake decreased by 1.8%. Steers were grazed on introduced pastures in the humid area of eastern Oklahoma at the Eastern Research Station, Haskell, Oklahoma in order to determine the effects feeding rates of the distiller’s grains cube has on performance and pasture carrying capacity. Steers grazed fertilized tall fescue/bermudagrass pastures with or without 2 lbs/day of supplementation or grazed unfertilized pastures with supplement provided at 0.75% of bodyweight. The high supplementation rate was able to replace chemical nitrogen fertilization and increase daily gains by 30%. (3172)

Sponsors: Oklahoma Agricultural Experiment Station, Dennis and Marta White Endowed Chair.
PI/PDs: Paul Beck, Andrew Foote, Laura Goodman, Chris Richards

Using Stored Forages to Optimizing Cropland use for beef cattle production

Research conducted at the University of Arkansas LFRS on tillage systems for continuous wheat pasture production shows that wheat pastures can produce gains in excess of 2.5 lbs/day if grazeable forage is produced. Inadequate rain or delayed planting can reduce the forage production potential, which is a source of substantial risk for the wheat grazing enterprise. The objectives of this research were to determine the effects of offering ad libitum bermudagrass round bale silage on performance and stocking rate of growing steer grazing wheat pasture. Steers were stocked to wheat fields planted for fall and winter grazing at 1 steer per acre without additional round bale silage or 1, 1.5, or 2 steers per acre with round bale silage provided ad libitum. Average daily gains of steer stocked at 1 steer per acre did not differ whether silage was offered or not (3.1 lbs/day), as stocking rate increased daily gains were decreased to 2.5 and 2 lbs/day when stocked at 1.5 and 2 steers per acre, respectively. Even though daily gains decreased, total gain per acre increased by 37 to 54%, respectively, with increasing stocking rate. This research shows that even though individual animal performance decreases, stocking rates can be increased by two-fold with up to 54% increase in total production per acre. (3182)

Sponsors: Arkansas Agricultural Experiment Station, Oklahoma Agricultural Experiment Station, the Dennis/Marta White Endowed Chair.
PI/PD: Paul Beck
**Microbial Ecology of the Equine Uterus**
The goal of this study is to understand the composition and existence of a resident uterine microbiome, the presence of a core microbiome and identify its role in endometritis, and response to antibiotic therapy. We have analyzed the uterine microbiomes of over 50 mares and generated over 6 million 16S rRNA gene sequences. 19,542 unique sequences were assigned to 17 known phyla and 213 known genera. Equine uteri were dominated by Pseudomonas, Lonsdalea, Lactobacilli and Escherichia/Shigella. We found that the species diversity, richness, and evenness depend on the geographical region and a core microbiome exists over different regions. (3192)

**Sponsor:** Oklahoma Agriculture Experiment Station  
**PI/PD:** Udaya DeSilva  
**College of Veterinary Medicine:** G. Reed Holyoake

**Precision management strategies to improve productivity and sustainability of Oklahoma grazing systems**
The long-term goal of this project is to increase the economic prosperity and sustainability of the 44,000 ranchers managing the 4.6 million cattle on 22 million acres of grassland and 5.3 million acres of wheat in Oklahoma. Research is being conducted to improve sustainability of wheat and warm-season perennial grass grazing systems through development of decision support systems and grazing management approaches that incorporate next-generation sensors, automation, and real-time data analytics. Improved sustainability will improve profit margins for ranchers, while simultaneously increasing availability of food for society and improving ecosystem services from Oklahoma grazing lands. (3193)

**Sponsors:** Oklahoma Agricultural Experiment Station, NIFA  
**PI/PD:** Ryan Reuter

**Impact of micronutrient supplementation on subsequent performance, health, and mineral balance of beef calves**
Bovine respiratory disease (BRD) accounts for the majority of morbidity and mortality in feedlot cattle. The effects of trace mineral supplementation on efficiency, daily gains, clinical health, immune response variables, and mineral balance in calves following exposure to BRD pathogens were evaluated. The results indicated that organic trace mineral supplementation may improve clinical symptoms and decrease fever after a BRD pathogen challenge. In addition, supplementing calves with organic trace minerals increased serum cobalt and liver and serum selenium concentrations. This indicates that trace mineral source may play an important role in both mineral balance and immune response in challenged calves. (3194)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Blake K. Wilson
**Influence of Prenatal Stress on Immune Function, Behavior, and Welfare of the Progeny**

Maternal stress exposes fetuses to high cortisol levels, resulting in lifelong and multi-generational effects on physiology and behavior, especially if stress occurs during sensitive periods of development. The overall goals are to characterize immunologic, behavioral, and epigenetic signatures in piglets born to maternally stressed sows. Preliminary results imply social behaviors were disrupted in piglets born to sows stressed in late-gestation; whereas immunity was affected among those born to sows stressed in mid-gestation. Further characterizing and defining these signatures would allow us to develop methodologies to select animals with more robust stress and immune responses and devise strategies for improved welfare. (3204)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA

**PI/PDs:** Janeen Salak-Johnson, Darren Hagen

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**Epigenetic Regulation of Host Defense Peptide Synthesis**

The overall goal of this project is to evaluate the efficacy of newly identified epigenetic compounds in host defense peptide (HDP) induction and bacterial clearance in a chicken model of necrotic enteritis. The central hypothesis is that strategies to enhance HDP synthesis will promote bacterial clearance. We proposed to identify the most efficacious epigenetic compounds and their combinations to induce HDP and demonstrate their efficiency in promoting gut health and pathogen clearance. The outcome of this project will pave the way for the development of an innovative antibiotic alternative technology to maintain animal health and production efficiency. (3206)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-AFRI

**PI/PD:** Glenn Zhang

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**The role of glucose metabolism in the regulation of feed intake**

Metabolic factors contribute significantly to the control of feed consumption or feed intake when cattle consume high-energy feedlot diets. There is a lack of understanding of how glucose metabolism and insulin signaling contribute to feed intake regulation and nutrient utilization in growing and finishing cattle. The purpose of this research is to improve the efficiency of nutrient utilization by growing and finishing beef cattle. The specific goals of this project are 1) to determine the role of peripheral glucose metabolism and insulin sensitivity in regulating feed intake; and 2) to determine the role of hepatic signaling and metabolism in regulating feed intake. (3210)

**Sponsor:** USDA

**PI/PD:** Andrew Foote

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**Growth performance, nutrients utilization and gut microbiota of pigs fed with low protein diets supplemented with isoleucine and valine**

Decreasing the dietary protein by 25% of recommended levels may produce beneficial effects on nitrogen excretion, but these diets negatively influence the growth performance of pigs. Therefore, identifying the limiting amino acids that can reverse the negative effects of moderately low protein (MLP) diets on growth performance of pigs is essential. The objective of this project is to investigate the effect of MLP diets supplemented with isoleucine (Ile), valine (Val) or combination of both on growth performance, nutrients utilization and gut microbiota composition of nursery pigs. The long-term goal of this project is to improve feed efficiency and ultimately enhance the environmental sustainability of swine production. (3211)

**Sponsor:** USDA NIFA/AFRI

**PI/PDs:** Adel Pezeshki, Darren Hagen
Ribosome-bound transcriptomics as a link between gene expression to protein translation

Functional annotation of the genome is necessary in order to fully discern the effects of genetic variation on phenotypic variation. To determine the role of translation regulation and efficiency in the functional annotation of genomes, we must first decipher the translatome. The translatome refers to the entirety of messenger RNAs associated with ribosomes and undergoing active protein synthesis. Our long-term goal to understand how genetic variation among livestock can impact phenotypic variation through altered translation efficiency and contribute this knowledge to the advancement of genetic selection for animal breeding and production. (3212)

**Sponsors:** USDA-NIFA, Oklahoma Agricultural Experiment Station

**PD:** Darren E. Hagen

Unraveling the biology of conceptus elongation in cattle

Infertility and subfertility represent pervasive problems in domestic animals and humans, and embryonic mortality is a major factor limiting reproductive efficiency. The goal of this project is to use innovative system biology approaches to investigate early embryonic development in cattle. Our ultimate goal is to improve cattle production systems and reduce the impact of reproductive problems in cattle operations. (3215)

**Sponsor:** Oklahoma Agricultural Experimental Station

**PI/PD:** Joao G. N. Moraes

Integrated approach to enhance efficiency of feed utilization in beef production systems

The US beef industry's productivity has significantly risen, but there is minimal emphasis on improving nutrient utilization efficiency from the feedstuffs used in cattle production. To date, there is very limited ability to select cattle for feed intake capacity, and there is limited ability to account for the massive variation observed in feed intake. There is a critical need to obtain a deeper understanding of the metabolic and hormonal control of appetite and feed intake of growing and finishing cattle and nutrient utilization. The specific goals of this project are 1) determine the role of increased rumen propionate on whole-body metabolism, feed intake, and liver metabolism; and 2) determine the role of rumen fiber digestion in finishing diets on nutrient utilization efficiency. (3217)

**Sponsors:** Oklahoma Agricultural Experiment Station, NIFA

**PI/PD:** Andrew Foote

National Animal Nutrition Program – NRSP9

The overarching goal of this program is to provide easily accessible and publicly available resources applicable to, and essential for, animal nutrition research. The specific goals of this project are 1) support research efforts that enhance the sustainability, competitiveness, and profitability of U.S. agriculture by providing easily accessible and publicly available resources applicable to, and essential for, animal nutrition research; 2) expand and enhance shared multispecies databases that can be integrated across species to ensure sufficient data are available to enable animal nutrition research; and 3) identify gaps within animal nutrition research that address global challenges such as adapting to and mitigating climate change; ensuring a safe, secure, and abundant food supply; and heightening environmental stewardship. (3218)

**Sponsors:** Oklahoma Agricultural Experiment Station, NIFA

**PI/PD:** Andrew Foote

Effect of differing Carbon Dioxide levels on lamb color in Modified Atmosphere Packaging

Fresh meat color is an extremely important factor influencing consumer purchasing decisions. United State consumers have become accustomed to meat that is bright in color and associate it with
freshness. The goal of this project is to assess the effect of various carbon dioxide concentrations on the display life of fresh lamb chops. Our ultimate goal is to maintain display life stability of lamb chops while decreasing the inclusion of CO₂ to meet the expectations of color form consumers. (3224)

**Sponsor:** Oklahoma Agricultural Experimental Station  
**PI/PD:** Morgan M. Pfeiffer

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**Synergistic Induction of Host Defense Peptides by Epigenetic Compounds**  

The demand for effective antibiotic alternatives is accentuated by restriction of in-feed antibiotics. Modulating the synthesis of endogenous host defense peptides (HDPs) is a promising antibiotic-free approach. We have found synergy between two classes of epigenetic compounds, namely histone deacetylase inhibitors and histone methyltransferase inhibitors, in the induction of HDP and barrier function genes. This project will confirm the synergy among different classes of epigenetic compounds in different cell types and further explore the mechanisms of synergy. The outcome could potentially lead to the development of epigenetic compounds as novel antibiotic alternatives for poultry and other livestock. (3227)

**Sponsor:** USDA-NIFA  
**PI/PDs:** Melanie Whitmore, Glenn Zhang

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**BIOCHEMISTRY AND MOLECULAR BIOLOGY**

**Structure-function studies on viral-host interactions key to animal immunity**  
The main goal of this research is to provide a detailed molecular basis by which several important viral and host proteins function; and to provide important clues on how to design novel anti-viral reagents key to the immunity of livestock animals. The outcome will be helpful for the development of treatments and preventions against a number of infectious diseases that target livestock animals and are economically devastating. (3060)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Junpeng Deng

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**The structure of the integral plant cell wall component, pectin, its interactions with other cell wall polymers, and changes during growth**  
In this project, we attempt to determine how several of the various major polymers of plant cell walls connect. These linkages must be made and broken during cell wall growth and maturation. We find by NMR and mass spectrometry that xyloglucan is linked to an arabinan and that some of this arabinan is linked to pectin. We are investigating the effects of knock-out mutations of cell wall enzymes and find they cause considerable differences in the response of the plants to both cold stress and salt stress. RNA seq experiments should tell us how the responses are modified by the mutations. (3061)

**Sponsors:** Oklahoma Agricultural Experiment Station, Stevens Endowed Chair in Agricultural Biotechnology.  
**PI/PD:** Andrew Mort

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**The molecular basis of salt tolerance in rice**  
Rice is the most important crop in the world as measured by the portion of calories provided to the human diet, and has served as a model system for monocots, especially for cereals. The USA is among the top five rice-exporting countries. Specifically, the states such as Arkansas, California, Louisiana, Mississippi, Missouri, and Texas produce 20 billion pounds of rice in the United States. Salinity is a major problem in South and Southeast Asian countries, where rice is commonly grown. Even in the United
States, rice-growing areas in California and Louisiana are severely affected by salinity. Therefore, developing salt-tolerant rice varieties is an important goal, and understanding the molecular basis of salt tolerance is an important direction in this effort. Rice is endowed with rich genetic diversity including wild species, landraces, and mutants. Among diverse salt-tolerant rice genotypes, Pokkali (Pok) is highly salt-tolerant, therefore, frequently used as a tolerant donor in breeding programs. On the other hand, IR29, a modern high-yielding cultivar but is salt-sensitive. Molecular comparisons between salt-tolerant Pok and salt-sensitive IR29 can instruct us about the underlying mechanisms Pok uses to adapt to salt stress. A comparative expression profile of genes, proteins, and microRNAs under salt stress in these two genotypes will reveal significant information on the genes and gene products that contribute to salt tolerance. This resource will lay strong foundations for future functional genomic studies aimed at improving the salt tolerance of rice. The information also has the potential to apply to closely related cereals such as wheat. (3062)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Ramanjulu Sunkar

**Function analysis of HSBP genes in cotton**

Heat shock proteins (HSP) are protective proteins that are expressed in response to high temperatures and other stresses. The expression of HSP genes is regulated by heat shock factors (HSF). HSF activation is attenuated by heat shock factor binding proteins (HSBP) that bind to HSFs and interfere with their activation. Our research in model plants shows that partial silencing of HSBP expression caused increased activation of HSP leading to increased stress tolerance. Our ongoing project is aimed at understanding and exploiting this critical regulatory pathway to increased abiotic stress tolerance in cotton plants to improve the yield and quality of cotton under conditions of high temperature and limited water availability. (3083)

**Sponsors:** Oklahoma Agricultural Experiment Station, OCAST  
**PI/PD:** Randy Allen

**Cereal Grain Products and Ingredients - Opportunities for Future Food and Feed Additives**

Cereals and grains represent a rich source of nutrients for humans. The goal of this research project is to develop analytical tools, products, and processes to understand and improve the quality of grain products. We emphasize the study of viscoelastic properties and food sensory analysis of grain products. Specific aims also include adding value to grain products via processing such as spontaneous or specific fermentation and addition of ingredients that enhance processing, nutritional status, sensory and shelf-life attributes of grain products. Examples include grain products with improved nutritional value, protein, antioxidants, and fiber content. (3091)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-NIFA  
**PI:** Patricia Rayas-Duarte
Ribosomes and Translation in Antibiotic-Tolerant Bacteria
Our research is continuing to address the problem of how antibiotic-tolerant bacteria survive. In the last decade, antibiotic-resistant bacteria have become a major health problem. Antibiotic-resistant bacteria frequently emerge in livestock animals, and then transmit their antibiotic-resistant genes to pathogenic bacteria, causing a variety of chronic diseases in humans. Our long-term goal is to understand how antibiotics impact bacterial growth and survival by disrupting the activities of ribosomes, higher-order translation complexes, and ultimately cell physiology. The goal of this HATCH project is to characterize ribosomes from a variety of models and pathogenic bacteria. The assembly states of ribosomes will be profiled from bacterial cells that can tolerate multiple types of clinically important antibiotics. (3096)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Kevin Wilson

Characterization of The Mechanism of Action Bioactive Compounds Present in Functional Herbs and Foods
We are determining whether bioactive compounds identified as putative inhibitors of Hsp90, function by inhibition of the Hsp90 chaperone machine. To achieve this, we are: 1) carrying out assays to confirm that the Hsp90 machine is the target of the bioactive compounds, 2) characterizing the mechanism by which the compounds inhibit the Hsp90 machinery, 3) determining the impact of Hsp90 inhibitors on the proteome of cancer cells, and 4) co-crystalizing Hsp90 constructs with inhibitors. (3159)

**Sponsors:** Oklahoma Agricultural Experiment Station, NIH.

**PI/PD:** Robert Matts

Drought Induced Global Changes of Chromatin Structure in Winter Wheat
Drought stress on wheat production is a growing concern due to its impact on grain yield in Oklahoma and throughout the entire world. To combat this problem, this project aims to identify drought resistant varieties of winter wheat using a unique set of biochemical and genetic approaches. We hypothesize that by comparing chromatin structure patterns between water-restricted versus control winter wheat plants, specific genes and genomic regions important for drought-resistance can be identified. This research is significant because it will improve our ability to identify and develop drought-resistant varieties of winter wheat. (3167)

**Sponsor:** OCAST

**PI/PD:** Donald Ruhl, Charles Chen

Predicting Winter Wheat Agricultural Performance under Drought- an integral systems biology approach
Agricultural sustainability has become increasingly vulnerable due to unprecedented precipitation deficit and climatic extremes. Understanding how environmental perturbations modulate plant genomes is a key element required for sustainable crop production in this rapidly changing climate. Our research aims to uncover the regulatory mechanism that modulates gene expression, such as histone modification and genome-wide chromatin structure changes responding to environmental cues. We hypothesize that plants respond to drought stress through alterations in chromatin structure to regulate transcriptional responses, and these rapid and reversible changes add to rapid acclimation to water stress. The expected outcomes from this study will be impactful for sustainable crop production in this rapidly changing climate. (3188)

**Sponsors:** Oklahoma Wheat Research Foundation, OCAST

**PI/PDs:** Charles Chen, Donald Ruhl
Antibiotic resistance in the multidrug resistance opportunistic bacterial pathogen Elizabethkingia
Elizabethkingia anophelis, E. meningoseptica, and E. miricola are opportunistic human pathogens found everywhere in the environment and are resistant to most available antimicrobial drugs. Elizabethkingia sp. produces multiple β-lactamase enzymes which are bacterial enzymes that cleave β-lactam antibiotics such as penicillin, and related antibiotics and thus are a key player in conferring bacterial antibiotic resistance. The goal is to elucidate the mechanism of β-lactam antibiotic resistance in Elizabethkingia as a potential reservoir of novel β-lactamase genes. We aim to identify all β-lactamase genes in E. anophelis, E. meningoseptica, and E. miricola and quantitatively characterize the β-lactam antibiotic substrates and inhibitors for these enzymes. (3189)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Patricia Canaan

Antibiotic Susceptibility of the Elizabethkingia and the effects of vancomycin
Antibiotic-resistant “golden staph” causes disease in livestock and humans and causes mastitis in dairy cattle which negatively impacts this industry. Our long-term goal is to determine how this pathogen thwarts the action of alcohol and plant antimicrobial essential oils. It is hoped that this research will reveal unique genetic alterations and physiological responses that will help design novel antistaphylococcal agents. In the last year, the laboratory completed a manuscript on the proteomic/metabolomic analysis of tea tree oil reduced susceptibility mutants and isolated ethanol reduced susceptibility mutants that have been subjected to proteomics analysis which is being prepared for interpretation. (3190)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** John Gustafson

Metabolism of Glycerides in Insects
Fat plays an essential role as a reserve of metabolic energy in all animals. Our studies intend to improve our understanding of the processes of synthesis, accumulation, mobilization, and degradation of fat in insects. Fat in the form of triglycerides represents the main energy store in insects in general and these stores are essential to support flight and reproduction. Therefore, a deeper understanding of the mechanisms involved in fat metabolism could be useful; to identify potential targets for the control of; the populations of insects that directly impact the yield of crops or that are vectors of human or animal diseases. Moreover, the metabolism of fat in insects has unique features that could allow the discovery of mechanisms useful for medical and animal sciences, in general. (3191)

**Sponsors:** State of Oklahoma, Oklahoma Agricultural Experiment Station, National Institutes of Health, OSU Foundation

**PI/PDs:** Jose L Soulages, Estela L Arrese

**BIOSYSTEMS AND AGRICULTURAL ENGINEERING**

Using Big Data and the Internet of Things to Manage Tomorrow’s Agricultural Production Systems
The goal of this project is to develop intelligent control systems and sensors to help monitor, optimize, and manage agricultural machinery systems. The big data sets produced by the sensors are processed in a computer-based learning environment to enact real-time machine operational decisions. This project has already completed the testing and analysis of the field performance of commercially available soil sensing systems to determine their suitability for use on automated agricultural machinery. In the past year the project has developed methods for processing image data from UAVs to aid in cotton and peanut production and tested a 3D camera-based autonomous navigation system for row crop
production. Due to the COVID-19 pandemic, progress on this project has not been as efficient as planned or desired. (3070)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Paul Weckler

**Value-added Processing of Pecan Nut Shells**  
Pecan nuts are native to Oklahoma. Over 16 million pounds of pecan nuts are produced in the state annually. Despite the large production, value-added processing of pecans is not well developed, and the value generated by this industry remains to be relatively low. Shell accounts almost half of the nut weight. Industrial processing produces large amounts of shells as byproducts which are currently used in low value applications such as gardening aid. Hence, shells have economic significance to pecan growers and processors. This study explores valorization of the pecan processing industry byproducts. Aqueous ethanol (70% ethanol), microwave and sonication aided water and subcritical water (pressurized water) extraction techniques are being examined for their efficacy for recovering health beneficial and biologically active compounds naturally present in pecan nut shells. Chemical composition and biological activity of the extracts obtained from two different industrial byproduct streams and five pecan cultivars have been evaluated. So far, we have demonstrated that crude aqueous ethanol extracts prepared in the lab possess strong antioxidant activity and inhibit human cancer cell growth. Our ongoing research focuses on optimization of other environmentally benign and sustainable extraction techniques, crude extract purification, testing efficacy of the purified extracts and formulation of consumer products for food and industrial applications. (3087)

**Sponsors:** US Department of Agriculture through Oklahoma Department of Agriculture, Food and Forestry-ODAFF, Specialty Crops Program.  
**PI/PD:** Nurhan Turgut Dunford

Basic and applied research is needed to help develop better weather-based operational systems to serve as decision-support tools for those who fight wildfires or do prescribed burning. This project focuses on three areas related to wildland fire management: 1) the role of weather, soil moisture, and remote sensing in modeling the spatial and temporal dynamics of wildland fuels; 2) the relationship of weather, soil moisture, and other fire danger variables to historical wildfire occurrence in Oklahoma; and 3) the continued development and improvement of OK-FIRE, Oklahoma’s operational system for wildland fire management (https://www.mesonet.org/index.php/okfire). (3101)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** J. D. Carlson

**The Science and Engineering for a Biobased Industry and Economy**  
The overall goal of this research is to address key issues that limit the commercial application of OSU-developed gasification technologies. Based on the current interest in commercializing the OSU patented downdraft gasifier in a mobile, self-contained electricity generation unit, we are addressing the key reliability issues in the gasifier scale-up. These issues include systems control under a wide range of operating conditions, feedstock type and condition, and producer gas cleanup. (3139)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Raymond L. Huhnke
The Science and Engineering for a Biobased Industry and Economy
The needs for electricity, fuels, and chemicals continue to grow worldwide and are currently met primarily by fossil-based resources that emit greenhouse gases. At the same time, agricultural biomass and organic wastes including municipal solid wastes continue to get underutilized and degrade to form methane, a potent greenhouse gas. Efficient and economically viable technologies are needed to convert the underutilized biomass and organic wastes into electricity, fuels, and chemicals. This project focuses on the advancement and analyses of thermochemical conversion technologies to utilize these wastes for generating electricity, fuels, and chemicals. (3141)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: A.J. Kumar

Management and Policy Challenges in a Water-Scarce World
This multistate project quantified likely impacts of plausible climate futures on agricultural water availability in the middle section of the Rio Grande. A climate change impact assessment framework was developed. The main components of the framework included downscaled bias-corrected projected reservoir inflows, projected releases obtained from a reservoir routing model, soil, and water assessment tool (SWAT) watershed hydrology model, and a relationship between reservoir releases and groundwater pumping for irrigation. The climate impact assessment framework was applied to project the state of principal reservoirs and draw insights about groundwater sustainability for irrigated agriculture under status quo water and land management. It is likely that the fresh groundwater storage will be depleted in the study watershed within the second half of the 21st century under warm-dry climate scenarios using available hydrogeologic estimates of the size of fresh groundwater storage. It is timely to think about adaptation strategies such as preparing to use slightly saline and moderately saline groundwater for irrigation. Results inform planning and decision-making as well as the development of management interventions in Southcentral and Southwestern US. (3161)
Sponsors: National Institute of Food and Agriculture, Oklahoma Agricultural Experiment Station
PI/PD: Ali Mirchi

The Science and Engineering for a Biobased Industry and Economy
A crucial step in developing a sustainable biobased economy is establishing viable integrated biorefineries capable of converting biomass feedstocks and industrial wastes into biofuels, and biobased chemicals. Gasification-syngas fermentation involves the conversion of biomass, coal, and municipal solid wastes to syngas, primarily containing carbon monoxide, carbon dioxide, and hydrogen, followed by the fermentation of syngas to chemicals. This research examines syngas fermentation process development and conversion of CO2 to alcohols and value-added products from biomass and waste gas streams. Gas fermentations with three new syngas fermentation strains (Strain A, Strain B and Strain C) were compared with Clostridium carboxidivorans P7 and C. ragsdalei P11 for production of C2-C6 products from CO2. All strains converted CO2 into alcohols and fatty acids. The new strains A, B and C produced more butanol and hexanol from CO2 than strains P7 and P11. We also compared the life cycle environmental impacts of petroleum and corn-based butanol and jet fuel production pathways to those from switchgrass using traditional butanol fermentation and co-fermentation of sugars, CO2 and H2 into butanol. Switchgrass to jet fuel pathway via co-fermentation route has lower 100-year Global warming potential (GWP-100, expressed in CO2e/MJ) when compared to fossil fuel pathways. This shows the potential for the novel co-fermentation of sugars and gas for production of higher alcohols that can be further converted into jet-fuels. (3163)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Hasan Atiyeh
Intelligent Sensing/Control Systems and Data Analytics for Precision Crop Production
In 2020-2021, we completed the design and fabrication of a multi-rotor drone platform, which can carry and control three cameras simultaneously. This platform provides flexibility for field data collection with various goals. A set of field experiment have been conducted to evaluate its performance on providing high quality image data, stable flight, sufficient battery life, and ease-of-controls in this summer. The drone platform has also been used to collect images from peanut fields to evaluate leaf spot and other disease damages and for the cotton fields to predict the opening of bolls. Two ground-based, remote-controlled plant phenotyping platforms have been optimized. One was used to collect close-to-plant data for peanut flower counting and one was used to collect data from turfgrass nursery to assist sample quality ratings. We also develop various image processing and analysis approaches to process the image data collected by the drone and ground-based platforms, respectively. To improve the accuracy of image analysis, new machine learning algorithms are being used. (3169)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-ARS-WPOFCU
PI/PD: Ning Wang

Microirrigation: A Sustainable Technology for Crop Intensification and Improved Crop Productivity
Our research efforts are focused on testing the reliability and effectiveness of a new irrigation management technology developed for irrigated cotton in Australia. Collaborating with USDA-ARS scientists, these systems were installed at seven cotton fields in southwest Oklahoma. All fields were under subsurface drip irrigation systems. The systems are equipped with a modified infrared thermometer that records canopy temperature and provides decision makers with a plant-based stress index that can be used for irrigation scheduling. In addition, the system is connected to a 90-cm soil moisture probe and uses data on root zone water content in conjunction with canopy temperature data. Finally, the system relies on remotely sensed imagery to capture variability across the field. The systems have been maintained during the growing season and data have been collected. Southwest Oklahoma has been subject to severe droughts in the past decade, with a significant impact on its limited water resources. Use of advanced technologies like the one tested here can help optimize irrigation management, conserve water resources, and increase economic profitability. (3177)
Sponsors: National Institute of Food and Agriculture, Oklahoma Agricultural Experiment Station, Cotton Incorperate
PI/PDs: Saleh Taghvaeian

Integrated Systems Research and Development in Automation and Sensors for Sustainability of Specialty Crops
The practice of hand-opening pods for rating disease is a major bottleneck in breeding for peanut smut resistance. This method is so slow that disease ratings for one season are often not completed until seed for the next season is being planted. Healthy peanut pods filled with seed are denser than infected pods filled with teliospores of Thecaphora frezzii. In 2020-2021-19, we conducted experiment using an X-ray camera at BAE Lab to screen peanut with faux-infected pods. The results showed promising results on detecting infected pods. Then a new X-ray imaging device based on a line-scan X-ray camera was designed and fabricated. A detailed experiment design was also developed for further tests with diseased peanut pods. (3178)
Sponsor: Oklahoma Agricultural Experiment Station, USDA-ARS-WPOFCU
PI/PD: Ning Wang

Membranes for Sustainable Water Treatment
Membrane fouling, accumulation of substances on/inside the membrane, remains a major obstacle for the application of membrane technology in wastewater treatment. We worked on the integration of
hydrophilic and omniphobic nanocoatings to improve fouling resistance of desalination membranes. The modified membrane demonstrated excellent desalination performance in treating oily wastewater, with > 99.99% salt rejection and stable permeate flux at oil content as high as 5 g/L and >230 g/L dissolved salt. The research is expected to have a positive impact on membrane technology by increasing the efficiency, stability, and lifespan of membranes. (3183)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Jessie Mao

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**CENTER FOR VETERINARY HEALTH SERVICES**

**Regulation of latency-reactivation cycle by ORF2 and beta-catenin/Wnt signaling pathway.**
Following acute infection, bovine herpesvirus 1 (BoHV-1) latency is established in trigeminal ganglionic (TG) sensory neurons. Stress stimulates reactivation from latency and virus transmission. Approximately 100 cellular genes are differentially expressed during stress-induced reactivation compared to latency or uninfected calves. A cellular signaling pathway, Wnt/b-catenin, that regulates metabolism, cell survival, and neurogenesis is expressed at higher levels during latency relative to reactivation from latency. A viral protein abundantly expressed during latency (ORF2) stimulates Wnt/b-catenin signaling. Components of this signaling hub interfere with stress-induced viral transcription suggesting cellular factors actively maintain latency by suppressing stress-induced transcription and promoting normal neuronal functions. (2016)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Clinton Jones

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**Pathogenesis, Diagnosis, Treatment, Prevention and Control of Livestock Diseases**
This project covers agricultural and biomedical research funded by sources other than USDA that contributes to the total research capacity of the OSU College of Veterinary Medicine (CVM). We are developing strategic alliances with partner institutions and the private sector and growing the supporting infrastructure. Consequently, publications are presented as evidence of progress and productivity. Expenditures for these non-USDA projects came from Federal, State, and private funding sources, including biological and pharmaceutical corporations. (2061)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Jerry Malayer

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**Regulation of bovine herpes virus 1 reactivation from latency by progesterone and corticosteroids.**
Bovine herpesvirus 1 (BoHV-1) is an important causative agent of abortion and a cofactor during development of bovine respiratory disease. A life-long latent infection is established in neurons after acute infection. Progesterone, a hormone essential for maintaining pregnancy in cows, stimulates viral gene expression, growth of BoHV-1, and sporadically induces reactivation from latency. Interestingly, the glucocorticoid receptor (GR) and progesterone receptor (PR) cooperatively stimulate productive infection and key viral promoters. We suggest that BoHV-1 vaccines that do not reactivate from latency via increased progesterone and stress, will reduce abortions in pregnant cows. (3129)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Clinton Jones

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**Physiochemical causes of muscle fatigue and muscle damage in horses**
Strenuous exercise produces skeletal muscle hyperthermia and acidosis in horses, often with intramuscular temperatures as high as 43-44oC and pH as low as 6.2. Muscle hyperthermia and acidosis can alter cellular functions and intracellular signaling which can lead to a plethora of changes within the
cell, including impaired or inefficient production of adenosine triphosphate (ATP) and loss of key mitochondrial elements into the sarcoplasm. Our central hypothesis is that physiological hyperthermia and acidosis, individually and in combination, result in progressive leakage of skeletal muscle mitochondrial membranes and oxidative stress, resulting in impaired oxidative phosphorylation, decreased ATP production, muscle damage, and reduced performance. (3142)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Michael Davis

**Integrated Beef Cattle Program for Veterinarians to Enhance Practice Management and Services**  
Oklahoma has 1.6 million beef cows yet lacks the veterinarians necessary to fully service cattle operations. This project seeks to offer intervention strategies for rural sustainability by expanding veterinary skills and knowledge to address the common needs of beef producers. Surveys were developed and administered to fully evaluate the shortage situation including the geographic range of veterinarians. Currently, educational modules for veterinarians are being created focusing on beef cattle herd management with the ultimate goal to expand services provided by veterinarians. Finally, veterinary students will be networked with participating rural veterinarians to help sustain rural veterinary practices. (3179)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PDs:** Rosslyn Biggs, John Gilliam, Jerry Malayer, Brandon Raczkoski, Carlos Risco

**Animal and Food Science:** Paul Beck, David Lalman, Derrell Peel

**Effect of bovine viral diarrhea virus on thymus function and calf immunity**  
Bovine viral diarrhea virus (BVDV) infection in calves causes major economic losses to US producers. BVDV leads to transient immunosuppression and significant thymus atrophy. Therefore, the impact of BVDV infection may go beyond the increased susceptibility to other pathogens during acute infection, BVDV may lead to prolonged altered protective immune responses to other pathogens due to the effect on the thymus on young animals. The project will specifically evaluate the magnitude and kinetics of specific humoral and T cell responses of calves previously exposed to BVDV on a subsequent viral infection and the impact on the thymus function. (3203)

**Sponsors:** Oklahoma Agricultural Experiment Station  
**PI/PDs:** Fernando V. Bauermann, Mayara Maggioli, Jared Taylor

**Regulation of bovine herpesvirus 1 gene expression by pioneer transcription factors**  
Bovine Herpesvirus 1 (BoHV-1) is a major cattle pathogen and a leading cause of disease in bovine herds. Following acute infection, BoHV-1 establishes lifelong latency in sensory neurons, with periodic reactivation and recurrent disease. We have identified several key hormone receptors that regulate BoHV-1 lytic gene expression, specifically ICP0 and ICP4. The androgen, glucocorticoid and progesterone receptors activate the immediate early transcription unit 1 promoter, which drives ICP0 and ICP4 expression, cooperatively with the stress-induced Krüppel-like transcription factor 15 (KLF15) when stimulated by their respective hormone. Additionally, these receptors activate ICP0 through a separate early promoter independent of hormone treatment, in cooperation with KLF4. These data suggest that changes in hormone levels can aggravate BoHV-1 productive infection and induce reactivation of latent virus genomes. (3205)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Jeffery Ostler
Maintenance of bovine herpesvirus 1 latency by viral and cellular factors.
During bovine herpesvirus 1 (BoHV-1) latency, viral DNA persists in latently infected neurons. Stress can trigger reactivation from latency and virus shedding. The focus of studies in this grant is to understand how BoHV-1 establishes and maintains latent infections in neurons. Recent studies revealed that viral genes abundantly expressed during latency reprogram expression of certain bovine genes in latently infected neurons to prevent cell death, ensure latently infected neurons perform normal functions, and interfere with viral gene expression following low levels of stress. This knowledge is predicted to develop novel strategies designed to impair reactivation from latency. (3236)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Clinton Jones

ENTOMOLOGY & PLANT PATHOLOGY

Biology, ecology, and integrated management of turfgrass disorders caused by fungi and nematodes
Turfgrasses grown in Oklahoma can be damaged by a variety of diseases and pests. The objectives are to characterize the biology of important turfgrass pathogens and to develop integrated management strategies for these pests. The interaction of a fungal pathogen of bermudagrass and host plant varying in disease susceptibility continues to be investigated. The genomes and transcriptomes of both the host and the fungi are being utilized to study the interaction. Additional efforts include the characterization of elicitors responsible for disease and improving genetic disease resistance. Screening of bermudagrass germplasm has expanded to include nematodes and other common soilborne diseases such as root-decline of warm-season grasses. Current integrated pest management approaches used for turfgrass continue to be evaluated and modified. (3034)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Nathan Walker, Stephen Marek
Plant & Soil Science: Yanqi Wu

Pest management of fly pests impacting Oklahoma beef production systems
Oklahoma is ranked second nationally in cow calf production and is the largest animal commodity market within the state. Arthropods associated with the cattle industry have been estimated to cause trillions of dollars in losses nationally to producers annually. Biting flies are considered one of the most important external parasites affecting cattle production. This project will address two broad areas related to biting fly associations to cattle in Oklahoma: 1) new technologies for management of biting and nuisance flies in beef cattle systems, and 2) characterize population biology of biting and nuisance flies. (3036)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Justin Talley

Filling the Gaps in Crop Biosecurity: Training Graduate Leaders in Plant Pathogen Forensics
Forensic studies in plant pathology is an important component of agricultural biosecurity. The need to train highly qualified students capable of moving into law enforcement, diagnostics, and intervention positions at borders is constantly present because of the rapid and almost unobstructed entryways for foreign plant disease agents on imported commodity crops and plant products. To that end, three of the four national needs fellows have completed their degrees as doctoral or master’s students at Oklahoma State University. The final master's student is currently enrolled and an on-time completion is anticipated. The graduate student projects are diverse: detection of foodborne pathogens on plants using NGS technologies; study of grape-infecting viruses and pathways of infection, food safety diagnostics, and development of cereal-infecting pathogen diagnostic assays. (3037)
Extracellular Signal Transduction of Insect Immunity by Serine Proteases
We have examined the proteomes of hemolymph from prepupae, pupae, and adults. Drastic changes in the storage proteins and lipophorins reflect physiological differences in these stages. Defense proteins detected include 54 serine protease-related proteins. Some of them are members of the immune signaling network discovered in feeding larvae, and others may confer new features to the network in the later life stages. The proteins and their levels revealed in this study, together with their transcriptome data, are expected to stimulate focused explorations of humoral immunity and other physiological processes in wandering larvae, pupae, and adults. (3054)

Sponsors: NIH, Oklahoma Agricultural Experiment Station
PI/PD: Haobo Jiang

Biological Control of Arthropod Pests and Weeds
The major goal of this project is to characterize, evaluate and incorporate the impact of biological control agents and other beneficial insects into integrated pest management programs. Specifically, project members are describing the spatial and temporal patterns of aphid parasitism and pollination in agriculture landscapes of the Southern Plains, documenting competitive outcomes among parasitoids, describing natural enemy ecology in sorghum and wheat systems, and developing management programs that integrate bio-rational insecticides, host-plant resistance, and conservation biological control. (3075)

Sponsors: Oklahoma Agricultural Experiment Station, USDA-NIFA
PI/PD: Kristopher Giles

Biology, Ecology, and Pest Management of Wood-Destroying Termites
A survey of ant diversity across Oklahoma is continuing, providing information on ant biology, and spread of Fire Ants. Research clarifying effects of habitat-restorative prescribed fire on termite foraging behavior within a sagebrush mountain habitat are completed and submitted for publication. Effect of 'biochar' carbon-replacement amendments to soil on a conifer salvage cut site relative to subterranean repopulation continues, providing information on termite foraging and recycling of woody debris. A study with termite bait systems is underway, providing information on bait location by termites. Termite contributions to metabolic gas flux on Oklahoma's Tallgrass prairie are evaluated and submitted for publication. (3084)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Brad Kard

Ecological and social determinants and management of arthropod-borne diseases of public and veterinary health in South Central United States
This project continues to focus on understanding the underlying determinants involved in the transmission and ecology of tick/mosquito-borne diseases in Oklahoma. Specific projects continue to focus on how invasive plant species in the Great Plains are contributing to the spread of vector-borne disease in the region. Additionally, we have surveyed what university students in the region know about ticks and tick-borne pathogens. Ongoing studies are identifying bacterial species in fleas obtained from companion animals that are human pathogens. (3085)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Bruce Noden
Molecular and applied aspects of fungicide hormesis in fungi and oomycetes

Our research focused on fungicide sensitivity and hormesis (high-dose inhibition/low dose stimulation) in fungal pathogens of onion, grape, and ornamentals, and in fluorescent transformants of *Fusarium*. Significant growth stimulation of one strain each of two *Fusarium* species was observed at concentrations of iprodione below the recommended doses for disease management, in pure cultures and during infection of plant tissues. Differential gene expression assays were conducted to examine the activity of metabolic pathways of a *F. proliferatum* isolate during hormetic stimulation compared to fungicide-free controls. Changes in expression were observed in 177 genes (117 upregulated, 60 downregulated). Upregulation of genes involved in detoxification processes, production of secondary metabolites and carbohydrate metabolism were observed during stimulatory responses. (3095)

**Sponsors:** Oklahoma Research Experiment Station, ODAFF
**PI/PDs:** Stephen Marek
Delaware Valley University: Carla Garzon

A field deployable Rapid Anaplasma Detection (RAD) kit for screening three Anaplasma species infecting livestock

This USDA-NIFA-AFRI Seed project focuses on detecting three major blood-born diseases (Anaplasma marginale, A. phagocytophilum, and A. ovis) that affect cattle and sheep worldwide. To date, here is only a commercially available test provided by certified diagnostic veterinary laboratories to test cattle blood for bovine anaplasmosis. The goal of this project is the development of a specific and sensitive field-deployable Rapid Anaplasma Detection (RAD) kit for the economical, large scale, and rapid screening of livestock (mainly cattle and sheep) that is a low cost easy-to-use, and accurate for the detection of three Anaplasma species. (3097)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-NIFA-AFRI
**PI/PD:** Bruce Noden

Fly Management in Animal Agriculture Systems and Impacts on Animal Health and Food Safety

Pestiferous flies are among the most important pests in livestock and poultry production systems. These flies are responsible for damage and control costs in excess of a billion dollars per year in the United States. In addition to the direct damage these flies inflict upon livestock, their presence as a byproduct of confined livestock and poultry operations has been repeatedly cited as a nuisance, especially when flies enter the vicinity of human habitations. Recently, the threat of African Swine Fever virus has led to research focused on the role flies play in animal mortality management systems associated with mass euthanasian of infected swine carcasses. Successful completion of this project will provide a better understanding of the interactions between livestock production systems and the life cycles of pestiferous flies. (3110)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PDs:** Justin Talley, Astri Wayadande, Bruce Noden

Improving Soybean Arthropod Pest Management in the U.S.

We will conduct surveys and research/demonstrations projects that evaluate insect control in soybean arthropod pests. Projects included insecticide evaluations, date of planting evaluations. Project goals are to 1) document changing soybean pest and beneficial arthropod assemblages that feed on soybean leaves, stems, roots, nodules, and pods, 2) educate farmers, industry, colleagues, the public, and agricultural professionals using traditional tools and innovative methods, and 3) develop coordinated best management practices (BMPs) for soybean arthropod management. (3115)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA
**PI/PDs:** Tom Royer, Ali Zarrabi
Biology, Etiology, and Management of Dollar Spot in Turfgrasses

Turfgrasses are one of the largest cultivated plants in the United States and provide numerous benefits to society and the environment. Dollar spot, a disease caused by a fungus, is the most common, widespread, and therefore the most important and destructive disease of turfgrasses. Management of dollar spot is most often through the use of fungicides, especially where the turfgrass is intensively maintained. The fungus that causes dollar spot has repeatedly developed resistance to many groups of fungicide rendering those chemistries ineffective. This effort proposes to utilize several cultural approaches to managing dollar spot without or with minimal use of fungicides. Nitrogen fertilization is known to influence dollar spot severity and this study will attempt to find a fertilization rate that maximizes turfgrass quality and minimizes dollar spot disease of bermudagrass. (3119)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Nathan Walker
Horticulture & Landscape Architecture: Charles Fontanier

Detection and Diagnostic Methods for Agricultural Biosecurity and Forensic Plant Pathology Applications

This research contributes to biosecurity, forensic plant pathology developing diagnostic support tools for prioritization, emergency management, alternatives for biomedical surrogate research, and prediction of biosecurity threats: 1) viruses infecting wheat, cucurbits, ornamentals (roses), waterborne plant viruses, and microbes threatening Oklahoma’s agriculture, 2) methods for regulatory plant health emergencies and microbial forensics (EDNA), 3) develops and adapt technologies for sampling, molecular identification, and discrimination of microbial genomic landmarks (EICD). Three scientific articles in refereed journals were published.

Sponsors: Oklahoma Agricultural Experiment Station, OSU Office of the Vice President for Research and Technology Transfer, ODAFF-SCGP, USDA-NIFA-SCRI
PI/PD: Francisco, Ochoa-Corona

Characterizing and Enhancing the Activities of Beneficial Insects in Range Ecosystems.

Cattle contribute more than $5.40 billion to Oklahoma’s economy with herd health and weight gain being influenced by pasture conditions and arthropod pests. This project seeks to characterize the biology of beneficial insects as part of developing integrated pest management strategies. Statewide grasshopper sampling has updated species distribution and potential for outbreaks while surveys of dung beetles have characterized the community and its role in manure degradation. The influence of prescribed fire on insect faunas are now being investigated. (3155)

Sponsors: Oklahoma Agricultural Experiment Station, USDA ARS, US ARMY National Guard, Tulsa Zoo, Cherokee Nation
PI/PD: W. Wyatt Hoback
Preserving Effectiveness of Phosphine and Increasing IPM use for Stored Grain Insects
Research is being conducted to detect phosphine resistance and to develop robust phosphine resistance management strategies. Investigation of functional and numerical responses of two predatory mites Cheyletus eruditus and Cheyletus malaccensis to Liposcelis decolor is conducted to assess their potential for use as biological control agents for the management of stored product psocid pests. Scaling of novel technologies is conducted for improved storage of cereal grains and pulses. (3156)

**Sponsors:** Oklahoma Agricultural Experiment Station, USAID Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss (PHLIL)

**PI/PDs:** George P. Opit  
USDA ARS CGAHR: Paul Armstrong  
KNUST: Enoch Osekre

Insect Transmission of Plant and Human Pathogens
This project focuses on the transmission biology of hemipteran and dipteran vectors of phytopathogenic and human viruses and bacteria. To understand leafhopper transmission efficiency, genomic and transcriptomic sequencing was performed on vector and non-vector leafhoppers. Comparisons revealed gene and transcript differences between the two groups indicating that several key genes may regulate the ability to acquire and transmit plant pathogens. Feeding activities, including pathogen acquisition and inoculation behaviors, of leafhoppers, planthoppers, mosquitoes and aphids were studied by electropenetrography. (3168)

**Sponsors:** Oklahoma Agricultural Experiment Station, NSF, USDA NIFA, and Department of Defense (DARPA) Insect Allies

**PIs/PDs:** Astri Wayadande, Li Ma, Francisco Ochoa-Corona  
University of Illinois: Chris Dietrich, Dmitry Dmitriev  
Ohio State: Guoliang Wang  
USDA: Lucy Stewart, Peter Kurti-Balint  
North Carolina State: Dorith Rotenberg, Anna Whitfield, Tim Sit, Max Scott, Marce Lorenzen

Biology of Fungi Affecting Oklahoma Crops
This research investigates the biology and virulence of plant pathogenic fungi affecting Oklahoma’s agricultural and horticultural crops and natural ecosystems. Genomics, molecular and cell biology, and population biology are used to elucidate the molecular mechanisms of pathogenic fungi infecting economically important crop plants and model plants. Fungal plant diseases under investigation include wheat tan spot, switchgrass rust, alfalfa leaf spots, Phymatotrichopsis root rot, onion salmon blotch, bermudagrass spring dead spot, and Botrytis blight. Applications of fungi in biofuel feedstock saccharification, biological control of insects, mushroom cultivation, and mycotoxin contamination also are under study. (03175)

**Sponsors:** Oklahoma Agricultural Experiment Station, NSF-EPSCoR, Noble Foundation, ODAFF, OWRF, USDA-NIFA, DOE

**PI/PDs:** Stephen Marek, Robert Hunger, Nathan Walker, Eric Rebek, Biosystems & Ag Engineering: Danielle Bellmer  
Delaware Valley University: Carla Garzon  
Noble Research Institute: Carolyn Young  
University of Arizona: Barry Pryor

Biology, Ecology & Management of Emerging Disease Vectors
This project focuses on understanding the underlying determinants involved in the transmission and ecology of regional tick/mosquito-borne diseases in the southern Great Plains. Specific projects include
ecological studies of medically important mosquito and tick species. Current studies are focused on how an invasive plant species in the Great Plains is contributing to ecology of WNV in the region. Ongoing studies are focusing on identifying the potential for flea/mite-borne pathogens in the region as well as mosquito genetics. (3186)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Bruce Noden

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**Decontamination of Foodborne Pathogens on Produce by Atmospheric Cold Plasma**

Decontamination of foodborne pathogens from foods is critical to human health and food industry. Research studies have been conducted during this period that include 1) optimizing cold plasma actuator design and 2) validating the improved design on inactivation of foodborne bacterial pathogen and mycotoxin-producing fungal spores on glass coverslips. The results showed that the electrode width, not gaps, has significant impact on the inactivation of the pathogens including spores. Additional studies are ongoing to evaluate the impact of power input and pulse interval on inactivation efficiency. (3195)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Department of Agriculture, Food and Forestry, USDA National Needs Fellowship Program

**PI/PD:** Li Maria Ma

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**Development of Value-Added Products from Food Industry Waste**

Brewer's Spent Grain (BSG) is a processing waste generated in large quantities by the brewing industry. It is estimated that over 38 million tons of BSG is produced worldwide each year, and is usually used as animal feed, composted, or thrown into landfills. BSG contains valuable nutritional components, including protein, fiber, and antioxidants, but has seen limited use in food products for human consumption. The goal of this project is to develop value added products from the spent grain, including pet treats and snack foods. An artisan snack chip product is being developed that utilizes significant quantities of BSG and embraces the robust flavor and texture of the spent grain. (3086)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Danielle Bellmer
Value-added Processing of Pecan Nut Shells

Pecan nuts are native to Oklahoma. Over 16 million pounds of pecan nuts are produced in the state annually. Despite the large production, value-added processing of pecans is not well developed, and the value generated by this industry remains to be relatively low. Shell accounts almost half of the nut weight. Industrial processing produces large amounts of shells as byproducts which are currently used in low value applications such as gardening aid. Hence, shells have economic significance to pecan growers and processors. This study explores valorization of the pecan processing industry byproducts. Aqueous ethanol (70% ethanol), microwave and sonication aided water and subcritical water (pressurized water) extraction techniques are being examined for their efficacy for recovering health beneficial and biologically active compounds naturally present in pecan nut shells. Chemical composition and biological activity of the extracts obtained from two different industrial byproduct streams and five pecan cultivars have been evaluated. So far, we have demonstrated that crude aqueous ethanol extracts prepared in the lab possess strong antioxidant activity and inhibit human cancer cell growth. Our ongoing research focuses on optimization of other environmentally benign and sustainable extraction techniques, crude extract purification, testing efficacy of the purified extracts and formulation of consumer products for food and industrial applications. (3087)

Sponsors: US Department of Agriculture through Oklahoma Department of Agriculture, Food and Forestry-ODAFF, Specialty Crops Program.
PI/PD: Nurhan Turgut Dunford

Impacts of Changing Food Safety Policies and Product Verification Strategies on the Production and Marketing of Food and Fiber Products

Work was conducted to estimate the impacts of food trends and food safety policies on Oklahoma food businesses, in addition to analyses of value-added processing options for byproducts from food processing. Research projects were also completed regarding the costs of procuring and transporting switchgrass feedstock for bio-refineries. Results from this latter study were published this year. (3088)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Rodney B. Holcomb

Promoting the food safety of fruit and vegetable-based foods and evaluating the processing potential of Oklahoma produced and/or processed specialty crops.

The goal of this research project is to promote the creation of safe new food products and to help expand existing markets for Oklahoma’s fruit and vegetable producers and processors. Specific project goals are to identify and investigate the winemaking potential of fruit crops in Oklahoma with an emphasis on evaluating varieties, cultural practices, and winemaking techniques, enhance the safety of fresh and processed fruits and vegetables with an emphasis on developing effective strategies for smaller-scale growers and processors, and develop new, high-value processed specialty crop products with an emphasis on product and process development. (3089)

Sponsors: National Institute for Food and Agriculture, Oklahoma Agricultural Experiment Station
PI/PD: William McGlynn

Detection, Characterization, and Inhibition of Foodborne Pathogens, Toxins, and/or Spoilage Microorganisms

This project involves the detection, isolation, and characterization of pathogenic and spoilage microorganisms in food and food processing environments. The purpose is to reduce the incidence, survival, and/or proliferation of pathogenic or spoilage microorganisms in food using physical processes
(radiant heat, submersion in hot water, hot water shower), chemicals (antimicrobials, nitrite), or biological interventions (bacteriocins, bacteriophage). Although pathogens are of strong concern to food manufacturers, perhaps nothing presents as much a day-to-day problem as do losses resulting from spoilage organisms. In many cases, addressing spoilage organisms inadvertently also addresses pathogens as well. This work may involve genetic/microbiome analysis, differentiation, and rapid detection methods in the characterization of problem pathogens/spoilage organisms to understand them so that interventions may be better applied. Studies may also involve the use of nonpathogenic ‘surrogate’ microorganisms that can take the place of pathogenic strains so that intervention strategies may be examined directly in working food processing environments. (3090)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI:** Peter Muriana

**Rheological and Sensorial Properties of Grain Products**  
Cereals and grains represent a rich source of nutrients for humans. The goal of this research project is to develop analytical tools, products and processes to understand and improve the quality of grain products. We emphasize the study of viscoelastic properties and food sensory analysis of grain products. Specific aims also include adding value to grain products via processing such as spontaneous or specific fermentation and addition of ingredients that enhance processing, nutritional status, sensory and shelf life attributes of grain products. Examples include grain products with improved nutritional value, protein, antioxidant and fiber content. (3091)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA  
**PI:** Patricia Rayas-Duarte

**Coordinating the Research Efforts within the Robert M. Kerr Food and Agricultural Products Center.**  
The mission of the Robert M. Kerr Food & Agricultural Products Center (FAPC) is to discover, develop and deliver food and fiber value-added products and processes that help stimulate the growth of the Oklahoma food and agribusiness industries. This past year, the FAPC assisted 112 Oklahoma businesses representing 57 communities and 45 counties, resulting in revenue impacts of more than $6 million in annual sales. Additionally, the FAPC incubated 7 start-up businesses in 2020. The FAPC trained and educated 358 food industry employees in 2020 in contemporary food safety and security, best manufacturing practices, and food product development. The FAPC works with state and federal agencies and economic development offices across Oklahoma to deliver effective and impactful results. (3092)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** J. Roy Escoubas

**Development and Evaluation of Effective Intervention Strategies to Reduce the Occurrence of Shigatoxigenic Escherichia coli and their Biofilms in the Food Industry**  
Efficacy of bacteriophages (individually or cocktails) to prevent or correct *E. coli* O157:H7 attachment to intestinal cells (Caco-2) was investigated. Phages, used alone, effectively prevented pathogen attachment to intestinal cells, reducing population by 2.7 logs CFU/cm² compared to the control (4.4 logs CFU/cm²). Corrective treatment reduced pathogen population by 1.4 logs CFU/cm² (control-5.2 logs CFU/cm²). Phage-cocktail was more effective as a corrective treatment, showing 2.6 logs CFU/cm² reduction, compared to the control (4.1 logs CFU/cm²) while the preventive treatment reduced *E. coli* O157:H7 population by 2.0 logs CFU/ cm² (control-2.0 logs CFU/ cm²). (3098)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI:** Divya Jaroni
Texture measurement and use in food processing

Inexpensive and easy-to-use tools and procedures for texture measurement of foods and agricultural products will be developed. Improved access to texture measurement tools and methods will impact product quality and safety, especially for startups and small organizations. (03164)

**Sponsors:** R.M. Kerr Food & Ag Products Center, Biosystems & Ag Engineering, USDA NIFA

**PI/PD:** Timothy Bowser

**HORTICULTURE AND LANDSCAPE ARCHITECTURE**

Turfgrass Selection and Management for Sustainability in a Multi-stress Environment

This project will improve on the limitations of existing turfgrasses through the screening of new experimental bermudagrasses and zoysiagrasses for improved shade tolerance and drought resistance. Newly developed varieties from breeding programs across the southern region will be planted in the field under shaded environments, and the best performing plants advanced for further screening of other traits. (3039)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Charles Fontanier

Reducing Tillage and Improving Soil Quality for Oklahoma Vegetable Production

The project evaluated summer and winter cover crops for soil improvement for cool- and warm-season vegetable crops. Crops trialed in the different cover crop treatments included Southern pea and sweet potato. Cultivar trials included replicated trials with Brussel Sprouts and lettuce. Trial results will be available in the 2021 Vegetable Trial Report MP-164 available on-line at http://www.hortla.okstate.edu/outreach/vegetables. (3068)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Lynn Brandenberger, Niels Maness, Bizhen Hu

Plant & Soil Sciences: Hailin Zhang, Misha Manuchehri, Tyson Ochsner

Field & Research Services Unit: Joshua Massey

Flowering Management: Minimizing the Harms Caused by Spring Freeze in Pecans

Threshold temperatures and levels of carbohydrates and hormones in pecans during spring freeze events were studied to understand the effect of temperature on flower development. Our results revealed Kanza as the most susceptible cultivar when compared to other popular pecan cultivars. Temperatures from 32°F to 39°F were found to have adverse effects on different stages of development. Stigma cells collapsed on the flowers with 39°F treatment at the early bloom stage. Sugar content in shoots and flowering-related hormone gibberellin was significantly increased which could be related to the triggering of secondary buds which provides a second chance at flowering. (3121)

**Sponsors:** Oklahoma Department of Agriculture, Food, & Forestry Specialty Crop Grant Program, J.D. (Scotty) Scott Horticulture Research Endowed Professorship, Oklahoma Agricultural Experiment Station

**PI/PDs:** Lu Zhang, Niels Maness

Evaluation of More Efficient Practices and Technology in Controlled Environments for Ornamental and Food Crop Production

Hydrogen peroxide products have been shown to reduce algae numbers while also boosting oxygen levels. Application rates and timing for Zerotol and PERpose Plus, both hydrogen peroxide products, are being established for lettuce and basil grown in Ebb and Flood systems in a greenhouse. Water temperature is known to affect plant growth and quality of hydroponic crops, so a replicated trial to determining optimum water temperature for several different types of basil using nutrient film
technique with the addition of water chillers is underway. Colored shade nets may have advantages in terms of light quality over traditional black. A new trial on use of colored shade nets on ornamentals (dahlias and snapdragons) and vegetables (lettuce and basil) to improve growth and quality has been initiated. Results will be shared with the industry through site visits, presentations, and publications. (3124)

**Sponsors:** Oklahoma Agricultural Experiment Station, ODAFF Specialty Crop (USDA-AMS)

**PI/PD:** Bruce Dunn

**Postharvest Handling and Processing Systems for Horticultural and Alternative Agricultural Commodities**

The research develops postharvest handling and quality analysis procedures necessary for new crop/new use production/harvesting/processing systems to provide alternatives for Oklahoma producers and food processors. The quality of Oklahoma grown lettuce is being assessed in terms of bitterness (sesquiterpene lactones) and sweetness (soluble sugars) and possible conditions to improve flavor (reduced bitterness/increased sweetness) are being explored in the field and hydroponic production systems. Pecan oil obtained from nutmeats of two cultivars, of six native populations, and cold-pressed oil produced in Oklahoma are being assessed for potential variability of quantities of key nutritional compounds in various Oklahoma locations. Gamma tocopherol and beta-sitosterol are targeted for putative activity against diabetes and squalene is targeted for sunburn protection. Storage conditions that maintain high levels of these phytochemicals are also being investigated. Eastern red cedar harvesting and extraction technologies for the production of podophyllotoxin as a medical ingredient have been developed. Podophyllotoxin purification from the extract is being achieved to produce a new Oklahoma pharmaceutical product. Scale-up studies may assist the development of a new use for this invasive species. (3145)

**Sponsors:** Oklahoma Agricultural Experiment Station, ODAFF Specialty Crop Block Program, OCAST Plant Science

**PI/PD:** Niels Maness

**Investigations of Turfgrass Abiotic Stress**

The goal of this project is to promote urban environmental sustainability, efficient use of water, and to reduce lawn inputs through the development, testing, and selection of bermudagrasses with improved abiotic stress tolerance for sod production and fine turf, lawn, and landscape use in Oklahoma and the U.S. transition zone. Several bermudagrass genotypes were field established in 2020 for evaluation and data was collected in 2021. Establishment rate, turfgrass quality, leaf firing, and digital image analysis data were collected during the growing season. This is a multi-year evaluation process and data will continue to be collected through future growing seasons. Ultimately, improved genotypes will be selected based upon seasonal water use requirements, drought resistance characteristics, and winter hardiness. (3146)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA

**PI/PD:** Justin Quetone Moss

**Integrated Resource Management Systems for Turf-type Plant Culture in Oklahoma**

Testing in 2021 continued Kentucky bluegrasses, Kentucky bluegrass X Texas bluegrass hybrids, tall fescues, seashore paspalums, buffalograsses, and zoysiagrasses for winterkill, general field performance and summer diseases. Slight differences in brown patch disease resistance were found among turf-type tall fescues. Large differences were present among bluegrasses for stem rust resistance. Testing of advanced experimental OSU bermudagrasses continued. Accessions of low-mowing-tolerant and winter-tolerant genotypes of common bermudagrass were collected from a golf course for future breeding
purposes. Entries in a 2019-planted national bermudagrass trial were evaluated for general field performance in addition to divot recovery in July - August 2021. (3196)

**Sponsors:** United States Golf Association, Oklahoma Golf Course Superintendents Association, Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Extension Service, Oklahoma State Regents for Higher Education, Specialty Crops Research Initiative – National Institute for Food and Agriculture, Huffine Professorship through the OSU Foundation

**PI/PDs:** Dennis Martin, Justin Moss, Charles Fontanier
Plant & Soil Sciences: Yanqi Wu
Entomology & Plant Pathology: Nathan Walker
Texas A&M University: Ambika Chandra, Ben Wherley
University of Georgia: Brian Schwartz, Paul Raymer
North Carolina State University: Susana Milla-Lewis, Grady Miller
University of Florida: Kevin Kenworthy

**COLLEGE OF EDUCATION AND HUMAN SCIENCES**

**Human Nutrition, Health and Consumer Issues**
The purpose of this project is to manage funds awarded to Human Sciences’ faculty investigators who are supported by the Oklahoma Agricultural Experiment Station to explore novel approaches to current issues related to human nutrition and health, as well as safety and consumer issues. (3074)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Christine Johnson

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**Role of the Anti-Inflammatory Interleukin-10 in Attenuating Obesity and Insulin Resistance**
Obesity and type 2 diabetes (T2D) are all major health issues in the US. In 2015, 30.3 million Americans (9.4%) had diabetes and another 84.1 million had pre-diabetes. Chronic inflammation produced by activated immune cells damage many tissues and is implicated in the development of obesity, insulin resistance (IR), and T2D. This study is investigating the role of the anti-inflammatory molecule interleukin (IL)-10 in the development of IR in IL-10 knock-out mice. Our findings will demonstrate the role of IL-10 in obesity and IR and help develop prevention and treatment strategies to reduce the impact of these conditions. (3104)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Edralin Lucas

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**Anti-Inflammatory Properties of Interleukin-10: A Novel Target to Mitigate Age-related Osteosarcopenia**
The decline in muscle and bone, a condition known as osteosarcopenia, begins in the 4th decade of life. It has significant consequences on health due to the decline in strength, endurance, and risk for chronic disease. Components of the immune system have the capacity to protect against these age-related, musculoskeletal changes. This project aims to determine: 1) how the anti-inflammatory effects of IL-10 protect against osteosarcopenia and the influence of the Western diet on this response; and 2) whether the immunomodulatory effects of shortchain fatty acids on T cells within the gut can counter this response. (3105)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Brenda Smith
Developing Synergistic Approaches to Healthy Weight in Childhood through Positive Relationships, Diet Quality and Physical Activity
As an active member of the W3005 research working group, the investigator made the following contributions to the W3005 umbrella review: reviewed and edited search strategy, performed full-text reviews, contributed to updated PROSPERO protocol, and conducted a quality assessment of final articles. As an active member of the W3005 Extension working group, the investigator participated in the iterative review process that led to the development of the W3005 COPPER rubric and contributed to the development of Qualtrics surveys to collect descriptive data on the wide range of childhood obesity prevention programs in Extension. In her role as W3005 chair, she mentored and monitored working group progress. (3117)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Laura Hubbs-Tait

Nutrient Bioavailability - Phytonutrients and Beyond
This project is to determine the bioavailability of food bioactive components in humans and mouse models. We also will determine the efficacy and mechanisms of action of these compounds in promoting gut health, chronic and acute inflammation, obesity and diabetes, and influenza A virus infection, through omics, physiological, and biochemical approaches. (3120)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Dingbo Lin

Personal Protective Technologies for Current and Emerging Occupational and Environmental Hazards
As an active member of USDA NC-170 Research Group, the investigator contributed: 1) to develop a Protective Textile and Clothing Laboratory at Oklahoma State University; 2) to characterize the protective and comfort performance of textile and clothing materials using state-of-the-art equipment; 3) to implement statistical and computational modeling techniques to analyze the protective and comfort performance of textile materials; 4) to develop interdisciplinary research collaboration with eminent professors in the field of protective textiles and clothing, and 5) to disseminate the research on protective textiles and clothing in scientific journals and conferences. (3202)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Sumit Mandal

NATURAL RESOURCE ECOLOGY AND MANAGEMENT

Functional Diversity and Resilience in Oklahoma Forests
The overarching goal of this research is to identify forest management practices that enhance the resilience of forest plant communities to unplanned disturbances. This work will help to bridge the gap between ecological mechanisms that affect resilience, and management practices that are based upon these concepts. (3015)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA
PI/PD: Bryan Murray

An Assessment of Opportunities and Obstacles Associated with Alternative Land Management Practices in Oklahoma
The objective of this research is to explore stakeholder opinions and concerns concerning alternative land management practices that support a better state of the Cross-timbers region, a large and
relatively intact ecosystem stretching from southern Kansas through central Oklahoma and into Texas. (3042)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma Department of Wildlife Conservation, Oklahoma Center for the Advancement of Science and Technology

**PI/PD:** Omkar Joshi

**Report of Research Efforts Related to Fisheries, Forestry, Rangeland and Wildlife Resources in the Department of Natural Resource Ecology and Management**

This project will coordinate the reporting of research efforts by first year tenure-track and non-tenure track faculty not associated with individual Hatch and McIntire-Stennis projects. These research projects explore novel approaches to current issues related to natural resources, ecology, and conservation issues in the areas of fisheries, forestry, rangeland and wildlife resources. (3051)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA

**PI/PD:** R. James Ansley

**Impacts of the Thermal Environment on Galliformes**

The primary goal of this research is to expand our current understanding of habitat for Galliformes in the southern Great Plains. Specifically, we will address what constitutes cover for greater prairie-chickens and wild turkey by gaining insight into how these birds relate to temperature variation on the landscape and how this variation is related to vegetation structure and composition. Data from this project will enable land managers to make informed decisions that account for the full habitat requirements of our target species and help to ensure resiliency in the face of climate change. (3056)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma Department of Wildlife Conservation

**PI/PD:** R. Dwayne Elmore

**Effects of Management and Climate Variability on Productivity and Value for Different Mixes of Timber, Cattle Grazing, and Wildlife**

The ultimate goal of this project is to facilitate sustainable management of the forest-grassland ecotone for different combinations of objectives such as timber, grazing, and wildlife habitat based on recent conditions and to adapt management to mitigate the negative effects of future drought and potential climate change. (3073)

**Sponsors:** USDA NIFA, Oklahoma Agricultural Experiment Station

**PI/PD:** Rodney E. Will, Jr., Omkar Joshi, Chris B. Zou

**Wood Composites Manufactured from Eastern Redcedar Using Modified Starch as Binder**

Manufacturing wood composite panels is a viable potential to add value to Eastern redcedar, an invasive and otherwise underutilized species in Oklahoma. In addition, this project will investigate using starch, a green adhesive, in the manufacturing process. (3094)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA

**PI/PD:** Salim Hiziroglu

**Developing Mycorrhiza Smart Agriculture: Linking Crop Production and Nutrition with Beneficial Soil Fungi**

Arbuscular mycorrhizal (AM) fungi increase host-plant nutrient and water uptake while enhancing soil quality, presenting an opportunity to address food production challenges, such as resource-use efficiency. This project’s goal is to develop Mycorrhiza Smart Agriculture by examining how plant
genetics, farm management, and soil amendments influence AM fungal abundance, diversity, and benefits in agroecosystems. (3144)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA
**PI/PD:** Adam B. Cobb

**Managing Above- and Belowground Linkages to Improve Rangeland and Agricultural Production and Sustainability**
This research will inform rangeland managers and crop breeders on belowground characteristics that may improve soil health, decrease agricultural inputs, and increase soil carbon storage, all without a loss in production. (3149)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA
**PI/PD:** Gail W. Wilson

**Understanding and Managing Human-caused Mortality Sources for North American Birds, Including Forest-inhabiting Species**
Understanding and reducing human-caused mortality of birds is beneficial to the citizens of Oklahoma, the United States, and beyond because birds provide invaluable ecosystem services, including insect pest control, plant pollination, herbaceous and woody plant seed dispersal, and provision of recreational opportunities and aesthetics. (3150)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA
**PI/PD:** Scott R. Loss

**Silviculture of Forest and Woodland Communities in Oklahoma to Enhance Productivity and Water Use**
The goal of this research is to investigate how the management of forests and woodlands in Oklahoma can be used to increase the economic value and ecosystem services important to residents. (3151)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA
**PI/PD:** Rodney E. Will, Jr.

**Hydrological Impact of Alternative Vegetation and Land Uses in the Forest-grassland Transition in the South-central Great Plains**
The overall goal of this project is to quantify the water quantity and quality response under different vegetation types and their change associated with the establishment of restored prairie and switchgrass. This information will become necessary for landowners, natural resources managers, and Native American tribes to manage their land in an environmentally sustainable manner in the south-central Great Plains, especially the Cross-timbers in Oklahoma. (3152)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA
**PI/PD:** Chris B. Zou
Managing Rangelands to Simultaneously Promote Livestock Production, Control Invasive Species and Maintain Biodiversity
Incorporating strategies to support biodiversity into rangeland management practices has the potential to substantially contribute to conservation. The overall goal of this research is to optimize conservation of biodiversity and maintenance or enhancement of agricultural productivity on privately-owned rangelands. (3153)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA, The Nature Conservancy, Tallgrass Prairie Preserve, Oklahoma Department of Wildlife Conservation
PI/PD: Samuel D. Fuhlendorf

Developing Conservation Strategies for Biodiversity in Grasslands
The general objective of this project is to examine the response of wildlife populations, predominantly avian species, to landscape changes at multiple spatial and temporal scales in grasslands in western Oklahoma. (3197)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA, Oklahoma Department of Wildlife Conservation, Oklahoma Cooperative Fish and Wildlife Research Unit
PI/PD: Craig A. Davis

Sustainability of Freshwater Fish Harvest from Public Waters
The overall goal of this research is to provide knowledge necessary for the wise management of sportfish populations in river, lake and reservoir systems in Oklahoma and throughout the US. (3198)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA, Oklahoma Department of Wildlife Conservation, Oklahoma Cooperative Fish and Wildlife Research Unit
PI/PD: Daniel E. Shoup

Spatial Ecology and Expansion of Recolonizing Black Bear Populations in Eastern Oklahoma
The goal of this research is to develop a more detailed understanding of the spatial ecology of recolonizing black bear populations in human-dominated landscapes which will help predict range expansion by black bears, anticipate potential for bear-human conflict, and identify, on a spatial scale, potential for black bear-human coexistence. (3199)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA, Oklahoma Department of Wildlife Conservation, Oklahoma Cooperative Fish and Wildlife Research Unit
PI/PD: W. Sue Fairbanks

Supporting Vital Rates for Native Birds on Working Lands in Oklahoma
Over the next five years, the objectives of this project will be to continue to provide information to stakeholders that can be incorporated into specific actions to improve fitness outcomes for native birds in Oklahoma. (3200)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA, Oklahoma Department of Wildlife Conservation, Oklahoma Cooperative Fish and Wildlife Research Unit, Oaks and Prairies Joint Venture
PI/PD: Timothy J. O’Connell
Understanding and Predicting Forest Dynamics in Oklahoma in Response to Multiple Disturbances
The ultimate goal of this project is to determine the mechanisms driving the heterogeneity of forest dynamics and improve predictions of future forest dynamics in response to disturbance in Oklahoma. (3208)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA, University of Arizona, University of Florida
PI/PD: Lu Zhai

Economics of Active Land Management Prescriptions in Cross-Timbers Region
The goal of this project is to conduct a socio-economic inquiry on sustainable management prescriptions that have the potential to enhance ecosystem services in the Cross-Timbers, an ecologically and socially important ecoregion in the Southern Great Plains of the United States. (3214)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA
PI/PD: Omkar Joshi

Using Camera Traps to Improve Our Ability to Estimate Wildlife Demographic Parameters in Forested Systems
The goal of this research is to use recently developed camera-based, unmarked abundance estimators to determine abundance and density of important game species and species of conservation or management concern in Oklahoma. (3230)

Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA, Oklahoma Department of Wildlife Conservation, Oklahoma Cooperative Fish and Wildlife Research Unit
PI/PD: M. Colter Chitwood

PLANT AND SOIL SCIENCES

Enhancing Oklahoma cropping systems through the adoption of a genotype by management by environmental (GxMxE) approach
Environmental issues paired with limited understanding of appropriate management has restricted adoption of suitable rotational crops. The focus of the 2020-2021 program was to understand how physiological growth changed with different soybean varieties in varying environments. This emphasized that all soybean varieties have a potential to branch. The differences between branching and single-stem genetics were the percentage of yield on branches compared to main stem. With later planting, due to less time to develop branches and pods, seeding varieties with higher yield on the main stem at higher rates were able to produce a greater number and develop pods. (3021)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Josh Lofton
Improving the sustainability and climate resilience of crop and grazing systems in the Southern Great Plains through agricultural systems modeling

The over-arching goal of this research is to help agricultural producers enhance the sustainability and resilience of crop and grazing systems for the Southern Great Plains (SGP). This project specifically addresses the development and improvement of process-based computer models that integrate our current best understanding of the processes driving agricultural systems in the SGP. The framework resulting from this work will generate model-based indicators, which collectively will provide a measure of agricultural system sustainability and resilience. This framework will provide agricultural decision-makers (e.g. producers, rural agribusinesses, and policy-makers) with vital information upon which to base their decisions. (3023)

Sponsors: Oklahoma Agricultural Experiment Station, USDA
PI/PD: Phillip D. Alderman

Building Pasture Resilience to Drought and Extreme Environmental Conditions in Oklahoma

Our main objectives are to improve techniques for promoting forage production year-round and pasture resilience to drought and hot conditions. The following framework was adopted: 1) Problem identification, 2) Vulnerability identification, 3) Options investigation, 4) Risk Evaluation, and 5) Action. The project is developing steps 3, 4, and 5. Interseeding cool-season forages into bermudagrass pastures, new alfalfa and bermudagrass varieties performance, adaptation of existing in-season decision-making tools for assessing pasture production and quality are the current investigated options. A mobile app, i.e., GrazeOK, field days, seminars, and factsheets are the main outputs of our active extension program. (3027)

Sponsors: Oklahoma Agricultural Experiment Station, USDA-NIFA
PI/PD: Alex Caldeira Rocateli

Winter Wheat Breeding for Oklahoma and the U.S. Southern Plains

Wheat cultivars are developed through field-based breeding procedures augmented with contemporary breeding tools. The goal is to release marketable cultivars in multiple classes for commercial production in Oklahoma and surrounding states. Additionally, fundamental research is conducted on optimized trait improvement. Five hard winter wheat cultivars were launched and licensed in 2020-2021: 1) Uncharted, with unprecedented barley yellow dwarf immunity, 2) Strad CL Plus, featuring imazamox resistance and superior quality, 3) Butler’s Gold, intended for late planting following summer crops, 4) Breakthrough, with protection against curl mite-transmitted viruses, and 5) Big Country for whole white wheat flour consumption. (3055)

Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation, Oklahoma Genetics, Inc., Oklahoma Wheat Commission
PI/PDs: Brett Carver, Amanda de Oliveira Silva, Brian Arnall, Liuling Yan, Gopal Kakani
Entomology and Plant Pathology: Bob Hunger, Kris Giles, Ali Zarrabi
USDA-ARS/Stillwater, OK: Xiangyang Xu
USDA-ARS/Manhattan, KS: Guihua Bai, Paul St. Amand, Richard Chen, Robert Bowden, Mary Guttieri, Mike Tilley
USDA-ARS/Lincoln, NE: Gary Hein
USDA-ARS/Pullman, WA: Kim Campbell

Molecular characterization and genetic incorporation of multiple resistance genes in Oklahoma wheat

Plant nucleotide-binding leucine-rich repeat proteins containing coiled-coil, nucleotide-binding ARC, and leucine-rich repeat domains, are associated with disease resistance in diverse organisms, including yellow rust, stem rust, powdery mildew in wheat, and programmed cell death. We identified semi-
dominant mutant allele causing necrotic death of the entire seedling (DES) of wheat in the absence of pathogen or external stimulus. DES1 is an ortholog of Sr35, which recognizes a Puccinia graminis f. sp. tritici stem rust disease effector in wheat, but mDES1 gained function as a direct inducer of plant death. These findings show the intersection of necrosis, apoptosis, and autoimmunity in plants. (3064)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-NIFA

**PI/PD:** Liuling Yan

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**Maximizing Bioproductivity in a Low Input Wheat Multispecies Cropping System**

Increasing crop diversity in a polycultural system may increase ecosystem function allowing for reduced inputs while increasing productivity and maintaining grain yield. Mesocosms of multiple plant species without fertilizer or pesticide were compared to a monocultural wheat production system with 100 lbs N/acre. For diversity, cover crops were incorporated as green manure and 1-3 species were intercrop planted with wheat. There is greater biomass production over the year with cover crops and intercrop compared to monocultural wheat. This comes at a sacrifice of overall grain yield which may be an improvement over dual-purpose wheat systems for animal and grain production. (3067)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Michael Anderson

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**Future Challenges in Animal Production Systems: Seeking Solutions through Focused Facilitation**

Livestock producers need new tools and technologies to improve grazing land management and water quality. One such technology, virtual fencing, has the potential to support improved grazing management. Virtual fencing employs GPS-enabled collars on individual cattle to provide auditory and electric stimulus to manage cattle location. In February 2020, virtual fencing was installed at the OSU Bluestem Research Range. A series of trials conducted in 2020-2021 demonstrated the technology could be used to effectively implement rotational grazing and riparian area protection. Funding from EPA will support an evaluation of the ecosystem benefits of virtual fencing over the next three years. (3079)

**Sponsors:** USDA-NIFA, Oklahoma Agricultural Experiment Station, Thomas E. Berry Professorship, U.S. Environmental Protection Agency

**PI/PDs:** Kevin Wagner
Animal Science: Ryan Reuter
Natural Resource Ecology and Management: Laura Goodman, Bryan Murray
Biosystems and Agricultural Engineering: Ali Mirchi

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**Plant Genetic Resources Conservation and Utilization**

The purpose of this regional project is to conserve genetic resources for a broad spectrum of crop species and to transfer related information to plant breeders and researchers in the Southern Region. A total of 872 accessions maintained at the USDA ARS Plant Genetic Resources Conservation Unit at Griffin, GA were distributed to organizations and individuals in Oklahoma. Receivers of the plant accessions include researchers at USDA-ARS laboratories, Oklahoma State University, Noble Research Institute, and residents in the state. (3107)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Yanqi Wu

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**Evaluating production practices and input management for optimizing winter canola production in the southern Great Plains**

The primary role of this project was to demonstrate canola as a valuable rotational crop for winter wheat systems throughout the region. In this year of the project, the primary focus has been to finish...
Field activities and disseminate accomplishments to stakeholders. Field trials continue to focus on appropriate input and N management of the crop. It was found that a three-way split of N almost always optimized yield and allowed for lower application rates. Furthermore, even with a substantial decrease in stands overwinter, if inputs are maintained, winter canola can compensate to produce acceptable yields. (3113)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA-SACC  
**PI/PDs:** Josh Lofton

**Herbicide resistant weeds in Oklahoma cropping systems**  
Herbicide resistance is one of the biggest challenges to Oklahoma crop production and the economic viability of Oklahoma producers. Herbicide programs to prevent the development of herbicide resistance and to manage current herbicide-resistant weed populations are being investigated. Research is being conducted at various Oklahoma Agricultural Experiment Station locations. New technologies being evaluated include XtendFlex (dicamba tolerant), Enlist (2,4-D tolerant), and GT27 (HPPD tolerant) soybean and cotton. Results from this research are shared with producers, commodity organizations, university colleagues, and agricultural industry. (3122)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Todd Baughman

**Soil, Water, and Environmental Physics to Sustain Agriculture and Natural Resources**  
Research in this project integrates scale-appropriate methods to improve decisions related to the management of soil and water resources. We explored the potential for forecasting seasonal streamflow totals using remotely sensed soil moisture data and a simple statistical model. We have given several conference presentations describing the outcomes of this work. Key outcomes of this project thus far are training one graduate student and advancing scientific knowledge on forecasting seasonal streamflow totals using remotely-sensed soil moisture data. (3123)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Tyson Ochsner

**The Science and Engineering for a Biobased Industry and Economy**  
Carbon farming requires both agricultural and non-agricultural biomass sources to produce renewable fuels and offset carbon emissions. On-farm studies implemented with eddy covariance systems and laser gas analyzers to determine biomass productions, carbon sequestration potential, greenhouse gas emissions, and water use in marginal croplands. Agronomic adaptation of new bioenergy crops and best management practices are developed. Drone based hyperspectral and LIDAR sensors help to detect biomass quantity and quality. Biomass traits identified for increased C sequestration using growth chamber and greenhouse facilities. Bioenergy crop models and Life Cycle Analysis tools will be developed and improved for assessing carbon sequestration. (3132)

**Sponsors:** DOEs ARPA-E, Oklahoma Agricultural Experiment Station, Warth Professorship,  
**PI/PD:** Gopal Kakani

**Developing Soil Health Testing Procedures for On Farm Use**  
Oklahoma's soil resources were degraded due to a century of tillage and the resulting loss of topsoil. Strategies have been identified to reduce or reverse these trends, such as no-till and rotational cropland management and proper stocking rates in pastures. However, there are questions about the extent to which soil health can be improved. This research aims to identify effective soil health assessment protocols. We developed a CO2 burst analysis for assessment of soil microbial activity. Secondly, we
evaluated an aggregate stability test that is cost effective. These analyses are being used to evaluate conservation in production environments across Oklahoma. (3133)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PDs:** Jason Warren, Hailin Zhang, Brian Arnall

**Enhancing nitrogen utilization in corn based cropping systems to increase yield, improve profitability and minimize environmental impacts**

For the project NC1195, the goal of the third and final season of the Nitrogen (N) by Water project was harvest. This project was a field scale project which encompassed 1/3 of a full pivot. Five rates of N were applied in strips with 3 ranges of irrigation applied across the rates. Rates of N were 0-280 lbs and water applied at 80%, 100%, and 120% of crop demand. The remainder of the year was used to manage and analyze the data which included aerial imagery, on site NDVI collection, soil moisture readings and grain yield. (3134)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Brian Arnall

**Understanding the molecular mechanism of MtWOX9-mediated leaf blade development in Medicago truncatula.**

The leaf blade is the primary photosynthetic organ that captures solar energy and produces sugars for heterotrophic organisms. The objective of this project is to understand the molecular mechanism of leaf blade expansion to be able to improve biomass yield by increasing photosynthetic surface area. MtWOX9 is a homeobox transcriptional activator and antagonizes the STF-mediated transcriptional repression in leaf blade development. We found that this antagonistic activity is important to balance cell proliferation and differentiation for proper expansion of the leaf blade. Current experiments focus on identifying targets to uncover the nature of the antagonism. (3135)

**Sponsors:** Oklahoma Agricultural Experiment Station, NSF  
**PI/PD:** Million Tadege

**Governing Soil Health and Sustainability through Understanding of Microbial Community and Enzyme Activities**

Soil microflora and enzyme activities play critical roles in sustaining agricultural production and maintaining soil health. We continue to explore new methods and improve existing enzyme assay methods to advance soil enzymology and knowledge of environmental microbiology. Our research effort also led to better understanding of fate and interaction of phosphorus and antibiotics in soil with respect to soil health and environmental quality. (3136)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PDs:** Shiping Deng, Hailin Zhang
Pasture, Turf, and Biofuel Grass Breeding and Genetics Research

Perennial grasses used in pasture and turf are economically, environmentally, and societally important. The main goal of this project is to develop new cultivars for improvements in forage yield and quality, turfgrass quality, adaptation, and other selected performance traits. This involves collecting, evaluating, enhancing germplasm of selected grass species, and elucidating reproductive behavior and genetic variation. The development and use of SSR and SNP markers and genetic maps is one of the current focused research. Our releases ‘Latitude 36’, ‘NorthBridge’, and ‘Tahoma 31’ bermudagrasses were expanded for commercial turf use in 2021. (3137)

Sponsors: Oklahoma Agricultural Experiment Station, U.S. Golf Association, USDA, Meibergen Family Endowed Professorship,
PI/PDs: Yanqi Wu
Horticulture & Landscape Architecture: Justin Moss, Dennis Martin, Charles Fontanier
Entomology & Plant Pathology: Nathan Walker

Increasing Cotton Sustainability and Profitability in the Southern Plains Region

Variety evaluations are pivotal to provide cotton producers with information to improve their production and profitability. Traditional areas of Oklahoma cotton acreage will utilize varieties also popular in other regions of the Cotton Belt, including other southwestern states, and the Mid-South and Southeast. This puts a strain on the seed supply of popular varieties that have a wide geographic fit and emphasizes the need for in-depth knowledge of various characteristics and yield potential to ensure proper variety selection. This work is conducted in collaboration with cotton producers across the state, with results shared through extension meetings and current reports. (3138)

Sponsor: Oklahoma Agriculture Experiment Station
PI/PD: Seth Byrd

Using Reduced-Lignin Alfalfa Cultivars to Improve Water Use Efficiency, Forage Yield, and Forage Quality in Water-Limited Environments

Reduced-lignin alfalfa (RLA) cultivars constitute a promising alternative forage for the water-limited region of the US Great Plains. Our objectives are to i) quantify the effects of cutting management in rainfed RLA; ii) conduct a survey to link management practices, benchmark yields and water use-efficiency across Oklahoma and Kansas; iii) assess the economic feasibility of RLA in water-limited environments; and iv) disseminate project findings to stakeholders. Field experiments and on-farm survey are being conducted in Oklahoma and Kansas. Based on our results, the economic feasibility of RLA will be determined. Project findings will be used to train educators and stakeholders. (3176)

Sponsors: Oklahoma Agriculture Experiment Station, USDA-NIFA
PI/PD: Alex Caldeira Rocateli

Examining the role of plant-soil interactions in mediating soil N dynamics in cereal cropping systems

The goal of this research is to examine controls on soil nitrogen storage and supply and to identify opportunities to optimize crop nitrogen use through management of plant-soil interactions. We are evaluating how long-term fertilization affects nitrogen storage in soil organic matter. We are also examining archived soils from across Oklahoma to characterize how soil type and mineralogy control soil organic matter storage. We will investigate how plant root inputs alter the rate of nitrogen release from soil organic matter. Our results will provide insight into how soil properties and plant inputs mediate nitrogen availability. (3180)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Andrea Jilling
Evaluation of varieties and management practices to improve yield, end-use quality, and resource use efficiency in wheat production systems

Wheat is the lead cash crop in Oklahoma. In 2020, the area in Oklahoma planted to wheat was 4.3 million ha, of which approximately 60% was used for livestock feed (i.e., dual-purpose). To date, there is no information on crop physiological traits associated with response to management for varieties currently being grown in Oklahoma. The main objective of this project is to increase productivity and sustainability of wheat production in Oklahoma and the southern Great Plains via investigating the influence of wheat varieties with different genetic and agronomic characteristics and management practices on grain yield, protein, and resource use efficiency. (3181)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Amanda de Oliveira Silva

Beneficial Use of Residuals to Improve Soil Health and Protect Public, and Ecosystem Health

Proper manure management is critical to the success of Oklahoma’s poultry and livestock industry. The benefits and potential impacts on the environment of using biosolids, animal manure and other organic wastes as soil amendments and nutrient sources will be evaluated and disseminated to farmers and gardeners. Guidelines on proper use of municipal and agricultural by-products to improve crop yields, soil health and environmental quality will be developed and provided to clients via presentations, fact sheets and social media. (3213)

**Sponsors:** Oklahoma Agriculture Experiment Station, Arthur L. Reed Endowment

**PI/PD:** Hailin Zhang
Charitable CEOs and Earnings Management
CEOs of public companies may serve on boards of non-profit organizations out of intrinsic motivation, reflecting a preference for the well-being of others. Alternatively, CEOs may serve on non-profit boards to increase moral reputation or manage their public image. We find that firms with CEOs serving on boards of non-profit organizations are associated with higher discretionary accruals, consistent with these firms engaging in more income-increasing earnings management. We also find these firms engage in more tax avoidance activities. Our findings suggest that on average, CEOs service on non-profit boards is driven by public image concerns and not intrinsic motivation.

Sponsors: Oklahoma State University, Northeastern University
PI/PDs: Bryan G. Brockbank
Northeastern University: Jaehan Ahn

Do Non-GAAP Exclusions Impact the Extent to Which Current Returns Reflect Future Earnings Information?
Motivated by regulators’ concerns about non-GAAP financial measures and building on research that finds more informative disclosures allow current stock returns to better reflect future earnings, I examine whether non-GAAP earnings exclusions enhance or garble the future earnings news captured in current stock returns. Utilizing Amazon Mechanical Turk (MTurk), I collect non-GAAP earnings data from 2003 to 2012 and measure managers’ non-GAAP exclusions relative to three comparable earnings: 1) GAAP earnings before extraordinary items, 2) GAAP earnings from operations, and 3) analyst-adjusted “street earnings. Finally, I find that consistent non-GAAP reporting is associated with more future earnings information reflected in current stock returns.

Sponsor: Oklahoma State University
PI/PD: Bryan G. Brockbank

Cutting R&D to Meet Earnings Benchmarks: The Effect of Firm-Level Innovation
This study examines whether innovation affects the likelihood of firms cutting research and development (R&D) spending to meet earnings benchmarks. We find that more innovative firms are less likely to cut R&D in order to meet earnings benchmarks. Consistent with R&D cuts being used to signal stronger future performance, we find that innovative firms that cut R&D to meet benchmarks have higher future earnings and operating cash flows. Results are concentrated among firms with greater R&D intensity and for firms operating in poor information environments. Overall, results suggest that managers of innovative firms have a long-term focus and are unwilling to sacrifice long-term performance to meet short-term benchmarks.

Sponsor: Oklahoma State University
PI/PDs: Bryan G. Brockbank, Kent Hu
The Effect of Analyst Conservatism on Meeting the Consensus Via Earnings Management
Conservative analysts react more to negative news than positive news. Consequently, firms followed by more conservative analysts should have a lower consensus earnings forecast. We find that firms followed by more conservative analysts engage in less earnings management in order to meet the consensus forecast. Results are stronger in settings where an individual analyst has more influence on the consensus forecast. Our findings suggest that management’s reporting behavior is impacted by the conservatism of the firm’s analyst following.

Sponsors: Oklahoma State University, University of Nebraska-Kearney
PI/PDs: Bryan Brockbank, Jaclyn Prentice
University of Nebraska-Kearney: Matt Bjornsen

Audit Market Structure and Audit Quality: Evidence from Financial Analysts’ Information Environment
Audit market structure remains a concern for both regulators and academics due to the potential impact of competition (or lack thereof) on audit quality. We find that audit market concentration improves analysts’ forecast accuracy and decreases dispersion, which is consistent with studies suggesting that higher audit market concentration improves audit quality. Additionally, we find that despite being associated with decreased auditor independence (consistent with regulators’ concerns), audit market concentration appears to benefit analysts’ information environment. Our results further our understanding of audit market structure and its impact on financial disclosure quality.

Sponsors: Oklahoma State University, University of Nevada, Reno
PI/PDs: Bryan Brockbank, Bradley P. Lawson
University of Nevada, Reno: Chuong Do

Bridging the Gap: Responding to a Reduction of Accounting Principles in the Business Core
We use the natural experiment provided by a curriculum change to analyze assessments of students’ financial accounting understanding. A new “bridge” course was created for accounting and finance majors in response to the reduction in principles of accounting courses from two courses to one. Compared to students who had completed the traditional two principles courses, students who completed this new course sequence scored higher on a financial accounting assessment than their peers who completed a traditional financial accounting and managerial accounting course sequence. We also find that the combination of adaptive learning software and live instruction is superior to adaptive learning software alone.

Sponsor: Oklahoma State University
PI/PDs: Bryan G. Brockbank, Craig A. Sisneros, Angela Wheeler Spencer

Remediation of Knowledge Gaps for Underrepresented Minority Students: Insights from a Natural Experiment in Financial Accounting
A curriculum change from the traditional two semesters of accounting down to a one semester survey course leading to intermediate financial accounting provided a natural experimental setting to examine the efficacy of several methods of alleviating a significant gap in knowledge created by the change. Our results suggest that a “bridge” course combining an adaptive learning tool with traditional classroom instruction resulted in no significant differences in assessed performance between underrepresented minority students and the broader student population. However, the adaptive learning tool alone resulted in significantly lower scores on assessed performance for the underrepresented minority students in this study.

Sponsor: Oklahoma State University
PI/PDs: Bryan G. Brockbank, Craig A. Sisneros, Angela Wheeler Spencer
**Mindsets as an enhancement of 21st century accounting education**

We propose complementing competency-based frameworks of accounting education with the cultivation of relevant mindsets. A mindset is a combination of cognitive filters and processes through which professionals interpret their professional environments and execute their professional responsibilities. We identify five key mindsets relevant for accounting graduates. We treat the "public interest mindset" (focus on "we" vs. "I," integrity, and professionalism) as foundational. The four other key mindsets include: 1) growth, 2) professional skepticism, 3) analytical/digital, and 4) global. We define and discuss each of these mindsets and suggest potential pedagogical approaches for integrating these mindsets into 21st-century accounting education.

**Sponsors:** Oklahoma State University, University of Dayton, University of Cincinnati

**PI/PDs:** Audrey Gramling
University of Dayton: Sridhar Ramamoorti
University of Cincinnati: Natalia Mintchik

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**The Relevance of non-income tax relief**

Governments regularly offer non-income tax relief to attract business interests. However, it is unclear whether markets impound information about the relief into security prices. We use novel data from retrospective public records to examine the information content of non-income tax relief. We find that non-income tax relief is strongly associated with future accounting performance and future abnormal returns. Overall, our evidence suggests the receipt of non-income tax relief reflects relevant information but investors have difficulty impounding the information into security prices in a timely way.

**Sponsors:** Oklahoma State University, Brigham Young University, Iowa University, University of Texas at Austin

**PI/PDs:** Ryan Hess
Brigham Young University: Michael S. Drake
Iowa University: Jaron Wilde
University of Texas at Austin: Braden Williams

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**Government assistance: A growing, undisclosed financing source**

We investigate whether firms treat government assistance as an additional source of external capital to provide standard setters evidence on a distinct impact of assistance on a firm’s financial statements. We find corporations in the highest decile of size-adjusted government assistance received have meaningfully lower leverage ratios than those in the bottom decile. We also find firms with lower debt ratios have higher investment commitments to governments, implying government assistance often creates off balance sheet obligations. These findings are relevant to the FASB as it deliberates requiring additional disclosure on government assistance under Topic 832.

**Sponsors:** Oklahoma State University, University of Texas at Austin

**PI/PDs:** Ryan Hess
University of Texas at Austin: Lillian F. Mills
Cash and Tax Evasion
Economists and public policy experts contend that paper currency facilitates tax evasion. However, due to the illicit nature of tax evasion, limited empirical evidence exists to document or quantify this claim. I use the staggered implementation of the Electronic Benefit Transfer (EBT) program to identify a decrease in local cash circulation that holds constant the level of income to provide empirical evidence on the role of cash in tax evasion and offer magnitude estimates. My results suggest that cash transactions are an economically significant means by which small businesses evade income taxes.

Sponsor: Oklahoma State University
PI/PD: Ryan Hess

The Feedback Loop of FDIC Insurance Premiums
There is a broad awareness about the potential for feedback effects in insurance premium pricing. Increasing (decreasing) deposit insurance premiums when a bank is performing poorly (well) has the potential to further constrain bank lending ability. We examine this feedback loop using confidential, archival bank data from the Federal Deposit Insurance Corporation (FDIC). Using credit unions as a suitable control group we estimate the impact of insurance premiums on bank lending. We empirically document a feedback loop between insurance premium and bank lending and further show that community banks are disproportionately affected by this feedback mechanism.

Sponsors: Oklahoma State University, Center for Financial Research Federal Deposit Insurance Corporation
PI/PDs: Ryan Hess
Federal Deposit Insurance Corporation: Jennifer S. Rhee

Does audit committee reporting need to be improved? Evidence from a large-scale textual analysis?
The SEC is considering expanding audit committee reporting requirements to include greater disclosure of the audit committee’s oversight of the external auditor. To provide insight into whether additional reporting requirements are needed we: 1) perform a large-scale textual examination of the characteristics and time trends of over 35,000 US firms’ audit committee report disclosures issued between 2004 and 2015 and, 2) explore whether investors find such reports useful. In sum, our findings suggest that there is a need to improve the usefulness of audit committee report disclosures.

Sponsors: Oklahoma State University, Colorado State University, University of Texas
PI/PDs: Bradley P. Lawson
Colorado State University: Michelle Draegar
University of Texas: Jaime J. Schmidt

The Consequences of Audit Market Structure on Financial Analysts’ Information Environment
Audit market structure remains a concern for both regulators and academics due to the potential impact of competition (or lack of) on audit and financial reporting quality. However, studies of audit market structure and financial reporting quality provide mixed results. Testing this association provides evidence on the topic without having to separate the constructs of financial reporting quality and audit quality. We find that concentration improves analysts’ forecast accuracy and decreases dispersion, which is consistent with studies suggesting that higher audit market concentration improves audit and financial reporting quality. Our results further our understanding of audit market structure and its impact on financial disclosure quality.

Sponsors: Oklahoma State University, Texas State University, University of Las Vegas, Nevada
PI/PDs: Bradley P. Lawson
Oklahoma State University: Bryan Brockbank
University of Las Vegas, Nevada: Chuong Do
Audit Partner Masculinity, Audit Pricing, and Audit Quality
Biology research finds that more masculine faced men are associated with greater ambition, a stronger desire to win, and less interpersonal trust. We examine the consequences of this trait for both audit pricing and audit quality. We find that audit partners with more masculine faces are associated with higher audit fees. We also find that partner facial masculinity is associated with higher fraud risk. Finally, we find that more masculine faced partners are associated with a lower likelihood of restatement announcements, but only for clients with high fraud risk. Therefore, masculine faced partners earn a fee premium, but are associated with lower audit quality. These results hold for only non-Big 4 partners, consistent with quality control mechanisms at the Big 4 mitigating individual auditor effects.

Sponsors: Oklahoma State University, Stoney Brook University, Rutgers, the State University of New Jersey
PI/PDs: Bradley P. Lawson
Stoney Brook University: Keval Amin
Rutgers, the State University of New Jersey: John Daniel Eshleman

Do Breaches of Public Trust Influence Nonprofessional Investors’ Perceptions of Auditor Credibility?
Audit quality is challenging to observe. Therefore, investors must rely on publicly available indicators such as PCAOB inspection reports. Source credibility theory suggests that the auditor’s inspection deficiency rate could signal perceived expertise, while an attempt to breach the inspection process could signal perceived trustworthiness. We find an interactive effect whereby participants were least likely to maintain their investment when the auditor had a higher deficiency rate and attempted to circumvent the inspection process. Supplemental analyses show that expertise influences the financial statements’ perceived accuracy, and trustworthiness influences the audit opinion’s perceived trustworthiness—and both influence investing decisions.

Sponsors: Oklahoma State University, University of Louisville, DePaul University
PI/PDs: Leah Muriel
University of Louisville: Dereck Barr-Pulliam
DePaul University: Stephani A. Mason

Where to Whistleblow? The Consequences of Reward and Retaliation Provisions for Intrinsically Motivated Individuals
Differing provisions in the EU and US exist to encourage whistleblowing. We examine how individuals with self-reported high intrinsic motivation (financial audit experience), respond to retaliation protection measures and an external reward opportunity. We observe that only visible protection provided by the subjects’ organization was associated with higher internal reporting intentions and do not find evidence that external retaliation protection or external reward are associated with higher external reporting intentions. Furthermore, we find evidence of an unintended consequence within this setting of highly intrinsic motivated individuals. The presence of an external reward was associated with lower intent to report internally.

Sponsors: Oklahoma State University, Universidad Adolfo Ibanez, The University of Tennessee
PI/PDs: Leah Muriel
Universidad Adolfo Ibanez: Nelson Carrasco
The University of Tennessee: Robert M. Fuller

Is the reporting of critical audit matters associated with information overload and does that affect nonprofessional investors’ perceptions of audit quality and investment risk?
The Public Company Accounting Oversight Board (PCAOB) recently adopted a new standard that requires the auditor to report critical audit matters (CAMs) within the audit report. We find that the presence of a
CAM is associated with higher perceptions of auditor credibility, but also an increased in perceived information overload. Despite the perceived higher information load to process, the presence of a CAM is associated with an increased in perceived audit quality and a decrease in perceived investment risk. Increasing the readability of CAM’s may help reduce feelings of information overload for individuals utilizing audit reports.

**Sponsors:** Oklahoma State University, Clemson University, Iowa State University  
**PI/PDs:** Leah Muriel  
Clemson University: Brian T. Carver  
Iowa State University: Brad S. Trinkle

**A Cross-Language Analysis of Disclosure Properties: Evidence from Hong Kong** Using the setting of Hong Kong, we examine how the linguistic properties of financial disclosure differ across languages. Firms listed on the Hong Kong Stock Exchange publish annual reports in both English and Chinese. We find that English reports are more positive, convey more uncertainty, and focus more on the past and present and less on the future, than Chinese reports. We also find that English (Chinese) reports are more likely to manage their tone by varying the frequency of positive (negative) words. Finally, the stock market only reacts positively to tone management in Chinese reports.  
**Sponsors:** Oklahoma State University; University of Nevada, Reno  
**PI/PDs:** Sandeep Nabar, Kent Hu  
University of Nevada, Reno: Chuong Do

**CFO Characteristics and Accruals Earnings Management**  
We examine the association between CFO characteristics and accruals earnings management (AEM). We find that the CFO’s internal power and the CFO’s career horizon are both negatively related with AEM.  
**Sponsor:** Oklahoma State University  
**PI/PDs:** Sandeep Nabar, Yahya Abdullah

**The Impact of Benefit Plan Audits on the Financial Statement Audit**  
We explore the implications of benefit plan audits for the financial statement audit. We find that performing a benefit plan audit increases the likelihood that the firm will be selected as a company’s financial statement auditor. Further, we find that companies that engage the same audit firm for both their benefit plan and financial statement audits have a lower likelihood of misstatements, shorter audit report lags, and a lower likelihood of switching the financial statement auditor. Our findings speak to the continued debate over effective market expansion of financial statement audit providers, audit quality determinants, and audit efficiencies.  
**Sponsors:** Oklahoma State University, Michigan State University, University of Arkansas  
**PI/PDs:** Jaclyn Prentice  
Michigan State University: Kenneth L. Bills  
University of Arkansas: Gary F. Peters

**The Effect of Analyst Conservatism on Meeting the Consensus Via Earnings Management**  
Little is known about the impact of conservative analysts on firm management. We examine the effect of analyst conservatism on firms meeting the consensus via accrual-based earnings management. We find that firms with a more conservative analyst following engage in less accrual-based earnings management to meet the consensus, with this effect being strongest in poor information environments. We also find that firms followed by more conservative analysts are more likely to meet the consensus forecast via
accruals-based earnings management. Collectively, our results suggest that management’s reporting behavior is impacted by the conservatism of the firm’s analyst following.

**Sponsors:** Oklahoma State University, University of Nebraska-Kearney  
**PI/PDs:** Matt Bjornsen, Bryan Brockbank, Jaclyn Prentice  
University of Nebraska-Kearney: Matt Bjornsen

**Does Insider Trading Affect Auditors’ Risk Assessments? Evidence from Audit Pricing**

Audit regulations require auditors to consider insider trading as part of their risk assessment. Companies file Form 4 with the SEC when insiders trade. We find that the number of requests for Form 4 in the SEC EDGAR online system is positively associated with audit fees. In addition, audit fees are higher among companies with net insider selling, relative to companies with net insider buying. We find that officer net selling drives this relation. These results suggest that auditors’ risk assessments are sensitive to information reflected in insider trading, consistent with regulatory requirements for auditors to consider non-traditional risk characteristics.

**Sponsors:** Oklahoma State University, Texas Tech  
**PI/PDs:** Jaclyn Prentice  
Texas Tech: Sabrina Chi

**Tax Aggressiveness and the Tax Risk Disclosure**

We examine the variation of the Tax Risk disclosure that companies include in their 10K (Item 1A - risk factors). We examine the influences and determinates for disclosing taxes as a business risk and investigate the relation between the Tax Risk disclosure and tax aggressiveness. In addition, we analyze whether management adds this disclosure in response to an event such as, Tax Cuts and Jobs Act, a tax-related restatement, or material weakness. Also, we examine whether companies that employ their auditors as their tax provider are more likely to disclose less than if the company employs another firm.

**Sponsors:** Oklahoma State University, San Francisco State University  
**PI/PDs:** Jaclyn Prentice  
San Francisco State University: Bing Luo

**Goodbye and hello: audit quality, the Big 4, and acquiring consulting practices**

The largest accounting firms have been acquiring consulting practices for the last decade. I find that the audit quality of the companies being audited by the accounting firm acquiring a large consulting practice decreases in the year of the acquisition, but this result reverses in the subsequent period. This finding suggests accounting firm management may be distracted in the year of the acquisition and then in the subsequent year audit quality improves as accounting firms are better able to utilize consulting practices’ specialized knowledge.

**Sponsor:** Oklahoma State University  
**PI/ PD:** Jaclyn Prentice

**Are Analysts’ Forecast More Informative than a Random Walk Model of Earnings Before Extraordinary Items in the Presence of Special Items?**

The purpose of this study is to determine whether analysts’ forecasts outperform a simple random walk model in the presence of special items, both positive and negative. Prior research shows that special items have market and future earnings implications on their own as well as affect the implications of adjusted (for special items) earnings. We test this by comparing the strength of association between these constructs and cumulative abnormal returns at earnings announcement dates.

**Sponsor:** Oklahoma State University  
**PI/PDs:** William C. Schwartz, Jr. and Craig A. Sisneros
Multiemployer Pension Plans: Disclosure and Recognition Requirements, Recent Legislation, and Firm Responses
Multiemployer pension plans provide retirement benefits to retired employees of all firms that contribute. However, the assets in the fund are combined and the obligation to pay an employee remains even if that specific employee’s former employer leaves the plan. If all other firms withdraw, the last remaining firm could be left with the obligation to fund the benefits for all retirees, regardless of their former employer. Firms are consistently withdrawing from these plans to avoid being the last firm standing and a significant portion of these multiemployer plans do not have the funds to pay current and future retirees.
Sponsor: Oklahoma State University
PI/PDs: Bryan Brockbank, William C. Schwartz, Jr., Craig A. Sisneros

Empirical Implications of Incorrect Tax Rate Assumptions
The objective of this study is to explore the empirical consequences of assuming an incorrect tax rate in adjusting special items. Our evidence suggests extreme tax rate assumptions, in particular the highest statutory rate, are especially problematic and yield dramatically biased estimates. Our review of the tax consequences of special items suggests that in almost all circumstances the marginal tax rate is the theoretically correct rate to apply to these items when adjusting for tax. Consistent with this view, our empirical evidence, with a limited exception, suggests that marginal tax rates represent the best estimate of the “true” tax rate.
Sponsors: Oklahoma State University, University of Texas at Dallas, University of Alabama
PI/PDs: Craig A. Sisneros
University of Texas at Dallas: William M. Cready
University of Alabama: Thomas J. Lopez, Shane R. Stinson

Bridging the Gap: Responding to a Reduction of Accounting Principles in the Business Core
We use the natural experiment provided by curriculum change to analyze assessments of students’ financial accounting understanding given alternate paths into the first intermediate financial course. A new “bridge” course was created for accounting majors in response to the reduction in principles of accounting courses from two courses (six semester hours) to one (three semester hours). As compared to students who had completed the traditional six hours of principles courses, the students who completed this new course sequence scored higher on a financial accounting assessment than their peers who completed a traditional financial accounting and introductory managerial accounting course sequence.
Sponsor: Oklahoma State University
PI/PDs: Bryan G. Brockbank, Craig A. Sisneros, Angela Wheeler Spencer

Toward Equitable Remediation: Insights from a Natural Experiment in Financial Accounting
A curriculum change provided a natural experimental setting to examine the efficacy of several methods of alleviating a significant gap in knowledge created by the change. Students were given three options: Self-study and a "gateway" examination; a self-paced adaptive learning software and examination, or opting into a "bridge" course combining the adaptive learning software and proctored exams. Our results suggest the latter method resulted in no significant differences in assessed performance between underrepresented minority students and the broader population. However, the adaptive learning tool alone resulted in significantly lower scores on assessed performance for underrepresented minority students in this study.
Sponsor: Oklahoma State University
PI/PDs: Bryan G. Brockbank, Craig A. Sisneros, Angela Wheeler Spencer
An Analysis of the Historical Analysis and Future Outlook for Sustainability Reporting

Sustainability reporting holds the promise to significantly improve the decision-relevant information set available to capital providers and other stakeholders of firms and organizations. However, the current set of sustainability information is often unstandardized, lacking comparability, and potentially lacking reliability. In this paper, we explore the history of sustainability reporting, examine the need for reporting about sustainability issues, and examine shortcomings in the current sustainability landscape. Drawing upon the historical and theoretical underpinnings of financial reporting, we conclude with recommendations about the prospects for the accounting profession to provide value-added information related to sustainability issues.

Sponsors: Oklahoma State University, The University of Mississippi
PI/PDs: Angela Wheeler Spencer
University of Mississippi: Zach Webb

Special Purpose Vehicles and Audit Fees

In this paper, we investigate the relationship between audit fees and special purpose vehicles (SPVs). SPVs are separate entities that inherently increase the underlying complexity of firm operations. Further, during the period examined here (2000-2009), many of these structures were reported off-balance sheet. Overall, our results suggest that auditors price the additional work and risk associated with client utilization of these structures. Evidence provided here is essential to understand better the total costs related to SPVs and the effects of unique forms of complexity on audit fees.

Sponsors: Oklahoma State University, The University of Mississippi
PI/PDs: Angela Wheeler Spencer
University of Mississippi: Zach Webb

Remediation of Knowledge Gaps for Underrepresented Minority Students: Insights from a Natural Experiment in Financial Accounting

A curriculum change from the traditional two semesters of introductory accounting to a one semester survey course provided a natural experimental setting to examine the efficacy of several methods of alleviating a significant gap in knowledge created by the change. Our results suggest that a bridge course combining the adaptive learning tool with traditional classroom instruction resulted in no significant differences in assessed performance between underrepresented minority students and the broader student population. However, use of the adaptive learning tool alone resulted in significantly lower scores on assessed performance for the underrepresented minority students in this study.

Sponsor: Oklahoma State University
PI/PDs: Bryan G. Brockbank, Craig A. Sisneros, Angela Wheeler Spencer
The Impact of Increased Managerial Discretion and of Adoption Disclosure Transparency on the Usefulness of Reported Revenues: Evidence from Accounting Standard Updates for Multiple-Deliverable Sales Arrangements

Research suggests that revenue recognition accounting standards which restrict management discretion resulted in improved faithful representation but reduced relevance of revenues. We use the adoption of Accounting Standards Updates 2009-13 and 2009-14 to examine the effects of increased management discretion to accelerate revenue recognition. We find that this increased discretion results in an increase in the relevance of reported revenues without reducing faithful representation. These results provide evidence in assessing whether standards that allow greater discretion affect the usefulness of financial statement information.

Sponsors: Oklahoma State University, University of Tennessee, Brigham Young University
PI/PDs: Michael Stuart
University of Tennessee: Linda Myers, Roy Schmardebeck
Brigham Young University: Timothy Seidel

CEO Partisan Bias and Management Earnings Forecast Bias

Political science research finds individuals exhibit overly favorable economic expectations when their partisanship aligns with that of the US president. We examine whether this partisan bias is present in management earnings forecasts. We find that firms with CEOs whose partisanship aligns with that of the US president issue more optimistically biased forecasts than firms with CEOs who are not aligned. Our results suggest CEOs fall prey to partisan bias, resulting in suboptimal forecasting behavior. Additionally, we find that investors fail to discount the news in forecasts issued by partisan-aligned CEOs and that post-forecast abnormal returns are lower for these firms.

Sponsors: Oklahoma State University, Queen’s University, Vanderbilt University
PI/PDs: Michael Stuart
Queens University: Jing Wang
Vanderbilt University: Richard Willis

The Effect of Voluntary Accounting Policy Changes on Earnings Informativeness

While voluntary accounting policy changes (VAPCs) enable managers to better present the firm’s financial position and results as circumstances change, they may be used to opportunistically influence earnings. We examine the impact of the method of accounting for VAPCs (retrospective and modified retrospective methods) on earnings informativeness. While the retrospective method arguably improves comparability over time, it allows firms to record the same earnings twice or avoid reporting expenses. We find that earnings informativeness is lower and opportunism is greater for VAPCs accounted for using the retrospective method compared with those accounted for under the modified-retrospective method.

Sponsors: Oklahoma State University, Queen’s University, Vanderbilt University
PI/PDs: Michael Stuart
Queens University: Jing Wang
Vanderbilt University: Paul Chaney, Rita Gunn

CEO Political Alignment and Corporate Tax Avoidance

We investigate the impact of CEOs’ sentiment towards the government on firms’ tax avoidance behavior. We proxy for CEOs’ attitudes toward the government using their political alignment with the US president, where a politically aligned CEO is expected to possess more favorable views of the government. We find that effective corporate tax rates are lower for firms with politically aligned CEOs, suggesting that CEOs who have more trust in the current administration engage in less tax avoidance.
behavior. Our research contributes to literature suggesting that top managers’ experiences, values, and personalities significantly influence a firm’s choices and actions.

**Sponsors:** Oklahoma State University, Queen's University, University of Texas at El Paso

**PI/PDs:** Michael Stuart

Queens University: Jing Wang

University of Texas at El Paso: Yun Ke

The Substance of Enduring Relationships: Interpreting Auditor Tenure

A public company’s auditor must now disclose in the audit report the year it began serving as the company’s auditor. Yet the interpretation of auditor tenure is unclear. We address this gap in understanding by examining what characteristics of an auditor-client relationship affects its persistence. Using survival analysis, we find that enduring relationships are characterized by sustained conservative financial reporting choices, choices evident since the inception of a relationship.

**Sponsors:** Oklahoma State University, Vanderbilt University

**PI/PDs:** Michael Stuart

Vanderbilt University: Paul Chaney, Karl Hackenbrack, Catherine Lee

Does How Managers Answer an Analyst’s Questions during an Earnings Call Matter?

Earnings calls are quarterly interactive conference calls in which firm managers present corporate financial information and address questions from call participants. We examine whether, and, if so, in which direction, the tone of managers’ responses to an individual analyst’s questions during an earnings call are associated with the analyst’s subsequent earnings forecast revision for the company on whose call the analyst participated. We are analyzing data to study these relationships, and we believe that our research will be the first archival study to directly study the direct interchanges between analysts and managers on earnings calls.

**Sponsors:** Oklahoma State University, Vanderbilt University

**PI/PDs:** Michael Stuart

Vanderbilt University: Craig Lewis, Richard Willis

The Effects of Independent Director Litigation Risk

The unexpected *In re Investors Bancorp* decision in 2017 by the Delaware Supreme Court lowered the liability threshold only for directors in derivative litigation over their own equity grants, increasing their future litigation risk. Investors and firms reacted to the decision. Overall, results are consistent with director litigation concerns having a significant effect on firm value and firm and director behavior.

**Sponsors:** Oklahoma State University, University of Iowa, Texas A&M University

**PI/PDs:** Elizabeth Tori

University of Iowa: Dain C. Donelson

Texas A&M University: Christopher G. Yust
Rival Firms’ Response to a Competitor’s Bankruptcy: Can Press Releases Facilitate a Competitive Advantage?
I investigate how rival firms alter their voluntary disclosures, specifically their press releases, following a competitor’s bankruptcy. I find that rival firms increase their product-related, but not their earnings-related press releases following a bankruptcy. I also investigate the change in market share for disclosing rivals and find that market share increases, consistent with press releases affecting product market conditions. The results suggest that bankruptcy provides an opportunity for rival firms to gain a competitive advantage through disclosure of product-related information, highlighting a benefit of voluntary disclosure.

Sponsors: Oklahoma State University, Texas A&M University
PI/PD: Elizabeth Tori

Non-Financial Government Violations and Financial Voluntary Disclosures
Non-financial violations are enforcement actions brought by government agencies relating to operational failures, such as environmental damages. In this study, we examine whether a non-financial violation affects managers’ voluntary disclosure decisions and the capital market’s perception of managerial credibility. We find that managers tend to reduce the likelihood, frequency, and precision of management forecasts and that investors respond less strongly to forecasting news following a non-financial violation. Although prior literature finds no reputation damage in the capital markets, our results suggest managers experience a loss of credibility that may reduce their incentives to provide management forecasts from non-financial violations.

Sponsors: Oklahoma State University, Texas A&M University, University of Connecticut
PI/PDs: Elizabeth Tori
Texas A&M University: Sean McGuire, Sarah Rice
University of Connecticut: Nina Xu

Non-Financial Violations and the Credibility of Voluntary Disclosures: Evidence from Employee Discrimination Violations
I examine whether firms’ non-financial violations lead to a loss of credibility in the capital markets. Specifically, I examine whether investors change the magnitude of their reaction to management earnings forecasts and product press releases following an employee discrimination violation. Despite growing interest in firms’ non-financial performance, prior studies have found no evidence of capital market reputation damage from these failures. This study provides the first evidence of the capital market reputation damage caused by non-financial violations as measured by voluntary disclosure credibility.

Sponsors: Oklahoma State University, Texas A&M University
PI/PD: Elizabeth Tori
Negative Net Debt Firms’ Voluntary Disclosure Practices
NND firms have fewer constraints from creditor monitoring and higher operating variability and higher returns on their operating assets than their financial assets. Does this fact mean NND firms’ management forecast guidance is less useful? If so does media step in and take over the monitoring role for these firms? This study provides evidence that NND firms have weaker information environments and that the media serves an alternative monitor when creditors and financial intermediaries are less effective.

Sponsors: Oklahoma State University, Texas A&M University, University of Connecticut
PI/PDs: Elizabeth Tori
Texas A&M University: Senyo Tse
University of Connecticut: Nina Xu

Mutual Fund Disclosure and Board Monitoring
Mutual funds are required to disclose their fund performance and fees relative to their peers and the board is required to review and approve this disclosure. We find that firms truthfully disclose low fees, but avoid disclosing high fees. We also examine the effect of director monitoring on the truthfulness of the disclosures.

Sponsors: Oklahoma State University, Texas A&M University, University of Houston
PI/PDs: Elizabeth Tori
University of Houston: Minjae Koo

How Managers Respond to the Effects of Bright-Line Rules: Evidence from Management Forecasts and the Valuation Allowance for Deferred Tax Assets
Firms record a deferred tax assets (DTA) if they expect sufficient taxable income to realize the asset in the future. Management records a valuation allowance (VAA) against the DTA if they believe their firm will generate insufficient taxable income to realize the asset. Prior research argues that the VAA represents management’s forecast of future taxable income and contains information relevant to the capital markets. However, in practice audit firms frequently apply a bright-line test to DTAs that forces a firm to record a full VAA. We investigate the consequences of this bright-line test on firms’ information environment.

Sponsors: Oklahoma State University, Texas A&M University
PI/PDs: Elizabeth Tori
Texas A&M University: Brad Hepfer

Can FinTech Competition Improve Sell-Side Research Quality?
We examine how competition from FinTech influences analyst research quality. We find that firms added to Estimize, a platform that crowdsources short-term earnings forecasts, experience a substantial reduction in consensus bias and a limited increase in consensus accuracy. Long-term forecasts and recommendations remain similarly biased, alleviating the concern that the documented reduction in bias is a response to broad economic forces. At the individual analyst level, bias reduction is more pronounced among close-to-management analysts, and more biased analysts respond by reducing their coverage of Estimize firms. The evidence suggests that competition from Estimize improves research quality by discouraging strategic bias.

Sponsors: Oklahoma State University, University of Kentucky, University of Texas at Dallas
PI/PDs: Michael C. Wolfe
University of Kentucky: Russell Jame
University of Texas at Dallas: Stanimir Markov
Corporate Codes of Ethics and Cash Holdings
We examine the relation between corporate codes of ethics and cash holdings. We find a negative association between code of ethics quality and cash holdings which suggests that managers hold less cash when the firm has a strong code of ethics in place. The effect is greater when agency costs are elevated due to weaker country-level investor protections. We also find that payouts and the marginal value of cash holdings to investors are increasing in code quality. Overall, our results are consistent with ethics codes helping to limit opportunistic behavior from managers when determining the firm’s level of cash holdings.

Sponsors: Oklahoma State University, University of Texas at El Paso, University of Nebraska, Korea University
PI/PDs: Michael C. Wolfe
University of Texas at El Paso: Giorgio Gotti
University of Nebraska: Tony Kang,
Korea University: Yong K. Yoo

Earnings Attributes and Credit Ratings
We investigate the association between different earnings attributes and credit ratings. We examine seven attributes - discretionary accruals, accruals quality, persistence, predictability, smoothness, timeliness, and conservatism. We find that six of the seven attributes are associated with credit ratings and that accrual quality and predictability dominate the other attributes, including accounting conservatism. Additional analysis shows that accruals quality is relatively more important to credit rating agencies than equity investors. This study provides comprehensive evidence on the relative importance of different earnings attributes to credit rating agencies.

Sponsors: Oklahoma State University, University of Nebraska, Korea University
PI/PDs: Michael C. Wolfe
University of Nebraska: Tony Kang
Korea University: Sang Ho Lee, Yong K. Yoo

Accounting Comparability and the Efficiency of Intra-Industry Information Transfer
Prior studies find that the market is inefficient in its reaction to the earnings announcements of industry peers. This study contributes to the literature by showing that this overreaction is related to differences in accounting comparability. The evidence also suggests that this association has diminished in recent years, particularly for firms with the highest levels of comparability. Overall, the results suggest that investors are unable to properly adjust for differences in accounting comparability when responding to the information releases of peer firms.

Sponsor: Oklahoma State University
PI/PD: Michael C. Wolfe

DEPARTMENT OF ECONOMICS

The Effect of Land Size and Market Distortions on Bolivian Farmers
Access to more land may not lead to income gains for smaller farms in Bolivia. Restrictions on the use of land as collateral cause imperfections in credit and labor markets that lead to lower income as farms reach the institutional threshold for the land’s collateralization.

Sponsors: Oklahoma State University, Oklahoma Department of Human Services
PI/PDs: Lee C. Adkins, Bidisha Lahiri
Oklahoma Department of Human Services: Naneida Lazarte-Alcala
Unauthorized Immigration: the theoretical effects of a dual labor market
The effects on wages, employment, and output in an economy where unskilled labor is employed solely in labor intensive occupations are explored using a two-sector general equilibrium model.
Sponsor: Oklahoma State University
PI/PD: Lee C. Adkins

A Shrinkage Estimator for Endogenous Regressor Models and Weak Instruments. A shrinkage estimator is proposed that takes a convex combination of two-stage least squares and efficient 2-step GMM estimators. Shrinkage is controlled based on FEFF (see Andrews, 2018).
Sponsor: Oklahoma State University
PI/PD: Lee C. Adkins

Promoting Economic Literacy: Combining News Articles and Clicker Questions in a Large Introductory Microeconomics Course
The author of this article presents a brief introduction to the use of current events news articles in an introductory microeconomics course for business students. Popular press articles are integrated with small-group peer instruction, and student understanding is assessed using student response system, or clicker, questions. Examples of lesson learning objectives are presented, along with a discussion of how news articles and clicker questions are combined to promote student interest and engagement. Sample clicker questions are also provided.
Sponsor: Oklahoma State University
PI/PD: Laura J. Ahlstrom

Gender and Performance in Intermediate Microeconomics: Does the Format of the Principles of Microeconomics Course Matter?
This study analyzes the effect that completing an introductory microeconomics course online or face-to-face has on student performance in intermediate microeconomics, paying particular attention to the gender question in online education. We find no significant correlation between completing the principles course online and men’s intermediate microeconomics course grades. However, female students who complete principles of microeconomics online perform significantly better in intermediate microeconomics, though the marginal benefit diminishes the higher the principles grade. Additionally, the grades students of both genders receive in face-to-face principles of microeconomics courses have a significant, positive effect on their intermediate microeconomics performance.
Sponsor: Oklahoma State University
PI/PD: Laura J. Ahlstrom

Instructor Gender and Student Performance in Introductory Economics Courses: Is There a Role Model Effect?
Past research in economic education has revealed a gender gap in undergraduate economics. Studies also show that the quality of the instructor leads to better outcomes for students and that instructors can act as role models for students. Our study examines the role model effect in the context of the gender gap in achievement in introductory collegiate economics courses. Using an ordered regression, we find that female students perform significantly better in introductory economics courses when taught by female instructors while controlling for other variables.
Sponsor: Oklahoma State University
PI/PD: Laura J. Ahlstrom
Are Instructors Role Models Indirectly? Testing the Relationship between Instructor Gender, Course Performance and Undergraduate Economics Major Selection
Prior research has found student performance in introductory economics courses is positively correlated with choosing economics as a major. Although the association between instructor gender and students’ economics major selection is less evident, students may earn higher grades in courses taken with same-gender instructors. As a result, students’ economics major choice may be indirectly influenced by the gender of their introductory economics course instructors through the assignment of course grades. This study examines the relationship between instructor gender, students’ introductory economics course grades and economics major selection.

Sponsor: Oklahoma State University
PI/PD: Laura J. Ahlstrom

Grades as Reference Points: Impact on Performance and Motivation
This study examines how students’ grades on an initial exam affects their future test performance. Students who achieve desirable grades on their first tests may not exert less effort on the next test compared to students who earn an initial test grade that is lower than their “goal grade”. We hypothesize that a student who receives a score of 72 (narrowly earning a C) on the first test may perform differently on their next test relative to a student who has received a score of 68 (narrowly missing a C) on the first exam.

Sponsor: Oklahoma State University
PI/PD: Laura J. Ahlstrom

Women in the Finance Major: Gender Disparities in Finance Course Completion and Degree Attainment
This study assesses the gender gap in undergraduate students’ finance course persistence, defined as taking an additional finance course after completing an initial course, as well as gender disparities in students’ finance degree selection. The research is guided by the following question: How do student, instructor, and structural (class) characteristics differentially affect gender persistence in taking finance courses and the propensity to earn a finance degree?

Sponsor: Oklahoma State University
PI/PD: Laura J. Ahlstrom

Quiet Restaurants near Political Power Centers: How Has the Anti-Corruption Campaign Changed a Consumer City?
China’s 2012 Eight-point Regulation, imposed harsh austerity measures on the spending of government officials. The effect of the regulation remains an open question. Using data from a large online review platform for retail stores, we take a spatial difference-in-differences approach to investigate the impact of the regulation on restaurant consumer spending in Beijing. Establishment-level regressions document a substantial post-regulation decline in the consumer spending of the restaurants close to power centers. The impact is greater for the restaurants in government-designated hotels, for those in proximity to the power centers with higher political accountability, and on weekdays.

Sponsors: Oklahoma State University, Central University of Finance and Economics, Chinese Academy of Sciences, Massachusetts Institute of Technology
PI/PDs: Rui Du
Central University of Finance and Economics: Weizeng Sun
Chinese Academy of Sciences: Jianghao Wang
Massachusetts Institute of Technology: Siqi Zheng
High-stakes Examinations and Educational Inequality: Evidence from Transitory Exposure to Air Pollution

This paper provides the first evidence of the educational inequality that arises from air quality degradation and a minimum-passing-score exam policy. Using unique data on a large-scale high-stakes college English test in China, we study the impact of random disturbances to cognitive performance on access to graduate education. Tracking repeat exam takers over multiple exams, a panel model with individual fixed effects documents significant adverse cognitive effects of transitory air pollution exposure. The adverse effects vary considerably by the severity of air pollution, exam section, student academic ability, and gender. We further show that the harmful cognitive effects reduce students’ chances of getting into graduate school.

Sponsors: Oklahoma State University, Tsinghua University, Central University of Finance and Economics, Beijing Jiaotong University

PI/PDs: Rui Du
Tsinghua University: Hui Deng
Central University of Finance and Economics: Dongmei Guo, Weizeng Sun

Higher Education, College Location, and Migration

Using college enrollment data and nationally representative population census data, this paper examines the impact of college education and college location on later-life migration in China. We take advantage of the in- and out-of-province variation in college enrollment driven by China’s massive higher education expansion to identify the effects. Our results show that an increase in either in- or out-of-province college enrollment leads to a higher probability of college attendance. Only out-of-province college expansion increases the likelihood of attending college out-of-province. Using a two-step instrument variable approach, we find a modest negative effect of college education per se and a positive effect of college location per se on later-life migration.

Sponsors: Oklahoma State University, Jinan University, Dickinson College

PI/PDs: Rui Du
Jinan University: Shu Cai
Dickinson College: Xiaozhou Ding

The Network Effect of Air Pollution: Evidence from the Housing Market in China

This paper examines the housing market reaction to changes in the non-local housing investor attention due to the degraded air quality. Based on a sample of 39 prefectural-level cities in China, we document a strong positive effect of local air pollution on housing prices in other cities, which reflects investors’ propensity to make out-of-town purchases. A city’s out-of-town housing attention increases dramatically following heavily polluted days in the local area.

Sponsors: Oklahoma State University, Central University of Finance and Economics, Massachusetts Institute of Technology, Zhejiang University

PI/PDs: Rui Du
Central University of Finance and Economics: Weizeng Sun
Massachusetts Institute of Technology: Siqi Zheng
Zhejiang University: Zhaoyingzi Dong

International Travel Cost and Entrepreneurship Comovement

Despite the rapid advances in digital communication tools, information exchange and the transmission of tacit knowledge via in-person interactions are still of great importance to entrepreneurs and venture capitalists. Using new international non-stop flight routes as a natural experiment, this article examines whether a reduction in international travel cost increases the comovement of new firm formation in
connected cities across different countries. Using panel data at the US-China city-pair level from 1990-2017, we demonstrate that a reduction in information frictions induced by geography has a substantial positive impact on business matches between entrepreneurs and investors of the two countries. The evidence confirms the importance of efficient transportation networks in facilitating information exchange and long-range business matches.

**Sponsors:** Oklahoma State University, Massachusetts Institute of Technology  
**PI/PDs:** Rui Du  
Massachusetts Institute of Technology: Wang Jin

**Proximity, Knowledge Diffusion, and Technology Similarity: Evidence from the High-speed Rail in China**  
Using the high-speed rail (HSR) expansion in China as a natural experiment, this paper identifies the effect of travel cost reduction due to HSR connection between cities on technology similarity. We are able to identify similar effects using a wall-city instrumental variable approach based on the minimum cost spanning tree. The effect is stronger for cities that are farther away to each other in distance but closer to each other in technology space. Our findings highlight the role of travel cost in influencing regional knowledge diffusion and technology space integration.

**Sponsors:** Oklahoma State University, Southeast University  
**PI/PDs:** Rui Du  
Southeast University: Yingcheng Li

**State Business Incentives, Firm Demographics, and Innovation**  
Technology-based, innovation-driven startups are central to regional productivity, economic development, and job creation in the United States. State and local governments offer numerous and varied programs, financial incentives, and tax breaks to promote innovation-driven entrepreneurship and attract high-growth startups. This paper examines how the dynamics in the state governmental provision of financial and tax incentives influence the age distribution of innovation-driven startups. We further investigate the distributional effects of the firm age distribution on innovation activities.

**Sponsors:** Oklahoma State University, Southeast University  
**PI/PDs:** Rui Du  
Southeast University: Yingcheng Li

**College Location and Migration: Evidence from China’s Higher Education Expansion**  
Using college enrollment data and the 1% national sample-census population data, this paper examines the impact of college education expansion on individual decisions about education and mobility. Our findings suggest that college location impacts college graduates’ geographic mobility in an equally important way as college education does.

**Sponsors:** Oklahoma State University, Jinan University, Dickinson College  
**PI/PDs:** Rui Du  
Jinan University: Shu Cai  
Dickinson College: Xiaozhou Ding

**The effect of trade liberalization on marriage and fertility: Evidence from Indian Districts**  
We examine the medium-run (1991-2001) and long-run (1991-2011) impacts of the 1991 trade liberalization in India on marriage and fertility rates among young women aged 15-34 years. We exploit the fact that the countrywide tariff reductions varied across industries creating exogenous local labor market shocks based on the initial industrial composition of the district. We find that districts that were...
more exposed to tariff cuts witnessed a larger increase in the marriage rate, especially in urban areas. On average, the trade reform had no negative impact on the employment of young men and women.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Mehtabul Azam, Shruti Sengupta

**Trade Liberalization and Human Capital Accumulation: Evidence from Indian Census**
We use the 2011 Indian census data, and exploit the exogeneous nature of Indian trade liberalization and cohorts that attended school before and after the reforms to implement a Difference-in-Difference strategy to estimate the impact of trade-liberalization on human capital accumulation. We also construct a district-level panel data that covers 1981-2011, and use a Difference-in-Difference strategy to get an alternative estimate of the impact of Indian trade liberalization on human capital accumulation. We find that no evidence of trade-liberalization on attainment of different stages of schooling.

**Sponsor:** Oklahoma State University  
**PI/PD:** Mehtabul Azam

**Household Cooking Fuel Choice in India, 2004-2012: A Panel Multinomial Analysis**
Using household level panel data, we examine factors driving the cooking fuel choice in urban and rural India, separately. We find that a clean-break with the use of traditional fuels is less likely in rural areas, but more probable in urban areas. The household characteristics (e.g. income, education) that are positively correlated with use of clean fuel also increases the probability of fuel stacking for rural households. We also find that access to paved road is an important determinant for rural household adopting clean fuel, and there exists evidence of social spillover effects in rural areas.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Mehtabul Azam, Ying-Min Kuo

**Household Income Mobility in India, 1993-2011**
Using longitudinal data, we examine income mobility among rural Indian households over 1993-2004 and 2004-2011. Absolute measures of mobility suggest higher income mobility during 2004-2011 compared to 1993-2004, and each social group witnessed higher income mobility over 2004-2011. Importantly, significant differentials in income mobility exist across the Hindu castes in both the time intervals. We also find that conditional on having similar rankings in base period national income distribution, urban households have higher probability to improve their rankings in national income distribution. We find similar patterns in social group differentials in mobility over 2004-2011 using the consumption expenditure as a measure of well-being.

**Sponsor:** Oklahoma State University  
**PI/PD:** Mehtabul Azam

**Does access to clean energy reduces women household burden?**
Access to modern energy is one of the most basic requirements for development. In rural areas of developing countries, there are a large number of people who do not have access to LPG and depend on traditional biomass such as wood, crop, and dung for cooking. One of the reasons for low labor force participation is women’s time spent on domestic works. In this paper we look at the question whether access to clean energy reduces time spent in domestic work, and free up women for labor force.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Mehtabul Azam, Su Qinghe
Trade Liberalization and its impact on Social Group Welfare Gap
We examine the causal impact of the 1991 Indian trade liberalization on the evolution of conditional welfare gaps across social groups. We hypothesize that the trade reforms would induce foreign competition and thus, reduce the inherent taste-based employer discrimination in the Indian labor market. While we find medium-run (transitional) effects of trade openness on caste-based labor market discrimination, the impact dies out in the long-run. This indicates the existence of discrimination against the marginalized groups in spite of increased competition.

Sponsor: Oklahoma State University
PI/PDs: Mehtabul Azam, Shruti Sengupta

Tax Increment Financing and Spatial Spillovers in Oklahoma City: Estimating the Localized Marginal Effects of Proximity to TIF Districts
Tax increment finance (TIF) is a critical component of local economic development policy. In contrast to previous research, we recognize the limitation of a linear spatial specification. Instead, we adopt a Gaussian-process regression specification to estimate the functional form that defines the relationship between a dependent variable and its functional arguments. Our findings suggest that much care should be taken when drawing TIF boundaries, recognizing that a small but potentially important subset of parcels could be relegated to the outside of the development zone and left without access to the public support that similar parcels inside the TIF are afforded.

Sponsors: Oklahoma State University; Oklahoma City University
PI/PDs: Mary N. Gade
Oklahoma City University: Russell Evans

A Localized Analysis of Property Tax Incidence Across Space and Time
This paper explores the hypothesis that the incidence of the property tax may vary across jurisdictions. We pool observations from 17 independent school districts in Oklahoma County, Oklahoma across 27 years (1982-2008) and investigate the responsiveness of the tax base to changes in the jurisdiction’s tax rate relative to the county average. Using a Finite Mixture Model approach that allows for estimation of distinct and heterogeneous components, we find evidence that the economic incidence varies across jurisdictions, across time within a jurisdiction, and across specific property tax levies within a jurisdiction.

Sponsors: Oklahoma State University, Oklahoma City University
PI/PDs: Mary N. Gade
Oklahoma City University: Russell Evans
Child Marriage and the Role of Brides: Descriptive Evidence from Six West African Countries
Although almost universally banned, child (under the age of 18) marriage remains a pervasive issue throughout the world. In this study, we quantify the importance of the child marriage problem, on which evidence remains surprisingly scarce. To do so, we use data we collected in Burkina Faso, Chad, Côte d'Ivoire, Mali, Mauritania, and Niger – six West African countries where child marriage rates are particularly high. This extensive dataset allows us to compare the characteristics of girls based on their age when they first married.

Sponsors: Oklahoma State University, Paris-Dauphine University, Paris School of Economics, The World Bank
PI/PDs: Harounan Kazianga
Paris-Dauphine University: Olivia Bertelli, Elise Huillery
Paris School of Economics: Bastien Michel
C4ED: Markus Olapade
The World Bank: Estelle Koussoubé, Léa Rouanet

Exposure to Agricultural Technologies and Adoption: The West Africa Agricultural Productivity Program in Ghana, Senegal and Mali
We estimate the effects of increased exposure to agricultural technologies on farmers’ adoption and economic well-being in Ghana, Mali, and Senegal. The program, known as the West Africa Agricultural Productivity Program (WAAPP), aimed at improving agricultural productivity to enhance economic growth, food security and to reduce poverty and ran in two phases. We focus on the second phase of the program, which ran between 2012 and 2019. We use ex-ante matching at the village and household levels to select the estimation sample. We find that the treatment raised technology adoption by 0.32 percentage points and the adoption of improved seeds by 0.20 percentage points.

Sponsors: Oklahoma State University, University of Ouagadougou, Burkina Faso
PI/PDs: Harounan Kazianga
University of Ouagadougou, Burkina Faso: Anurag Deb

Pathways out of Extreme Poverty: Tackling Psychosocial and Capital Constraints with a Multi-faceted Social Protection Program in Niger
This analyzes a four-arm randomized evaluation of a multi-faceted economic inclusion intervention delivered by the Government of Niger to female beneficiaries of a national cash transfer program. All three treatment arms include a core package of group savings promotion, coaching, and entrepreneurship training, in addition to the regular cash transfers from the national program. The first variant also includes a lump-sum cash grant and is similar to a traditional graduation intervention (“capital” package). The second variant substitutes the cash grant with psychosocial interventions (“psychosocial” package). The third variant includes the cash grant and the psychosocial interventions (“full” package). The control group only receives the regular cash transfers from the national program.

PI/PDs: Harounan Kazianga
Sponsors: Oklahoma State University, Northwestern University, Catholic University of Louvain, Paris School of Economics, The World Bank
Northwestern University: Dean Karlan, Chris Udry
Catholic University of Louvain: William Parenté
Paris School of Economics: Kelsey Wright
The World Bank: Thomas Bossurowy, Patrick Premand, Julia Vaillant

Agricultural Transformation and Farmers' Expectations: Experimental Evidence from Uganda
This paper uses a randomized control trial to study Ugandan subsistence smallholders' decisions to adopt
cash crops. A unique way of eliciting farmers' price and yield expectations allows us to investigate the role of farmers' ex-ante beliefs about crop profitability on adoption decisions. We find that the provision of extension services increases oilseeds adoption by 15%, and farmers who under-estimate oilseeds price at baseline are the most likely to adopt the new crops. The results suggest that changes in expectations drive agricultural technology take-up.

**Sponsors:** Oklahoma State University, University di Milano--Bicocca, Centro Studi L.d'Agliano,
**PI/PDs:** Harounan Kazianga
Universita di Milano--Bicocca, Centro Studi L.d'Agliano: Jacopo Bonan, Mariapia Mendola

**The Effects of Old Age Pension Program on African Young Adults’ Labor Force Participation and Schooling**
We examine the effects of South Africa’s Old Age Pension (OAP) program on labor force participation and schooling of African young adults aged 15-34 using a regression discontinuity design. The results suggest that OAP Program has a significant secondary effect on African young adults and could help address inter-generational poverty in South Africa.

**Sponsors:** Oklahoma State University, Ministry of Finance, Liberia
**PI/PDs:** Harounan Kazianga
Ministry of Finance, Liberia: Mounir Siaplay

**A Decade Later: The Long-Term Effects on Education and Young Adults Outcomes of School Infrastructure**
We evaluate the long-term effect of a “girl-friendly” primary school program in Burkina Faso, using a regression discontinuity design. The intervention consisted in upgrading existing three-classroom schools to six-classroom schools in order to accommodate more grades. After 6 years, the program increased enrollment by 15.4 percentage points and increased test scores by 0.29 standard deviations. Students in treatment schools progress farther through the grades, compared to students in non-selected schools. These upgraded schools are effective at getting children into school, at getting children start school on time and at keeping children in school longer.

**Sponsors:** Oklahoma Stata University, University Texas, Mathematics Policy Research
**PI/PDs:** Harounan Kazianga
University of Texas: Leigh Linden
Mathematics Policy Research: Nicholas Ingwersen, Arif Mamun, Ali Protik, Matt Sloan

**Evidence from a Randomized Evaluation of the Household Welfare Impacts of Conditional and Unconditional Cash Transfers Given to Mothers or Fathers.**
We conducted a randomized control trial in rural Burkina Faso to estimate the impact of alternative cash transfer delivery mechanisms on education, health, and household welfare outcomes. The two-year pilot program randomly distributed cash transfers that were either conditional or unconditional and were given to either mothers or fathers. Conditionality it was linked to older children enrolling in school who were attending regularly and younger children receiving preventive health check-ups. Compared to the control group, cash transfers improve children’s education and health and household socioeconomic conditions. For school enrollment and most health outcomes, conditional cash transfers outperform unconditional cash transfers.

**Sponsors:** Oklahoma Stata University, The University of Illinois at Urbana Champaign, The World Bank
**PI/PDs:** Harounan Kazianga
University of Illinois at UC: Richard Akresh
The World Bank: Damien de Walque
Uncertainty Shocks, Asymmetric Dynamics, and Inflation Targeting: A Nonlinear Approach
This study investigates the impact of uncertainty shocks on macroeconomic activity in developed and emerging economies. A Smooth Transition VAR model is employed to document the state-dependent dynamics of two distinct types of uncertainty shocks, financial market based and news-based. When nonlinearity is allowed to play a role in our model, quantitatively very different asymmetric dynamics are observed. Following inflation targeting, the responses tend to be smoother and less pronounced. Our empirical results support the view that the link between uncertainty and macroeconomic activity is clear over both recessions and expansions.

Sponsors: Oklahoma State University, Bank of Ozark, AR
PI/PDs: J.B. Kim
Bank of Ozark: Kevin Larcher

Oil Price Shocks and Macroeconomic Dynamics: A Nonlinear Approach
We study the business cycle-dependent nonlinear effects of global oil price shocks on US aggregate economy. For this purpose, we decompose the oil price changes into supply and demand shocks and assess the state-dependent dynamics of structural shocks on U.S. industrial production, employment, and inflation using a Smooth Transition VAR model. We find evidence that declines in employment and industrial production conditional on recessions are shown to have quantitatively larger and more persistent. Headline inflation is found to display substantially greater reactions during economic contractions.

Sponsors: Oklahoma State University, National Assembly Research Service
PI/PDs: J.B. Kim
National Assembly Research Service: Inwook Hwang

FDI, Economic Growth and Convergence Clubs: A Nonlinear Approach
To study the relationship between FDI and growth with more homogeneous countries we employ an array of convergence tests designed to capture nonlinear transitional dynamics with 62 countries spanning the period of 1987-2016. Our new empirical evidence therefore suggests that there is a potential maximum financial development threshold beyond which the positive effect of FDI on economic growth becomes negligible, suggesting that more finance is not necessarily better for the nexus in each convergence club. The nonlinearity and homogeneity in the convergence club may actually reflect the kick in effect at the beginning and the vanishing effect in the end.

Sponsors: Oklahoma State University, Millikin University
PI/PDs: J.B. Kim
Millikin University: Michael Osei

Financial Development, Innovation, and Market Structure: Evidence from Industry Level Data
We study the nonlinear effects of financial development on innovation as well as the potential mechanism, using a unique Research Quotient database. Our findings can be summarized as follows. 1) Significant inverted-U effects of financial development on innovation. 2) The effects of both markets are sector-specific. Specifically, the nonlinear effect of the equity market works by influencing the high technology industries, while that of the credit market mainly affects the non-high technology industries. 3) We find that the nonlinear effect of financial development on market competition serves as a potential channel through which finance affects innovation nonlinearly.

Sponsor: Oklahoma State University
PI/PDs: J.B. Kim
Wichita State University: Xiaoyang Zhu
**Effect of India's De-monetization on its Exports**
The Indian economy has a large segment of small businesses as well as a significant informal sector which were primarily cash based. The government’s surprise move to invalidate existing currencies overnight in an attempt to clear unaccounted cash flows affected the day to day operations for a large segment of domestic producers. We examine the impact of this policy on exports and imports with the expectation of the effect to be stronger in the short run than the long run as the economy adjust to the new system.

*Sponsor*: Oklahoma State University  
*PI/PDs*: Bidisha Lahiri, Anurag Deb

**Effect of Prenatal Care visits on Antenatal Outcomes: A survival model analysis**
The number of weeks of pregnancy at which antenatal care was first received, the number times of antenatal care was received and whether antenatal care was received in the last three months of pregnancy are three important but similar indicators of antenatal care received during a given pregnancy. We examine the impact of each of these variables on several outcomes such as whether the delivery was at home or medical institution, the presence of skilled birth attendant during delivery, birth weight of the baby and use of postnatal care.

*Sponsors*: Oklahoma State University, University of Kalyani, India  
*PI/PDs*: Bidisha Lahiri  
University of Kalyani, India: Prasenjit Sarkhel

**Entrepreneurial Effect of Income Program in India**
We examine the impact of on an ambitious employment and income guarantee program for the poor in India on family entrepreneurial activities. We find that participation in this program affects family entrepreneurship both at the extensive and intensive margins, and the effect is heterogenous across the scale of the family business endeavor.

*Sponsor*: Oklahoma State University  
*PI/PDs*: Bidisha Lahiri, Richard Daramola

**Role of product life cycle in tempering international trade's impact on Indonesian Firms**
Our paper empirically examines how the effect of international trade on Indonesian firms varies by the length of product life cycle and R&D activities of different industries. Our exploration is based on theoretical models that predict trade and outsourcing/FDI affect firms in developing countries differently compared to firms in developed countries like the USA.

*Sponsors*: Oklahoma State University, University of Texas at Arlington  
*PI/PDs*: Bidisha Lahiri  
University of Texas at Arlington: Mahmut Yasar

**Low level equilibrium trap for women**
Women are less likely to pursue a job if the cost of child-care exceeds the salary earned. While this might seem optimum in the short run, there are long run costs in terms of experience forfeited. Women who start at a lower wage job are more likely to get stuck in the equilibrium described above, while women who start at higher paid jobs circumvent the above situation. This widens the experience gap and in turn the income gap. This child-care-cost driven 2-equilibrium phenomenon should be expected to be weaker (more likely absent) for men.

*Sponsor*: Oklahoma State University  
*PI/PD*: Bidisha Lahiri
The Multi-Headed Effects of Corruption on SMEs
We examine how informal payments to government officials reduce tax and fees payment, and number of inspections for small and medium sized firms, while at the same time relax credit constraints and make access to technology easier. While payment of bribes is also often considered necessary for the survival of firms, few studies have explored this. We take a unique empirical approach and find strong evidence of higher rate of firm deaths among firms that do not or cannot pay bribes.

Sponsor: Oklahoma State University
PI/PDs: Bidisha Lahiri, Haider Ali

Effect of ICT on Product Quality
Product quality, which is an important dimension of research in economics, is combined with the consideration of firm level access to information and communication technology. Using a recent econometric technique, we find that even for firms without market power, firms with ICT capabilities produce products with higher unit values, compared to otherwise similar firms within the same industries. This supports the hypothesis that ICT facilitates product quality. These results are robust to alternate specifications and estimation methods.

Sponsors: Oklahoma State University, Temple University
PI/PDs: Bidisha Lahiri, Ramesh Sharda
Temple University: Taha Havakhor

Household Debt and Meeting Fertility Intentions
This study examines how housing and non-housing debt impacts the probability that women meet their fertility intentions. Housing debt increases fertility for those planning to have children soon and decreases fertility for those not planning to. Housing debt also decreases the probability women have fewer children than they intended. Greater non-housing debt, on the other hand, reduces the probability of having children in the short-term, but only noticeably for non-married women. However, this reduction is not generally related to a higher probability that women have fewer total children over their lifetime than originally intended - unless those debts persist into their mid-thirties.

Sponsor: Oklahoma State University
PI/PDs: Michael Morris, Karina Shreffler

Neighborhood Violence, Family Stress and College Intentions
Student intentions regarding college attendance not only strongly predict earning a higher degree, but also has been found to differ by income and race. We suggest that exposure to neighborhood violence and family stress have negative impacts on college intentions. Using data collected from an in-depth interview of 206 largely minority (70%) 4th through 12th grade students, and their parents. In estimating indirect effects of neighborhood violence and family stress on college intentions, we find that neighborhood violence has a negative effect through school GPA. Family stress has a negative indirect effect through how much an adolescent enjoys school while parental involvement has a positive impact.

Sponsor: Oklahoma State University
PI/PDs: Michael Morris, Michael Criss

Improved IV Estimation of Vertical Property Tax Inequity
In this paper we propose a new IV estimator to be used in detecting vertical property tax inequity. We conduct Monte Carlo experiments to evaluate the bias of this estimator in comparison to traditional linear and log-linear regression based estimators. We find that the new estimator is more robust to bias across alternative average assessment ratios, even in the presences of errors-in-variables, than the IV estimator suggested by Clapp (1990) and frequently used for such purposes. Furthermore, the new
instrument allows for an investigation into how strong the measurement error in sales prices relative to
that in assessed values must be for the results to change from those of the traditional methods.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Michael Morris, Bill Dare

### Increasing the Learning Effectiveness of Economics Education

This study develops, implements, and evaluates a new economics teaching pedagogy based on the U.S. Army’s systems approach to training model. Using the approach, tasks are identified that compose the task domain for the Principles’ of Microeconomics course. From the 130 identified tasks, 73 are used by Economics of Socials Issues classes for the evaluation phase. Next each task is expanded to include task conditions, task standard, task performance steps, and task performance measures. The developed document is called a teaching, learning, and evaluation outline (TLEO). The same process identifies 53 tasks used in unit 3 of Money and Banking classes. An experiment is used to assess the impact of using the TLEO documents to enhance learning.

**Sponsor:** State of Oklahoma  
**PI/PD:** William McLean


In this paper we attempt to address limitations of previous research to provide further guidance on US state and local fiscal policy making. We implement the synthetic control method (SCM) to create pairwise matches for states in subsequent regression analysis. Several economic indicators and principal component analysis are used to construct broader narratives of state economic performance and we provide updated evidence. We compare the results with those obtained from using neighbors as matches and from standard growth regressions. The SCM-based analysis produces a number of useful findings, some robust, though insufficient to provide universal policy recommendations.

**Sponsor:** Oklahoma State University  
**PIs/PDs:** Dan Rickman, Hongbo Wang

### Industry Aggregation and Assessment of State Economic Development from Motion Picture and Television Production Incentives

Studies of the economics of state fiscal incentives for the motion picture and television industry use differing levels of industry aggregation. This study unpacks aggregate sector multipliers for 48 states and shows how the use of aggregated measures for the motion picture and television industry may lead to inaccurate input-output multipliers and empirical estimates of the role of incentives in the location of the industry. We conclude that the Motion Picture and Video Production (North American Classification System Code 51211) most corresponds to incentivized activity in the industry. A hypothetical case study demonstrates practical alternatives to modifying regional input-output models to obtain more accurate economic impact multipliers.

**Sponsor:** Oklahoma State University  
**PIs/PDs:** Dan Rickman, Hongbo Wang

### Fiscal Implications of Interest Rate Normalization in the United States

We study the fiscal implications of interest rate normalization from the zero lower bound (ZLB) in the United States. At the ZLB, falling tax revenues and real bond prices increase government debt accumulation. During normalization, interest payments remain above the path without the ZLB, and government debt can increase further despite the recovery of output and tax revenues. Against the yardstick of ability to pay, interest rate normalization is unlikely to threaten federal debt sustainability at
the current net federal debt level about 100% of GDP. If the government fails to reform Social Security and major healthcare programs, sovereign default risk can rise more quickly when debt reaches 150% of GDP.

Sponsors: Oklahoma State University, Federal Reserve Bank of Kansas City, Institute of Economics, Academia Sinica
PI/PDs: Wenyi Shen
Federal Reserve Bank of Kansas City: Huixin Bi
Institute of Economics, Academia Sinica: Shu-Chun Yang

Uncertain Policy Regime and Government Spending Effects
The literature generally suggests that money-financed government spending has much bigger multipliers than debt-financed spending. Most analyses, however, assume that policy regimes are fixed. Using a fully nonlinear New Keynesian model with endogenous policy regime uncertainty, we show that inflation-driven expectations about switching to the debt-financing regime reduce money-financed spending multipliers. When interacting with high government debt, policy regime uncertainty decreases money-financed multipliers below one. This conclusion holds at the zero lower bound and with a large spending increase. Also, policy regime uncertainty similarly decreases multipliers under active fiscal and passive monetary policies, in which seigniorage is implicitly used to finance government spending.

Sponsors: Oklahoma State University, Grinnell College, Institute of Economics, Academia Sinica
PI/PDs: Wenyi Shen
Grinnell College: Ruoyun Mao
Institute of Economics, Academia Sinica: Shu-Chun Yang

SCHOOL OF ENTREPRENEURSHIP

The Effects of Neurodiversity on Cognitive Attributes of Early-Stage Entrepreneurs
Utilizing a neuropathology perspective and conservation of resources theory, we investigated the relationship between neurodiversity and entrepreneurial cognition. Specifically, we introduce the resource-induced coping heuristic (RICH) as a mechanism to explain the relationship that ADHD has with entrepreneurial alertness, cognitive adaptability, and entrepreneurial intent. Our findings indicate that RICH fully mediates the relationship between ADHD has with entrepreneurial alertness, cognitive adaptability, and entrepreneurial intent.

Sponsors: Oklahoma State University, University of Memphis, West Virginia University
PI/PDs: Curt B. Moore
University of Memphis: Stephen Lanivich
West Virginia University: Nancy McIntire

External Corporate Governance Mechanisms: Considering Markets and Networks
External corporate governance mechanisms are forces that promote governance structures and practices by top executives and board directors that emanate from outside of the organization. Institutions, industries, markets, and networks all work to influence governance decisions and behaviors both directly and indirectly through interactions with internal corporate governance mechanisms. These mechanisms may induce behaviors that are desirable to external stakeholders or intervene when internal mechanisms are compromised or ineffective.

Sponsors: Oklahoma State University, Louisiana State University
PI/PDs: Curt B. Moore
Louisiana State University: G. Tyge Payne
An Introductory Guide to the use of Social Network Analysis in Family Business Research
We present a practical, introductory guide on the use of social network analysis to examine social structures (e.g., family and organization) in family business research. We present an overview of social networks coupled with a taxonomy of social ties. Then, we discuss the basics of designing social network research with a focus on data collection and management. **Sponsors**: Oklahoma State University, Boise State University
**PI/PDs**: Curt B. Moore
Boise State University: Karen Nicholas

Network Safeguards to Knowledge Spillovers in Strategic Alliance Networks
Firms gain from their strategic alliance networks, both in terms of resources and knowledge. Knowledge spillovers have traditionally been viewed in terms of benefits to recipient firms. From the perspective of a firm with valuable knowledge assets, the potential expropriation of rents may be avoided by implementing network. Therefore, once a firm has generated knowledge assets externally through its strategic alliance network, it may subsequently seek to safeguard knowledge assets by altering their network of alliance relations.
**Sponsors**: Oklahoma State University, Boise State University
**PI/PDs**: Curt B. Moore
Boise State University: Karen Nicholas

Women's Collective Entrepreneurship: Catalyzing Innovation in Emerging Markets
Studies show that women make significant contributions to innovation in developed economies, but less is known about their contributions in emerging markets where institutional factors often restrict women's entrepreneurial activities. Thus, we investigate how women contribute to innovation in emerging markets despite contextual constraints. We recognize the benefits of women’s collective entrepreneurship and integrate transactive memory theory to hypothesize that when more women are represented and more frequent communication exists in the SME, innovation is enhanced.
**Sponsors**: Oklahoma State University, Texas State University
**PI/PDs**: Kristen Madison, Curt B. Moore, Joyce Nabisaalu
Texas State University: Joshua Daspit

Opaque Costly Signals and Debt Contracts
New Ventures that are unable to fund expansion using internal equity and prefer to maintain complete firm ownership may supplement existing cash flow by accessing external funds in the form of debt contracts (Berger & Udell, 1998). These firms send signals to external stakeholders that represent a sufficient level of legitimacy and worthiness of investment. However, many new ventures are unable to send preferred costly signals because they do not possess them. In this study, I examine specific signals that carry the preferred costly weight needed to gain a stakeholder’s perception of legitimacy.
**Sponsors**: Oklahoma State University, Baylor University
**PI/PDs**: Matt Rutherford, Curt B. Moore
Baylor University: Lee Grumbles

Will Crypto Become Actual? An Institutional Approach to Cryptocurrency
How can cryptocurrency gain legitimacy in the eyes of users? We propose that cryptocurrency firms, through evasive entrepreneurial actions reflected by rhetorical strategies, can acquire legitimacy in the market that will ultimately reduce institutional uncertainty. Drawing from Williamson’s (1998, 2000) hierarchical model of institutional systems, we propose that legitimacy acquisition at the market level
via evasive action will attenuate uncertainty in the formal institutional environment; which will beget additional legitimacy for cryptocurrencies, and thus higher performance to those firms, on average.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Matt Rutherford, Duygu Phillips, Per Bylund, Curt B. Moore

### New Venture Legitimacy Diffusion: The Role of Storytelling and Social Networks

Legitimacy diffusion is critical for new venture success, survival, and growth. Storytelling is a powerful technique to acquire legitimacy as well as to diffuse it. The focus of the current study is to analyze the role of storytelling in social media, specifically on Twitter. We also investigate the moderating effects of social networks based on network density and eigenvector centrality. Results indicate that storytelling in social media can be effective in legitimacy diffusion and that storytelling elements influence the extent on diffusion, specifically cognitive, pragmatic, and emotional elements as well as network density and eigenvector centrality. Implications and limitations are discussed.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Matt Rutherford, Duygu Phillips, Curt B. Moore

### When Family Business Meets Social Enterprise: An Integrative Review and Future Research Agenda

Family businesses and social enterprises are typically examined as distinct organizational forms, yet scholars in these domains often study similar phenomena. While both domains acknowledge the significant role of family in hybrid organizational missions, findings vary in emphasis and rhetoric. Our review of 117 articles, published in 59 journals between 1996 and 2020, capitalizes on this connection and attempts to integrate the varying perspectives. We consider the common underlying research motivations, illuminate the role of family in advancing social missions and creating social value, and provide a foundation for future research that can extend family business and social enterprise domains.

**Sponsors:** State of Oklahoma, Kennesaw State University, California Polytechnic State University, Ryerson University  
**PI/PDs:** Kristen Madison  
Kennesaw State University: Robert V. Randolph  
California Polytechnic State University: Benjamin N. Alexander  
Ryerson University: Francesco Barbera

### Women’s Collective Entrepreneurship: Catalyzing Innovation in Emerging Markets

Our study investigates how women contribute to innovation in emerging markets despite the institutional constraints prevalent in this context. We recognize the benefits of women’s collective entrepreneurship and integrate transactive memory theory to hypothesize that when more women are represented and more frequent communication exists in the venture, innovation is enhanced. Data from 805 SMEs in 34 emerging markets support our theorizing; although, results reveal different effects based on the innovation type. Overall, findings indicate that women catalyze innovation when they have strength in numbers, which highlights the importance of women’s collective entrepreneurship in gender-restrictive contexts.

**Sponsors:** State of Oklahoma, Texas State University  
**PI/PDs:** Kristen Madison, Curt B. Moore, Joyce Komakech Nabisaalu  
Texas State University: Joshua J. Daspit

### Parenting Legacy: How Parenting Style Affects Family Business Successors and their Employees

Transferring leadership across generations is a defining characteristic of family firms. Yet many successors underperform, and little is known about why. We extend parental control theory to develop a model of parenting legacy in family firms. Primary dyadic data from successors and subordinates in
119 family firms, supplemented with 24 interviews with family firm leaders, shows that predecessors’ parenting style affects successors’ psychological functioning, which impacts employees’ citizenship and counterproductive behaviors. Among firms that make it to the second generation, the seeds of success are partially sown long before succession takes place, drawing attention to the important role of parenting.

**Sponsors:** State of Oklahoma, Middle Tennessee State University, University of Central Florida, Northeastern University  
**PI/PDs:** Kristen Madison  
Middle Tennessee State University: Kristen K. Shanine  
University of Central Florida: James G. Combs  
Northeastern University: Kimberly A. Eddleston

**Employer Branding in Family Firms: The Influence of Category-Based Beliefs on Applicant Attraction**  
Family firms often face challenges attracting employees. We theorize and test a parallel mediation model that highlights the importance of the family firm brand in the recruitment process. Results indicate that job seekers have opposing category-based beliefs about family firms that influence their level of attraction: they have negative perceptions of family firm HR systems but positive perceptions of family firm brand authenticity, with authenticity exhibiting a stronger positive influence on applicant attraction. These findings provide nuanced insight into how employer branding can fit into the overall HR system and strategy of family firms to reap advantages over nonfamily firms.  
**Sponsors:** State of Oklahoma, University of Witten-Herdecke, University of Bern, University of North Carolina-Charlotte  
**PI/PDs:** Kristen Madison  
University of Witten-Herdecke: Sandra Wolf  
University of Bern: Andreas Hack  
University of North Carolina-Charlotte: Franz W. Kellermanns

**Linking the Entrepreneur’s Childhood Communication Patterns to the Innovativeness of their Ventures**  
This study integrates human communication and imprinting theories to advance our understanding of family firm innovation. Using primary triadic data from leaders, family employees, and nonfamily employees in 38 U.S. family firms, results demonstrate the more effective the human communication within the family, the more effective the organizational communication within the family firm and subsequently, the greater the innovativeness. However, due to differing perceptions of family and nonfamily employees, results indicate founder communication patterns do not fully imprint on the family firm. This implies the relationship between founder imprinting and organizational outcomes is more nuanced than theory would suggest.  
**Sponsors:** State of Oklahoma, Mississippi State University  
**PI/PDs:** Kristen Madison  
Mississippi State University: Emily G. Marett

**Entrepreneurial Response to Interstate Regulatory Competition: Evidence from a Discrete Choice Experiment**  
How do entrepreneurs decide between specific entrepreneurial opportunities? We conduct a discrete choice experiment (DCE) with a population of entrepreneurs/small business owners how they perceive and decide between specific opportunities in the food industry. Using latent class logit analysis, we separate our sample based on entrepreneurs’ revealed utility functions and are so able to distinguish two distinct types of entrepreneurial decision-making. Our findings suggest that not only are entrepreneurs different from non-entrepreneurs, but there are different types of entrepreneurs who
perceive opportunities differently. This decomposes the entrepreneurship concept and suggests that we should predict different types of entrepreneurs to act differently.

**Sponsors:** Oklahoma State University, Michigan State University  
**PI/PDs:** Per Bylund  
Michigan State University: Trey Malone

**Overcoming Uncertainty, Resilience, & Overconfidence in Entrepreneurship**  
We use conjoint experiments to provide empirical evidence regarding how individuals in the early stages of the entrepreneurial process and under different levels of uncertainty are influenced by the individual’s resilience and overconfidence in their propensity to pursue entrepreneurial action. Results support the view that higher levels of individual resilience will partially mitigate the hindrances to entrepreneurial action associated with higher levels of uncertainty, while, counterintuitively, the results of overconfidence were not significant. Consequences of these findings for these theory of entrepreneurship under uncertainty are discussed.  
**Sponsor:** Oklahoma State University  
**PI/PDs:** Per Bylund, Fernando D’Andrea, Steven Trost

**Effectuation and The Logic of Action: A Critical Assessment from a Praxeological Perspective**  
Building on recent discussions about the veracity of effectuation research, we analyze the theoretical structure of effectuation. We rely on a rarely used method for reasoning about social phenomena prevalent in the contemporary Austrian School – formalized as praxeology – to systematically probe into effectuation challenging its core tenets, identifying critical issues that need to be addressed, and offering possible actionable remedies. Based on our analyses, we question the novelty and usefulness of effectuation principles for entrepreneurship research and practice, and highlight avenues for constructive scholarship in this area. Implications and directions for future research are discussed.  
**Sponsors:** Oklahoma State University, University of Alabama Birmingham  
**PI/PDs:** Per Bylund  
University of Alabama Birmingham: Vishal Gupta

**Where do factor markets come from? Toward a Resource-Based Theory of the Entrepreneurial Firm**  
We argue that the firm as a precondition to and a creator of factor markets. We suggest that the firm is the means through which such advantages are established, an island of entrepreneurial innovation, that provides the means through which goods otherwise not possible in the market are brought into being. The firm is the entrepreneur’s means of realizing an imagined competitive advantage. We contribute to a rich literature exploring the roots of entrepreneurial strategy, and our exploration of entrepreneurial factor markets provides an essential theoretical link necessary for a creation-infused account of entrepreneurial firm formation.  
**Sponsors:** Oklahoma State University, University of Utah  
**PI/PDs:** Per Bylund  
University of Utah: Robert Wuebker

**Boundaries of Strategic Theory and Its Implications for Entrepreneurship**  
Entrepreneurship draws on theories in strategy to answer its central questions, and strategy increasingly looks at the origins of new value, disclosing a mismatch between canonical strategic theories and their application where value creation, rather than discovery or exploitation, are the focus. We claim that there are important and often-neglected boundary conditions for strategic theories applied to entrepreneurial settings. This misapplication of strategic theories in entrepreneurship has important
implications for the program of research in entrepreneurship, strategic entrepreneurship, and strategy, and calls for new theory at the intersection of entrepreneurship and strategy focused on the origins of new value.  

**Sponsors:** Oklahoma State University, University of Utah  
**PI/PDs:** Per Bylund  
University of Utah: Robert Wuebker

**Crypto vs. Fiat: An institutional approach**  
We propose that cryptocurrency firms can acquire market legitimacy that will ultimately reduce institutional uncertainty and propose a process model in which that legitimacy acquired at the market level via evasive action will reduce uncertainty in the formal institutional environment, which will beget additional legitimacy for cryptocurrencies, and thus higher performance to those firms, on average. This study (1) extends our understanding of the evolution of an innovation and its diffusion under institutional uncertainty, (2) elucidates how cryptocurrency can become a medium of exchange, and (3) contributes to the development of institutional theory.  

**Sponsor:** Oklahoma State University  
**PI/PDs:** Duygu Phillips, Per Bylund, Curt B. Moore, Matt Rutherford

**The Effects of Country-level Institutional Configurations on the Entrepreneurship Process**  
This research performs an exploratory comparative institutional analysis to understand how country-level institutional configurations may shape the entrepreneurship process. The study uses fsQCA to examine how different characteristics of institutional contexts (i.e., informal institutional support, formal institutional strength, and formal institutional efficiency) generate distinct national institutional configurations with varying advantages for entrepreneurial activities performed at the early vs. the late stage of the entrepreneurship process, thereby affecting the productivity of entrepreneurship in countries. The study’s findings are discussed to form new theory on why certain institutional profiles are more or less effective in promoting entrepreneurial activities throughout the entrepreneurship process.  

**Sponsors:** Oklahoma State University, Mississippi State University  
**PI/PDs:** Per Bylund  
Mississippi State University: Sohrab Soleimanof, Hessamoddin Sarooghi

**A Process Theory of Value and its Implications for Entrepreneurship and the Market Process**  
We advance a conception of value as a process, and formalize an integrative theory of subjective value—phenomenal value theory—that depicts value in terms of an experiential learning process. We build upon dualist philosophy to explain how the term ‘value’ describes both the experience of subjective benefit as well as the ascription of benefit (expected or realized) to specific sources. We then leverage phenomenal value theory to revisit market process theory. Our entrepreneurial market process theory offers important and previously unrecognized implications regarding the nature and costs of regulatory policy in fettering the value learning process.  

**Sponsors:** Oklahoma State University, University of Nevada Reno  
**PI/PDs:** Per Bylund  
University of Nevada Reno: Mark Packard

**New Venture Social Media Legitimacy: The Role of Antenarratives and Social Networks**  
Can online fragments of stories—antenarratives—influence legitimacy judgments of audiences? While the work on fully formed narratives and legitimacy is advancing, we know very little about online antenarratives and their legitimacy inducing impact. Drawing on cultural entrepreneurship theory, we
offer an empirical analysis of a large, unique dataset and develop a novel dictionary to analyze the new ventures’ tweets. Our results indicate that tweets containing legitimating content positively affect social media legitimacy, while emotive content is negatively related to social media legitimacy. We further find the size of an actor’s social media network moderates our antecedents in somewhat unexpected ways.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Duygu Phillips, Matt Rutherford, Curt B. Moore

**Optimally Distinctive or Optimally Isomorphic? A Quasi-Experimental Investigation of New Venture Names**  
How do organizations saddled with extreme liabilities of newness choose a name that will assist in the difficult process of emergence? Drawing on optimal distinctiveness theory and literature from marketing, we propose that new ventures whose names communicate both distinctiveness and conformity will attain elusive legitimacy judgments from audiences. We find that; indeed, both are important; but the connotations of distinctiveness of a venture’s name are more strongly associated with legitimacy and subsequent performance than the connotations of conformity. Moreover, while names conveying conformity have curvilinear relation with legitimacy, names transmitting distinctiveness possess a linear relationship.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Duygu Phillips, Matt Rutherford

**Department of Management:** Bryan Edwards

**Legitimate Distinctiveness via Cultural Entrepreneurship in New Ventures**  
“To be different or to be the same?” Adopting a cultural entrepreneurship process model, we submit that both competitive distinctiveness and institutional conformity can individually serve as legitimating strategies in identity development by forming *propriety judgements* and that legitimacy mediates their relationships performance. Moreover, we suggest that these relationships will be contingent upon *validity judgments of category appeal*. We develop theory around, and test, the relationship between distinctiveness and pragmatic legitimacy and challenge the longstanding path-dependent assertion that prioritizes conformity. Using a mixed methods approach, we test the hypotheses through two separate studies.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Duygu Phillips, Matt Rutherford

**Crypto vs. Fiat: An Institutional Approach**  
How can cryptocurrency gain legitimacy in the eyes of users? We propose that cryptocurrency firms can acquire market legitimacy that will ultimately reduce institutional uncertainty, through rhetorical strategies that circumvent the existing institutional framework. Drawing on recent theory of institutional uncertainty, we propose a process model in which that legitimacy acquired at the market level via evasive action will reduce uncertainty in the formal institutional environment, which will beget additional legitimacy for cryptocurrencies, and thus higher performance to those firms. This study extends our understanding of the evolution of an innovation under institutional uncertainty, elucidates how cryptocurrency can become a medium of exchange, and contributes to the development of institutional theory.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Duygu Phillips, Per Bylund, Matt Rutherford, Curt B. Moore
What do we “Know” about New Venture Legitimacy: A Meta-Analytic Review of the Relation between New Venture Legitimacy and Firm Performance

We present insights, based on the sum total of the accumulated empirical knowledge in the literature, regarding the relation between legitimacy and firm performance in new entrepreneurial ventures. Our meta-analysis that captured legitimacy in new, as well as mature, ventures illustrates four primary insights that we could not have otherwise inferred from the extant literature. We discuss the implications of these findings—both theoretical and practical—and we explore multiple avenues for future research to advance the literature with regards to legitimacy in new ventures.

Sponsor: Oklahoma State University
PI/PDs: Duygu Phillips, Matt Rutherford

Opaque Costly Signals and Debt Contracts

New Ventures that are unable to fund expansion using internal equity and prefer to maintain complete firm ownership may supplement existing cash flow by accessing external funds in the form of debt contracts (Berger & Udell, 1998). These firms send signals to external stakeholders that represent a sufficient level of legitimacy and worthiness of investment. However, many new ventures are unable to send preferred costly signals because they do not possess them. In this study, I examine specific signals that carry the preferred costly weight needed to gain a stakeholder’s perception of legitimacy, however are difficult to fully verify.

Sponsors: Oklahoma State University, Baylor University
PI/PDs: Duygu Phillips, Matt Rutherford, Curt B. Moore
Department of Management: Bryan Edwards
Baylor University: Lee Grumbles

An Introduction and Clarification of Ex Nihilo Propriety

Organizational legitimacy attainment is one of the most important precursors to the success of new ventures. However, an underrepresentation within the entrepreneurship literature—describing and examining the actual attainment of legitimacy—has been apparent. To address this omission, we present a discussion of the earliest of all legitimacy types to be attained, which we term ex nihilo propriety. We provide a brief review of the theoretical framework. We then discuss the nomological network of this novel construct. In conclusion, we offer multiple theoretical propositions to serve as guidance for the empirical testing of this newly conceptualized legitimacy construct.

Sponsor: Oklahoma State University
PI/PDs: Matt Rutherford, Duygu Phillips

Bootstrapping: Complementary Lines of Inquiry in Entrepreneurship

Bootstrapping is a term, a construct, and a paradigm that has attracted substantial attention from both popular press writers and scholarly researchers. However, insights from existing theory (e.g., signaling, cultural entrepreneurship) as well as the relatively recent development of closely related bases (e.g., effectuation, bricolage) can complement and advance bootstrapping by adding theoretical breadth and depth. When understood alongside these related lines of research in entrepreneurship, researchers are better equipped to create, catalog, and accumulate knowledge regarding bootstrapping. In turn, educators will be more effective in communicating how entrepreneurs are able to launch in resource poor environments, and ultimately achieve success.

Sponsor: Oklahoma State University
PI/PDs: Matt Rutherford, Duygu Phillips
The Bootstrapping-Bricolage Interface

The entrepreneurial frameworks of bootstrapping and bricolage both address the broad challenge of surviving and thriving under conditions of resource scarcity. However, while similar in this regard, these frameworks also possess distinct attributes. Bootstrapping has been traditionally more focused upon exploring issues concerned with financing choices, whereas bricolage considers a broader range of, mostly improvisational, activities. These improvisational activities can be considerations of financial capital, but may also include social, human, and institutional capital. In this work, we outline the similarities and divergences between the two frameworks, and cast them as opportunities for developing scholarly work in entrepreneurship.

Sponsor: Oklahoma State University
PI/PDs: Matt Rutherford, Duygu Phillips, Jorge Arteaga

Nonresponse Bias in Family Business Research

How do response rates influence outcomes in family business studies? Relatedly and perhaps more importantly, how do they influence the collective quality of family business research? Although there is wide consensus that response rates—and the resultant nonresponse bias—matter in scientific research, there is considerable debate regarding their substantive effect on the studied relationships. Here, we address this issue in family business research. Our broad purpose is to take up on a well-accepted issue in research and provide a guide on strategies to reduce nonresponse bias, enhance study quality and advance the growing field of family business research.

Sponsor: Oklahoma State University
PI/PDs: Matt Rutherford, Duygu Phillips

Building Durability Capabilities

New Venture Navigation of the Great Recession

Results from an analysis of 2,500 firms that were founded just prior to the start of the Great Recession indicate that new ventures which display a commitment towards “durability resources” are more likely to survive a recession—and thrive afterword. With regard to combinations of these resources, we found that firms could be described in one of four ways: 1) Resource-Constrained, 2) Bootstrappers, 3) Adequate, and 4) Beneficent. With the exception of the Resource-Constrained, all types demonstrated some association with elevated performance during a recession; but the Beneficent firms were the most strongly associated.

Sponsors: Oklahoma State University, DePaul University, Samford University
PI/PDs: Matt Rutherford
DePaul University: Paul Sanchez-Ruiz
Samford University: Matt Mazzei
Deliberate Practice as Entrepreneurship Curriculum: A Study of Middle School Girls in Economically Challenged Regions

Can the deliberate practice process be employed to swiftly improve individual entrepreneurial performance? To address this question, a curriculum was developed based on the deliberate practice model and administered to middle school girls from economically challenged regions to determine whether deliberate entrepreneurial skills practice could lead to the *expeditious* acquisition of enhanced entrepreneurial performance. Our findings confirmed the conceptual relationship between deliberate practice and entrepreneurial performance. It is hoped that the results of this study can be used by researchers, educators, and policy makers to address a general lack of entrepreneurship in economically challenged regions with knowledge and skills to create a new business.

**Sponsors:** Oklahoma State University, ARDX, Southwestern Oklahoma State University  
**PI/PDs:** Matt Rutherford  
ARDX: Angela Reddix  
Southwestern Oklahoma State University: Lincoln Brown

An Introduction and Clarification of ‘Ex Nihilo’ Propriety

Organizational legitimacy attainment is one of the most important precursors to the success of new ventures. Until now, an omission within the entrepreneurship literature describing and examining the attainment of legitimacy has been apparent. Previously, the identification and description of the attainment of legitimacy that occurs in the earliest stages of new venture development have been neglected. Consequently, the following is a description and discussion of the earliest of all legitimacy types to be attained, *ex nihilo* legitimacy. Next, the nomological network of the new construct is discussed.

**Sponsors:** Oklahoma State University, North Carolina State, Samford University, Bradley University  
**PI/PDs:** Matt Rutherford  
North Carolina State: Jeffrey M. Pollack  
Samford University: Matt Mazzei  
Bradley University: Brian G. Nagy


Cronyism is the practice of favoritism based on connections. The institutionalization of cronyism as a rational practice within a context promotes rewards for unproductive behaviors at the expense of productive behaviors. This study strives to explain how the prevalence of cronyism can increase unproductive entrepreneurship and decrease productive entrepreneurship in different countries. Moreover, this research examines the moderating role of formal, inclusive institutions—rule of law—on the relation between cronyism and entrepreneurial motives. Analysis of data from 96 countries over 7 years provides empirical support for the notion that productive entrepreneurship and cronyism are inversely related.

**Sponsors:** Oklahoma State University, Louisiana State University  
**PI/PDs:** Matt Rutherford  
Louisiana State University: Sohrab Soleimanof

Legitimation in De Novo Firms: A Microfoundational Perspective

We engaged in a longitudinal multiple case study whereby we followed three firms over a period of five years. The data gathered and analyzed here suggest that stakeholders predominantly make legitimacy judgments about new ventures along two lines: relational and technological appropriateness. With regard to the former, in new ventures, stakeholders prefer to perceive appropriate: 1) board members,
2) partners, 3) human resources, and 4) communications with stakeholders. With regard to the later, we found that stakeholders prefer appropriate: 1) levels of product novelty, 2) levels of product testing and development, and 3) integration with existing technology.

**Sponsors:** Oklahoma State University, The Artic University of Norway, DePaul University

**PI/PDs:** Matt Rutherford
The Artic University of Norway: Elin M. Oftedal, Lene Foss
DePaul University: Paul Sanchez-Ruiz

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**The Attracted but Ill-Suited Entrepreneur: The Dark Dyad’s Link to Resource Depletion and New Firm Performance**

Previous studies have shown positive outcomes related to dark characteristics suggesting that they are beneficial for the individual while being detrimental to others and society. This study extends the existing literature by investigating dark dyad’s deleterious outcomes related both to the individual, i.e. individual burnout, as well as to others, i.e. reduced employee and firm performance. A sample of 299 entrepreneurs-employee dyads significantly demonstrated that entrepreneurs’ dark triad traits are positively correlated with burnout, and negatively correlated with their employees’ performance and new venture sales.

**Sponsors:** Oklahoma State University, Ball State University

**PI/PDs:** Jonathan Butler, Imran Syed

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**For Better or for Worse: Spousal New Venture Employment, Founder Passion, and Founder Burnout**

Because the startup environment is resource constrained, often entrepreneurs turn to spouses for low or no cost sources of human capital (Blenkinsopp & Owens, 2010; Dyer, Dyer, & Gardner, 2012) without considering how that decision may affect their own well-being. Extending the Sustainable Family Business Theory (SFBT Werbel & Danes, 2010), this paper examines how spouses act as resource gatekeepers, monitoring the flow of resources between the family and business systems.

**Sponsors:** Oklahoma State University, Ball State University

**PI/PDs:** Jonathan Butler, Imran Syed

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**Illuminating the Dark: The Dark Triad’s Threat to New Venture Performance and Employee Creativity**

Miller (2014) recently called for increased research into the dark side of entrepreneurship. The dark triad (Machiavellianism, narcissism, and psychopathy), introduced by Paulhus and Williams (2002), were recently found to be over-represented among entrepreneurs and entrepreneurship students (Akhtar et al., 2013; Mathieu & St-Jean, 2013). Founders with dark triad characteristics initially appear to be ideal leaders (Maccoby, 2000). However, the dark triad share attributes of manipulation, superiority, low-empathy, and moral deficit (Wai & Tiliopoulos, 2012, Furnham et al., 2013) which over time undermine social exchanges by violating reciprocity assumptions.

**Sponsor:** Oklahoma State University

**PI/PD:** Jonathan Butler
Imagination & Entrepreneurial Alertness in the Midst of Adversity: The Influence of Social Capital

Cognitive Adaptation Theory (Taylor, 1983) describes how individuals, in response to adversity, use imagination and imagined futures for self-enhancement and to gain control of one’s life. In this study, the authors hypothesize that adversity will be positively related to entrepreneurial alertness when mediated by factors of imagination including prospective thinking, perspective taking, and counterfactual thinking. For nascent entrepreneurs currently suffering from adversity (natural disasters, economic downturn, or adverse events) this study provides hope in that it is expected to demonstrate that adversity may be linked to higher ability to recognize entrepreneurial opportunities.

Sponsor: Oklahoma State University
PI/PD: Jonathan Butler

The Nature of Entrepreneurial Imagination: A Process Perspective

This work-in-progress paper seeks to offer more definitive view of the nature of entrepreneurial imagination and demonstrate the reasons why imagination is directly relevant to entrepreneurship. Taking cues from cognition and economics literatures, the authors seek to develop a theoretical framework concerning the role of imagination is several key aspects of the entrepreneurial process including concept ideation, entrepreneurial alertness, and opportunity recognition. Finally, the implications and potential contributions of the proposed framework will be explored.

Sponsor: Oklahoma State University
PI/PD: Jonathan Butler

Antecedents and Consequences of Individual-Level Trust in the Fields of Management and Entrepreneurship

When an individual has trust in another individual there is always a possibility that the other individual will break that trust. Trust is similar to a bet we take on others. It has an inherent element of risk (DeSteno, 2014). Why then do individuals trust each other? What role does trust play, if any, in management and entrepreneurship? This work-in-progress paper strives to take an initial step towards answering these questions. This paper explores the need and rationale for trust, its biological and chemical foundations, as well as some of the implications of trust for management and entrepreneurship.

Sponsors: Oklahoma State University, Ball State University
PI/PDs: Jonathan Butler, Imran Syed
SCHOOL OF HOSPITALITY AND TOURISM MANAGEMENT

Creating an Effective Support System for Small and Medium-Sized Farm Operators to Succeed in Agritourism

Agritourism has the potential not only to keep small farms in business but also to provide important local economic development spillover effects. However, key barriers prevent many farmers from diversifying to include agritourism. These barriers represent opportunity costs and include not only lack of information among producers, consumers, supporting organizations and policy makers, but also regulatory gaps across states. Project objectives include understanding the roles and educational needs of various organizations in supporting agritourism; understanding the factors that contribute to growth in agritourism across U.S. counties; and delivering educational materials to farmers and supporting organizations and policy makers.

Sponsors: National Institute of Food and Agriculture (NIFA) Agriculture and Food Research Initiative (AFRI), Oklahoma State University, Penn State University, University of Vermont
PI/PDs: Stacy Tomas
Penn State University: Claudia Schmidt, Stephan Goetz, Sarah Rocker, Suzanna Windon
University of Vermont: Lisa Chase

Hospitality Training for Wineries

Increased visitation and sales at Oklahoma wineries can be the result of positive staff interactions through great customer service and wine knowledge. The purpose of this project is to develop a research-based hospitality training program specific to Oklahoma wineries to help staff more fully engage with visitors and to increase tourism in many rural communities across the state. The curriculum will be developed by Oklahoma State University in consultation with an advisory committee comprised of Oklahoma Department of Agriculture, Food and Forestry, the Oklahoma Grape Industry Council and Oklahoma winery owners. The curriculum will be delivered state-wide through regional trainings.

Sponsors: Oklahoma Department of Agriculture, Food and Forestry, Oklahoma State University
PI/PD: Stacy Tomas

National Agritourism and Direct Sales Research

From a national perspective the understanding of agritourism, as both a tourism product and as a strategy for income diversification is limited. While regional research exists across the country, a holistic and comprehensive understanding of this industry segment does not. This multi-state research study is led and orchestrated by the University of Vermont. The Oklahoma portion of this study is being managed by OSU. Results of this project will provide comprehensive data on the industry not only in Oklahoma, but across the country, and will also be used to develop tools and resources to increase the success of agritourism enterprises.

Sponsors: Oklahoma State University, University of Vermont, Oregon State University
PIs/PDs: Stacy Tomas
University of Vermont: Lisa Chase
Oregon State University: Mary Stewart
Applying Psycho-Physiological Methods to Comparison of Virtual Reality Visualizations to Traditional Visualizations in Hotel Settings.
VR visualizations of a hotel room will be compared to 2-D hotel room images in terms of emotional, attitudinal, and behavioral responses utilizing psycho-physiological measurement methods in addition to traditional survey methods.
Sponsor: Oklahoma State University
PI/PDs: Lisa Slevitch, Tilanka Chandrasekera, Luis Meja, Kate Korneva

Empirical Comparison of Kano Categorization Methods.
The aim of the study is to conduct a comprehensive empirical comparison of the existing Kano methods. The accuracy of the methods will be tested using a generated dataset simulating the relationships between attribute performance and customer satisfaction as proposed in the original Kano Model. Additionally, bootstrapping technique will be used to compare the generated dataset with a real data set. The findings will assist with choosing the most appropriate method and also help with application in a technically fitting manner.
Sponsor: Oklahoma State University
PI/PDs: Lisa Slevitch, Mindy McCann, Josephine Acosa, Aisya Larasati

Optimizing Frontline Shift Composition for Increased Customer Satisfaction and Firm Performance.
The effects of shift composition on customer satisfaction and firm performance will be examined in OSU dining services using qualitative approach.
Sponsor: Oklahoma State University
PI/PDs: Tom Arnold, Lisa Slevitch

The Bleisure Travel Experience: Combining Business and Leisure
The study aims to examine how travelers experience bleisure travel, explore how they balance leisure and business as the two purposes of their trips, and to find out how bleisure travel experience impacts each component individually. Identifying the differences between leisure or business experiences can help tourism companies to respond to the preferences of the different traveler segments. It is vital for tourism practitioners to look beyond the traditional classification of leisure and business travelers and to consider the new growing segment in order to customize their products or services accordingly and by doing so better satisfy bleisure travelers.
Sponsor: Oklahoma State University
PI/PDs: Bardia Batala, Lisa Slevitch

Foodservice Mobile Application Quality Determinants’ Impact on Customer Satisfaction and Repeat Usage Intentions: The Role of Perceived Risk
The current study aims to examine foodservice mobile commerce success model and investigate the relationships among its quality components, customer satisfaction, and repeat usage intentions in the restaurant context. The study can assist practitioners involved in the restaurant industry by showing how to configure quality components to satisfy customers and make them more willing to use food delivery mobile applications in casual dining restaurants.
Sponsor: Oklahoma State University
PI/PDs: Joo Ahn, Lisa Slevitch
**When Employees Feel Envy: The Role of Psychological Capital**
This study explores the relationships between LMXSC, malicious and benign envy, and Psychological Capital (PsyCap) in the hotel industry. This study found that the employees with low LMXSC were likely to experience not only negative envy but also positive envy as the emotional responses towards the unpleasant low LMXSC. The employees’ PsyCap impacted the ability for employees to manage their emotional responses: employees can alleviate hostile emotions towards the envied coworkers (malicious envy) and focus on improving their current situation rather than annoying the envied coworkers (benign envy).

**Sponsors:** Oklahoma State University, Daegu University  
**PI/PDs:** Choonghyoung Lee, Bill Ryan  
Daegu University, South Korea: Jahyun Song

**Examining the Impact of Artificial Intelligence on Hotel Employees Through Job Insecurity Perspectives**
The purpose was to examine hotel employees’ perception of AI and its impact by identifying the critical role of job insecurity, job engagement, and turnover intention through a pragmatic approach. An explanatory sequential mixed-methods design was used by conducting a quantitative study with an empirical survey method followed by a qualitative study with a case study. Results from the quantitative study demonstrated that perceived job insecurity significantly affected perceived job engagement and perceived job insecurity indirectly affected turnover intention through intermediary variable of perceived job engagement. There were no statistical differences between nonmanagerial positions and managerial positions.

**Sponsors:** Oklahoma State University, Florida Gulf Coast University  
**PI/PDs:** Bonhak Koo, Bill Ryan  
Florida Gulf Coast University: Catherine Curtis

**Employee Brand Love and Love Behaviors: Perspectives of Social Exchange and Rational Choice**
Marketing scholars study customers’ love for a brand, but little attention has been paid to understanding employees’ love for their brands. The study proposed that forgiveness behavior, supportive voice behavior, and helping behavior are three love behaviors improved through employee brand love. Organizational culture types are shown to moderate the relationship between brand love and these love behaviors. Testing the moderating effects of organizational cultures reveal that forgiveness behavior may be strengthened through a hierarchy culture, that supportive voice behavior can be strengthened via clan culture, and that helping behavior can be strengthened under a hierarchy organizational culture.

**Sponsors:** Oklahoma State University, University of Arkansas, Ling Tung University, Taiwan  
**PI/PDs:** Bill Ryan  
University of Arkansas: Yao-Chin Wang  
Ling Tung University, Taiwan: Chu-En Yang
Hotel General Managers’ Brand Love: A Thematic Analysis

Literature has identified support from top managers as one key success factor in internal branding, a knowledge gap remains regarding understanding general managers’ (GMs’) mindset toward their brands. This study conceptualizes brand love and explores factors influencing brand love identified through interviews. Thematic analysis is applied with three raters to code the information collected. This study identifies five dimensions of hotel GMs’ conception of brand love: affinity, experience, pride, loyalty, and reputation. Four dimensions of positive factors (employee benefits, organization, product, community) and four dimensions of negative factors (individual, organization, product, guests) emerged with several sub-dimensions.

Sponsors: Oklahoma State University, University of Arkansas, University of New Orleans
PI/PDs: Bill Ryan
University of Arkansas: Yao-Chin Wang, Courtney Troxtel, Mackenzie Cvar
University of New Orleans: Han Chen

Engage More and Burnout Less Through Love! Examining the Mechanism of Hotel Department Managers’ Brand Love and Health

This research investigates brand love from hospitality managers’ perspective to see whether this concept can also influence their three work-related attitudinal outcomes, namely work engagement, burnout and positive affect. When individuals have a passion or emotional attachment toward their organizations’ brand, they essentially have identified themselves with their organizations. The rationale of organizational identity theory indicates people highly identified with their organizations would exhibit positive work-related attitudes such as increased work engagement and reduced burnout. This study proposes that hospitality managers who develop love emotions toward their organizations’ brand should also be likely to display these positive work-related attitudes.

Sponsors: Oklahoma State University, University of Arkansas, National Taiwan Normal University
PI/PDs: Bill Ryan
University of Arkansas: Yao-Chin Wang
National Taiwan Normal University: Allan Cheng Chieh Lu

A Meta-Analysis of Customer Loyalty: A Decade of Empirical Research

Customer loyalty has long been recognized as a critical driver of business success in the tourism and hospitality industry. Despite extensive research on loyalty formation, findings regarding interrelationships between loyalty and its key drivers are inconclusive and often contradictory. This study aims to synthesize and analyze findings from 71 articles published in eight top-tier tourism and hospitality journals between 2006 and 2020 using meta-analytic structural equation modeling. This study contributes to the literature by reconciling and synthesizing inconclusive findings from prior research.

Sponsors: Oklahoma State University, Temple University
PI/PDs: Kevin Kam Fung So
Temple University: Yang Yang, Xiang (Robert) Li

Customer Experience in Tourism and Hospitality Research: Bibliometric Analysis, Topic Modeling and Research Agenda

Customer experience has attracted significant attention in past two decades. This study aims to provide the evolution of scientific research on customer experience articles published in 12 tourism and hospitality journals between 1998 and 2019. Using the Web of Science database and the PRISMA technique, relevant articles will be retrieved for quantitatively bibliometric and qualitatively thematic content analyses. The results will illustrate publication outlets, trajectories, the most influential papers,
co-citation, and keyword co-occurrence of the lexical and temporal networks, as well as proposing a conceptual model of customer experience that includes the theoretical building blocks of customer experience.

**Sponsors:** Oklahoma State University, University of South Carolina

**PI/PDs:** Kevin Kam Fung So
University of South Carolina: Hyunsu Kim

**A bibliometric analysis of customer engagement: A comparison of the marketing and tourism/hospitality fields**
The concept of customer engagement has dominated many industry and practitioner discussions in the tourism industry. Using bibliometric analysis, this study covers an 11-year publication period and targets specific marketing/service and hospitality/tourism journals to systematically assess the structure of research related to customer engagement. By following the recommendations suggested by Koseoglu, Rahimi, Okumus, and Liu (2016) and Zupic and Čater (2015), this study is among the first to conduct all three techniques of bibliometric analysis: 1) systematic literature techniques, 2) evaluative techniques, and 3) relational techniques. This study comprehensively identifies current trends and future research avenues.

**Sponsors:** Oklahoma State University, University of South Carolina, Temple University

**PI/PDs:** Kevin Kam Fung So
University of South Carolina: Hyunsu Kim
Temple University: Ceridwyn King

**Artificial intelligence in service management: Service robots and customer responses**
The emergence of artificial intelligence and the increasing adoption of service robots in service organizations have called for more research on human-robot interactions. This study investigates the role of different attributes of service robots in influencing trust and attitude by adopting a multi-study approach to test the theoretically derived hypotheses. Study 1 adopts Connie to empirically analyze the structural relationships between constructs, while Study 2 adopts Pepper to replicate the model with a different robot to improve external validity. Study 3 and Study 4 provide further investigate the customer responses to service robots and the relevant mechanism through multiple experimental research.

**Sponsors:** Oklahoma State University, University of South Carolina, Ohio State University, National University of Singapore

**PI/PDs:** Kevin Kam Fung So
University of South Carolina: Hyunsu Kim
Ohio State University: Stephanie Liu
National University of Singapore: Jochen Wirtz
Actor value formation in a peer-to-peer accommodation: Insight from text-mining
The sharing economy including Airbnb has been described as a disruptive innovation transforming many traditional businesses. To capture actor value formation (AVF) in the context of Airbnb, this study proposes two stages of investigation. Stage One adopts a hybrid approach involving deductive and inductive thematic analyses to evaluate 586,778 existing Airbnb reviews. This study then investigates the effects of AVF on value, communication, accuracy, and overall rating. Stage Two subsequently investigates the linkages through primary consumer data capturing negative and positive Airbnb experience. The moderating effects of valence experience on the relationships among AVFs, accuracy, communication, value, and satisfaction will also be tested.

Sponsors: Oklahoma State University, University of South Carolina, The Hong Kong Polyethnic University
PI/PDs: Kevin Kam Fung So
University of South Carolina: Hyunsu Kim
The Hong Kong Polyethnic University: Hailey Shin

Social influencers and argument quality on online engagement and behavior
This study focuses on social influencer marketing in tourism. The research draws on the elaboration likelihood model (ELM) and examines social influencers as a peripheral cue and argument quality as a central cue to identify how customers process information differently in different service settings. Through a series of experiments, this study investigates the effects of social influencers and argument quality on online engagement and behavior intention. Follow investigations examines (1) self-esteem and (2) brand familiarity as moderators of the effects of a dual-route on online engagement and behavior intention.

Sponsors: Oklahoma State University, University of South Carolina
PI/PDs: Kevin Kam Fung So
University of South Carolina: Hyunsu Kim

Post-disaster recovery strategies in tourism destinations
Covid-19 has devastated the global travel and tourism industry. The aim of this proposal is four-fold. First, by reconciling the literature on disaster management with the findings from automatic and manual text analysis, this study develops a framework of post-disaster recovery strategies for tourism destinations. Second, this study empirically examines the effects of post-disaster recovery strategies on behavioral outcomes in tourism destinations. Third, this study investigates spatial-temporal behavioral patterns of tourism destinations by using the UNWTO Tourism Recovery Tracker. Fourth, this research uses user-generated contents and cutting-edge big data mining techniques to identify the most frequently mentioned areas and extract main themes in the reviews.

Sponsors: Oklahoma State University, University of South Carolina
PI/PDs: Kevin Kam Fung So
University of South Carolina: Hyunsu Kim, Bryan Mihalik
**Customer touchpoints with co-creation experience: Scale development and validation**
This study explores the role of the emerging concept of customer touchpoints in building a co-creation experience in the context of tourism and hospitality services (i.e., hotels, restaurants, and airlines). The scale, developed from a restaurant, hotels, and airline customers survey, is further tested to demonstrate strong psychometric properties across multiple samples and service settings. This article contributes to the literature by providing a comprehensive conceptualization of customer touchpoints within the tourism context, developing a scale to measure customer touchpoints with the cocreation experience effectively, and using evaluations of the critical customer touchpoints to predict the co-creation experience.

**Sponsors:** Oklahoma State University, University of South Carolina  
**PI/PDs:** Kevin Kam Fung So  
University of South Carolina: Hyunsu Kim, Bryan Mihalik, David Cardenas, Simon Hudson

**Customer touchpoints, customer engagement, and co-creation experience: Insight from symmetric and asymmetric approaches**
This study focuses on the empirical relationships between customer touchpoints, customer engagement, and the co-creation experience. From an analytical standpoint, this study uses symmetric structural equation modeling (SEM) and asymmetric fuzzy-set qualitative comparative analysis (fsQCA) to test the research hypotheses. In addition to using SEM to examine the effects of the transactional and relational antecedents of the co-creation experience, this study uses fsQCA to reveal general patterns and synergy effects of several equifinal configurations, which contribute to the co-creation experience. The findings uncover the important customer touchpoint dimensions and their combinational synergy effects, which in turn affect business performance.

**Sponsors:** Oklahoma State University, University of South Carolina  
**PI/PDs:** Kevin Kam Fung So  
University of South Carolina: Hyunsu Kim, Bryan Mihalik, David Cardenas, Simon Hudson

**How does Airbnb experience transfer to memorability and platform loyalty? Findings from a sequential mixed method approach**
While the sharing economy has been boosted by platform and has received increasing attention from academics and industry practitioners, the role of Airbnb experience in transforming memorability and platform loyalty remains unexplored. As such, a sequential mixed method approach is adopted to achieve fill the research gaps. Building on the memory-dominant logic, Study 1 proposes a conceptual framework to investigate how the three dimensions of Airbnb experience form memorability and subsequently build platform loyalty. Study 2 adopts in-depth interviews to further explain and contextualize the findings of Study 1. The findings of this study make significant theoretical and practical contributions to the current understanding of Airbnb experiences.

**Sponsors:** Oklahoma State University, Texas Tech University, University of South Carolina  
**PI/PDs:** Kevin Kam Fung So  
Texas Tech University: Jing Li  
University of South Carolina: Simon Hudson

**Touch vs. Tech service in the hospitality**
Due to COVID-19, both scholars and industry professional suggest applying innovation technology such as self-service kiosk and service robots in the tourism and hospitality industry. Previous studies have suggested that consumers wanted to have service robots in the areas such as front desk, concierge, and room service within a hotel. However, the interaction comfort and perceived service quality with service robot at these three settings remain sparse. Thus, this study investigates the effects of service
encounter types and service settings through a number of scenario-based experiments on customer behavioral intentions together with context-dependent factors informed by prior consumer research.

**Sponsors:** Oklahoma State University, Texas Tech University  
**PI/PDs:** Kevin Kam Fung So  
Texas Tech University: Jing Li

**Platform branding vs. pipeline business branding**
Despite increasing attention has been paid to platform business models (e.g., Van Alstyne et al., 2016; Wirtz et al., 2019), studies focused on branding in platform business remain sparse. Pipeline business models are significantly different from platform business models, as aforementioned. The triatic business model has made the branding process different from the pipeline business models (Van Alstyne, Parker, & Choudary, 2016; Wirtz et al., 2019). Thus, it is critical to investigate branding related issues with both pipeline business and platform businesses to understand the factors that keep customers with the platform (Wirtz et al., 2019). Taken together, this study aims to explore if platform branding differs from pipeline business branding, as well as the role of customer engagement in building customer loyalty.

**Sponsors:** Oklahoma State University, Texas Tech University, University of South Carolina  
**PI/PDs:** Kevin Kam Fung So  
Texas Tech University: Jing Li  
University of South Carolina: Simon Hudson

**Inside the feeling economy: understanding consumer adoption behavior of empathetic artificially intelligent device**
AI has significantly transformed the economy as mechanical tasks have largely been taken over by machines. A number of studies have investigated customers’ adoption motivation of AI, such as utility, capacity, and usefulness of AI devices. However, research on the potential acceptance of empathetic AI applications remain sparse. This study investigates consumers’ adoption of empathetic AI applications in the tourism and hospitality industry. Building on sRAM and extended TAM models, this study includes social-emotional and relational elements to explore the adoption motivation of empathetic AI applications.

**Sponsors:** Oklahoma State University, Texas Tech University  
**PI/PDs:** Kevin Kam Fung So  
Texas Tech University: Jing Li

**The effects of travel experiences across time: A three-wave longitudinal investigation**
This study examines the effects of travel experiences across time. Using three-wave data collection, this study investigated the lagged effects of travel experiences on customer engagement, subjective well-being, and revisit intention. The findings are expected to offer critical insight into the interrelationships among the well-established components of the consumer evaluative process underlying travel experiences. This study is one of first to provide longitudinal evidence of the potential fading of the impacts of travel experiences on destination specific factors as well as the more general subjective well-being.

**Sponsors:** Oklahoma State University, Texas Tech University  
**PI/PDs:** Kevin Kam Fung So, Yueying He  
Texas Tech University: Jing Li
Reciprocal links between destination brand experience and social media stickiness: a three-wave longitudinal study
This study aims to investigate how tourists’ remembered experience interplays with social media usage and their consequences on tourists’ intention to revisit. The model was tested using 3-wave longitudinal data collected across three time points. The finding suggests that positive remembered destination brand experience could lead to increased social media stickiness among tourists, and then the increased social media stickiness enhanced the destination brand experience recalling, which could evoke tourists’ intention to revisit.
Sponsors: Oklahoma State University, Texas Tech University
PI/PDs: Kevin Kam Fung So, Yueying He
Texas Tech University: Jing Li

The reciprocal relationships between remembered destination brand experience, emotions, and brand attachment: A cross-lagged panel model
Creating a memorable destination brand experience has been recognized as the ultimate competitive advantage of tourism destination management organizations. Prior research has largely concentrated on the use of cross-sectional data to draw statistical inferences. The study aims to evaluate the reciprocal associations between remembered destination brand experience, emotions, and brand attachment using a cross-lagged model using 3-wave longitudinal data collected across three months after a recent trip. The findings of the research will offer an longitudinal perspective on the casual chain of remembered destination brand experience, emotions, and brand attachment.
Sponsor: Oklahoma State University
PI/PDs: Kevin Kam Fung So, Yueying He

A bibliometric investigation of service innovation literature and a research agenda
To identify the knowledge structure and offer a synthesis of findings on service innovation in hospitality and tourism, this study conducts bibliometric investigation by assessing peer-viewed articles sampled from Web of Science (WOS) database. Through BibExcel, Pajek, Gephi, and VOSviewer, citation analysis, co-citation analysis, co-authorship analysis and co-occurrence analysis, the literature will form a service design-delivery-evaluation theoretical model that combines both the organization perspective and customer perspective.
Sponsors: Oklahoma State University, Temple University
PI/PDs: Kevin Kam Fung So, Yueying He
Temple University: Xiang (Robert) Li

Measuring Restaurant Service Sabotage Behaviors: Developing and Validating a Scale
Despite the prevalence and profound negative impact of restaurant service sabotage behaviors (RSSB) worldwide, it has been a challenge for researchers to properly gauge such a construct and understand its contextualized specifications. The purpose of the study is to develop a reliable and valid scale to measure RSSB. A mixed-methods research design, consisting of scale development, refinement, and initial validation, was applied. A tri-dimensional 10-item RSSB scale was developed. This psychometrically valid and conceptually sound scale can be adapted in future research to further explore the criterion network while providing pragmatic insights to the restaurant industry professionals.
Sponsors: Oklahoma State University, Kansas State University
PI/PDs: Willie Tao
Kansas State University: Junehee Kwon
"We learn; we share": Culinary knowledge management practices of the 2019 World Pastry Champion
Culinary knowledge is hard-earned and passed down frugally from one culinarian to another. This attitude is gradually diminishing as elite culinarians are becoming increasingly altruistic and open-minded in disseminating their knowledge. Based on a four-year qualitative project, the authors explore how an elite culinarian—the 2019 World Pastry Champion—navigates his responsibilities as a culinary knowledge bearer. Analysis yields three themes showing how one embraces the roles of a “fundamentalist,” “culinary ambassador,” and “generative culinarian.” Findings converge into the “generative model of culinary knowledge sharing,” a new conceptualization offering implications to both theory and practice in knowledge management and marketing.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Willie Tao, Kai-Sean Lee

What affects dining services at continuing care retirement communities? Manager's perspective
Many older adults prefer to reside in continuing care retirement communities (CCRC). However, only limited research investigated the dining aspects of CCRC, and the perspective of foodservice managers was overlooked. This qualitative study explored the factors that influence CCRC dining service by interviewing 15 CCRC foodservice managers. Nine major subcategories under generic, aging-related, and organizational aspects of dining services emerged and guided the subsequent thematic analysis. Managers’ shared vision of “brining in hospitality to older adults” for the future CCRC dining services was also identified and discussed, providing pragmatic strategies for CCRC operators and managers to strengthen the dining services.

**Sponsors:** Oklahoma State University, Kansas State University  
**PI/PDs:** Willie Tao, Kiyan Shafieizadeh, KyongSik Sung  
Kansas State University: Junehee Kwon

What attracts older adults when dining at restaurants? A mix-methods study
Aging is a complex process; however, previous restaurant studies regarding older adults were conducted from managerial perspectives without considering the effect of aging itself. Drawing on the three pillars of aging and Kano Model, this mixed-methods research aims to identify the most influential factors affecting older adults’ dining behaviors when dining at restaurants. By integrating perspectives from gerontology into restaurant research, this study has broadened our understanding of the wide range of factors influencing older adults’ dining behaviors. Our study also provides and practical implications for the restaurant industry to better accommodate the aging population.

**Sponsors:** Oklahoma State University, Kansas State University, University of North Texas, Macao Institute of Tourism Studies  
**PI/PDs:** Willie Tao  
Kansas State University: Junehee Kwon  
University of North Texas: Han Wen  
Macao Institute of Tourism Studies: Xiaoye Li
Experience is the apple of tourist’ eyes: A vicarious viewpoint of authenticity
This study applied big data techniques to collect and analyze a sizable data set of travel blog postings, aiming to identify the experiential components of tourists’ authentic experiences. While a sense of authenticity of tourists’ experiences in locals’ daily lives appears to entail a mix of different types of authenticity to a certain degree, several aspects remain insufficiently captured by the existing types of authenticity. Based on the results, this study shows several remarkable findings from a vicarious viewpoint.

Sponsors: Oklahoma State University, Hong Kong Polytechnic University
PI/PDs: Willie Tao, Li Miao
Hong Kong Polytechnic University: Gemmy Moon

Evaluating the Impact of Food Safety Messages on Customers’ Perceptions and Attitudes Toward the Restaurants
The purpose of this project is to investigate how customers’ perceptions and attitudes toward a restaurant would change based on the type of online food safety messages that are provided to customers by the restaurant marketers. Moreover, the moderating effect of customers' health consciousness level will also be examined. The preliminary analysis indicates that all hypotheses of the direct associations are significant, and the proposed moderating effect of customers' health consciousness is also significant.

Sponsor: Oklahoma State University
PI/PDs: Willie Tao, Kiyan Shafieizadeh, Salman Alotaibi

Older Consumers’ Acceptance of Mobile Food Delivery Apps: Moderating Effects of Aging
Interweaving the theory of consumer acceptance technology with the three pillars of aging, this study aims to investigate the influential app attributes that affect older adults’ acceptance of mobile food delivery apps. The current research consists of two 2x2 experimental studies while assessing the moderating effects due to biological, social, and psychological aspects of aging. This study will be one of the first FDA research focusing on older consumers and the critical FDA attributes for technology adoption, raising the awareness of the aging society and its impact on technology use in the restaurant industry.

Sponsors: Oklahoma State University, Auburn University, East Carolina University, University of South Carolina
PI/PDs: Willie Tao
Auburn University: Alecia C. Douglas
East Carolina University: Seung Hyun (Jenna) Lee
University of South Carolina: Haemoon Oh
Navigating Social Media Firestorms in Hospitality: Investigating Brand Hate and Negative Consumer Behaviors

Academic research concerning social media firestorms (SMFs) have only recently gained momentum in the marketing and consumer behavior literature. SMFs imply the sudden occurrence of many, predominantly negative social media expressions against a brand. Given the high velocity of these negative messages, SMFs are an important threat to a firm’s reputation and, ultimately, its performance and brand assets. The current 2x2 experimental study will be set in a simulated social media environment where a luxury hospitality brand is in the midst of a SMF, addressing the call for more research on the diffusion of negative messages on brand management.

**Sponsors:** Oklahoma State University, Auburn University, East Carolina University, University of South Carolina

**PI/PDs:** Willie Tao
Auburn University: Alecia C. Douglas
East Carolina University: Seung Hyun (Jenna) Lee
University of South Carolina: Haemoon Oh

TOSIC: A Data-Driven Framework for Making Strategic Choices in the Industry Cycle

An industry cycle captures the recurrent fluctuation of the output of an industry. It consists of a set of phases that present different opportunities and threats to companies. A major challenge for companies is to determine what and when to make strategy choices in the industry cycle for survival and growth. In this study, TOSIC, a data-driven framework, is presented in a rigorous and precise manner using formal notations. TOSIC supports systematic analysis of industry cycles, strategic choices, financial performance and their relationships.

**Sponsors:** Oklahoma State University, Oakland University

**PI/PDs:** Yeasun Chung
Oakland University: Daekyu Kim

Institutional ownership, innovation, and firm value: Entry, exit, re-entry and investment horizon of institutional investors

Changes in corporate governance affect a company’s strategy, resource allocation, and financial performance. Amid a significant increase in the share of corporate equity held by institutions in the hospitality and tourism industry, existing studies show inconsistent evidence of the impact of institutional ownership on innovation and performance. This study, which examines the entry, exit, and reentry of institutional investors, aims at clarifying the impact of institutional ownership. The concentration, distribution and investment horizon of institutional investors are also examined.

**Sponsor:** Oklahoma State University

**PI/PD:** Yeasun Chung

Managing diversity and inclusion: D & I maturity model

A systematic approach to diversity and inclusion is an important strategic planning process that supports a company’s D&I development and boosters innovation and financial outcomes. As part of this effort, this study aims to propose a D&I maturity model. The D&I maturity model is a useful tool for assessing where a company is today and setting strategic goals for the next step. We also identify competencies and constraints related to D&I, and examine innovation and financial performance according to the stage of diversity and inclusion maturity.

**Sponsor:** Oklahoma State University

**PI/PDs:** Yeasun Chung, Jinyoung Im
**DEPARTMENT OF MANAGEMENT AND LEGAL STUDIES**

**Bargaining your way to success: Machiavellian CEOs and their effects on organizational costs and performance**

This study examines the effects of CEO Machiavellianism on firm performance. While Machiavellianism has been usually construed as a purely negative trait, we argue that the pragmatic focus on the outcomes of exchanges and psychological obsession with winning in transactions that Machiavellian CEOs bring to their organizations can have important effects on organizational costs and performance. In line with our arguments, we find that CEO Machiavellianism has negative effects on relevant organizational costs and positive effects on organizational performance. We find support for our ideas with a sample of S&P 500 CEOs, operationalizing CEO Machiavellianism with a videometric approach.

**Sponsors:** Oklahoma State University, Pennsylvania State University  
**PI/PDs:** Federico Aime  
Pennsylvania State University: Tessa Recendes

**The joys and perils of working in plain view: Entrepreneurial engagement with organizational patrons and the emergence of an external layer of organizational control**

Drawing on interviews and observation from a multi-year field study, this article investigates the impact of enacting a permeable organizational boundary by engaging with patrons (e.g., customers, crowd funders). Findings describe how the organization’s members were involved in an external stakeholder-based system of normative and motivational cues that powerfully and efficiently affected their behaviors and feelings of well-being. This account describes how opening the organizational boundaries to external stakeholders through direct exposure and social media evolved into a new form of control – the Patron Control System (PCS) – aligned employee activities by introducing both strong coercive and enabling pressures for employees.

**Sponsors:** Oklahoma State University, Pennsylvania State University  
**PI/PDs:** Federico Aime  
Pennsylvania State University: Stephen Humphrey

**Control Theory and Employee Affective Adaptation to COVID-19**

We use control theory to outline the theoretical mechanisms of how people respond to an ongoing crisis using different aspects of the way that it unfolds over time and how this impacts anxiety, attitudes, and behaviors (i.e., task performance, engagement, and burnout). We show the power of different referents either diminishes or strengthens over time as people habituate to some changes but are overwhelmed by others. We test these predictions in a shingled ESM study covering a 12-week period that spans the introduction and exponential rise of the virus.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Lindsey Greco, Nikos Dimotakis, Sherry Fu, Anna Lennard
Examining the Interplay Between Counterproductive Work Behavior and Negative Affect
We aim to explain how people are affected by their own negative behaviors. Negative feelings bring about such behaviors, but they do not affect subsequent moods for the average person. We show individual’s empathy determines how people feel after engaging in negative tasks, with low empathy people feeling better, and high empathy people feeling worse.

**Sponsors:** Oklahoma State University, Ohio State University, Central Connecticut State University, Texas A&M, University North Carolina, Shippensburg University of Pennsylvania, University of Georgia, Athens

**PI/PDs:** Nikos Dimotakis
Ohio State: Bennett J. Tepper, Robert Lount
Central Connecticut State University: James Conway
Texas A&M: Joel Koopman, Young Lee
University North Carolina: Steven G. Rogelberg
Shippensburg University of Pennsylvania: Virginia E. Pitts
University of Georgia, Athens: Fadel Matta

Why Some Leaders Develop Trust More Rapidly and Whether It Matters
Existing research has provided important insights regarding the positive impact that the level of trust in a leader has on organizational outcomes. Less attention, however, has been given to fact that trust changes over time. We investigate whether changes in trust, above and beyond the level of trust, impacts leader and unit effectiveness. The highest levels of effectiveness were associated with leaders who exhibited an increase in their followers’ trust as the relationship developed.

**Sponsors:** Oklahoma State University, Washington University, Saint Louis, Wake Forest University, West Point

**PI/PDs:** Nikos Dimotakis
Washington University, Saint Louis: Kurt Dirks
Wake Forest University: Pat Sweeney
West Point: Todd Woodruff

Is (in)consistency Key? Understanding How Patterns of Abusive Supervision Influence Employee Anxiety and Engagement
Abusive supervision has harmful, far-reaching effects on a broad range of employee outcomes. These effects can be particularly strong when an employee’s experience of abuse is unanticipated or persists outside of their realm of control. We posit that an examination of abusive supervision over time will capture cumulative or combinatory effects previously overlooked. Over four studies, we investigate how consistent and inconsistent levels of abuse relate to feelings of anxiety.

**Sponsors:** Oklahoma State University, Texas A&M, University of Arkansas, Mercer University, Townson University

**PI/PDs:** Nikos Dimotakis
Texas A&M: Joel Koopman, Young Lee
University of Arkansas: Lauren Simon
Mercer University: Juanita Forrester
Townson University: Tanja Darden

Gains and Losses: Week-to-Week Changes in Leader-Follower Relationships.
Leader-Member Exchange (LMX) theory and research suggest that leader-follower relationships develop during the early stages of the dyad, mature relatively rapidly and then stabilize. We predict that leader-follower relationships, like other types of relationships, can improve or deteriorate over time and that these shifts influence follower affect and behavior on the job. Results showed that when LMX improved
from one week to the next (gains), employees experienced positive affect and were more likely to engage in positive discretionary behavior (OCBs). When LMX deteriorated over the prior week (loss), they experienced negative affect and engaged in more negative discretionary behavior (CWBs).

**Sponsors:** Oklahoma State University, University of Ottawa, Southern Methodist University, Ohio State University, Georgia State University

**PI/PDs:** Dimotakis, N., Lambert, L. S., Fu, S.
University of Ottawa: Corner, A. J.
Southern Methodist University: Boulamatsi, A.
Ohio State University: Tepper, B. J.
Georgia State University: Maurer, T.

“**I didn’t see that coming!**: Effects of As-Expected and Un-Expected Workload Levels on Well-Being Through Anxiety

Workload is a ubiquitous feature of the workplace, and one that has been a focus of investigations for decades. In contrast to other workplace aversive experiences, workload cannot be eliminated; thus, research has focused on identifying factors that could alleviate its negative consequences instead, with much of this focusing on the buffering effects of organizational resources. We propose that an unexamined characteristic of workload has the potential to inform much of this literature and thus help to clarify future work. We propose and find that the degree (and type) of workload unexpectedness is associated with well-being via anxiety.

**Sponsors:** Oklahoma State University, Texas A&M, Ohio State University

**PI/PDs:** Nikos Dimotakis, Sherry Fu
Texas A&M: Joel Koopman
Ohio State University: Ben Tepper

**Does The Use of Alternative Predictor Methods Reduce Subgroup Differences? It Depends On the Construct**

Many selection assessments yield race/ethnic-based subgroup differences (e.g., the ACT) and a popular way to address this is to change the method of measurement (the method-change approach). We conducted a meta-analysis of subgroup differences by construct and method to show that changing the method does help eliminate subgroup differences, but it depends on the underlying construct assessed.

**Sponsors:** Oklahoma State University, Texas A&M University

**PI/PDs:** Bryan D. Edwards
Texas A&M University: Winfred Arthur, Jr., Nathanael L. Keiser, Olabisi A. Atoba, Inchul Cho
Oh the Anxiety! How the Disruption of Leader Bottom Line Mentality Motivates Unethical Employee Behavior.
Leader bottom line mentality (BLM) is often considered to be a static, unchanging tendency among supervisors/leaders. We challenge this view and show that changing leader demands can shift their attention to and away from the bottom line on a daily basis. We also demonstrate that this varying leader BLM behavior will lead to employees undermining each other to satisfy the leader’s changing behaviors. A leader’s shift in focus to the bottom line can be disruptive to employees because they will need to abandon their usual routines and change efforts toward the bottom line.

Sponsors: Oklahoma State University, University of Georgia, University of New Mexico, Rutgers University, Drexel University
PI/PDs: Bryan D. Edwards
University of Georgia: Marie S. Mitchell
University of New Mexico: Andrea Hetrick
Rutgers University: Rebecca Greenbaum
Drexel University: Mary Mawritz

Inform, Offer, Connect: Using Portal Messaging and Embedded Asynchronous Care to Remotely Increase Physician-Assisted Smoking Cessation Quit Attempts
We randomly assigned 100 smokers to receive a message from their physician encouraging them to quit and the other 100 smokers received a system-generated message (digital outreach). We also randomly assigned smokers to receive asynchronous care from their physician or not. We demonstrated that the quit rate was 4% with digital outreach alone versus 9.5% when digital outreach was combined with asynchronous care. Thus, our intervention was successful in connecting smokers with their physician and ultimately improving quit attempt rates.

Sponsor: Oklahoma State University
PI/PDs: Bryan D. Edwards, Marjorie Erdmann, Tomi Adewumi

Recruiting (dis)advantage: Men and Women Differ in Their Evaluations of Gender-Based Targeted Recruitment
Organizations use targeted recruitment to attract applicants with specific characteristics or to diversify the workforce. Research reports mixed findings regarding the extent to which beneficiaries and non-beneficiaries are attracted to organizations. We explore this inconsistency by investigating how men and women respond to recruitment materials targeted toward members of the traditionally underrepresented gender. We show that a gender asymmetry exists such that men and women respond differently when targeted for occupations in which they are typically the minority gender.

Sponsors: Oklahoma State University, Ball State University, Pennsylvania State University, Northeastern University
PI/PDs: Alexis Nicole Smith, Bryan Edwards
Ball State University: Brian Webster
Pennsylvania State University, Eerie: Joongseo Kim
Northeastern University: Marla B. Watkins

Employee Entitlement, Engagement, and Performance: The Moderating Effect of Ethical Leadership.
Because of their skewed sense of deservingness, employees high in entitlement are less likely to experience workplace engagement. Furthermore, the negative relationship between employee entitlement and workplace engagement is stronger with supervisors low in ethical leadership, but mitigated when ethical leadership is high. We also showed that under conditions of low ethical
leadership, low levels of engagement explain why employee entitlement results in poorer job performance. But, this effect does not hold when ethical leadership is high.

**Sponsors:** Oklahoma State University, Rutgers University, Clemson University,

**PI/PDs:** Toby Joplin, Bryan D Edwards
Rutgers University, Rebecca Greenbaum
Clemson University, J. Craig Wallace

**Houston Sport Organizations’ Disaster Relief Efforts Following Hurricane Harvey**

Sport organizations have often been active in community recovery following natural or man-made disasters. Following the September 11, 2001 terrorist attacks, members of the Yankees baseball team visited several sites throughout New York City. In New Orleans, members of the Saints National Football League franchise actively served in volunteer roles and fundraising following the devastation of Hurricane Katrina in 2005. The research questions focused on identifying the types of responses to the disaster and exploring the sport organizations leader’s perspectives on the relief process.

**Sponsor:** Oklahoma State University

**PI/PD:** Bryan Finch

**Investigating Collegiate Athletics’ Post-disaster Community Support**

This study sought to examine historical examples of community recovery efforts undertaken by American collegiate athletic programs and to specifically review the responses of Oklahoma State University (OSU) athletics following a tragic community event in Stillwater, Oklahoma. Results found community relief efforts by college athletic programs in 21 of 32 major disasters in the United States since 2000. This study provided insight into the role of a college athletic program following a local disaster and discussed ideas for future research into the topic.

**Sponsor:** Oklahoma State University

**PI/PD:** Bryan Finch

**Virtual Teams Meta-Analysis**

Organizations are increasingly structuring work around teams; increases in technology use, means that most of these teams can be categorized as “virtual teams” that are comprised of geographically and/or organizationally dispersed coworkers that are assembled using a combination of telecommunications and information technologies. This modern reality of teamwork creates a real need to understand the fundamental ways in which technology impacts team functioning in terms of: 1) what are the team inputs that relate to effective virtual team communication and performance, and 2) how does the degree of virtuality relate to team performance.

**Sponsors:** Oklahoma State University, Drake University, Georgia Southern University Brigham Young University

**PI/PDs:** Truit Gray, Lindsey Greco
Drake University: Ina Purvanova
Georgia Southern University: Steve Charlier
Brigham Young University: Cody Reeves

**Moral Emotions Meta-Analysis**

Organizations are rife with situations likely to cause emotional responses in employees including personal relationships, work stressors, and environmental considerations. The importance of moral emotions has led to a range of studies exploring the implications of emotions in organizational phenomena, yet despite the increase in scholarly attention, our understanding of emotional experiences and expression in organizations is limited. We provide a meta-analytic review of this diverse literature.
Dynamic Identification
Theories of group identification explicitly consider identification with multiple targets, specifically outlining process related to transitions between identities or conditions under which one identity may be more salient than another. However, the overwhelming majority of research into multiple identification focuses on measures of identification collected at a single point in time. This study focuses on the dynamic nature of identification, specifically how conflict with team and non-team members can affect identification with either team or organizational targets that varies over time.

Stress and Coping in the Fire Service
Firefighters are frequently exposed to severe operational stressors, such as rendering aid to seriously injured victims, rescuing victims from dangerous situations, and death. Firefighters are also exposed to management-related stressors, such as work overload, staff shortages, and lack of support. In addition, the COVID-19 pandemic has added new layers of both operational (e.g., exposure to COVID-19) and managerial (e.g., constant changes in Incident Action Plan) stress. This study measures the various stressors experienced by firefighters as well as the contextual and managerial issues that mitigate or exacerbate the effect of these stressors on negative mental and physical health outcomes.

Norm-Based Counterproductive Work Behavior
Current conceptualizations of counterproductive work behavior position it largely as norm-violating behavior. That is, the assumption is that such behavior is always judged negatively by others in the organization. However, judging whether CWB is norm-violating or norm-conforming depends on the referent group. This study identifies two referent groups for establishing normative standards: society (prescriptive norms of what one should or should not do) and the workgroup (descriptive norms based on what one typically observes) and explores the relationship between each in predicting CWB.

Work-Effort & Guilt
Employees may feel guilty after withholding effort on their jobs, yet explanations of when employees feel guilty and how this guilt motivates positive behaviors such as impression management and organizational citizenship behavior is lacking. Drawing on theories of social identity and feedback intervention, we propose and test a model wherein employees feel guilty when they withhold work effort, especially when employees have high work role identity salience. This guilt, in turn, motivates impression management and organizational citizenship behavior.
Instrumental CWB
The dominant theoretical rationales used to explain counterproductive work behavior (CWB) position the behavior as a reaction to negative work events. Within these widely used frameworks CWB is preceded by aversive emotional states, with the primary goal of the behavior being harm to an intended target. However, these approaches fail to recognize alternative, goal-directed motives for CWB. This type of CWB, motivated by achievement of planned objectives, is better conceptualized as instrumental CWB. Using a grounded theory approach, we define four alternative motives for CWB: affiliation, conformity, status gain, and tangible goods.

Sponsors: Oklahoma State University, Indiana University
PI/PDs: Seth Smart, Lindsey Greco
Indiana University: Sheri Walter

Taxing Sports
Sports are no longer mere games. In today’s money-driven culture, they have cultivated into a lucrative business enterprise where everyone – whether professional or amateur; owner or player; coach or spectator – stands to make significant money. Modern sports have also morphed into a landscape encompassing both traditional athletic events, and the more novel esports and daily fantasy sports (DFS) arenas. This article is a holistic and modern analysis of the impact of U.S. tax law across the contemporary business of sports, including franchises, business ventures, universities, athletes, individuals, and federal and state taxing jurisdictions.

Sponsors: Oklahoma State University, Clemson University
PI/PDs: John Holden
Clemson University: Kathryn Kisska-Schulze

Taboo Transactions: Selling Athlete Biometric Data
The collection of biometric data from elite-level athletes has become increasingly complicated, as sports leagues, teams, and other governing organizations have begun to see potential commercial value beyond increased performance in this data. This article is divided into five substantive parts, 1) We provide an overview of the biometric data and its value within the gambling marketplace, 2) Discusses the issues surrounding data ownership in the major professional sports leagues, 3) Examines the growth and importance of commercial data sales, 4) Analyzes the questions surrounding the ownership of data, and 5) Finally, proposes new directions for sports organizations.

Sponsors: Oklahoma State University, University of North Texas
PI/PDs: John Holden
University of North Texas: Kimberly A. Houser

Fraud on Any Market
We first argue that fraud-on-the-market would benefit most types of investable markets like sports gambling as well as supporting the doctrine in the securities context. Despite criticisms of the doctrine, our analysis shows that fraud creates the presumption of distorted prices. Second, the money wagered via sports betting and daily fantasy sports (“DFS”) would generate such damages such that leagues would better maintain a competitive environment, boosting sports integrity akin to how securities regulations provide market protections. Since the leagues benefit directly from gambling, and lucratively so, they should owe their fans a truly competitive landscape.

Sponsors: Oklahoma State University, University of Georgia, University of Texas
PI/PDs: John Holden
University of Georgia: Gregory Day
University of Texas: Brian M. Mills
Monopolizing Sports Data
U.S. professional sports leagues’ recent attempts to collectivize the sale of sports game data and prevent non-league affiliated entities from competing in the markets to collect, aggregate, and resell game data gives rise to both legal and policy concerns under federal antitrust laws. This Article analyzes whether the league-wide sale of sports game data should be viewed as a form of collusion among individual sports teams that may potentially violate Section 1 of the Sherman Act, and whether league-wide efforts to secure exclusive rights to sell sports game data should constitute a potential form of exclusionary conduct under Section 2 of the Sherman Act.

Sponsors: Oklahoma State University, Baruch College
PI/PDs: John Holden
Baruch College: Marc Edelman

Reshaping College Athlete Sports Betting Education
The time has come for the NCAA, collegiate athletic conferences, and colleges and universities to take the steps necessary to coexist with widespread legal betting markets. This Article provides the necessary framework for collegiate sports organizations to move forward with modernizing sports wagering education and awareness for collegiate athletes, and affiliated individuals through adopting best practices, establishing reporting processes, and creating a necessary system of education that provides additional measures of protection and awareness of the threats brought on by nefarious individuals.

Sponsors: Oklahoma State University, University of Nevada Las Vegas
PI/PDs: John Holden
University of Nevada Las Vegas: Becky Harris

Breaking The Glass Monitor: Examining the Underrepresentation of Women in Esports Environments
While the growth of esports is undeniable, access, inclusivity, and diversity within this space is reminiscent of U.S. pre-Title IX traditional sport environments. As such, recent calls for the inclusion of esports within the traditional sport management literature have been persuasive. The esports industry is largely male dominated, as women and girls represent a lower proportion of participants, fans, and employees. While the proportions are staggering, the underrepresentation of women and girls in the esports industry has not been fully explored. This serves as the first qualitative study in sport management that examines the career experiences of elite-level women gamers and executives.

Sponsors: Oklahoma State University, University of Georgia, University of South Florida, State University of New York – Cortland
PI/PDs: John Holden
University of Georgia: Thomas A. Baker III
University of South Florida: Janelle E. Wells
State University of New York – Cortland: Lindsey Darvin
U.S. Fantasy Sports Law: Fifteen Years after UIGEA
This Article explains how the U.S. regulates fantasy sports today—fifteen years after the passing of the Unlawful Internet Gambling Enforcement Act. This discusses the change in regulatory governance of fantasy sports in the U.S. that has overlapped with the massive growth of the daily fantasy sports industry in the aftermath of Congress's passing of UIGEA. We then investigate the growing cybersecurity concerns that emanate from the rise of daily fantasy sports as big business in the United States, including concerns related to both customer identification, and consumer privacy.

Sponsors: Oklahoma State University, Baruch College, John Jay College
PI/PDs: John Holden
Baruch College: Marc Edelman
John Jay College: Adam S. Wandt

Regulating Vice: From Marijuana to Sports Gambling
In spite of the growing state-level legality of both marijuana and sports gambling, the exuberance for sports gambling by entities like banks and institutional investors has surpassed the marijuana industry despite the marijuana industry having a significant head start. This Article explores why sports gambling has been widely accepted and led banks and financial institutions to take risks that they have not been willing to take for the marijuana industry. It also explores best practices adopted by the sports gambling industry that the marijuana industry may be able to emulate to garner broader legal acceptance.

Sponsors: Oklahoma State University, Baruch College, John Jay College
PI/PDs: John Holden
Baruch College: Marc Edelman
John Jay College: Adam S. Wandt

Exploring College Sports in the Time of COVID-19: A Legal, Medical, and Ethical Analysis
This Article explores the implications of resuming intercollegiate sports in the midst of a pandemic from a legal, medical and ethical perspective. Adopting a true interdisciplinary approach to the question of how and when to return to sport, the authors collectively express their concerns regarding how NCAA member colleges are approaching the legal and ethical issues surrounding the offering of intercollegiate sports during a pandemic and propose ten best practices for colleges to determine when and how to resume offering intercollegiate sports.

Sponsors: Oklahoma State University, Baruch College, University of Georgia, University of Michigan
PI/PDs: John Holden
Baruch College: Marc Edelman
University of Georgia: Thomas A. Baker III
University of Michigan: Andrew G. Shuman

Global Sports Leagues and China’s Free Speech Problem
This article looks at the legal and ethical challenges posed for U.S. professional sports leagues that seek to do business with China based on fundamental differences in free speech norms between the United States and China. In particular, this article explores the pressure both the Chinese government and its business leaders have placed on U.S. sports leagues to censure employees and fans who speak publicly on issues that are critical of the Chinese government, as well as the potential ramifications on U.S. sports leagues that adhere to Chinese pressure.

Sponsors: Oklahoma State University, Baruch College, University of Georgia
PI/PDs: John Holden
Baruch College: Marc Edelman
University of Georgia: Thomas A. Baker III
The Agency of Female Small Business Owners & Their Responses to Pandemic Issues
This past year has been fraught with major challenges to the survival of small businesses in the USA. We posit that current agency measures will reflect differences in responses to these challenges, and thus the subsequent success in mitigating the effects due to the pandemic. Sponsor: Oklahoma State University
PI/PDs: Chalmer Labig, Juliet Abdel

The Tulsa Police Department’s Response to its Diminished Reputation due to the Black Lives Matter Movement
A change in leadership of a police department may have major effects on public perception of the department. We are investigating one mid-sized department’s various efforts to raise their reputation. Of the many strategies employed which have seemed to have made the most positive impact on the general public as well as on its officers.
Sponsor: Oklahoma State University
PI/PDs: Chalmer Labig

An Overlooked Aspect of Measurement: Does the Content of Verbal Anchors Matter?
Discussions of content validity have focused on item generation, and have seemingly overlooked the response formats (e.g. strongly disagree, strongly agree) that accompany the items. We reason that there may be constructs measured with inappropriate response formats, and that an inappropriate response format may generate biased data. Our results show that changing the response format results in differences in the data, suggesting that the choice of response format matters.
Sponsor: Oklahoma State University
PI/PDs: Lambert, L.S., Gray, T., Davis, A., Erdman, M., and McDermott, R.

Heuristics and Comparison Standards: Developing Hypotheses Via Thought Experiments
The task of hypothesis development is widely acknowledged to require imaginative and disciplined thinking, unfortunately, the practice defies efforts to distill it into a replicable process or even into a set of best practices. We develop strategies to spur the development of well thought out and precise hypotheses by combining theories of comparison with thought experiments and three heuristics.
Sponsor: Oklahoma State University
PI/PDs: Lambert, L.S., and Gray, T.

Construct Development and Validation in Three Practical Steps: Recommendations for Authors, Reviewers and Editors
We review contemporary best practice for developing and validating measures of constructs. The three basic steps in scale development are: 1) construct definition, 2) choosing operationalizations that match the construct definition, and 3) obtaining empirical evidence to confirm construct validity. While summarizing this 3-step process, we address how to establish construct validity and provide a checklist for journal reviewers and authors when evaluating the validity of measures. We pay special attention to construct conceptualization, acknowledging existing constructs, improving existing measures, multidimensional constructs, macro-level constructs, and the need for independent samples to confirm construct validity and measurement equivalence across subpopulations.
Sponsors: Oklahoma State University, University of Illinois
PI/PDs: Lambert, L. S.
University of Illinois: Newman, D.A.
Development of a New Measure of Corporate Reputation
Understanding and measuring the reputations of corporations is key to answering important questions. We employ up-to-date scale development practices to the construct of corporate reputation.

Sponsors: Oklahoma State University, University of Texas Arlington, University of Texas A & M, Texas Christian University

PI/PD's: Lambert, L.S.
University of Texas Arlington: Parker, O.
University of Texas A & M: Devers, C.
Texas Christian University: Krause, R.

Supervisors’ Trust in their Subordinates: A Quantitative and Qualitative Exploration of Trust and Trustworthiness
Subordinates assess the trustworthiness of their supervisors based on their ability, benevolence and integrity. Supervisors’ assessments of trustworthiness have been presumed to rely on these same dimensions, but the inherently asymmetrical relationship between subordinate and the supervisor suggests that the development of trust for the supervisor and the subordinate may differ. Using quantitative and qualitative data, the authors provide evidence that supervisors and subordinates focus on different aspects of trustworthiness in assessing whether to trust someone. Within the context of the supervisor-subordinate relationship, this study lays the groundwork for a new dimension of trustworthiness, subordinates’ development over time.

Sponsors: Oklahoma State University, Caucasus University, Towson State University, Xavier University, Abraham Baldwin College

PI/PDs: Lambert, L. S.
Caucasus University: Brekashvili, P.
Abraham Baldwin College: Currie, R.
Xavier University: Hardt, G.
Towson State University: Darden, T.

Too Much of a Good Thing: Prosocial Fit Predicting Job Satisfaction and Pride
We examined the implicit assumption that increasing prosocial values and impact will have increasing benefits for organizations and employees by considering that employees likely vary in the strength of their prosocial values and that their jobs offer varying amounts of opportunity to experience prosocial impact. Our results indicate that employee attitudes vary substantively depending on whether prosocial supplies meet, are deficient of, or in excess of, prosocial values. Both deficiency and excess were associated with lower satisfaction and pride, but the relationship was asymmetrical such that the effects of deficiency were more severe.

Sponsor: Oklahoma State University

PI/PDs: L. S. Lambert, Anna Zabinski, Abbey Davis, Cassidy Creech, Nick Hayden
Emotion Regulation and Work family conflict
We expand emotional labor beyond the work domain to demonstrate how experiences at home can help employees recover from the emotional requirements of their job. By creating a much-needed connection between theorizing on emotional labor and appraisal theory, we explain those processes by focusing on surface acting at home and subsequent responses. We demonstrate that emotional labor is not merely an intrapersonal process; it is an interpersonal process where its implications are as much determined by the response from the recipient of the surface acting as they are by engaging in the act itself.

Sponsors: Oklahoma State University, Michigan State, University of Nebraska
PI/PDs: Anna Lennard
Michigan State: Brent Scott
University of Nebraska: Amy Bartels

Abusive Supervision and Performance Cycles
Abusive supervision harms individuals and costs companies billions of dollars annually (e.g., legal fees; Tepper et al., 2006, 2017). Consequently, an understanding of abusive supervision’s antecedents is critical. Herein, we demonstrated that different patterns of performance predict the abusive supervision that employees sustain, and that abusive supervision predicts lower levels of subsequent employee performance. Moreover, we determined that employee prevention focus influences the stability of their performance, with higher levels of prevention focus associated with more variable performance. We hope that the results of this investigation provide researchers with a clearer understanding of the employee performance-abusive supervision relationship over time.

Sponsors: Oklahoma State University, Michigan State, University of Georgia
PI/PDs: Anna Lennard, Nikos Dimotakis
University of Georgia: James Matusik
Michigan State: Brent Scott, Lance Ferris

Escalation of Commitment
Escalation drivers affect projects at different stages, but time and different organizational levels of influence are often not considered in the escalation of commitment literature, and there is little theory to organize and delineate these various drivers and contexts. We believe that these limitations in theorizing are reducing the usefulness of escalation of commitment research and aim to build new theory on escalation of commitment by using the organizational commitment literature as a lens to understand how commitment can increase over the lifetime of a project and what situational and personal drivers of commitment can be impactful.

Sponsors: Oklahoma State University, Michigan State
PI/PDs: Anna Lennard
Michigan State: Donald Conlon, Gerry McNamara

A Return to Reasonableness: State Regulation of Noncompetition Agreements
States regulate restrictions on employee mobility because noncompetition agreements affect the job market and business environment. In recent years, many states targeted noncompetition agreements for further regulation. The rapid adoption of noncompetition regulation has presented employers with a challenge. I examine a representative sample of new laws passed by states intending to reduce or eliminate the use of noncompetition agreements. I then review the traditional reasonableness analysis
and explain its strengths. I conclude by arguing for reduced regulation and expansion of a court’s power to construe reasonableness.

Sponsor: Oklahoma State University
PI/PD: Griffin Pivateau

Making Arbitration Work: A Better Means of Dispute Resolution
During the last decade, the Supreme Court has made it clear that it favors arbitration as a means of dispute resolution. Arbitration clauses have become standard in employment agreements. Nevertheless, opponents of mandatory arbitration allege that such agreements are intended to rob employees of important rights. Here, I describe the arbitration process and review the numerous benefits that it provides to employees. I discuss the problems that a typical employee will incur in the litigation process.

Sponsor: Oklahoma State University
PI/PD: Griffin Pivateau

Shields and Swords: Structural Reforms to End Workplace Harassment
The explosion of sexual harassment claims spurred by the #MeToo movement exposed the widespread nature of workplace harassment and abuse. The movement further revealed the decades-long ethical and legal failure by organizations to stop harassment. Responding to the movement, many state legislatures passed laws intending to make litigation of claims easier. I examine these new regulatory schemes to determine whether the new laws combat workplace harassment or simply increase lawsuits. I conclude that relying on costly and inefficient litigation will not be enough. Organizations should instead adopt structural reforms to end workplace harassment.

Sponsor: Oklahoma State University
PI/PD: Griffin Pivateau

An Integrative Model of the Role of Structural, Behavioral, and Cognitive Coordination in Intergroup Effectiveness: How Middle Managers Play a Role
A major challenge for organizations is coordinating interdependent teams’ effective performance of joint tasks, but an integrative theoretical understanding of how to coordinate such intergroup effectiveness is missing. Consolidating three separate literatures, we develop an integrative multidisciplinary framework of the role of structural, behavioral, and cognitive coordination in intergroup effectiveness, and how these coordination mechanisms interrelate. Multisource data on 188 intergroup dyads support our predictions. Our integrative framework deepens understanding of how these coordination mechanisms combine in driving intergroup effectiveness and suggests that middle managers boundary spanning has a critical role in modern team-based organizations.

Sponsors: Oklahoma State University, Drexel University
PI/PDs: Jeanine Porck,
Drexel University: Daan van Knippenberg

Preventing Silo’s from Going Solo: the Role of Conflict Management Style and Team Learning Behavior in Inter-team Coordination & Knowledge Exchange.
A challenge many organizations face pursuing strategies that require cross-team coordination and knowledge exchange is eradicating silo thinking. This study explores the role of conflict management style and team learning with longitudinal data collected from 27 interdependent teams in a large government organization in Western Europe. Preliminary results show that interdependent teams that recognize their interdependence link are better at exchanging knowledge and inter-team coordination. Interdependent teams that engage more in team learning and coordinative conflict management are
also better at exchanging knowledge and inter-team coordination. Relational identification and
organizational identification seem to impact the strength of these relationships.

**Sponsors:** Oklahoma State University, Drexel University

**PI/PDs:** Jeanine Porck

Drexel University: Daan van Knippenberg

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**Strategic Decision Making in Multi-team Systems.**

Judgment and decision-making research has a long tradition in management. Despite numerous reviews
of this topic in the organizational behavior, and psychology, there is little investigation of decision
making in multi-team systems. This is surprising, given the extreme decision-making context faced by
multi-team systems—such as high uncertainty, time pressure, emotionally charged, and consequential
extremes. I will study the role of strategic decision making and contextual factors in multi-team systems,
composed of three five-person, functionally specialized component teams, which will be engaged in an
exercise that is simultaneously “laboratory-like” and “field-like.”

**Sponsor:** Oklahoma State University

**PI/PD:** Jeanine Porck

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**Middle Managers, Coopetition and Intraorganizational Knowledge Transfer**

Intraorganizational knowledge transfer is difficult yet critical for numerous organizational outcomes. The
knowledge-sharing behavior of middle managers, those often tasked with managing this knowledge
transfer, should, however, not be taken for granted. This paper aims to develop an understanding of the
underlying motives middle managers have when coordinating knowledge transfer between teams that
are in coopetition, i.e. engage simultaneously in cooperative and competitive behaviors. Specifically, I
argue that coopetition may prompt middle managers to adopt more myopic motives that make these
managers less inclined to coordinate knowledge exchange between teams in their organization.

**Sponsor:** Oklahoma State University

**PI/PDs:** Jeanine Porck, Juan Du

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**An Identity Perspective on Middle Managers’ Role Conflict and their Strategic Role Performance**

What drives middle managers to champion new strategic initiatives to top management and
simultaneously encourage their followers to implement the organization’s current strategy? These
divergent and integrative strategic roles of middle managers are crucial to the strategy process. We
argue that the complexity of middle managers’ identity will influence their perceived role conflict and
will consequently determine their strategic role performance. Moreover, we hypothesize that managers’
organizational identification affects whether they perform better at the divergent or integrative part of
their strategic role. We plan to collect data from middle managers and their supervisors to test these
hypotheses.

**Sponsor:** Oklahoma State University

**PI/PDs:** Jeanine Porck, Juan Du

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**When Middle Manager’s Performance Appraisals Are Clouded: the Role of Leadership (Mis)Fit and
Depletion**

Middle managers’ appraisals of employee performance are critical. Two contingencies may influence
performance appraisals: the (mis)fit between how much employees need and receive task focused
leadership behavior (initiating structure) from their manager, and the extent to which the middle
manager is depleted. We hypothesize that deficient amounts of initiating structure are associated with
lower performance appraisal, while a fit between needed and received is associated with higher
performance appraisal. Yet, when middle manager depletion is high, misfit will ‘cloud’ their performance
ratings negatively. Resulting in lower performance ratings for employees that receive deficient or excess amounts of initiating structure.

**Sponsor**: Oklahoma State University  
**PI/PDs**: Lisa Lambert, Jeanine Porck, Juan Du

**Endorsement Ambiguity: When Do Employees Re-voice?**
Voice, or speaking up with work related ideas and concerns, is important. By speaking up, employees offer unique and relevant insights, ultimately influencing work group and organizational functioning. Although much work has focused on affirmative responses to voice, more recent work has begun to consider how employees respond following non-endorsement. Indeed, it is important that employees do not simply give up after a non-endorsement episode, but rather continue to engage with their improvement-oriented ideas for the organization. This study is aimed at understanding how employees learn to become more effective voicers (i.e., get endorsed).

**Sponsors**: Oklahoma State University, Iowa State University  
**PI/PDs**: Jeanine Porck  
Iowa State University: Melissa Chamberlin, Maartje Schouten

**Minority Perspective-Taking: When Authenticity Climate Promotes Minority Involvement in White-Dominated Spaces**
Underrepresented minorities often have negative workplace experiences that influence their intentions to stay within their white-dominated organizations. We posit that perspective-taking—imagining the world from another’s perspective—is a strategic tool that minorities use to effectively manage their workplace experiences. We argue that perspective-taking allows minorities to have greater certainty about how to best navigate their organizational worlds.

**Sponsors**: Oklahoma State University, Northwestern University, London School of Economics, Slippery Rock University, Columbia University  
**PI/PDs**: Alexis Smith Washington, Bryan Edwards  
Northwestern University: Cynthia Wang  
London School of Economics: Gillian Ku  
Slippery Rock University: Edward Scott  
Columbia University: Adam Galinsky

**The Implication of Power Dynamics in Dual-Earner Couples: A Study of Household Labor**
Our research studies the household labor of dual-earner couples—married or cohabiting couples where both partners are employed. Integrating power theories and gender-role perspectives, we examine how power dynamics within dual-earner couples influence each spouse's household labor. Polynomial analyses of 204 respondents in dual-earner couples revealed that relative power between spouses affects men and women differently. Our research contributes to the literature of power, gender, and dual-earner couples by examining all possible patterns of the power structure within couples and providing a precise explanation of how relative power and joint power between spouses affect husbands' and wives' household labor.

**Sponsor**: Oklahoma State University  
**PI/PDs**: Alexis Smith Washington, Elise Yu, Nikos Dimotakis

**Making Sense of Perceived Sameness and Difference: An intersectional Perspective of Executives Interpersonal Interactions at Work**
As organizations strive to promote gender and racial equality at work, more research and theorizing is needed that acknowledges a minority point of view. Drawing from interviews with 53 Black female
executives holding senior leadership roles in U.S. firms, we sought to understand how their intersectionality influences perceptions of inter-race and inter-gender interactions and relationships at work. We looked specifically at how Black women executives make sense of interpersonal interactions based on perceived asymmetries with others at work in light of their own intersectionality.

**Sponsors:** Oklahoma State University, Northeastern University

**PI/PDs:** Alexis Smith Washington
Northeastern University: Jamie Ladge, Keimei Sugiyama, Marla B. Watkins

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**School of Marketing and International Business**

**Are Lonely Consumers Loyal Consumers? Two-dimensional Lonely Consumer’s Brand Relationships**

Although loneliness has been shown to influence consumer behaviors, prior research conceptualized loneliness unidimensionally as a feeling of inadequate relationships. However, relationships can be inadequate in terms of quality and quantity, creating a two-dimensional view of loneliness. We show that these dimensions have distinct effects on how consumers relate to brands. Emotional loneliness, due to insufficient relationship closeness, increases brand loyalty, whereas social loneliness, due to insufficient number of relationships, increases preference for greater brand assortment, creating the appearance of weaker loyalty to any one brand. Three studies indicate that loneliness fluctuates brand loyalty, depending on the dimension of loneliness.

**Sponsor:** Oklahoma State University

**PI/PDs:** Zachary Arens, Eunyoung Jang

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**Disentangling Product Comparisons with the Attribute-Hedonic Model**

Marketing policies assume that consumers comparing products will show a hedonic contrast effect, when a product seems more appealing being compared with an unappealing competitor. However, hedonic judgments are confounded with underlying attribute judgments and it is important to delineate their effects. This paper presents six studies to disentangle them and consistently finds two distinct effects in opposite directions: while attribute judgments contrast with a competitor, hedonic judgments assimilate. The results show a hedonic contrast effect on the surface, but deeper investigation finds no evidence of the effect. This research shows hidden complexity underlying product comparisons and the consequences for marketing tactics that rely on them.

**Sponsor:** Oklahoma State University

**PI/PD:** Zachary Arens

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**Entrepreneurial Orientation (EO) and Firm Innovation Performance**

Using a dynamic capabilities perspective as our theoretical foundation, this study contributes by highlighting the underlying mechanism through which EO affects firm performance based on the subsequent theoretical linkages: 1) strategic resources, 2) strategic actions (organizational responsiveness), 3) competitive advantage, and 4) performance. Our theoretical rationale is that EO as an important strategic resource contributes to firm performance through a sequential link of EO: 1) dynamic capabilities, 2) competitive advantages, and 3) firm performance. More specifically, among various views of firm capabilities, the importance of dynamic capabilities is especially emphasized in the current business environments characterized by fast and unpredictable change.

**Sponsors:** Oklahoma State University, Chinese Culture University, Taiwan

**PI/PDs:** Todd Arnold
Chinese Culture University, Taiwan: Peter Chen
**Alliance Orientation, Competitive Advantage in NPD, and New Product Success**
Strategic orientation is a key determinant of new product development (NPD) performance, yet, little is known about the real value of alliance orientation (AO) in the context of NPD, as well as how it contributes to new product success. This study advances knowledge by investigating the role of important mediating and moderating mechanisms underlying the AO—new product success relationship. Applying a dynamic capabilities perspective, the research demonstrates that competitive advantage in NPD program and process play a significant and varied role (depending upon environmental conditions) in affecting new product success.

*Sponsor:* Oklahoma State University, Chinese Culture University, Taiwan  
*PI/PDs:* Todd Arnold  
Chinese Culture University, Taiwan: Peter Chen

**Enhancing Perceived Product Value through Peripheral Product Attributes**
We examine how firms could design their products’ packaging both to help customers socialize more successfully, as well as profit. We investigate how a *peripheral product anecdote*, or a brief, interesting story that is loosely connected to the product, but not connected to its history or usage, can serve this purpose. For example, Combat Wombat beer is an Australian beer with an anecdote about a wombat, an Australian animal, on its label. Does such a story facilitate social interaction among those who consume the product? This study addresses such a question.

*Sponsors:* Oklahoma State University, SUNY Albany  
*PI/PDs:* Todd Arnold, Josh Wiener  
SUNY Albany: Hillary Wiener

**The Costs (and Opportunities) of Highly Involved Organizational Buyers**
The authors examine the impact of organizational buyers’ product involvement on customers’ and suppliers’ financial outcomes, driven by buyers’ increased willingness to pay and their perceived credibility in negotiations with the supplier. The effects of these competing mechanisms are moderated by characteristics of the customer firm and the customer-supplier relationship. The authors examine effects of buyer product involvement using a survey of organizational buyers matched with secondary profit data from their supplier. Customer firms should encourage their buyers to be highly involved but limit their influence within the firm. Highly involved buyers can be potentially costly to suppliers.

*Sponsors:* Oklahoma State University, University of Missouri  
*PI/PDs:* Todd Arnold, Justin Lawrence, Colleen McClure  
University of Missouri: Lisa Scheer

**End User Engagement with Supplier Firm Brands: Meaningfulness of Work and Differential Impact of Other-Focused versus Self-Focused Marketing Initiatives**
Findings suggest a key management concept, meaningfulness of work, can be applied to brand attachment in a work context. More specifically, results illustrate how end users find meaning on their job and develop strong feelings for supplier firm brands. The interaction between meaningfulness of work and supplier firm brand performance demonstrates that end users who find work more meaningful are more likely to both develop strong attachment for a supplier firm brand and more likely to advocate for that brand to superiors and peers.

*Sponsors:* Oklahoma State University, Georgia Gwinnett College  
*PI/PDs:* Todd Arnold  
Georgia Gwinnett College: Amy Fehl
Optimizing Frontline Shift Composition for Increased Customer Satisfaction and Firm Performance

Both academics and marketing managers agree that frontline employees (FLEs) are paramount for the provision of excellent service to customers. What is less well understood in extant research is the impact other employees may have upon a given individual frontline worker. We term this influence the shift climate, defined as the FLE’s perception of the tendencies of other members on the shift toward service behaviors that focus on customer need satisfaction. This study investigates the influence of shift climate on FLE performance.

Sponsors: Oklahoma State University, Georgia Gwinnett College, Grand Valley State University
PI/PDs: Todd Arnold
Georgia Gwinnett College: Amy Fehl
Grand Valley State University: Valerie Good

The Positive Influence of Watching Others Receive Preferential Treatment: The Role of Envy

The purpose of this research is to examine how and when companies can motivate non-prioritized consumers to respond positively to customer prioritization and mitigate their negative reactions. We conducted two studies to test whether non-prioritized customers can respond positively to preferential treatment received by others. We used a video experiment to increase the realism of the manipulation and to establish internal validity and we employed a field survey to demonstrate external validity. We also suggest that the aspect of upward comparison that people pay attention to can influence whether they respond positively or negatively to an upward comparison episode.

Sponsors: Oklahoma State University, Texas A&M University-Corpus Christi
PI/PDs: Tom Brown
Texas A&M University-Corpus Christi: Yu-shan Huang

The Drivers of Salespersons’ Customer Insight-Generating Behavior and Its Impact on Sales Performance Outcomes in a Relationship Selling Context

Salespeople have long been told to uncover information about their prospective customers and their needs. This project examines the degree to which (and process through which) uncovering customer insights influences sales performance.

Sponsors: Oklahoma State University, Weber State University, University of Tennessee-Knoxville
PI/PDs: Tom Brown, Karen E. Flaherty
Weber State University: Nicole A. Flink
University of Tennessee-Knoxville: Alex R. Zablah

Bleisure Motivation of Meeting, Incentive, Convention, and Exhibition Travelers

The objectives of this study are to 1) examine the bleisure motivations of MICE travelers, 2) investigate the trip characteristics of bleisure travelers, and 3) induce a grounded theory from data collection and analysis. This study adopted a pragmatic mixed method of emic and etic approaches. Triangulation (participant observations, interviews, and surveys of MICE travelers) was conducted with several datasets collected over time from 2011 to 2021.

Sponsor: Oklahoma State University
PI/PDs: Goutam Chakraborty, Bongkosh Rittichainuwat

CO2 Storage Site Screening Platform Development and CO2 Storage Resource Analysis in SECARB Offshore Reservoirs Using SAS® Viya

In this study, the SAS® Viya platform was utilized to manage the geological datasets and analyze the geological characteristics of the shelf and deep-water areas through the use of correlation plots and distribution maps. In addition, a CO2 storage site screening platform was developed in SAS® Viya. This
screening platform is flexible and allows for quick access to the results, which enables users to easily tune the screening criteria and understand the how various screening criterion affect the output.

**Sponsors:** Oklahoma State University, (external funding from SECARB)  
**PI/PDs:** Goutam Chakraborty, Xitong Hu, Prem Bikkina, Jack C. Pashin

**Developing and Creating a User-Friendly Dynamic Dashboard of Catalogue using Tableau for Love’s Travel Stop and Stores**

In this funded research project, we developed and created a user-friendly dashboard catalogue for Love’s Travel Stop and Stores using Tableau. The project involved first understanding which elements the mangers want to see in the dashboard. This was accomplished through many in-depth interviews with the managers. The next phase was to create mock ups of dashboards using static data and present to the managers for further refinement. Once buy-in was obtained from the managers through many iterations, then the final phase included replacing the static data with dynamically pulled data from their warehouse and helping them put this into production.

**Sponsors:** Oklahoma State University (External funding from Love’s Travel Stores and Stops)  
**PI/PDs:** Goutam Chakraborty, Melissa Reed

**Developing and Fine-Tuning a Machine Learning Model to Track a Custom Object which is Initialized only once in a Video**

In this research project, we developed and tuned a machine-learning model using Python to track an object that appears only once in a video, and to be able to handle occlusion. First, a thorough review of all existing algorithm packages that handle such tasks. These include open CV trackers, deep sort algorithm, Kalman filters and CSRT/MOSSE trackers. While each one of these has advantages, none could handle both of our objectives. Therefore, we developed a custom Python code that created an ensemble of best features from each of the reviewed packages. The Python code was tested with real data and was reasonably accurate.

**Sponsors:** Oklahoma State University, (External funding from Concat Systems)  
**PI/PDs:** Goutam Chakraborty, Nikhil Gunti

**Developing and Validating a Customer Lifetime Value Model for Love’s Travel Stop and Stores**

In this funded research project, we developed and validated a customer Lifetime Value (CLV) model for Love’s Travel Stop and Stores using Tableau. Done through building and validating two specific models for the drivers. Forecasting the number of transactions for each driver on a weekly basis. We evaluated multiple time-series models and selected the auto-ARIMA which performed the best on the validation data. Then combined forecasting with operational and financial metrics to create a Customer Lifetime Value (CLV) for each driver. These numbers were used to create segments of drivers who receive customized promotional offers to move them to a higher value segment.

**Sponsors:** Oklahoma State University, (External funding from Love’s Travel Stores and Stops)  
**PI/PDs:** Goutam Chakraborty, Harshit Agarwal

**Developing and Creating a User-Friendly Dynamic Dashboard of Campaign Analytics using Snowflake and Tableau for Heartland Payment Systems**

In this funded research project, we developed and created a user-friendly dashboard for Heartland Payment Systems using Snowflakes and Tableau. The project involved first understanding which elements of campaign analytics the mangers want to see in the dashboard. This was accomplished through many in-depth interviews with the managers. The next phase was to create mock ups of dashboards using static data and present to the managers for further refinement. Once buy-in was
obtained from the managers through many iterations, then the final phase included replacing the static data with dynamically pulled data using Snowflake to optimize time needed to populate the dashboard.

**Sponsors:** Oklahoma State University, (External funding from Heartland Payment Systems)
**PI/PDs:** Goutam Chakraborty, Katelyn Byrne

### The Influence of Donation Resource Abundance on Choice of The Abstract Donation Target

This paper aims to investigate how to improve the donation choice toward abstract targets by matching donation resource abundance (abundant vs. limited) and message construal level (high vs. low) within donation appeals. Four studies were conducted to examine the influence of donation resource abundance on donation choice toward abstract target. We find that people with abundant resource are more likely to choose an abstract target versus a concrete target. Notably, perceived response efficacy mediates the effect of resource abundance on abstract target choice. In addition, the message construal level plays the moderate role.

**Sponsors:** Oklahoma State University, Sun Yat Sen University
**PI/PDs:** Xiang Fang, Pramit Banerjee
Sun Yat Sen University: Yimin Zhu, Jifei Wu, etc.

### The Effect of Power Distance Beliefs on Vertical vs. Horizontal Display

This research is to investigate how individuals’ power distance beliefs influence their evaluations of the products displayed vertically or horizontally. We expect individuals’ with high power distance beliefs are more likely to prefer the products presented vertically than horizontally. This effect is stronger for material products than experiential products. Process fluency mediates the effect of PDB on the evaluations.

**Sponsor:** Oklahoma State University
**PI/PDs:** Xiang Fang, Pramit Banerjee

### Vicarious Authenticity in Tourism: Experientialism Approach and Focus Group Interviews

Authenticity is a core theme in the hospitality and tourism industry as it brings “a sense of the genuine, the real or the unique” to visitors at a destination via traditional culture and origins of a locality (Sharpley, 1994, p. 130). Three types of authenticity have been identified: objective, constructed, and existential authenticity (Bruner, 1994; MacCannell, 1976; Wang, 1999). The purpose of this research is to theorize a new type of authenticity, ‘vicarious authenticity’, using experientialism as a philosophical base. The objectives of this research are to define vicarious authenticity and explore how it transpires in tourists’ experiences through participation in locals’ everyday lives.

**Sponsors:** Oklahoma State University, Hong Kong Polytechnic University
**PI/PDs:** Xiang Fang, Li Miao
Hong Kong Polytechnic University: Gemmy Moon
**Touch or Click? The effect of direct and indirect human-computer interaction on consumer responses**

Human-computer interaction is the way consumers access product, service and information, which affects consumers’ attitude, evaluation and purchase behavior. This paper examines how human-computer interaction affect consumer attitude and purchase intention. Four studies demonstrate that consumer with direct human-computer interaction will generate more favorable consumers’ attitudes and greater purchase intentions than those with indirect human-computer interaction. This effect is mediated by sense of immersion and this effect is moderated by the product haptic importance. These findings enrich the literature on human-computer interaction and provide some marketing implications for firms to improve product evaluation and purchase behavior by the means of human-computer interaction.

**Sponsors:** Oklahoma State University, Sun Yat Sen University  
**PI/PDs:** Xiang Fang  
Sun Yat Sen University: Jifei Wu, Hongyan Yu

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**Examining the Effect of a Firm’s Product Recall on Financial Values of Its Competitors**

Scholars examine the effect of product recall on the recall firms from two different perspectives. One is from a consumer’s perspective, and the other is from a financial perspective. We chose the second perspective and tested how different product recall strategies (proactive vs. passive) influence competitors’ financial values. We collected 14 years (January 1996 to December 2009) of CPSC product recalls, and found that competitors experience positive abnormal returns when the recall firm employs proactive recall strategies. This confirms that investors interpret proactive recall differently from consumers. Proactive recall not only hurts the recall firm’s stock prices but benefits competitors’ financial values.

**Sponsors:** Oklahoma State University, Towson University, Shanghai Univ. of Finance and Economics  
**PI/PDs:** Xiang Fang  
Towson University: Yingying Shao  
Shanghai Univ. of Finance and Economics: Xiaoyu Wang

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**A Cross-Cultural Exploration of How Employees’ Intervention Discourages the Subsequent Misbehavior of Other Customers**

The spreading of Dysfunctional Customer Behavior (DCB) is particularly problematic and costly for organizations. Drawing on social learning theory (Bandura, 1978), we expect that responding to DCB with certain interventions helps other customers learn that an employee has ability to cope with DCB, implying that such behavior is not accepted and will be reprimanded, which may decrease the DCB of other customers. In addition, we investigate the moderating role of cultures (particularly, power distance beliefs).

**Sponsor:** Oklahoma State University  
**PI/PDs:** Xiang Fang, Sandy Huang, Ruping Liu
Managers as Engineers of Market Knowledge Network: Typology and a Conceptual Framework
Adopting a grounded theory approach, we offer a typology of manager’s network engineering that is based on three key variables, including managers’ market orientation, their network approach (proactive or reactive), and their servant leadership approach (self-focused or other-focused). Specifically, we propose that marketing managers engineer the social networks of their frontline employees in four unique ways—they may 1) facilitate connections, 2) alter connections, 3) lend connections, or 4) sever connections between the frontline employees and important others.
Sponsors: Oklahoma State University, Baylor University, University of Georgia
PI/PDs: Karen Flaherty
University of Georgia: Son Lam
Baylor University: Andrea Dixon

How are Salesperson Professional Identities Shaped? Elements of Identity Work
Today’s employees often demonstrate stronger commitment to their chosen professions than to the companies they work for. This raises an important research question: how do salespeople’s views of the sales profession as a whole shape their career goals, motivations, attitudes and behaviors? Using a grounded theory approach, we address this question. Based on 54 in-depth interviews with sales professionals, we offer a complex process model of salesperson professional identity construction. Salespeople’s professional identities are malleable and socially constructed. Salespeople engage in a complex process of assessment and reconciliation to form professional identities. This process influences important salesperson outcomes.
Sponsor: Oklahoma State University
PI/PDs: Karen Flaherty, Curtis Schroeder

Making a Positive (or Negative) First Impression with Small Talk
We examine the effect of small talk and relationship orientation on customer intentions to use a service provider in three experiments and one cross-sectional survey. Customers respond positively to small talk when communally oriented, but negatively when they are more exchange oriented. Mediation analyses reveal this effect occurs because small talk differentially leads to feelings of rapport and impatience for people high (versus low) in relationship orientation. While prior research has shown benefits to small talk, we show significant downsides to using small talk with customers who are exchange oriented and show process evidence of why small talk functions as a “double-edged sword.”
Sponsors: Oklahoma State University, University at Albany
PI/PDs: Karen Flaherty, Joshua Wiener
University at Albany: Hillary Wiener

Who will Compromise? The Role of Gender in Joint Ethical Decision-Making
Current understanding of how unethical behavior arises in a business context remains unclear. This may be due in part to the complex nature of business decisions. In this study, we report the results of an experiment designed to shed some light on factors that influence how moral judgments arise in a team situation. Based on a sample of 249 undergraduate student teams, we first consider the role that the individual’s and their partner’s motivation-to-lead and political skill play in determining the extent to which the person adjusts his/her response to an ethical dilemma to reflect greater sensitivity to moral issues.
Sponsor: Oklahoma State University
PI/PDs: Karen Flaherty, Jim Pappas
Alliance Value Creation and Appropriation: The Role of Customer- and Product-Centric Structures
Establishing a customer-centric structure is a popular but costly marketing strategy; some firms thus seek alliances with customer-centric partners, with mixed results. In this article, according to event study analyses (Study 1) of strategic alliances by Fortune 1000 firms over a 17-year period, product-centric firms create 2.5 times more value on average when they work with customer- versus product-centric partners, but they also capture significantly less share of the joint alliance value when allying with customer- versus product-centric partners. A complementary panel data analysis (Study 2) details the net long-term performance of a product-centric firm’s alliance portfolio.

**Sponsors**: Oklahoma State University, Iowa State University, University of Washington

**PI/PDs**: Justin M. Lawrence

Iowa State University: Ju-Yeon Lee
University of Washington: Robert W. Palmatier

Mitigating Price Discount Spillover in Online and Offline Markets
In accordance with today’s multichannel B2B environments, the authors theorize differential effects on the seller’s margin via offline and online discount contagion. The authors test their theoretical framework across two large-scale field studies featuring spatial econometric analyses. If managers fail to consider contagion systematically, the effects of targeted discounts can spill over to untargeted buyers, resulting in approximately three times the margin losses. Granting highly differentiated discounts further fuels this contagion process, precipitating even greater margin decline. However, contagion-conscious deployment, such as targeting buyers that limit e-commerce price transparency, allows sellers to virtually eliminate adverse effects of discount contagion.

**Sponsors**: Oklahoma State University, Iowa State University, University of Washington, Colorado State University

**PI/PDs**: Justin M. Lawrence

Iowa State University: Andrew T. Crecelius
University of Washington: Robert W. Palmatier
Colorado State University: Jonathan Z. Zhang

Sales Channel Specialization for B2B Resellers: Cost-matching versus Relationship-driven Models
In an effort to cost-effectively match sales channels to the shifting needs of customers and reap the benefits of sales specialization, business-to-business sellers are challenged with migrating customers between outside (field) salespeople and inside (remote) salespeople. Prevalent approaches include cost-matching—assigning less-developed accounts to low-cost inside salespeople and migrating them to the costlier outside sales channel once the account grows—and the relationship-driven approach—deploying the richer outside sales channel to establish relationships with newer customers, until the account can be migrated to inside sales. The authors’ findings challenge accepted wisdom and inform practical recommendations for sales channel specialization strategies.

**Sponsors**: Oklahoma State University, Iowa State University, University of Washington

**PI/PDs**: Justin M. Lawrence

Iowa State University: Andrew T. Crecelius
University of Washington: Robert W. Palmatier

The Opportunities and Costs of Highly Involved B2B Buyers
The authors examine the impact of organizational buyers’ product involvement on customers’ and suppliers’ financial outcomes, driven by buyers’ increased willingness to pay and their perceived credibility in negotiations with the supplier. The effects of these competing mechanisms are moderated by characteristics of the customer and the customer-supplier relationship. The authors examine effects
using a survey of organizational buyers matched with secondary profit data from their supplier. This study contributes to the limited literature on product involvement and the role of buyer emotions in a B2B exchange setting.

**Sponsors:** Oklahoma State University, University of Missouri

**PI/PDs:** Justin M. Lawrence, Colleen E. McClure, Todd J. Arnold

University of Missouri: Lisa K. Scheer

**Targeting and Designing Supplier-Initiated Relationship Expansion Proposals**
The authors assess effects of relationship expansion proposals contingent on three account opportunity metrics: sales potential, gross margin position, and historical service provision. Study 1), reveals that higher sales potential and higher service provision make a customer a more favorable target for a relationship expansion proposal; conversely, when a customer relationship is more profitable to the supplier, relationship expansion proposals can backfire, resulting in lost business. Study 2), focuses on the strategic design of relationship expansion proposals and demonstrates how the depth of discounting in a proposal affects purchasing, contingent on the same account opportunity metrics used in Study 1.

**Sponsors:** Oklahoma State University, Iowa State University, Marquette University, Ohio University

**PI/PDs:** Justin M. Lawrence

Iowa State University: Andrew T. Crecelius
Marquette University: Jessica L. Ogilvie
Ohio University: Adam A. Rapp

**When Hybrid Sales Structures Enhance Performance in B2B Markets**
Business-to-business selling firms (sellers) increasingly assign customers an inside salesperson, in addition to a traditional outside salesperson. These multichannel sales structures are believed to decrease expenses by substituting a less-costly sales channel and increase sales by enabling more efficient exchange. However, the authors theorize that substitution toward the leaner inside channel can also constrain the seller’s relationship building efforts and induce sales headwinds. Further, if some customers elect not to substitute but instead use the new channel as a supplement, the seller’s customer-level expenses can increase considerably due to the additional resources required to deploy the inside channel.

**Sponsors:** Oklahoma State University, University of Notre Dame, Iowa State University, University of Washington

**PI/PDs:** Justin M. Lawrence

University of Notre Dame: Vamsi Kanuri
Iowa State University: Andrew T. Crecelius
University of Washington: Robert W. Palmatier
Managing Moral Misalignment and Donor Defection
Unlike performance-based defectors who leave firms in response to some form of utility deficit with the offering, identity-based defectors are customers who sever relationships due to a perceived mismatch between their identities and their perceptions of the firm’s identity. Using consumer data from a multinational nonprofit firm and a framework derived from customer-company identification theory, this study examines optimal communication strategies for the reacquisition of identity-based customer defectors and reveals suboptimal reacquisition results related to traditional reacquisition messaging. This article introduces identity-based defectors to extant literature and outlines specific routes by which firms should approach their reacquisition.

Sponsors: Oklahoma State University; Florida State University; University of North Carolina, Greensboro
PI/PDs: Justin M. Lawrence
Florida State University: Colleen Harmeling, Michael Brady
The University of North Carolina, Greensboro: Harrison Pugh

The Upstream Impact of Online Ratings on B2B Relationships
Online reviews reflect relationships and interactions between a firm and end users. Dimensions of marketing strategy execution, such as service quality and affordable prices, drive positive reviews. These reviews therefore capture information that has implications not only for the firm, but for its upstream channel partners, a spillover effect not examined in extant research. Drawing on value capture theory, the authors investigate the differential effects of a firm’s Google reviews on its supplier’s performance, mediated by the buyer firm’s value creation–value capture tradeoff with its end users.

Sponsors: Oklahoma State University; Iowa State University
PI/PDs: Justin M. Lawrence, Colleen E. McClure, Hans Nguyen
Iowa State University: Andrew T. Crecelius

Motivating Customers to Respond Positively to Involuntary Intermediation: Minimizing Defection and Maximizing Purchasing
Tightening margins and emerging competitors are motivating manufacturers to streamline distribution systems by assigning customers to channels where they can be profitably served. One frequently chosen strategy is involuntary intermediation: a manufacturer unilaterally terminating a customer’s direct relationship and encouraging the customer to migrate to a designated intermediary. Drawing on event system theory, this research examines the decisions at hand for customers following an involuntary intermediation, specifically: 1) whether to migrate to the manufacturer’s designated intermediary or defect to a competitor, and 2) how much to purchase of the manufacturer’s products and other products sold by the intermediary after intermediation.

Sponsors: Oklahoma State University; Iowa State University; University of Missouri
PI/PDs: Justin M. Lawrence
Iowa State University: Andrew T. Crecelius
University of Missouri: Lisa K. Scheer, Divya Anand
The authors examine when longer-term pricing policies in B2B markets can generate higher profits for suppliers. Drawing on cost of price adjustment (COPA) theory, the authors suggest that price-adjustment carries costs and benefits for customers, and that not all customers find a longer-term policy equally attractive. The authors identify customer characteristics that signal when longer-term pricing policies are more attractive to customers and more profitable for suppliers. This study utilizes a quasi-experiment involving 8,987 business customers of a global U.S.-based industrial distributor.

Sponsors: Oklahoma State University; Southern Illinois University
PI/PDs: Justin M. Lawrence
Southern Illinois University: Omid Kamran Disfani, Ashok Bhattarai

The Negative Impact of Seasonal/Limited Edition Packaging on Product Recognition and Shopping Experience
Brands often vary their traditional packaging for different times of year (i.e., Coca-Cola’s winter cans), when introducing limited edition products, and when co-branding and crossing promoting products. We find that limited edition/seasonal packaging has a negative impact on consumers’ ability to find the target product. This in turn has a negative impact on their experience, reporting more annoyance with the simulated shopping process. Finally, we show that this is due to the fact that seasonal packaging often eschews familiar brand elements (e.g., color) which are heavily relied on in the search process. Implications for package design and promotion are discussed.

Sponsor: Oklahoma State University
PI/PD: Steven Shepherd

Cultural Diversity in Advertising and Representing Different Visions of America
Cultural diversity in advertising has the potential to reflect American society and embody a view of America that is either consistent or inconsistent with a consumer’s beliefs and values. Our research explores how consumers with differing visions of America and its values evaluate cultural diversity in advertising. Consumers who support America’s dominant ideology more negatively evaluate ads with cultural diversity, particularly for brands that are American as opposed to foreign. We find this is due to the presence of ethnic minorities in ads increases perceptions of threat to American values and culture.

Sponsor: Oklahoma State University
PI/PD: Steven Shepherd

Identifying and Explaining the Gender-Gap in Consumer Responses to Product Failures: Gender Stereotypes Create Victims out of Women
Every year, thousands of consumer complaints are made to regulatory agencies, including the Consumer Product Safety Commission, Federal Trade Commission, among others. The current research asks if the victim matters is how such incidents are interpreted and reported; specifically, the victim’s membership in a group that is seen as vulnerable (e.g., women, children, elderly). We propose based on various model of person perception and stereotyping that when members of these group are victims of a product failure, consumers will: 1) see increased harm done, 2) blame the company more, and 3) show increased tendency to complain about the product failure.

Sponsor: Oklahoma State University
PI/PD: Steven Shepherd
Military Veterans are Morally Typecast as Heroic but Unfeeling
What kind of “mind” do people assume those in the military have? Leveraging previous theorizing on mind perception, dehumanization, and career typology, the current research shows that veterans are seen as having a higher capacity for agency but less capacity for experience. As a result, veterans are seen as relatively ill suited for careers that require a high capacity for experience. Results are found across laypeople and those employed in management and human resources. Implications for veteran well-being are discussed.
Sponsor: Oklahoma State University
PI/PD: Steven Shepherd

Brand Dependence, Domain Complexity, and Motivated Brand Trust
We find that highly victim sensitive individuals want to trust others, but are also very concerned with being taken advantage of. Counterintuitively, we find that these people report increased trust in a brand or service provide when the particular domain at hand is seen as complex (vs. simple), which in turn increases perceived dependence on a particular brand or service. In other words, the concern of being taken advantage of appears to lead one to bolster trust in a brand that one is dependent on.
Sponsor: Oklahoma State University
PI/PD: Steven Shepherd

The Challenges of Military Veterans in the Workplace: Applications, Integrations, and Opportunities
Understanding disadvantage and how processes of stereotyping, stigma, and social circumstance affect individuals and society has long been an active area of research within psychology. However, how these processes affect military veterans and their transition to civilian life have largely been ignored. We discuss contemporary social psychology theories and relevant recent research that are relevant to challenges veterans encounter when they transition from military. We hope that this synthesis inspires other researchers to conduct research in the context of veterans, and for clinicians to draw on these theories to inform programs and interventions.
Sponsors: Oklahoma State University, Duke University
PI/PDs: Steven Shepherd
Duke University: Aaron Kay

The Effect of Brand Personality and Acceptance of LGBT Representation in Ads Among Liberals and Conservatives
In this research we explore how liberals and conservatives respond to LGBT representation in advertising. Critically, we also test the moderating role of brand personality. While conservatives generally respond more negatively to LGBT representation in ads, this is particularly the case for sincere brand (e.g., brands that are seen as down-to-earth, wholesome, family-oriented), whereas this negative reaction is attenuated for exciting brands.
Sponsors: Oklahoma State University, Duke University
PI/PDs: Steven Shepherd
Duke University: Aaron Kay
Differing Terms for the Peer-to-Peer Economy and Their Associations with Race, Morality, and Legitimacy

Numerous terms that lack clear definitions are often interchangeably used to refer to the peer-to-peer economy and activities within it. Moreover, the popular press has noted racial disparities in how different peer-to-peer activities are perceived and treated. We find that different terms for the peer-to-peer economy are not equivalent when it comes to perceptions of: 1) who participates in these activities, and 2) their morality. Specifically, despite their overlap in application and usage, the sharing economy is more associated with White actors and increased morality, whereas side hustles are more associated with Black actors and decreased morality.

Sponsors: Oklahoma State University, Duke University
PI/PDs: Steven Shepherd
Duke University: Aaron Kay

Passion Exploitation: Legitimization of Taking Advantage of Other People’s Passion for Work

Although passion may indeed be beneficial in many ways, we suggest that the modern cultural emphasis may also serve to facilitate the legitimization of demeaning and unfair management practices—a phenomenon we term the legitimization of passion exploitation. We show that people deem poor worker treatment as more legitimate when workers are presumed to be “passionate” about their work. We demonstrate two mediating mechanisms by which this process of legitimization occurs: 1) assumptions that passionate workers would have volunteered for this work if given the chance, and 2) beliefs that, for passionate workers, work itself is its own reward.

Sponsors: Oklahoma State University, Duke University
PI/PDs: Steven Shepherd
Duke University: Jae Yun Kim, Aaron Kay

The Cheating Culture: Consequences of Neurotic Competitiveness

Karen Horney (1937) discussed the concept of neurotic competitiveness. Neurotically competitive persons are more focused on defeating their opponents than on winning per se. Existing research shows that a significant segment of the American public may have a neurotic win-at-any-cost attitude. The current research will examine the link between neurotically competitive attitudes and cheating behavior in business and everyday life.

Sponsors: Oklahoma State University, California State University at Chico
PI/PDs: Ajay Sukhdial
California State University at Chico: Kirk Damon Aiken

The Joyless Economy: The Marketing Implications of Consumer Strategies for Beating Everyday Boredom

Throughout history, philosophers have argued, “Boredom is the root of all evil.” Current academic research confirms that ongoing feelings of boredom, a modern existential condition, are associated with numerous ills in society. Scholars have also argued that consuming all kinds of products and experiences is how consumers try to deal with feelings of boredom. This research will examine the commonly used strategies by individuals for beating everyday boredom and the marketing and public policy implications of such strategies.

Sponsors: Oklahoma State University, California State University at Chico
PI/PDs: Ajay Sukhdial
California State University at Chico: Kirk Damon Aiken
A Review and Meta-Analysis of Experimental Effects in Brand Alliance Research
A meta-analysis is a study of effect sizes across studies. We analyze reported results from a large number of papers. The findings indicate that the brand alliance effect is real and of a small to medium effect size. How research design elements affect the results are analyzed.
Sponsors: Oklahoma State University, States of Virginia, Texas, and Ohio
PI/PDs: Kevin E. Voss,
University of Virginia: Mayoor Mohan
University of Texas: Jinho Jung
University of Ohio: Fernando Jimenez

Sound Symbolism and Consumer Forgiveness
We explore how the sounds of the words used in an apology affect the customer’s likelihood of forgiveness. Such apologies are used in response to a brand transgression. We posit that certain words convey warmth while other sounds convey competence. The warmth or competence of the sounds leads to customer forgiveness intentions.
Sponsor: Oklahoma State University
PI/PDs: Kevin E. Voss, Minjoo Kim

Perceived Shared Experience: The Moderating Effect of Experience Type in Building Emotional Attachment
We explore how different types of experience, for example ordinary versus extreme, experiences affect how people form attachment to their brands.
Sponsor: Oklahoma State University
PI/PDs: Kevin E. Voss, Ying Ying Li

How Competing Ad Cues Overwhelm a Brand Alliance Cue
We demonstrate that distraction impairs brand alliance cues in advertising because brand alliance cues are relatively weak. In published research, theorists have demonstrated that a well-known ally brand improves consumer evaluations of a previously unknown focal brand. Mental load, sex appeals, and celebrity endorsers attenuate the effect of the brand alliance on the previously unknown focal brand.
Sponsor: Oklahoma State University
PI/PDs: Kevin E. Voss, Ying Ying Li, YoungOk “Sunny” Song

The Effect of Fear-based stimuli on Emotional Attachment: The Mediating Effect of Emotional Arousal
The authors demonstrate that fear arousal is an important antecedent of emotional attachment, even when viewers’ emotional arousal is attenuated from the presence of a previously attached brand. When viewers are exposed to a fear-based stimulus, the resultant level of fear arousal drives emotional attachment. Thus, emotional attachment both reduces experienced fear and is strengthened in response to exposure to a fear-based stimulus.
Sponsor: Oklahoma State University
PI/PDs: Kevin E. Voss, Ying Ying Li

Measuring Attachment Anxiety and Avoidance: A Semantic Differential Approach
Marketing researchers are increasingly interested in the effects of attachment styles on important variables in consumer and business-to-business markets. The scales developed herein provide reliable, valid, and generally applicable scales that are shorter than available alternatives. Respondents high in attachment anxiety had significantly lower evaluations of a shoe ad with exciting positioning while those
high in attachment avoidance had significantly lower evaluations of a shoe ad with authentic positioning.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Kevin E. Voss, Ying Ying Li

**The Effect of Unusual Brand Names on Consumer’s Brand Evaluations**
Research to understand companies’ use of brand names that we classify as unusual. These brand names often use profanity or words that allude to body parts. A website that tracks these names and has a list of 1,617. We lack credible research on why marketers choose such names, how consumers view such names, and what impacts these names have on brand building.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Kevin E. Voss, Richie L. Liu

**Building Brand Identification through Cause-Brand Alliances: The Role of Perceived Cause Controversy**
Examines the extent to which a cause-brand alliance leads to improved brand identification. In addition, to test whether the attitude toward cause brand alliance is determined, in part, by whether the non-profit organization’s main issue is the subject of controversy. On average, customers’ perception of controversy concerning the nonprofit ally in a CBA influences the average evaluation of the CBA and subsequently the level of identification with the brand ally. Specifically, when there is controversy concerning the non-profit’s issue, customers will have a more favorable attitude toward the CBA and identification with the brand ally only if both partners are credible.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Kevin E Voss, Yasamin Vahdati

**Conjunctionitis: A Call for Clarity in Construct Definitions.**
The authors determine the extent to which the use of coordinating conjunctions enhances or impairs definitional clarity. A sample of 736 construct definitions from Journal of Marketing, the Journal of Marketing Research, and the Journal of Consumer Research over a 30-year period were subjected to judging for ambiguity and vagueness by both academic and lay judges. The authors demonstrate that constructing definitions using both ‘and’ and ‘or’ increases the ambiguity and vagueness of the construct’s meaning. The most frequently used conjunction is ‘and’ which appeared in 42% of the definitions. A significant percentage (26%) contain the conjunction ‘or’.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Kevin E Voss, Alex R. Zablah, Yu-Shan “Sandy” Huang

**Integrating Reciprocity into a Social Exchange Model of Inter-Firm B2B Relationships**
Integrates reciprocity and its antecedents into a social exchange model of inter-firm relationships. The social exchange model includes credibility trust, benevolence trust, information exchange, affective commitment, calculative commitment, and long-term orientation. Primary data collection from a sample of firms in the Republic of Korea using a questionnaire. The authors used three-stage least squares to fit the model given the mediational and moderating effects. Adding reciprocity and its antecedents to the social exchange model produce results that differ from previously published findings. Specifically, reciprocity affects information exchanged indirectly through both credibility and benevolence trust.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Kevin E Voss, Mayoor “Max” Mohan, Emily C. Tanner, Yong-Ki Lee, Hong-Kuen Kim
Small Talk: A Double-Edged Sword
There is a pervasive belief in the sales literature that beginning a meeting with small talk will lead to a positive outcome. Drawing on the linguistics and management literature the authors identify conditions where small talk will be counter-productive. In particular, when a customer is exchange A series of experiments support these hypotheses.

Sponsor: Oklahoma State University
PI/PD: Josh Wiener

Communicating with a New Customer
The question is how a sales person should communicate to a customer that is a novice. S/he is unfamiliar with the product or service being sold. The salesperson must choose between beginning in a social or functional manner. A conceptual framework and series of empirical studies support the functional approach.

Sponsor: Oklahoma State University
PI/PDs: Josh Wiener, Karen Flaherty, Hillary Wiener

Product Anecdotes
Extant literature emphasizes how products can be used by a person for one-way communication, i.e., telling others about themselves. A theoretical framework is constructed to explain how a product can be used to facilitate two-way communication (conversation with others). The framework is used to create a marketing strategy (attaching anecdotes to products). A series of empirical studies supports the strategy.

Sponsor: Oklahoma State University
PI/PDs: Josh Wiener, Todd Arnold, Hillary Wiener

Support for Regulation
There are numerous regulations that restrict the freedom of companies and individuals in order to advance a public health or environmental objective. Drawing on the criminal justice literature a framework for understanding why people might support such restrictions is created. A key finding (empirically supported) is that one’s affect towards the agents whose freedom is restricted is more important than the supposed efficacy of the regulation.

Sponsor: Oklahoma State University
PI/PD: Josh Wiener

Why Scientists are Discounted
Assertions by scientists and other experts are often discounted or rejected by a significant portion of the population. A conceptual framework for understanding why is created. The core point is that if statements about a problem are accompanied by policy proposals then not only are the statements dismissed but future statements by this source are discounted. This extends the common idea that people believe what they want to believe by arguing their belief impacts source credibility.

Sponsor: Oklahoma State University
PI/PD: Josh Wiener
A Column Generation Approach for the Product Grouping Problem
We study the product grouping problem (PGP) which seeks to optimize its production process to minimize total materials and equipment changeover cost in a manufacturing plant. A simplified version of the problem that ignores materials cost is equivalent to the clique partition problem (CPP). This paper presents a column generation-based algorithm to solve CPP and PGP. The algorithm is particularly attractive as it requires less fine-tuning of its parameters, produces lower bounds that can be used to assess the quality of the solutions to the problem, and generates improved solutions for a benchmark dataset.

Sponsor: Oklahoma State University
PI/PD: Ali Amiri

Optimization of Product Category Allocation to Minimize Order Splitting
We study the problem of allocating product categories to multiple warehouses to reduce online order splitting and ultimately reduce shipping costs. We propose a column generation-based algorithm to solve the problem.

Sponsor: Oklahoma State University
PI/PD: Ali Amiri

Identifying Injury Severity Risk Factors in Automobile Crashes: A Hybrid Explainable AI Approach
We designed and developed a hybrid methodology involving predictive analytics, explainable AI, and heuristic optimization techniques to investigate the injury severity risk factors in automobile crashes. We proposed an explanation method based on a variable neighborhood search procedure and compared it with the existing methods. By applying an information fusion technique, we identified a ranking list of the most influential injury severity characteristics related to the driver, vehicle, and accident. The findings can be used by practitioners and policymakers to improve traffic safety by mitigating injury-related risk factors.

Sponsor: Oklahoma State University
PI/PDs: Ali Bagheri, Dursun Delen, Mostafa Amini

Measuring the Relative Performance of Accountable Care Organizations: The Role of Electronic Health Records
Accountable Care Organizations (ACOs) were established to address the issues related to the soaring costs of healthcare delivery. We propose an evaluation framework to measure ACO efficiency, based on their ability to use health care resources to maximize patient health outcomes. Drawing on a nationwide sample of ACOs, we find that larger ACOs are more likely to exhibit lower efficiency relative to smaller ACOs. We also find that usage of electronic health records mitigates the negative impact of size on ACO performance.

Sponsors: Oklahoma State University, University of Texas
PI/PDs: Chenzhang Bao
University of Texas: Indranil Bardhan

Antecedents and Impact of Health Information Sharing on Hospital Performance: EMR Sourcing Strategies and HIE Participation
Despite significant investments in health information technologies (IT), there is still a dearth of information sharing among healthcare providers and hospitals, which constrain adopters from reaping the full benefits of health IT. In this study, we examine the impact of electronic medical records (EMR)
sourcing strategies of healthcare providers, as well as their participation in health information exchanges (HIE), on the extent of health information sharing. We attempt to identify the underlying mechanisms through which the benefits of health IT on hospital outcomes are realized.

**Sponsors:** Oklahoma State University, University of Texas
**PI/PDs:** Chenzhang Bao
University of Texas: Indranil Bardhan

**IT Spillover Effects in Levels of Healthcare Delivery**
Recent literature has examined positive IT spillover effects in regional healthcare. We extend this idea and argue that patient and information exchange occur mainly between care-delivery levels (e.g. from primary care clinics to tertiary care hospitals and vice versa) rather than within a care level (e.g. from one tertiary care hospital to another). Using the Medicare Cost Report and HIMSS database, we assess how IT adoption by primary care clinics affect the operating cost of tertiary care hospitals.

**Sponsor:** Oklahoma State University
**PI/PDs:** Chenzhang Bao, Ankita Srivastava, Dursun Delen

**Investigating Uneven Distribution of Health IT Vendor Products**
While there is an increasing trend of adopting systems from several dominating vendors, health IT markets remain competitive and fragmented. This study investigates the distribution of different vendor products and how hospitals adopt health ITs compared to other neighboring peers in the local healthcare market. We focus on the longitudinal trajectories of different applications across years.

**Sponsor:** Oklahoma State University
**PI/PD:** Chenzhang Bao

**Evolution of EMRs and the Impact on Performance**
Health IT applications have been criticized for the lack of interoperability across vendor products. We investigate the difference in vendor selection of EMR applications within a hospital referral region. We cluster the longitudinal patterns of this evolution in vendor difference/similarity and examine its impact on hospital performance.

**Sponsors:** Oklahoma State University, Temple University
**PI/PDs:** Chenzhang Bao
Temple University: Sezgin Ayabakan

**Health Information Exchange: Hype or Hope?**
In recent years, healthcare providers increasingly adopt health IT systems primarily from a single supplier in order to maximize their capability to share patient health data. However, little is known about how much variation this merit in health information exchange explains the variations in hospital performance. In this study, we observe that while single-sourcing improves hospital performance, the level of information sharing has negligible explanation on relationship. Compared to information sharing, the benefit of adopting a single-sourced IT system is more likely rooted in its capability to facilitate clinical workflow.

**Sponsor:** Oklahoma State University
**PI/PD:** Chenzhang Bao

**Technostress Among Physicians and Nurses: A Longitudinal Investigation of Health IT Strategies and User Satisfaction**
In this research, we propose a strategic technostress model to study how EHR strategies impact clinicians’ satisfaction with IT. We perform text mining on data collected from the Glassdoor website to reveal clinicians’ techno-satisfaction and combine it with organizational EHR strategies. Our analysis
indicates that EHR adoption is positively associated with techno-satisfaction. We also observe that EHR sourced from multiple vendors is associated with higher satisfaction. However, these relationships are negatively moderated by EHR experience. Our study provides significant theoretical insights about clinicians’ perception of IT and managerial insights for system design.

**Sponsors:** Oklahoma State University, Temple University  
**PI/PDs:** Chenzhang Bao, Ankita Srivastava, Surya Ayyalasomayajula, Dursun Delen  
Temple University: Sezgin Ayabakan

**Quantum Information Systems: Harnessing Individual and Group Energies**

In this working paper, we propose that an organization is a living organism that generates energy to achieve certain outcomes. We propose that the relationship between the inputs (individual and group use of information systems) and the outputs (strategic alignment and competitive advantage) of a system depends on the basic principles of quantum mechanics. Specifically, we connect the neuroscience research that addresses qualia (individual) and quale (group) to the Management Information Systems (MIS) research. In this paper, we proffer our research objective, discuss our constructs, and present our interview process and survey items that we plan to conduct and administer.

**Sponsors:** Oklahoma State University, Virginia Military Institute, Indiana University of Pennsylvania  
**PI/PDs:** Corey Baham  
Virginia Military Institute: Jennifer Gerow  
Indiana University of Pennsylvania: James Rodgers

**Using Multi-Factor Authentication for Online Account Security: Examining the Influence of Anticipated Regret**

Authentication plays an important role in securing our systems but is threatened by increasingly sophisticated account hacking and account take over. Several security services have been developed, including multifactor authentication designed to cope with online account authentication. It remains unknown how users perceive and evaluate secure authentication for online accounts and consequently use it to avoid online account threats. This study investigates the factors that affect the use of secure authentication to avoid online account threats. This work extends PMT by showing how the emotion of anticipated regret heightens appraisals of threat and coping.

**Sponsors:** Oklahoma State University, University of North Texas  
**PI/PDs:** Corey Baham  
University of North Texas: Obi Ogbanufe

**Issues, Challenges, and Discussion of a Theoretical Core of Agile Software Development Research**

Information systems researchers need to balance their pursuit of theoretical contribution by applying the level of nuance needed to make an impact in both research and practice. We argue that the most expedient way to overcome challenges in conducting ASD research and evaluating knowledge claims is first to develop a theoretical core and second, address issues of rigor in ASD research. This paper aims to highlight major issues facing ASD research in IS, discuss how these issues can be overcome, and propose a theoretical core that can be debated, refined, and used in future research.

**Sponsors:** Oklahoma State University, Louisiana State University  
**PI/PDs:** Corey Baham  
Louisiana State University: Rudy Hirschheim
**Is Technostress Forcing Physicians to Leave Their Careers? An Exploration of EHR-Related Physician Burnout?**

The growing evidence on physician burnout is gaining paramount attention among practitioners, researchers and policy-makers. IS literature has theorized this phenomenon as technostress and there is considerable causal evidence explaining the effect of use of ICT’s on manifestations of strain and reduced productivity. We argue that the existing literature on technostress fails to generalize in healthcare and thus needs to be extended. We propose that an understanding of how EHR’s contribute to physician burnout is needed. A qualitative study using interviews will be deployed at all three levels of care delivery- primary, secondary and tertiary for a holistic exploration.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Corey Baham, Ankita Srivastava, Dursun Delen

**Generational Differences in Handling Technology Interruptions: A Qualitative Study**

Digital native and digital immigrant user types characterize the differences between those who grew up in a world of ubiquitous information systems and those who pre-date it. The rise in computer-mediated communication (CMC) technologies is creating more opportunities for interruption. Researchers have explored the impact of growing up in a world of technology, but little research has been conducted to understand potential differences concerning how different user types handle technology interruptions. This paper examines how individuals handle CMC interruptions differently based on the role of technology and its level of pervasiveness in the environment in which they grew up.

**Sponsors:** Oklahoma State University, Auburn University  
**PI/PDs:** Corey Baham, Ramesh Sharda  
Auburn University: Pankush Kalgotra

**Signals and Mechanisms for Unintended Consequences in AI: A Grounded Theory Approach**

Artificial Intelligence (AI) technologies such as including machine learning, deep learning, computer vision, and natural language processing, are becoming general-purpose technologies that significantly impact the economic and social structure of organizations and society. However, that impact has not been entirely positive. There have already been many cases where undesirable or negative consequences of AI tools have harmed their respective organizations in social, financial, and legal spheres. This research seeks to uncover common signals and mechanisms that lead to unintended consequences in AI. Using a grounded theory approach, we propose a unifying theoretical framework for unintended consequences in AI projects.

**Sponsors:** Oklahoma State University, Churadata Inc.  
**PI/PDs:** Corey Baham, David Biros, Madhav Sharma  
Churadata Inc.: Jacob Biros
Entrepreneurial Organizational Culture, IT-business Alignment, and Firm Agility: A Moderated Mediation

IT-business strategic alignment is one of the most long-standing managerial challenges. Research differs concerning its impact on firm agility. To better understand this relationship, we study the impact of both intellectual and social alignment on firm agility in the context of entrepreneurial organizational culture (EOC) to account for a firm's level of entrepreneurial intensity. In a field study of 100 CIOs, we find that EOC positively impacts firm agility through mediated and moderated effects of both social and intellectual alignment, respectively. This paper provides a theory-driven explanation of the dynamics of social and intellectual alignment's impact on firm agility.

**Sponsors:** Oklahoma State University, University of Tennessee, Virginia Military Institute  
**PI/PDs:** Corey Baham, Andy Luse, Ramesh Sharda  
University of Tennessee: Randy Bradley  
Virginia Military Institute: Jennifer Gerow

Bridging the Acceptance-Routinization Gap in Agile Software Development Assimilation: An Exploratory Cross Case Analysis

Agile software development methods represent a departure from the strong document-driven procedures of plan-driven approaches. As organizations continue to adopt agile methods, understanding how to sustain agile methods is a growing concern. In recent years, researchers have focused their attention on the issues of sustained agile use in order to extend our knowledge on agile assimilation. However, little research has been conducted to expose the assimilation gaps that occur as organizations seek to increase the extent and intensity of their agile use. Following prior literature, we investigate the role of organizational factors in the continuance of agile methods.

**Sponsors:** Oklahoma State University, Louisiana State University, Georgia State University  
**PI/PDs:** Corey Baham  
Louisiana State University: Rudy Hirschheim  
Georgia State University: Likeobe Maruping

The Moderating Effect of Ambiguity on Fake News and Sensemaking

Fakes news on the Internet has emerged as an issue with far-reaching consequences. Given fake news’ breadth of influence, depth of consequences, and perpetuity, we extend this line of inquiry to a less studied area - uncertainty-reducing behaviors in fake news online. In this study, we examine ambiguity in fake news and its relationship to information seeking and sensemaking. Our results yield strong theoretical and practical implications for public policy and future research.

**Sponsors:** Oklahoma State University, Louisiana State University  
**PI/PDs:** Corey Baham  
Louisiana State University: Reginald Tucker

Data is the Disaster: Data Issues in Disaster Management Scenarios

The 21st Century has been termed “the century of disasters” (Achenbach, 2011) due to several notorious forms of disasters (e.g., geophysical, hydrological, climatological). Among these, the recent biological disaster of the COVID-19 disease epidemic has seen global impacts. The disastrous effects of COVID-19 have exacted a devastating toll on civil and technological infrastructure and society as a whole (e.g., loss of human life, social and economic disturbances, and industry interruptions and shutdowns).

**Sponsor:** Oklahoma State University  
**PI/PDs:** Corey Baham, Andy Luse, Ramesh Sharda, Jared Taylor
A text-mining based cyber-risk assessment and mitigation framework for critical analysis of online hacker forums

Online hacker communities are meeting spots for aspiring and seasoned cybercriminals where they can engage in technical discussions, and share exploits and relevant hacking tools to be used in launching cyber-attacks on business organizations. Sometimes, the affected organizations can detect these attacks in advance, with the help of cyber-threat intelligence derived from the explicit and implicit features of hacker communication in these forums. In this research, we develop a novel text-mining based cyber-risk assessment and mitigation framework, which performs the cyber-risk assessment using explicit and implicit features applying various machine learning algorithms, sentiment analysis, and topic detection methods.

**Sponsor:** Oklahoma State University

**PI/PD:** Dursun Delen

A critical analysis of COVID-19 research literature: Text mining approach

Among the stakeholders of COVID-19 research, clinicians particularly experience difficulty keeping up with the deluge of SARS-CoV-2 literature while performing their much-needed clinical duties. To discover the major topics and trends, this study proposes a text-mining approach to navigating large volumes of COVID-19 literature (i.e., a corpus of 65,262 articles). We utilized natural language processing to curate and generate the term list. We applied topic modeling analyses and multiple correspondence analyses to reveal the trends and major topics, and the associations among topics, journal countries, and publication sources.

**Sponsors:** Oklahoma State University, University of Alabama – Birmingham

**PI/PDs:** Dursun Delen


Clustering Temporal Disease Networks to Assist Clinical Decision Support Systems in Visual Analytics of Comorbidity Progression

Detection and characterization of comorbidity, the presence of more than one distinct disorder or illness concurrently occurring among a specific cohort of patients, is an invaluable decision aid and a prominent challenge in healthcare research and practice. The aim of this study is to design a novel visual analytics system that can support efficient pattern detection and intuitive visualization of comorbidity progression modeled via temporal disease networks (TDNs). Through two case studies on Clostridioides Difficile and stroke, we demonstrate that the proposed system is able to provide evidence-based and visual insights regarding comorbidity progression effectively for clinical decision support.

**Sponsors:** Oklahoma State University, Center for Health Systems Innovation

**PI/PDs:** Dursun Delen

Center for Health Systems Innovation: Yajun Lu, Suhao Chen, Zhuqi Miao, Andrew Gin

An Investigation of the COVID-19 Characteristics Using HER Data from Cerner DW

Discovery of new novel patterns related to age, race and gender disparities on hospitalization, length-of-stay and mortality in COVID-19 patients through the use of machine learning and data mining techniques and specifically created database on COVID-19 patients within Cerner HealthFacts data warehouse.

**Sponsors:** Oklahoma State University, Center for Health Systems Innovation

**PI/PDs:** Dursun Delen

Center for Health Systems Innovation: Zhuqi Miao
Predicting and Explaining Pig Iron Production on Charcoal Blast Furnaces: A Machine Learning Approach
Pig iron, the source for a variety of iron-based products, is traded in commodity markets. Therefore, enhanced productivity has significant economic implications for the producers. In this study, we design, develop, and deploy novel machine learning models on a rich data sample covering more than 20 production variables spanning nine years of an actual operational period, collected at one of the largest pig iron production plants in Brazil. We show that, given the blast furnace parameters, machine learning models are capable of unveiling novel insights by illuminating the black box and successfully predicting production levels at different configurations.
Sponsors: Oklahoma State University, Metalsider - Brazil, Sabanci University – Istanbul, Turkey
PI/PDs: Dursun Delen
Metalsider - Brazil: Marcio Salles Melo Lima
Sabanci University - Istanbul, Turkey: Enes Eryarsoy

A Probabilistic Bayesian Inference Model to Investigate Injury Severity in Automobile Crashes
One area that has great potential to leverage the value of big data and analytics is the critical analysis of traffic accidents, where results can provide an in-depth understanding of the risks and provide measures to enhance the well-being of individuals involved in such accidents. This study proposes a data science methodology in a field where probabilistic modeling makes much sense for faster, better decision-making. The main objective of this data analytics study is to identify the high-risk factors with their apparent significance to influence the probability of injury severity on automobile crashes using a geographically representative car crash dataset.
Sponsors: Oklahoma State University, University of Tulsa
PI/PDs: Dursun Delen
University of Tulsa: Kazim Topuz

Crafting Performance-based Cryptocurrency Mining Strategies Using a Hybrid Analytics Approach
Crafting and executing the best cryptocurrency mining strategy is vital for success. This study aims to identify the best cryptocurrency mining strategy based on service providers’ performance for cryptocurrency mining using a hybrid analytics approach, which integrates the Analytic Hierarchy Process (AHP) and Fuzzy-TOPSIS techniques, along with sensitivity analysis. The results show that hosted mining is the overall best cryptocurrency mining strategy, followed by home mining and cloud mining, based on both total cost of operations and cryptocurrency payout criteria.
Sponsors: Oklahoma State University, Ibn Haldun University - Turkey
PI/PDs: Dursun Delen
Ibn Haldun University - Turkey: Umit Hacioglu, Dounia Chlyeh, Mustafa K Yilmaz, Ekrem Tatoglu
To Imprison or Not to Imprison: An Analytics Model for Drug Courts
Analytics can have a significant social impact on decisioning in drug courts. An alternative to traditional criminal courts, drug courts attempt to identify and transform the traditional punitive jurisprudence to a therapeutic one, where the eligible offenders are considered as individuals in need of rehabilitative treatments and are persuaded to undergo a regimen that seeks to return them back to the community, rather than sending them to prison. This initiative, if performed properly, has proven to be effective in lowering the costs and improving the social outcomes. The current study attempts to develop decision support systems for drug courts.

Sponsors: Oklahoma State University, University of Dayton, State of Oklahoma
PI/PDs: Dursun Delen
University of Dayton: Hamed M. Zolbanin,
State of Oklahoma: Durand Crosby, David Wright

Derivation and Validation of Essential Predictors and Risk Index for Early Detection of Diabetic Retinopathy Using Electronic Health Records
Diabetic retinopathy (DR) is a leading cause for blindness among working-aged adults. The growing prevalence of diabetes urges for cost-effective tools to improve the compliance of eye examinations for early detection of DR. The objective of this research is to identify essential predictors and develop predictive technologies for DR using electronic health records. These predictive technologies can provide an early warning sign that motivates patients to comply with eye examinations for early screening and potential treatments.

Sponsors: Oklahoma State University, Center for Health Systems Innovation
PI/PDs: Dursun Delen
Center for Health Systems Innovation: Ru Wang, Zhuqi Miao, Tieming Liu, Mei Liu, Kristine Grdinovac, Xing Song, Ye Liang, William Paiva

Discovering New Patterns in COVID-19 Literature Using Text Mining and Topic Modeling
Although the topic is rather fresh, there seem to be very large and rich literatures already accumulating on COVID-19-related research studies. In this text mining and topic modeling study, we accumulated several thousands of published articles and used data mining, Latent Semantic Indexing, and Latent Dirichlet Analysis (LDA) techniques to characterize the research landscape on COVID-19. The outcome of this research is expected to paint a picture on what has been done, what patterns are found to be significantly consistent, and what else needs to be explored (future research directions) relevant to the characterization and management of this epidemic.

Sponsors: Oklahoma State University, University of Wisconsin – Whitewater, University of Dayton
PI/PDs: Dursun Delen
University of Wisconsin – Whitewater: Behrooz Davazdamami
University of Dayton: Hamed Majidi Zolbanin
Identifying Adverse Drug Events with Big Data Analytics
In pharmacovigilance terminology, Adverse Drug Event (ADE) is a general term that refers to any injury caused by a medication. Although, pharmaceutical companies conduct rather extensive, time-demanding clinical studies to identify such adversities beforehand, it is not possible to do so for unexpected and slow-moving adverse outcomes. This research aims to discover such ADRs, using Big Data and advanced AI (machine learning techniques). The ultimate goal is to use HER, social media/network, medical literature, and biological/chemical databases to develop inelegant systems that detect ADR, thereby saving human lives.

**Sponsors:** Oklahoma State University, University of Wisconsin - Whitewater
**PI/PDs:** Dursun Delen
University of Wisconsin – Whitewater: Behrooz Davazdahemami

Improving Student Retention with Predictive Analytics
Accurately predicting and ranking students that are at risk of attrition is the key component of any retention management system. The goal of this research project is to use historical data to develop machine learning based prediction models to accurately identify the freshmen students that are at a greater risk of dropping out after their first year of college. The system not only predicts those students that are at risk but also prioritizes them based on their likelihood of dropping out so that the limited resources for the intervention and retention programs can optimally be utilized.

**Sponsor:** Oklahoma State University
**PI/PD:** Dursun Delen

Developing a Decision Support Systems for Predicting the Financial Success of Hollywood Movies
Motion picture business is one of the riskiest endeavors for investors, especially in today’s ever-changing needs and wants, and likes and dislikes of the potential audience. In this study, we aim at developing a Web-based DSS (which we refer to as Movie Forecast Guru, or MFG in short) for investors, movie producers, distributors, and exhibitors to make better decisions in their selection of movie projects. In addition to predicting the box-office success of potential movie projects, this DSS is also capable of assessing the importance and contribution of movie parameters such as genre, super stars, technical effects, release time, etc.

**Sponsor:** Oklahoma State University
**PI/PD:** Dursun Delen

Balanced Scorecard-based Analysis of Customer Expectations for Cosmetology Services: A Hybrid Decision Modeling Approach
The goal of this study is to analyze and characterize customer expectations in the cosmetics sector. By employing a multi-criteria decision analysis methodology, the weighted importance of the underlying criteria is identified, and leading cosmetic service providers are ranked. The findings of the study indicate that consumer-focused criteria (i.e., diversification of services, feedback on the product and services, and customer loyalty) have the most significant impact on the success of the cosmetology firms in Ukraine.

**Sponsors:** Oklahoma State University, Kharkiv National University of Economics - Ukraine, Medipol University - Turkey
**PI/PDs:** Dursun Delen
Kharkiv National University of Economics - Ukraine: Oleksandr Dorokhov, Liudmyla Dorokhova, Medipol University - Turkey: Hasan Dinçer, Serhat Yüksel
ICT4D and the Capability Approach: Understanding How Conversion Factors Affect Opportunity and Process Freedoms at the Country-Level

Prior macro-level research on ICT4Ds has measured country-level development using resource- or utilitarian-based approaches. We argue for a people-centered lens using the capability approach, using opportunity and process freedoms. Four conversion factors of ICTs are identified as enablers/restrictors of opportunity or freedoms. Using archival data and a 2SLS model, we test ICT-cost and ICT-infrastructure, and the interaction of e-participation and freedoms on ICTs to predict a country’s human development (HD). Results suggest that cost and infrastructure significantly affect HD, e-participation interacts with freedoms on ICTs such that freedom is only effective when accompanied by high levels of e-participation within a country.

Sponsor: Oklahoma State University  
PI/PDs: Bryan Hammer, Gabriel Bahr, Andy Luse

International Technology Diffusion, Development, and Trading Partner Spillovers

The purpose of this paper is to expand ICT4D literature by investigating the associations between international trade of technology merchandise and development across countries. Using a spatial autoregression model and data on 45 upper-middle and high-income countries from 2009 to 2018, we examine the effects of imports and exports of technology driven trade on two measures of development (GDP and Human Development Index). Additionally, we define spatial borders through a trade partner network and discover spillover effects of trade on development through the associated trading partner countries.

Sponsor: Oklahoma State University  
PI/PDs: Bryan Hammer, Gabriel Bahr, Andy Luse

The Role of Technological Progress in Vertical Specialization and Economic Growth

Previous research has studied how ICT adoption impacts trade on economic and human growth. Countries contribute to the global supply chain (GSC) with various levels of intermediate to final production. This research investigates to what extent countries with a higher intermediate to final product trade ratio and a higher IT skills/capabilities see faster levels of growth (GDP & HDI) than countries with lower IT skills/capabilities over time. Using 2SLS and data on 82 countries spanning 2005 to 2015, we examine the moderating impact of IT Skills/Capabilities with vertical specialization on economic growth and human development.

Sponsor: Oklahoma State University  
PI/PDs: Bryan Hammer, Gabriel Bahr, Andy Luse

The Neuro-Correlates of Information Privacy Concerns and Trust: A Longitudinal Study of Approach-Avoidance Behavior Using EEG

Privacy research has mainly focused on cognitive, conscious conceptualizations for privacy concerns and trust. Not much is known in how privacy operates in the subconscious mind. We posit, in a privacy-salient context, that trust operates as an approach-mechanism for information sharing; privacy concerns operates as an avoidance-mechanism. Using a longitudinal experimental design, we determine the extent to which levels of privacy influence approach/avoidance behavior. Additionally, whether the order of privacy level influences sharing behavior.

Sponsor: Oklahoma State University  
PI/PDs: Bryan Hammer, Andy Luse
The Role of Psychological Contract Violations in Social Media Platforms

Online business entities rely on privacy seals and user agreements to facilitate user information sharing. Interactions among users of social media platforms (SMP) do not rely on user agreements. As a form of social exchange, information sharing on SMPs uses a psychological contract (PC; implicit and assumed reciprocal obligations). This study investigates how PC violations (PCVs) affect sharing intentions on SMPs. We find that sharing intention is negatively influenced by interpersonal and institutional PCVs through privacy concern and trust. PCV by another user positively influences the perceived violation by the SMP, suggesting a collateral damage of interpersonal-PCV towards the SMP.

**Sponsors:** Oklahoma State University, Oregon State University
**PI/PDs:** Bryan Hammer
Oregon State University: Forough Nasirpouri Shadbad

Privacy as a Multidirectional Problem: A Social Relations Model of The Reciprocation of Privacy and Trust Using Network Analysis

Previous research on privacy (IS, Marketing, Management, Psychology, etc.) models information exchange in privacy salient situations as unidirectional, often from the perspective of a single user. As a social construct, privacy operates in social exchanges in which information moves between and among groups of individuals. Using network analysis, we model privacy and trust within a social relation model. Data come from an organization that uses a social media platform as its primary communication tool. We determine that trust is a reciprocating mechanism within relationships; however, privacy information concerns are not reciprocated, especially between management and subordinate relationships.

**Sponsor:** Oklahoma State University
**PI/PDs:** Bryan Hammer, Andy Luse

Information Sharing as a Multidimensional Phenomenon: A Multilevel Study of Multiplex Relationships, Privacy, and Trust in Social Media Platforms

Research on privacy and trust often model relationships (interpersonal, business-consumer, etc.) as unidimensional, lacking depth. Prior research indicates multidimensional relationships enhance trust, resource sharing, and satisfaction. This research proposes that multidimensional (i.e. multiplex) relationships increase trust, decrease privacy concerns, and increase information sharing in social media platforms (SMP). Data was gathered from an organization utilizing Facebook as their primary communication platform. Results suggest that more multiplex relationships lead to information exchange, especially when information sensitivity increases.

**Sponsor:** Oklahoma State University
**PI/PDs:** Bryan Hammer, Andy Luse

The Fear of Social Exclusion and Our Need to Belong: A Study of Interpersonal Privacy and Trust in Social Media Platforms

All individuals have an innate desire to belong to society in order to reduce costs of living as well as experience a reciprocation of welfare. Social media platforms (SMP) provide a vehicle that delivers a means to experience this. This research proposes that individuals’ fear of social exclusion and goal-directed enjoyment leads to information sharing in SMP while enjoyment influences all types of information (low, medium, high), social exclusion only influences sharing of low-sensitive information. Interpersonal trust leads to high-sensitive information sharing, but not medium- or low-sensitive; interpersonal privacy concern decreases medium- and low-sensitive information sharing, but not high.

**Sponsor:** Oklahoma State University
**PI/PDs:** Bryan Hammer, Andy Luse
The Antecedents of Habit on IS Continuance
This study theorizes the antecedents of the habit construct in hedonic IS usage. Studies of habit in IS investigated habit as a construct in both utilitarian and hedonic contexts, but the link between habit and hedonic IS usage isn't fully understood. Investigating the antecedents of habit should help establish a clearer picture. We investigate social network site and online gaming users through MTurk anonymous surveys to better understand the link between habit and antecedents from the literature.
Sponsor: Oklahoma State University
PI/PDs: Bryan Hammer, Jerome Kirtley, Andy Luse

Interruptions and Information Recall: Differences Between Virtual and Face-to-Face Learning
This study investigates the link between sensory interruptions and information recall in computer-mediated learning. There is a dearth of literature concerning sensory interruptions in IS literature and with the rising prevalence of virtual learning in the current environment, investigation of this phenomenon is critical. We will conduct an experiment combined with a survey to assess the effect of visual and audio interruptions on information recall.
Sponsors: Oklahoma State University
PI/PDs: Bryan Hammer, Jerome Kirtley, Andy Luse

Are You Game? A Meta-Analysis of Gamified Elements and Behavioral Outcomes
Commercial systems contribute increasing business value by playing a pivotal role in enhancing performance of firms (Melville et al. 2004). Despite the proliferation of technology in our lives, creating systems that maintain user engagement is a struggle for vendors. Previous research has investigated the interplay between gamified elements and user interaction. Using a meta-analysis approach, this research investigates hundreds of published research to investigate the saliency of gamified elements with different types of users and systems.
Sponsors: Oklahoma State University, Oregon State University
PI/PDs: Bryan Hammer, Andy Luse, Gabriel Bahr, Jerome Kirtley
Oregon State University: Forough Nasirpouri Shadbad

Hacking the Value Gap: Cybersecurity Investments, Cybersecurity Talent, and Vulnerability Relative to Peers
Cybersecurity investments, when publicly emphasized, create economic rents through gained legitimacy from stakeholders and a reduction in the cost of capital. The results suggest: 1) Publicly Emphasizing Cybersecurity Investments (PECI) are associated with a generally positive value as measured by Tobin's q, return on assets, and return on sales, 2) PECIs accompanied by security talent generate significantly higher gains, and 3) PECIs are more profitable for under-performing firms as well as over-performing firms. While PECIs without sufficient talent support does not significantly reduce subsequent cyber breaches, it generates market rewards for under- and over-performing firms.
Sponsors: Oklahoma State University, City University of Hong Kong, Temple University, Purdue University
PI/PDs: Bryan Hammer
City University of Hong Kong: TJ Zhang
Temple University: Taha Havakhor
Purdue University: Mohammad Rahman
Do I need to be liked to do my job? Perception on Information Security staff and Success of Cooperative Security Operations

This research examines the effect of employees’ perception on their information security staff on the success of security operations. The extent research has identified various mechanisms, such as sanctions, incentives, and employee training programs, that can improve the performance of information security. We propose that how employees perceive their security team (e.g., controller, projector, enabler, etc.) also plays critical roles, directly and indirectly, in security operations by encouraging or discouraging security-enhancing behaviors. The study will extend the model of security enhancing behaviors and suggest additional methods to improve information security controls.

**Sponsor:** Oklahoma State University  
**PI/PD:** JinKyu Lee

The Role of Individual Differences in Acceptance of Information Security Policies

Previous studies on corporate information security pointed out that employee incompliance is a major causes of information security incidents. While extant literature suggests that organizations can adopt various incentives and training programs to encourage employees’ compliance with information security policies, most studies considered employees as an invariant group of people regardless their paygrade, job type, industry, etc. In this study, we explore personal factors that can moderate employees’ conformity level in presence of compliance incentives and training programs. This study will identify major personal dispositions that can cause the disparity in policy compliance behaviors and propose a solution.

**Sponsor:** Oklahoma State University  
**PI/PD:** JinKyu Lee

Technical Control or Managerial Control? – A Decision Making Framework for Infosec Control Selection

Employee training has been widely recognized as one of the most important means to strengthen the information security posture of an organization. However, its complementary and supplementary roles with technical measures in a corporate security architecture has not been clearly understood. This study examines the effectiveness of employee trainings on organizational security posture in relation to technical security countermeasures for various types of information security threats. This study will focus on identifying underlying characteristics that determine the control effectiveness and develop a decision-making framework for managers who need to select an optimal mix of technical and managerial security controls.

**Sponsor:** Oklahoma State University  
**PI/PD:** JinKyu Lee

Strong vs. Weak Theory: An Evaluative Mechanism for Theoretical Development

The goal of many theoreticians is to develop sound theory that will be utilized within their field both by researchers and practitioners. Yet, scholars have not arrived at a consensus concerning what constitutes appropriate theoretical structure. In this paper, we offer an approach to theory design and analysis based on a categorization of strong and weak theory structure. We first offer a concrete definition of the meaning of strong and weak theory that is based on a variety of literature. Second, we apply this evaluative framework to a prominent stream of theory development and discuss the nature of theory evolution.

**Sponsors:** Oklahoma State University, Iowa State University  
**PI/PDs:** Andy Luse, Bryan Edwards  
Iowa State University: Anthony Townsend
Does Technology Thwart Gender Stereotypes: An Impression Formation-based Examination of the
Differential Influence of Technology across Gender and Message
This research examines the relationship between gender, message bias, and technology use on the way
that observers form impressions of others. Building on impression formation and gender stereotype
research and theory, we develop a two-study research methodology for examining how impressions are
formed of technology users. The results of our two studies indicate that technology use is an important
component in impression formation, significantly inhibiting the effects of gender stereotyping, such that
women and men are not evaluated differently based upon their apparent competency in using
technology nor on the content of their messaging.
Sponsors: Oklahoma State University, Iowa State University
PI/PDs: Andy Luse
Iowa State University: Anthony Townsend

Company-Sponsored Online Co-Creation and Financial Incentives: The Impact of Intrinsic Motivation
on Participation Intention
In this study, we use LEGO Ideas, a prominent COCB, as an exemplar and employ a between-subjects
randomized experimental design to examine the effect of different types of financial incentives on IM’s
impact on participation intention in a COCB context, either directly or indirectly through personal
innovativeness in the domain of information technology. Our findings suggest that focused financial
incentives, representing situations where financial rewards are administered exclusively on the basis of
excellent performance, offer the best outcome for predicting PI. Findings provide support for cognitive
evaluation theory and insight into the role of financial incentives in a COCB context.
Sponsors: Oklahoma State University, Iowa State University
PI/PDs: Andy Luse
Iowa State University: Anthony Townsend, Sidharth Baswani

Using a Virtual Lab Network Testbed to Facilitate Real-world Hands-on Learning in a Networking
Course
The use of an Internet testbed technology named ISEAGE allows students to design and implement fully
functional networks using public IP space that is contained in the testbed. To the students, it appears as
if they were directly connected to the Internet while still being protected. This paper shows that ‘real
world’ projects using virtual lab technology can have a positive effect both on objective networking
knowledge, as well as subjective self-assessments of self-efficacy with regard to implementing the
technology. It also demonstrates that ‘real world’ final projects encourage student thinking at upper
levels of Bloom’s taxonomy.
Sponsors: Oklahoma State University, Iowa State University
PI/PDs: Andy Luse
Iowa State University: Julie Rursch

Gophish: Implementing a Real-World Phishing Exercise to Teach Social Engineering
Social engineering is a large problem in our modern technological world, but while conceptually
understood, it is harder to teach compared to traditional pen testing techniques. This research details a
class project where students implemented a phishing exercise against real-world targets. Through
cooperation with an external corporate partner, students learned the legal, technical, behavioral,
analyst, and reporting aspects of social engineering. The outcome provided both usable data for a real-
world corporation as well as valuable educational experience for the students.
Sponsor: Oklahoma State University
PI/PDs: Andy Luse, Jim Burkman
This Isn’t Your Parent’s TV Show…Oh Wait, It Is
Whether it be old games, books, technology, movies, or TV shows, the prevailing thought is that the younger generation prefers newer things. While this view may be perpetuated online and in popular press, it may also be less than accurate as data actually shows younger generations preferring older content. Utilizing Uses and Gratifications Theory, this research tests this assumption by tracking favorite TV shows of Millennials and Gen Z’ers over a seven-year period. Results show that these individuals actually prefer non-current TV shows and that the level of “non-currentness” of their preference is growing over time.

**Sponsor:** Oklahoma State University

**PI/PDs:** Andy Luse, Jim Burkman

Wearables in the Workplace: Examination Using a Privacy Boundary Model
Wearable types can take many forms but this study focuses on RFID wearables due to their low cost, proven durability and reusability (Zhu & Hou, 2020). This research investigates the use of RFID wearables in the context of a corporate environment. Utilizing privacy boundary research, findings show that while being monitored negatively impacts employee satisfaction, this satisfaction further varies based on the voluntary nature of the implementation and the gender of the employee. Findings suggest that greater transparency in implementation may alleviate some of the negative aspects of implanting such technologies in the workplace.

**Sponsor:** Oklahoma State University

**PI/PDs:** Andy Luse, Jim Burkman

Hot or Not: The Impact of Self-Perceived Facial Attractiveness on Webcam Use During Virtual Meetings
This research investigates the impact of facial attractiveness in the decision of an individual to display their webcam during a videoconference. Results show that while men are driven by self-views of their own facial attractiveness, women are instead driven by their beliefs about what others think of their facial attractiveness. This provides important information for those who wish to create a richer interaction for the widespread use of videoconferencing tools.

**Sponsor:** Oklahoma State University

**PI/PDs:** Andy Luse, Jim Burkman, Erin Stewart

Hackalytics: Using Computer Hacking to Engage Students in Analytics
This teaching brief describes a novel approach to teaching analytics through computer hacking. Students are exposed to the entire data lifecycle by first collecting intrusion detection data through the hacking of other student machines and then utilizing simple analytics procedures to analyze this data. Quantitative and qualitative results show that the students enjoy the activity both in terms of the fun of hacking their fellow classmates as well as analyzing this data in an area less utilized in analytics instruction – security analytics. Three levels of the exercise are provided as well as how-to materials for students to run the exercise.

**Sponsors:** Oklahoma State University, Oregon State University

**PI/PDs:** Andy Luse

Oregon State University: Forough Shadbad

Best of Both Worlds: The Inclusion of Gamified Elements in Virtual Lab Environments to Increase Educational Value
This research explores the idea of investigating both contexts within one unified platform. We examine whether using gamified elements within virtual labs is effective in enhancing learners’ educational
performance. Particularly, we employ leaderboards as a motivational gamification mechanism for more engagement and participation that can result in higher learning outcomes. Using a sample of students, our results show that utilization of gamification within a virtual lab environment causes students to exhibit higher performance in terms of more task accomplishments (specifically those tasks that are more complex in nature) and higher self-efficacy.

**Sponsors:** Oklahoma State University, Oregon State University  
**PI/PDs:** Andy Luse, Gabe Bahr, Bryan Hammer  
Oregon State University: Forough Shadbad

**Positive Spillover Effects of Mask Mandate Policy and COVID-19 Spread**
The mean daily case growth dropped 1.5 to 2.9 percent more following mask mandates for cities subject to the policy relative to non-mandate cities. We also examined whether mask mandate effects spilled over to neighboring municipalities without mandates and found evidence that spillover effects do occur. The spillover framework extends work in relational mobility to demonstrate that a relationally mobile society can have not only negative effects with regard to the spread of the virus, but also positive effects with regard to mask wearing spillover. This argues that mask mandates by major metro areas can be beneficial to neighboring communities.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Andy Luse, Greg Eaton, Jared Taylor, Ramesh Sharda

**Learned Helplessness Attributional Scale (LHAS): Development and Validation of an Attributional Style Measure**
In answer to the call to increase the use of attribution theory, we look to both the theory of learned helplessness and Weiner’s attribution theory to create a new set of scales to provide a stable, parsimonious instrument for measuring attributions. Twelve sections of four courses across ten semesters were used to develop the scales and test them across groups and time. The final result is a new measurement tool, the Learned Helplessness Attribution Scale (LHAS), that demonstrates solid psychometric properties.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Andy Luse, Jim Burkman

**Blocking Effects of Information Sensitivity and Approach-avoidance Disposition on Online Information Disclosure: A Longitudinal Experiment Using EEG**
We theorize that an overarching approach-avoidance mechanism drives information disclosure in which privacy- and trust-related concepts are driven by avoidance tendencies and approach tendencies, respectively. We posit blocking effects and approach-avoidance dispositions explain the inconsistencies. Using a longitudinal experimental design with EEG, we found that while sharing behavior of low sensitive information is not affected by either the approach-avoidance tendencies of the individual or initial information exposure, the sharing of highly sensitive information is significantly affected by both, such that disclosure is negatively impacted by initial exposure to highly sensitive information for those who display avoidance tendencies.

**Sponsor:** Oklahoma State University  
**PI/PDs:** Andy Luse, Bryan Hammer

**Information Sharing as a Multidimensional, Dyadic Problem: A Multilevel Study of Multiplex Relationships, Privacy, and Trust**
Using network theory, we theorize that privacy concerns, trust, and information sharing occur at two levels: relational (i.e., dyadic) and individual. Relationships characterized as multiplex, or more
multidimensional, are richer and experience greater trust while reducing privacy concerns. Utilizing data collected from an organization using Facebook as their communication and organization platform, we analyze our data using a Bayesian multilevel model approach. Our results indicate that privacy concerns operate mainly through the individual level while trust operates at the relational level. Our findings suggest that privacy mechanisms are more complex than previously modeled and that they depend on interpersonal relationships.

**Sponsor:** Oklahoma State University

**PI/PDs:** Andy Luse, Bryan Hammer

**Are Some Countries Wasting Their Time and Money with ICT4D Initiatives? A Process Freedom Approach to Understanding ICT4D Barriers**

Using publicly available archival data and a 2SLS model with instrumental variables, we test ICT cost, ICT infrastructure, and the interaction effect between e-participation and freedom of expression on ICTs to predict a country’s human development. Results suggest that both ICT cost and infrastructure significantly affect human development and that e-participation interacts with freedom of expression on ICTs in a way that freedom of expression is only effective when accompanied by high levels of e-participation within a country.

**Sponsor:** Oklahoma State University

**PI/PDs:** Andy Luse, Bryan Hammer, Gabe Bahr

**Journal Rankings and Impact Factors: A Comparative Analysis**

Publishing in journals of high quality and reputation has become increasingly important for faculty performance reviews, promotion and tenure. The jury is still out regarding the best way to assess publications and varies widely among universities. Traditionally, international universities have depended more on impact factors while nationally, results of journal ranking studies have taken precedence over impact factors which are based on cite scores. This study investigates journal rankings and impact factors for business related publications looking at the correlation between the two.

**Sponsor:** Oklahoma State University

**PI/PD:** Jeretta Horn Nord

**Critical Components in Organizational Performance**

Organizational performance is one of the most important factors leading to a company’s success. Recognizing the vital role of competencies, knowledge-oriented leadership, and innovation in organizations, there is a need to study how these variables affect organizational performance. This research builds a model with four constructs, i.e., competencies, knowledge-oriented leadership, innovation, and performance within manufacturing companies to find out, through path modeling, 1) the effect of competencies on innovation, 2) the effect of knowledge-oriented leadership on innovation, and 3) the effect of innovation on performance. The survey instrument included four constructs – Competencies, Knowledge-oriented Leadership, Innovation, and Performance.

**Sponsor:** Oklahoma State University

**PI/PDs:** Jeretta Horn Nord, Alex Koohang, Joanna Paliszkiewicz, Marcin Soniewicki
Data Analytics in Organizations: Leadership, Management, Talent, and Performance
The success of today’s organizations depends on data analytics—obtaining data, analyzing it, and using the results to make informed decisions. Although the significance of analytics is recognized more than ever by those in businesses, many lack the leadership and talent to optimize the transition from data analytics to data-driven decision making. This research investigates the state of data analytics in organizations through an investigation of leadership, management, talent, and performance.
Sponsor: Oklahoma State University
PI/PD: Jeretta Horn Nord

The Internet of Things (IoTs)
Those in the emerging digital world have recently witnessed the proliferation and impact of IoT-enabled devices. The Internet of Things (IoTs) has provided new opportunities in the technology arena while bringing security, privacy, and trust challenges to an increased level of concern. This research investigates the usage, benefits, and challenges of IoTs in organizations. The research has both practical and theoretical impetus since IoT is still in its infancy, yet is considered by many as the most important technology initiative of today.
Sponsor: Oklahoma State University
PI/PD: Jeretta Horn Nord

Using the Gaussian Copula to Generate the Predictive Distribution in Monotonic Nonlinear Models: An Efficient Resampling Approach
We present a resampling approach for generating the predictive distribution of a dependent variable that has monotonic nonlinear relationships with its predictors. The procedure provides an empirical estimate of the predictive (conditional) distribution in terms of the original variables without requiring analyst intervention to identify appropriate transformations (and back-transformations) of variables. This allows predictions based on the estimated conditional expectation, and prediction intervals based on the estimate of conditional variance. It employs the well-known Gaussian copula, is easily implementable and is computationally efficient.
Sponsors: Oklahoma State University, University of Oklahoma
PI/PDs: Rathindra Sarathy
University of Oklahoma: Krish Muralidhar

When will I get out of the hospital? Modeling Length of Stay using Comorbidity Networks
Using the EMR hosted by CHSI, we build models for predicting hospital length of stay by incorporating historical and probable comorbidities that a patient is likely to face during their hospital stay. The results show significant improvement in predictive performance.
Sponsors: Oklahoma State University, Auburn University
PI/PDs: Ramesh Sharda
Auburn University: Pankush Kalgotra

Pandemic Information Support Lifecycle: Evidence from the Evolution of Mobile Apps during COVID-19
We propose a pandemic information support lifecycle (PISL) consisting of five phases: awareness, preventive care, active information, confidence building and evaluation. We validated this PISL using analysis of the mobile apps developed worldwide.
Sponsors: Oklahoma State University, Auburn University
PI/PDs: Ramesh Sharda
Auburn University: Pankush Kalgotra, Ashish Gupta
Examining multimorbidity differences across racial groups: a network analysis of electronic medical records
Using the EMR hosted through CHSI, we study health differences by analyzing multi-morbidities among seven population groups based on race. Our multimorbidity network analysis identifies specific differences in diagnoses among different population groups, and presents questions for biological, behavioral, clinical, social science, and policy research.

**Sponsors:** Oklahoma State University, Auburn University
**PI/PDs:** Ramesh Sharda, Julie Croff
Auburn University: Pankush Kalgotra

What should I believe? Exploring information validity on social network platforms
We develop a theoretical framework to explore the accuracy and objectivity of social networks content by employing social capital theory. The proposed and validated measures can help assign an accuracy and objectivity score to a conversation taking place in social media.

**Sponsors:** Oklahoma State University, Wright State University
**PI/PDs:** Ramesh Sharda
Wright State University: Daniel Asamoah

How Can Our Tweets Go Viral? Point-Process Modelling of Brand Content
We develop and test stochastic models based on Hawke’s process to be able to predict which tweets are likely to go viral.

**Sponsors:** Oklahoma State University, Wright State University
**PI/PDs:** Ramesh Sharda
Wright State University: Amir Hasan Zadeh

Analytics/Data Science Decision Support for Management of Oklahoma COVID pandemic
We assist the State of Oklahoma with data accuracy analyses and positivity rate changes to better understand and mitigate the Covid-19 pandemic.

**Sponsors:** Oklahoma State Department of Health
**PI/PDs:** Ramesh Sharda, Andy Luse

COVID Increase Drives Decrease in Travel Risk Perception
This is a comparative analysis of perceived international travel risk immediately prior to COVID outbreak and in the months following most airlines returning to near full capacity.

**Sponsor:** Oklahoma State University
**PI/PD:** Mark Weiser

Task-based Self-efficacy and Perception Changes from Short-term Study Abroad Experiences
This study evaluates the practical value of short-term faculty-led study abroad experiences to increase an individual’s efficacy in tasks specifically related to traveling and interacting abroad, and in comfort and security perceptions about the country of travel and other countries.

**Sponsor:** Oklahoma State University
**PI/PD:** Mark Weiser
This study surveys municipal legislation from small cities in which a Division 1 FBS school is located to categorize approaches in developing home-sharing markets.
Sponsor: Oklahoma State University
PI/PD: Mark Weiser

Impacts of Smart Technology on Short-term Rentals Operations
This study analyzes the financial and operational impacts of deploying smart technologies in short-term rentals. Landlords are usually not co-located with lodging units rented through short-term agents, such as Airbnb and VRBO. Application of smart thermostats, plugs, and energy monitors can have a significant impact on costs without a comparable increase in operational burden. Using a case study of five properties, we assess the impact of these devices and explore additional benefits derived from behavioral changes by tenants due to the presence of these devices.
Sponsor: Oklahoma State University
PI/PD: Mark Weiser
College of Veterinary Medicine

FY2021 Research Abstracts
Designing an approach for the development of allosteric modulators targeting specific members of protein superfamilies

Human ribonucleases are a group of 8 important enzymes, which play roles in cancer through promoting the development of blood vessels in tumors and loss-of-function mutations leading to Lou Gehrig’s (amyotrophic lateral sclerosis, ALS) and Parkinson’s diseases (PD). We are using joint computational-experimental investigations to characterize regions of these enzymes, which can be targeted for drug design. In particular, our strategy uses identification of functionally important distal regions using molecular dynamics and quasi-anharmonic analysis. The results are validated and improved by NMR investigations (performed by our collaborator, Dr. Nicolas Doucet from INRS, University of Quebec, Canada). Our investigations are improving the fundamental knowledge of these enzymes, which will help in designing novel medicine for diseases associated with neuronal loss, cancer, and pathogenicity.

Sponsors: National Institutes of Health
PI/PDs: Pratul K. Agarwal

A rational enzyme engineering approach to improving the catalytic efficiency of enzymes

Enzymes are used in a wide variety of industrial applications. Improved catalytic efficiency and stability under higher temperature (or other conditions) are highly desired features. Our previous work has enabled us to obtain fundamental understanding of the interplay between enzyme structure, dynamics and function. We have developed and validated a biophysical model of enzyme catalysis that allows us to identify the function promoting protein regions and dynamical events. We are using this approach to develop improved versions of industrially important enzymes.

Sponsors: Amano Enzymes, LLC (Japan)
PI/PDs: Pratul K. Agarwal

Skeletal Muscle as a Target for Cardio-Metabolic Disease in Sarcopenic Obesity

The objective of this application is to examine how augmented muscle mass, a by-product of the exercise intervention commonly prescribed for treatment of obesity and sarcopenia, can prevent and rescue metabolic and vascular dysfunction in sarcopenic obesity. The core hypothesis of this application is that targeting skeletal muscle function in aging can ameliorate metabolic dysfunction and oxidant-induced hypertension in obesity.

Sponsors: National Institutes of Health
PI/ PD: Joshua T. Butcher

Targeting Oxidant Stress in Diabetic Retinopathy using an Exercise Mimetic

The Oklahoma IDeA Network of Biomedical Research Excellence (OK-INBRE; P20GM103447) Collaborative Research Grant program is to foster research interactions between faculty at the OK-INBRE primarily undergraduate institutions and their counterparts at research-intensive institutions.

Sponsors: National Institutes of Health
PI/PD: Cammi Valdez, Joshua T. Butcher

Targeting Skeletal Muscle (Fiber Type) for Protection against Diabetes

This pilot project award is from the Diabetes CoBRE Program at OUHSC (P30GM122744) and is designed to determine the role of skeletal muscle fiber types (oxidative versus glycolytic) in diabetes (Type 1 and Type 2 diabetes), and specifically the effect on muscle function and glucose homeostasis.

Sponsors: National Institutes of Health
PI/PD: Joshua T. Butcher, Jian-xing Ma
Roles of Estrogen Sulfotransferase in Estrogen-dependent Breast Cancers
This project develops novel treatments for estrogen-dependent cancers by enhancing in vivo estrogen sulfotransferase activity to block in vivo estrogenic activity.
**Sponsor:** Oklahoma State University
**PI/PD:** Guangping Chen

The Role of Glucose Homeostasis During Respiratory Infections
The specific aims of this project are to test the hypotheses that: 1) impaired glucose transport and utilization enhances influenza infection in the lungs of diabetic animals; and 2) alterations in the insulin signaling pathway in the diabetic lung enhance the inflammatory response and the severity of influenza infection.
**Sponsor:** The National Institutes of Health, P20GM103648
**PI/PDs:** Véronique Lacombe, Lin Liu

The Sarcoplasmic Reticulum Calcium ATPase Pump as a Major Regulator of Glucose Metabolism: A Novel Target for Diabetic Patients
We hypothesized that cardiac-specific overexpression of the sarcoplasmic reticulum calcium ATPase (SERCA) pump, which tightly regulates cytosolic calcium, modulates whole-body glucose homeostasis by secreting cardiokines during healthy and diabetic states.
**Sponsor:** Center for Advancement of Science & Technology (OCAST), HR20-100
**PI/PD:** Véronique Lacombe

Novel therapeutic targets to improve cardiorespiratory outcomes during COVID-19 infection and diabetes.
The overall hypothesis of this project is that alterations in insulin and glucose homeostasis enhance the pathogenesis of SARS-CoV-2 infection, which will be rescued by metformin treatment in diabetic subjects.
**Sponsor:** Oklahoma State University College of Veterinary Medicine Research Advisory Committee
**PI/PD:** Véronique Lacombe, Craig Miller

Bioprinting Vascularized 3D Liver Tissues and Drug Metabolic Pathways
This project develops a 3D liver tissue using cell bioprinting with coaxial nozzles, which can be used to spatially locate liver cells around microcapillaries. Using this technique, we want to evaluate the changes in drug metabolizing enzyme activities and influence of different cell types. We will develop models for drug metabolism evaluation, which will contribute to novel drug develop.
**Sponsor:** Oklahoma State University
**PI/PD:** Guangping Chen

Chemical Engineering: Sundar V. Madihally
Three-dimensional Tumoroid Culture for Estrogen-dependent Breast Cancer Drug Discovery and Development
This project investigates mechanisms of estrogen-dependent breast cancer MCF-7 cells using spheroid culture. Estrogen sulfotransferase, steroid sulfatase, estrogen receptor α-, estrogen receptor β-, and G protein-coupled estrogen receptor will be investigated.

**Sponsor:** Oklahoma State University, Research Jumpstart/Accelerator Grant Program  
**PI/PD:** Guangping Chen

New Protocols Development for Spheroid Culturing of Various Breast Cancer Cell Lines
This project develops methods to grow different types of breast cancer spheroids.

**Sponsor:** Oklahoma State University  
**PI/PD:** Guangping Chen

Physiology and Pathophysiology of Equine Athletic Performance
Superior athletic performance in horses requires optimal physiological adaptation in the musculoskeletal and cardiopulmonary systems, and improvements in these systems often lead to improve performance. Conversely, disease in these systems will invariably cause decreased performance, and in some cases the exercise itself is the cause of the disease. The goals of this program are to investigate the mechanisms underlying the physiological adaptation to exercise in horses, identify methods that will improve the horse's adaptation to exercise, and determine strategies that can prevent exercise induced disease.

**Sponsors:** Oxley Chair in Equine Sports Medicine  
**PI/PD:** Michael Davis

Physiochemical causes of muscle fatigue and muscle damage in horses
Strenuous exercise produces skeletal muscle hyperthermia and acidosis in horses, often with intramuscular temperatures as high as 43-44oC and pH as low as 6.2. Muscle hyperthermia and acidosis can alter cellular functions and intracellular signaling which can lead to a plethora of changes within the cell, including impaired or inefficient production of adenosine triphosphate (ATP) and loss of key mitochondrial elements into the sarcoplasm. Our central hypothesis is that physiological hyperthermia and acidosis, individually and in combination, result in progressive leakage of skeletal muscle mitochondrial membranes and oxidative stress, resulting in impaired oxidative phosphorylation, decreased ATP production, muscle damage, and reduced performance.

**Sponsor:** Grayson Jockey Club Research Foundation  
**PI/PD:** Michael Davis

The influence of cerebrospinal fluid collection site on the diagnosis of Equine Protozoal Myeloencephalitis.
Analysis of cerebrospinal fluid is critical for the diagnosis of horses with Equine Protozoal Myeloencephalitis, however concerns exist that the site of collection may influence the diagnostic results, compromising the ability of the clinical to make an accurate diagnosis. The aims of the study are to compare the diagnostic accuracy of tests performed on cerebrospinal fluid collected from different sites.

**Sponsor:** Research Advisory Council  
**PI:** Martin Furr
Adipose Tissue Niche Homeostasis
Disease is associated with both the loss of fat and the gain of fat. Obesity and its sequelae of diabetes, heart disease, and cancer is the by far the most recognizable disease as a result of fat gain, but disease also results from conditions that cause loss of fat stores. Therefore, the balance of fat stores in the body is important to health and longevity. This proposal’s focus is to validate key regulators in adipogenesis at the level of the adult adipose tissue stem cell.

Sponsor: Research Advisory Council
PI: Myron Hinsdale

Oklahoma Center for Respiratory and Infectious Diseases: Animal Models Core
This proposal’s focus is to train junior faculty that are new to using animal models for respiratory disease and to prepare them for future extramural funding.

Sponsor: National Institutes of Health/NIGMS, P20GM103648.
PIs: Myron Hinsdale, Co-Investigator, Animal Models Core Director

Expression Profiles of Long Noncoding RNAs in Lungs Infected by SARS-CoV-2 Virus
COVID-19 is a disease caused by the SARS-CoV-2. The current study is to identify dysregulated long noncoding RNAs in the respiratory system during SARS-CoV-2 infection through next-generation sequencing analysis.

Sponsors: Oklahoma State University, Research Advisory Committee
PI/PDs: Chaoqun Huang

Oklahoma Center for Respiratory and Infectious Diseases
The overall goal of this Phase II CoBRE grant is to further develop the State-wide multi-institute Oklahoma Center for Respiratory and Infectious Diseases (OCRID) into a sustainable center of research excellence.

Sponsor: National Institutes of Health/NIGMS, P20GM103648.
PIs: Lin Liu
OUHSC: Jordan Metcalf

The Role of LncRNAs in Pulmonary fibrosis
The goal of this project is to study roles and mechanisms of lncRNA FENDRR in pulmonary fibrosis.

Sponsor: National Institutes of Health/NHLBI, R01HL135152
PI: Lin Liu

Lnc-PINK regulation of innate immunity in lung epithelial cells
The major goal of this project is to investigate the functional roles and mechanisms of the host lnc-PINK in influenza virus replication.

Sponsor: National Institutes of Health/NIAID, R21AI152004
PI: Lin Liu

Development of a COVID-19 human lung tissue model for drug screen using iPSCs
The major goal of this project is to develop a COVID-19 human lung tissue model using iPSCs for drug screening to identify FDA-approved drugs for treating COVID-19.

Sponsor: Oklahoma Center for Adult Stem Cell Research
PI: Lin Liu
Modeling Influenza Virus Infection Using iPSC-derived Alveolar Organoids
The major goal of this project is to develop human alveolar organoids to recapitulate influenza virus infection in the in vivo alveolar epithelium using human induced pluripotent stem cells (iPSCs).
Sponsor: Oklahoma Center for Adult Stem Cell Research
PI: Lin Liu

Role of Tankyrase 2 in Lung Innate Immunity
The major goal of this project is to investigate the functional roles and mechanisms of tankyrase 2 in innate immunity.
Sponsor: Oklahoma Center for the Advancement of Science and Technology, HR20-050
PI: Lin Liu

G-RISE at Oklahoma State University
This predoctoral training grant will support the training and professional development of a diverse group of biomedical sciences doctoral students across 12 participating graduate programs at OSU.
Sponsor: NIH
PI/PDs: Pamela Lovern
Graduate College: Brenda Smith

Improved Treatment for Zoonotic Monkey B Virus Infections
Monkey B virus (BV) is a serious concern for research and veterinary personnel working with or around macaque monkeys due to the extremely high fatality rate of zoonotic infections. Current treatment utilizes drugs developed to treat infections with human herpes simplex virus, but BV is known to be less sensitive to these drugs and these drugs are not effective once BV has invaded the nervous system. This project explores the comparative efficacy of different drugs against BV and the use of topical drug administration as a means of prophylactic treatment to prevent BV from invading the nervous system.
Sponsor: National Institutes of Health
PI/PDs: Lara Maxwell

Clinical health markers, metabolites, inflammatory mediators and fecal microbiome in dogs fed raw meat based or commercial extruded kibble diet.
The goal of this project is to determine if health markers in dogs are affected by diet type, comparing a raw meat diet to a traditional kibble diet.
Sponsor: American Holistic Veterinary Medicine Foundation.
PI: Dianne McFarlane

Does feeding raw meat-based diet reduce intestinal inflammation?
The goal of this project is to determine if method of feeding dogs (raw meat versus kibble) is associated with fecal and systemic biomarkers of inflammation
Sponsor: American Holistic Veterinary Medical Foundation, Oklahoma State University, CVM, RAC
PI/PD: Dianne McFarlane
The role of corticotropin-like intermediate lobe peptide (CLIP) in insulin release following oral glucose challenge.
This study tests whether the pituitary hormone CLIP stimulates insulin release in horses after an oral sugar challenge. It has been suggested that high concentrations of pituitary hormones may promote excessive insulin release in horses, leading to development of laminitis.

Sponsor: RAC Small Veterinary Project.
PI: Dianne McFarlane

Investigation of genetic risk alleles for pituitary pars intermedia dysfunction.
The goal of this project is to identify genetic contributors to risk of PPID and dopaminergic neurodegeneration

Sponsor: Morris Animal Foundation, Oklahoma State University, CVM, RAC
PI: Dianne McFarlane
University of Minnesota: Milly McCue

The role of exosomes derived from ferroptotic lung epithelial cells in lung fibrosis
The proposal seeks to gain a better understanding of the lung fibrosis pathogenesis mediated by the interaction of damaged lung epithelial cells derived endogenous nanoparticles, called exosomes (50nm-200nm), with lung fibroblasts and immune cells.

Sponsor: Research Advisory Committee, College of Veterinary Medicine, OSU
PI/PDs: Maria Cristina Munteanu

High intensity focused ultrasound mediated targeting of solid tumors and hygroma in client owned dogs
The objective of this project is to utilize HIFU for a pilot clinical trial assessment of hygroma reduction in client owned dogs.

Sponsor: Focused Ultrasound Foundation
PI/PD: Ashish Ranjan

Focused ultrasound enhanced Calreticulin-nanoparticle for immune primed melanoma immunotherapy
The goals of this project is to assess the feasibility of liposome and focused ultrasound induction of Calreticulin expression in tumor for enhanced immunotherapeutic outcomes in canine and murine melanoma.

Sponsor: National Cancer Institute, National Institutes of Health
PI/PD: Ashish Ranjan

Magnetic hyperthermia combined antimicrobial targeting of bone pathogens
The goals of this project are to hyperthermia for treatment of hard to treat bone pathogen non-invasively.

Sponsor: Oklahoma Center for the Advancement of Science and Technology (OCAST)
PI/PD: Ashish Ranjan
Development of noninvasive cancer immunomodulation in Pets
The objective of this project is to utilize novel adjuvant and focused ultrasound for local tumor immune modulation in canine patients.

Sponsor: PETCO
PI/PD: Ashish Ranjan

Minimally Invasive Animal Sterilization
The objective of this project is to utilize novel chemical sterilant for the ablation of reproductive functions.

Sponsor: Oklahoma Center for the Advancement of Science and Technology (OCAST)
PI/PD: Ashish Ranjan

Kerr Chair
The objective of this grant is to support biomedical research in CVHS.

Sponsor: Oklahoma State University, College of Veterinary Medicine
PI/PD: Ashish Ranjan

Interdisciplinary Toxicology Program
The goal of this program is to facilitate research and education in interdisciplinary toxicology.

Sponsor: OSU Graduate College
PI/PDs: Carey Pope
College of Arts & Sciences: Jason Belden
Center for Health Sciences: David Wallace

The Effect of Pesticide Exposure on Cognitive and Brain Development in Latino Children
The goal of the project is to compare biomarkers of pesticide exposure to changes in brain development and cognitive function in children of Latino agricultural workers.

Sponsor: Wake Forest University, National Institute of Environmental Health Sciences
PI/PDs: Carey Pope, Kirstin Hester

Modulating protein dynamics to enhance butyrylcholinesterase-mediated ghrelin metabolism
The objective of this project is to evaluate the modeling of ghrelin deacetylation by butyrylcholinesterase.

Sponsor: CVM, Research Advisory Committee, Oklahoma State University
PI/PDs: Carey Pope, Kirstin Hester, Pratul Agarwal

Development of an integrated smartphone/resistive nanosensor for onsite biomonitoring of exposure to pesticides
The goal of this project is to develop and characterize a hand-held nano-based device for field measurements of cholinesterase inhibition.

Sponsor: Nanodiagnostic Technology, National Institute of Environmental Health Sciences
PI/PDs: Carey Pope, Landon Butler
Role of Nrf2 signaling and cellular senescence in obesity-induced sympathoexcitation
The specific aim of the grant tests the hypothesis that obesity causes Nrf2 dysfunction and promotes cellular senescence in the RVLM, which in turn contributes to neuroinflammation and increases in SNA leading to the development of hypertension.
**Sponsor:** National Institutes of Health
**PI/PD:** Madhan Subramanian

The Role of Hypothalamic Senescence in Obesity-Induced Loss of Neural Stem Cells
The specific aim of the grant tests the hypothesis that senescent cells induced inflammation is responsible for the decrease in neural stem cells in obesity. Our ongoing experiments will further determine whether neural stem cell loss in obese mice is mediated through senescent cells.
**Sponsors:** OCASCR
**PI:** Madhan Subramanian

In-situ protein and RNA detection in tissue slices using cryostat
This equipment helps in cryosectioning brain tissues that are used in staining senescent cells.
**Sponsor:** CVM, Research Advisory Committee
**PI/PDs:** Madhan Subramanian, Joshua Butcher

Establishing a Nanocellect Wolf cell Sorter at OSU
This equipment helps in performing gentle sorting of cell population including neural stem cells.
**Sponsor:** OCASCR
**PI/PDs:** Madhan Subramanian, Joshua Butcher

Sex-specific regulation of senescence and neuroinflammation in brainstem of aged mice.
The specific aim of the grant tests the hypothesis that aging-induces senescence in the brainstem in a sex-dependent manner.
**Sponsor:** CVM, Research Advisory Committee
**PI/PDs:** Madhan Subramanian, Clinton Jones

**DEPARTMENT OF VETERINARY PATHOBIOLOGY**

Pathogen Survival in Large Scale Carcass Management by Above Ground Burial
In the event of an African Swine Fever outbreak in the US, many pigs may die from the disease or require euthanizing for welfare reasons or to contain the outbreak. Therefore, a proven, safe, economical on-farm disposal method is needed. Above Ground Burial (AGB) have shown that cow and pig carcasses decompose completely within 9-12 months. This project will evaluate the survival of swine pox virus (as a surrogate for ASF virus) in sow femur bone marrow over a one-year period.
**Sponsors:** United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS); National Pork Board
**PI/PDs:** Fernando V. Bauermann, Keith Bailey

Effect of bovine viral diarrhea virus on thymus function and calf immunity
Bovine viral diarrhea virus (BVDV) infection in calves cause major economic losses to US producers. BVDV leads to transient immunosuppression, and significant thymus atrophy. Therefore, the impact of BVDV infection may go beyond the increased susceptibility to other pathogens during acute infection,
BVDV may lead to prolonged altered protective immune responses to other pathogens due to effect on the thymus on young animals. The project will specifically evaluate the magnitude and kinetics of specific humoral and T cell responses of calves previously exposed to BVDV on a subsequent viral infection and the impact on the thymus function.

**Sponsors:** National Institute of Food and Agriculture/USDA  
**PI/PDs:** Fernando V. Bauermann, Mayara Maggioli, Jared Taylor

**Level of infectious virus in decomposing tissues under simulated environmental conditions**  
The introduction or emergence of a high-impact animal disease affecting livestock into the U.S. is predicted to require the euthanasia and safe disposal of a large number of animals. The prediction of the level of infectious virus in decomposing supports data-based risk assessment and countermeasures development during an eventual security breach. Our goal is to use an in-vitro model to define the level of inactivation of 6 different viruses over a period of 90 days, simulating two contrasting environmental conditions: summer and winter time in Oklahoma.

**Sponsors:** United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS)  
**PI/PDs:** Fernando V. Bauermann, Mayara Maggioli, Akhilesh Ramachandran.

**Immune responses to RNA viruses associated with the bovine respiratory disease complex**  
Respiratory disease in calves is responsible for significant economic losses to the cattle industry. Although vaccines are widely used for bovine viral diarrhea virus (BVDV) and bovine respiratory syncytial virus (BRSV) in the US, both pathogens persist as a significant problem. Modulation of the immune system to promote resistance to respiratory viral infections has potential use in therapeutics. Therefore, our goal is to use cutting-edge technology to analyze innate and adaptive host responses to BVDV, BRSV, and the recently discovered influenza D virus in cattle.

**Sponsors:** National Institute of Food and Agriculture/USDA  
**PI/PDs:** Fernando V. Bauermann, Mayara Maggioli

**Effective interferon (IFN)-λ treatment regimen to control coronavirus infection**  
Effective broad-spectrum antivirals are critical to treat emerging human coronaviruses (hCoV). Despite considerable progress towards identifying and evaluating broad-spectrum antivirals against hCoVs, a narrow therapeutic window has limited their success. Enhancing endogenous antiviral response is another antiviral strategy. Here, we evaluated therapeutic efficacy of IFN-λ (antiviral protein produced by immune system) against hCoV infection. Our results show that two dose IFN-λ regimen provided better protection compared to single dose, and a combination of prophylactic and therapeutic regimen provided complete protection from lethal CoV infection. Collectively, we identify an ideal regimen for IFN-λ use and demonstrate its protective efficacy.

**Sponsor:** Oklahoma State University, National Institute of Health  
**PD/PI:** Muni Selvaraj (Mentor: Rudra Channappanavar)
Evaluating the basis for severe inflammation caused by coronaviruses
Severe inflammation caused hCoV infection is a crucial trigger for robust inflammation and fatal pneumonia. However, the basis for hCoV-induced inflammation is not well understood. Here we examined the role of mimics of structural proteins and GU-rich viral RNA and that toll-like receptor (TLR)/TNF receptor-associated factor 6 (TRAF6) activation in robust inflammation. Our results showed TRAF6/MEK1/2 signalling as the key mediator of coronavirus-induced pathogenic inflammatory response.

Sponsor: Summer Research Training Program
PD/PI: Titus Patton (Mentor: Rudra Channappanavar)

Differential replication and antiviral response to SARS-CoV-2 and it’s variant viruses
SARS-CoV-2 variant viruses show increased transmission and cause severe pneumonia. But whether severe disease is caused by high virus replication or inflammation is unknown. We examined replication and immunity to SARS-CoV-2 and variant viruses. We show that wild-type and beta variants replicated to similar levels, but both these variants replicated to high titers than alpha and gamma variants in immunocompetent lung cells. Interestingly, all variants replicated to similar levels in interferon deficient cells, suggesting differential susceptibility to interferons. Further evaluation showed SARS-CoV-2 variants induced differential host-response, highlighting the potential basis for different outcomes observed following infection with SARS-CoV-2 variants.

Sponsor: Oklahoma State University-College of Veterinary Medicine.
PD/PI: Muni Selvaraj (Mentor-Rudra Channappanavar)

Testing a novel vaccine to prevent COVID19 caused by variant viruses of concern
Goal of this project is to examine the protective efficacy of recombinant protein-based vaccine against SARS-CoV-2 and its variant viruses. Our results from pre-clinical studies show that this novel vaccine provides complete protection from severe disease against SARS-CoV-2 and its variant viruses.

Sponsor: OSU-CVM
PD/PI: Rudra Channappanavar

Exosome based therapy to prevent and treat COVID19
This project evaluates the protective efficacy of exosome derived antiviral and anti-inflammatory agents to prevent and treat SARS-CoV-2 infection. Results from in-vitro studies will be confirmed in a pre-clinical animal model to demonstrates the protective efficacy.

PD/PI: Debarati Chanda (Mentor: Rudra Channappanavar)

Pathogenesis, Diagnosis, Treatment, Prevention and Control of Livestock Diseases
This project covers agricultural and biomedical research funded by sources other than USDA that contributes to total research capacity of the OSU College of Veterinary Medicine (CVM). We are developing strategic alliances with partner institutions and the private sector and growing the supporting infrastructure. Consequently, publications are presented as evidence of progress and productivity. Expenditures for these non-USDA projects came from Federal, State and private funding sources, including biological and pharmaceutical corporations. (2061)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jerry Malayer

Validation of a naturally-occurring animal model for SARS-CoV-2 infection
Coronavirus Disease 2019 (COVID-19) is a global pandemic that has caused more than 4.5 million deaths worldwide. Approved therapies to treat COVID-19 are lacking, and supportive therapy is frequently inadequate to prevent respiratory failure and death. These gaps underscore the critical need for an
animal model to evaluate pathogenesis and develop effective treatment and prevention strategies during natural infection. The overall objective of this project is to validate mechanisms of viral fitness and immunopathogenesis during SARS-CoV-2 infection in domestic cats to establish baselines for downstream translational studies.

**Sponsor:** The National Institutes of Health, P20GM103648-09 9162

**PI/PDs:** Craig Miller, Lin Liu

**An innovative approach to replicate the Cytauxzoon felis lifecycle in vitro**

Cytauxzoonosis is a highly fatal disease of domestic cats with no effective vaccine and a limited therapeutic window. Attempts to improve diagnostic testing, test new therapies, and develop a vaccine have been consistently hindered by an inability to culture the infectious parasite (*Cytauxzoon felis*). This study will investigate the development of a novel in vitro cell culture system to study pathogenesis and immune function during Cytauxzoon felis infection.

**Sponsor:** Morris Animal Foundation, D21FE-809

**PI/PDs:** Craig Miller

**Development of an antigen ELISA for early diagnosis of feline acute cytauxzoonosis**

Cytauxzoonosis is a highly-fatal disease of domestic cats with limited treatment modalities and a narrow therapeutic window. Early diagnosis and therapeutic intervention is crucial to the survival of infected cats, however, currently available diagnostic methods have limitations.

The objective of this study is to design a diagnostic assay using ELISA technique to detect circulating *Cytauxzoon felis* antigens in peripheral blood samples of domestic cats with acute cytauxzoonosis.

**Sponsor:** Oklahoma State University, College of Veterinary Medicine, Research Advisory Committee

**PI/PDs:** Eva Kao, (Mentor: Craig Miller)

**Overlooked No More: Discovering Pathogens in a National Tick Collection**

Dogs, cats, and people are infested with the same tick species and can be infected by many of the same tick-borne pathogens. This project identifies zoonotic agents in a comprehensive, geographically diverse collection of ixodid ticks from dogs and cats and uses metagenomic sequencing and bioinformatic tools to discover potentially novel pathogens.

**Sponsor:** NIH

**PI/PD:** Susan E. Little

**Ticks, Pathogens, and Disease Risk in the Great Plains**

Tick-borne disease agents are increasingly important across North America but the risk of these infections is understudied in the Great Plains. This project, a collaboration between researchers in Kansas and Oklahoma, integrates historic and current data on ticks, pathogens, and landscape change over time to provide a more complete understanding of the complex factors responsible for creating risk of tick-borne infection in the region.

**Sponsor:** NSF

**PIs/PDs:** Susan E. Little

University of Oklahoma: Xiangming Xiao

University of Central Oklahoma: Robert Brennan

University of Kansas: A. Townsend Peterson, Fola Agusto

Pittsburg State University: Anuradha Ghosh
Statewide Surveillance of Ticks of Public Health Importance in Oklahoma
Ticks are expanding their geographic range and current distribution maps are incomplete. This project surveys counties in Oklahoma for several tick species known or suspected to transmit human disease and thus considered of medical importance. Collected ticks will also be evaluated for pathogens.  
**Sponsor:** Oklahoma State Department of Health  
**PI/PD:** Susan E. Little  
Oklahoma State Department of Health: LeMac’ Morris

Canine Heartworm Transmission Dynamics
The nematode that causes canine heartworm disease (*Dirofilaria immitis*) is transmitted to dogs by mosquitoes. This project investigates development of heartworm larvae in mosquitoes to identify novel strategies to interrupt transmission.  
**Sponsor:** Merck Animal Health  
**PI/PD:** Susan E. Little

Mapping Tick-Borne Diseases: A One Health Approach
Dogs are commonly infected with vector-borne pathogens, including heartworm and tick-borne disease agents. The geographic distribution of both arthropod vectors and the pathogens they transmit continues to expand. Large scale analysis of results from screening dogs for evidence of vector-borne infections, including those with zoonotic importance, is a valuable strategy and reveals geographic trends in infection risk over time.  
**Sponsor:** IDEXX Laboratories, Inc.  
**PI/PD:** Susan E. Little

Regulation of bovine herpesvirus 1 (BoHV-1) reactivation from latency by progesterone and corticosteroids.
BoHV-1 is an important causative agent of abortion and a cofactor during development of bovine respiratory disease. A life-long latent infection is established in neurons after acute infection. Progesterone, a hormone essential for maintaining pregnancy in cows, stimulates viral gene expression, growth of BoHV-1, and sporadically induces reactivation from latency. Interestingly, the glucocorticoid receptor (GR) and progesterone receptor (PR) cooperatively stimulate productive infection and key viral promoters. We suggest that BoHV-1 vaccines that do not reactivate from latency via increased progesterone and stress, will reduce abortions in pregnant cows.  
**Sponsor:** USDA-NIFA Competitive Grants Program (2018-06668)  
**PI/PD:** Clinton Jones

Maintenance of bovine herpesvirus 1 (BoHV-1) latency by viral and cellular factors.
During BoHV-1 latency, viral DNA persists in latently infected neurons. Stress can trigger reactivation from latency and virus shedding. The focus of studies in this grant is to understand how BoHV-1 establishes and maintains latent infections in neurons. Recent studies revealed that viral genes abundantly expressed during latency reprogram expression of certain bovine genes in latently infected neurons to prevent cell death, ensure latently infected neurons perform normal functions, and interfere with viral gene expression following low levels of stress. This knowledge is predicted to develop novel strategies designed to impair reactivation from latency.  
**Sponsor:** USDA-NIFA Competitive Grants Program (2021-67015)  
**PI/PD:** Clinton Jones
**Stress-Mediated Regulation of herpes simplex virus type 1 (HSV-1) Reactivation from Latency**

Recurrent HSV-1 infections are significant human health problems that can lead to encephalitis, serious recurrent eye infections, and perhaps an increase in the incidence of Alzheimer's Disease. The ability of HSV-1 to latently infect neurons and then reactivate from latency is required for virus transmission and recurrent disease. Studies in this grant will characterize the mechanism by which stress and activation of the glucocorticoid receptor disrupts latency and directly stimulates viral gene expression during early stage of reactivation from latency.

**Sponsor:** National Institute of Neurological Disorders and Stroke of the National Institutes of Health under Award Number (R01NS111167)

**PI/PD:** Clinton Jones

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**Construction of a bovine respiratory syncytial virus (bRSV) infectious clone and establishment of an experimental infection model of bRSV in neonatal calves**

The goal of the study is to establish a model in neonatal calves, allowing rational bRSV vaccine design and viral biology research with translational application.

**Sponsors:** Oklahoma State University

**PI/PDs:** Mayara Maggioli, Tom Oomens, Fernando Bauermann, John Gilliam

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**Pathogenesis of SARS-CoV-2 and Klebsiella pneumoniae coinfection**

SARS-CoV-2 is known to predispose patients to secondary bacterial infections which further complicates the disease progression, increased mortality, and clinical management. In this study, Klebsiella pneumoniae has been identified as a secondary infection in SARS-CoV-2 patients, and we are evaluating its impact on COVID-19. We are currently developing a mouse model to study how SARS-CoV-2 with Klebsiella pneumoniae coinfection impacts lung injury, immune response, and overall COVID-19 progression.

**Sponsor:** National Institute of Health, Startup funds and CVM, Research Advisory Committee

**PI/PD:** Sunil More, Akhilesh Ramachandran, Lin Liu

College of Arts and Sciences: Sathyanarayanan Aakur

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**Regulation of bovine herpesvirus 1 gene expression by pioneer transcription factors**

Bovine Herpesvirus 1 (BoHV-1) is a major cattle pathogen and a leading cause of disease in bovine herds. Following acute infection, BoHV-1 establishes lifelong latency in sensory neurons, with periodic reactivation and recurrent disease. We have identified several key hormone receptors that regulate BoHV-1 lytic gene expression, specifically ICP0 and ICP4. The androgen, glucocorticoid and progesterone receptors activate the immediate early transcription unit 1 promoter, which drives ICP0 and ICP4 expression, cooperatively with the stress-induced Krüppel-like transcription factor 15 (KLF15) when stimulated by their respective hormone. Additionally, these receptors activate ICP0 through a separate early promoter independent of hormone treatment, in cooperation with KLF4. These data suggest that changes in hormone levels can aggravate BoHV-1 productive infection, and induce reactivation of latent virus genomes.

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Jeffery Ostler
**Integrated Beef Cattle Program for Veterinarians to Enhance Practice Management and Services**

Oklahoma has 1.6 million beef cows yet lacks the veterinarians necessary to fully service cattle operations. This project seeks to offer intervention strategies for rural sustainability by expanding veterinary skills and knowledge to address common needs of beef producers. Initially, surveys will be developed to fully evaluate the shortage situation including geographic range of veterinarians. Secondly, educational modules for veterinarians will be created focusing on beef cattle herd management with the ultimate goal to expand services provided by veterinarians. Finally, veterinary students will be networked with participating rural veterinarians to help sustain rural veterinary practices.

**Sponsor:** USDA-National Institute of Food and Agriculture  
**PI/PDs:** Rosslyn Biggs, John Gilliam, Jerry Malayer, Brandon Raczkoski, Carlos Risco  
**College of Agriculture:** Paul Beck, David Lalman, Derrell Peel

**Sustainable Use of Saline Water by Ruminant Livestock Species**

This project will identify the sustainable use of saline water by ruminant livestock species identifying three responses. 1) Determine responses of goats, sheep, and cattle to different levels of total dissolved salts in drinking water as varied by water source and NaCl additions, 2) Identify factors affected by drinking water high in total dissolved salts that could affect performance of ruminant livestock, such as change in feed intake, ruminal conditions, digestion, blood constituent levels, and(or) energy metabolism, 3) Determine water intake, and requirements of goats, sheep, and cattle and how they vary with water total dissolved salts characteristics.

**Sponsor -** USDA 1890 Institution Capacity Building Grant Program  
**PI/PDs:** L.J. Dawson  
**College of Agriculture:** D.L. Lalman

**Management Practices for Production of Goats in the South-Central U.S.**

The objective of this project is to study goat management practices and product technologies to increase the level and efficiency of goat productivity for increased profitability from goat production and lower costs to consumers of goat products.

**Sponsor -** USDA NIFA Evans Allen  
**PI/PDs:** L.J. Dawson

**Persistence of Mycobacterium avium subsp. paratuberculosis (MAP) in fecal matter and a comparison of tissues according to the infection status in goats and sheep.**

This project will determine the effects of environmental conditions such as open versus shaded conditions and length of composting on viability of MAP in feces and in carcass tissues during composting over time.

**Sponsor –** Cooperative Extension Langston University, Department of Pathobiology, College of Veterinary Medicine Oklahoma State University.  
**PI/PDs:** L.J. Dawson, Jennifer. Rudd

**Relationships between the Microbiome and Internal Parasitism in Goats**

The overall objectives of this project are to: 1) Use functional genomics to identify specific genes associated with intact male Alpine that are non-infected/infected with HC (artificially/naturally) and ones treated with anthelmintics after artificial/natural infection; 2) identify anthelmintic treatment effects on MBs; 3) determine effects on the MB at different sites of goats; and 4) determine
relationships for the possible development of future diagnostic methods from microbial flora population structures at different sites of the animals using computational algorithms.

**Sponsor** - USDA NIFA Evans Allen  
**PI/PDs:** L.J. Dawson

**Effects of the level and quality of dietary forage and ruminally degradable fiber on milk yield and composition of Alpine goats and cheese yield and characteristics**

The general objectives of this project are to determine effects of the level and quality of dietary forage feed intake, digestion, metabolism, behavior, and milk yield and composition of Alpine goats. More specifically, effects on milk production and composition of diets high in high-quality forage compared with diets with similar levels of total fiber but derived from lower levels of more fibrous feedstuffs and including alfalfa will be determined. A general hypothesis is that there will be a more acetate-based fermentation with the high-quality forage diets that will maximize milk fat synthesis. The lower level of glucogenic substrates will also lessen nutrient accretion in peripheral tissues and maximize use in milk, including increased milk protein synthesis.

**Sponsor:** USDA NIFA Evans Allen  
**PI/PDs:** L.J. Dawson

**Clinical, surgical and pathological findings in client-owned rabbits with histologically-confirmed appendicitis: 19 cases (2015-2019)**

This project will report clinical, surgical and pathological findings in client-owned rabbits with appendicitis. Client-owned rabbits (19) that had a histological diagnosis of appendicitis from any of four different pathologists were eligible for inclusion. Abdominal ultrasound and computed tomography were suggestive of appendicitis in 6 out of 8 cases and in 1 out of 2 cases, respectively. Six rabbits received medical treatment: three died at 48 hours and 1 at 24 hours after hospitalization, one at 10 days after presentation and one is currently alive (1,030 days). Eight rabbits underwent appendectomy: three died before discharge from the hospital, one died 113 days from the surgery and four are currently alive (315, 334, 1,433, and 1,473 days).

**Sponsors:** None  
**PI/PDs:** Nicola Di Girolamo

**Feasibility and gross postmortem results of oblique pre-femoral ovariosalpingectomy during a teaching workshop in red eared sliders (Trachemys scripta elegans)**

Sixteen red eared sliders (Trachemys scripta elegans) were included in a teaching workshop on pre-femoral ovariosalpingectomy. Anesthetized chelonians were placed in left lateral recumbency at an oblique 45 degree angle by use of folded towels with the veterinarian sitting slightly lower than the table. After standard prefemoral access to the celom, the ipsilateral follicles were exteriorized via gentle maneuvering with cotton tip applicators and excised after application of titanium clips and cautery with bipolar radiosurgery. Fourteen of the 16 chelonians (87.5%; 95%CI: 64.0 to 96.5%) successfully had surgery completed.

**Sponsors:** None  
**PI/PDs:** Di Girolamo N

**Worldwide internet-based survey on sources for dosages of drugs prescribed to exotic animals**

A questionnaire was developed, pilot tested and disseminated between September and December 2019 through several online platforms. Logistic regression models were built to identify associations between demographic predictors and primary outcomes, 936 veterinarians from North America, Europe, Central and South America, Asia, Australia, and Africa responded. 682 respondents (72.9%) indicated drug
formularies as the single most common source used, 96 (10.3%) indicated scientific journals, 68 (7.3%) indicated other textbooks, 47 (5.0%) indicated that colleagues, and 38 (4.1%) indicated continuing education notes. Targeted education of specific groups of veterinarians on the correct use of information resources when treating exotic animals is recommended.

**Sponsors:** Start-up funds, Oklahoma State University

**PI/PDs:** Nicola Di Girolamo, João Brandão

**Association of Urolithiasis in Chelonians with Housing and Dietary Conditions**

The purpose of the present cross-sectional study is to evaluate the association between housing and dietary conditions with stone formation in chelonians. On the total of 1059 chelonians, 45 chelonians suffered urolithiasis. Animals living in a confined indoor area had 3.7 times the odds of presenting urolithiasis as compared to animals living outdoor (OR: 3.7, 95%CI: 1.2 to 11.0, P=0.02). African spurred tortoise had an incidence of urolithiasis of 23.3% when kept outdoor, 32.1% when free-roaming indoor and 42.0% when confined indoor. There was a modest increase of risk associated with eating fruits (OR: 3.1, 1.02 to 9.4, P=0.04).

**Sponsors:** None.

**PI/PDs:** Nicola Di Girolamo

**Effect of rectal insertion deepness on body temperature readings in healthy euthermic New Zealand white rabbits**

Rabbits are increasingly common pets. Hypothermia has been shown to be an indicator of poor prognosis of survival in pet rabbits presented to veterinary practices. Rectal temperature is considered the clinical standard to determine the body temperature of rabbits. This study sought to determine the effect of inserting the thermometer at 1 cm vs. 2 cm. Animals were physically restrained, and the body temperature was determined using a randomized order. Preliminary results appear to show a clinically relevant difference between the 2 methods.

**Sponsors:** Departmental funds, Oklahoma State University Summer Research Training Program sponsored by Boehringer Ingelheim, Dr. Kristie Plunkett Exotic Animal Fund

**PI/PDs:** João Brandão, Nicola Di Girolamo, LJ Chang, Mason Reichard

**Comparison of axillary, inguinal, corneal, microchip body temperature to rectal temperature in healthy euthermic New Zealand white rabbits**

Rabbits are increasingly common pets. Hypothermia has been shown to be an indicator of poor prognosis of survival in pet rabbits presented to veterinary practices. Rectal temperature is considered the clinical standard. Injuries associated with physical restraining are common and can hypothetically occur during rectal temperature. Identification of less invasive methods would be beneficial. In this study, body temperature for 8 New Zealand white rabbits was determined using several methods: rectal, inguinal, and axillary using a digital thermometer, microchip with temperature reading, and corneal with a thermal camera. Preliminary results suggest that inguinal and axillary as well as microchip appear to provide similar results to rectal temperature. Corneal temperature appears to underestimate the body temperature. Future clinical studies in clinical, non-euthermic, rabbits are warranted.

**Sponsors:** Departmental funds, Oklahoma State University Summer Research Training Program sponsored by Boehringer Ingelheim, Dr. Kristie Plunkett Exotic Animal Fund

**PI/PDs:** João Brandão, Nicola Di Girolamo, LJ Chang, Mason Reichard
Effect of topical lidocaine vs. prilocaine/lidocaine ointments and time of application on the success of ear vein catheterization in New Zealand white rabbits

Intravenous catheters are commonly needed for the administration of fluids and/or medications in rabbits. Ear catheters are commonly used for this purpose. A previous study showed that the application of prilocaine/lidocaine (EMLA) cream for 60 min improved the success of catheter placement. However, 60 min waiting period is not practical in cases needing urgent care. The purpose of this study was to compare the success of catheter placement using the criterion-standard, EMLA cream 60 min, to a placebo and alternative treatments; EMLA cream 10 min or lidocaine cream for 10 min. Using a randomized, double-blinded, complete cross-over design, 10 rabbits were used for this study. Statistical analysis is pending.

Sponsors: Departmental funds, Oklahoma State University Summer Research Training Program sponsored by Boehringer Ingelheim, Dr. Kristie Plunkett Exotic Animal Fund
PI/PDs: João Brandão, Nicola Di Girolamo, LJ Chang

A comparative study of measuring invasive blood pressure through a 22- and 26-gauge catheters in ketamine-midazolam-butorphanol sedated New Zealand white rabbits

Monitoring of invasive blood pressure is necessary during major procedures and has been recognized as the most accurate method to determined blood pressure. It has been reported that placement of peripheral arterial catheter is an adequate surrogate to measure blood pressure in rabbits. However, the size of the catheter is a factor that could affect the accuracy of blood pressure readings due to dampening effect. In this study, a 22- and a 26-gauge catheters where placed in each central auricular artery and used to measure invasive blood pressures. The objective of this study was to determine the differences between the two different size catheters. The hypothesis of this study is that dampening effect and more complications, such as catheter occlusion and difficulty in catheterization, can be observed more frequently when using a 26-gauge arterial catheter when compare to a 22-gauge catheter.

Sponsors: Start-up funds, Bell Professorship in Veterinary Clinical Science
PI/PDs: Li-Jen Chang, João Brandão

Validation of the oscillometric blood pressure monitor Vet25 SunTech® in ketamine-midazolam-butorphanol sedated New Zealand white rabbits

Monitoring of invasive blood pressure is the gold standard, however, it can be technically challenging and requires specialized equipment not commonly found in general practice. Therefore, monitoring of blood pressure with noninvasive equipment, such as an oscillometric blood pressure monitor, is an alternative method. Nevertheless, the accuracy of the monitor need to be validated for the target species before clinical use. The objective of this study is to evaluate the accuracy of a commercially available veterinary-specific oscillometric noninvasive blood pressure system (Vet25 SunTech®) for rabbits according to the guidelines of American College of Veterinary Internal Medicine (ACVIM) Consensus Statement. The hypothesis of this study was that the device been used in this study would meet the ACVIM Consensus Statement guidelines.

Sponsors: Start-up funds, Bell Professorship in Veterinary Clinical Science
PI/PDs: Li-Jen Chang, João Brandão

Identification of bacterial contamination in two fluid bag collection systems and the influence of hang time and location of fluid bags on bacterial contamination rates

This study aims to compare the bacterial contamination rates of two different systems to obtain fluid from a hanging intravenous bag. The screw port system has not been examined with respect to bacterial contamination rates, and therefore, its use is being compared to bacterial contamination rates of the
previously reported puncture system associated with the fluid bag. The null hypothesis is that there will be no difference in bacterial contamination rates between the puncture method and the screw port method.

**Sponsor:** Cohn Family Chair for Small Animals  
**PI/PD:** Danielle Dugat, DVM, MS, DACVS (Small Animal)

**“Pharmacokinetics and efficacy of high dose oral gabapentin in horses with chronic lameness”**

Musculoskeletal conditions resulting in chronic lameness conditions in horses are common. Gabapentin is an anticonvulsant drug used in the management of neuropathic or chronic pain in both human and veterinary medicine. The use of gabapentin for the treatment of neuropathic pain is well described in small animal patients. Studies evaluating its use at low doses (10-20mg/kg) to treat chronic lameness in horses have described poor results. This study will evaluate the pharmacokinetic and efficacy of a high dose of gabapentin (160mg/kg) administered for 4 weeks to horses with a chronic lameness condition.

**Sponsor:** OSU, CVM, RAC, Henthorne Professorship of Small Animal Medicine  
**PI/PDs:** Mike Schoonover, Megan Williams

**Investigation of the Impact of Pete’s Pet Posse Therapy Dogs on the OSU College Campus**  

Pet therapy programs on college campuses are an emergent phenomena and Pete’s Pet Posse (P3) is regarded as the flagship of university pet therapy programs. P3 provides thousands of pet therapy events and “touches”. Our collaborative team is working to evaluation the impact P3 has on the OSU campus family. This research is exploratory and will evaluate impact and outcomes at various levels of the pet therapy program from job satisfaction to student recruitment. As this program grows, so does the opportunity to evaluate its influence on students, staff and faculty. This research will allow for a better understanding of benefits associated with pet therapy programs on college campuses.

**Sponsors:** Henthorne Foundation  
**PI/PDs:** Lara Sypniewski  
College of Education, Health and Aviation: Penny Cantley

**Microvasculature of the suspensory ligament of the hindlimb of horses**

Injury to the suspensory ligament is a common cause of lameness in horses. In the hindlimb, proximal suspensory injury is associated with chronic, recurrent lameness. Anatomic descriptions of vasculature and microvasculature play an important role in understanding tendon injury and disease. There is minimal literature describing the microvascular anatomy of equine tendons and ligaments. The microvascular architecture of the equine forelimb suspensory ligament has been described (Williams et. al., 2013), however this has not been evaluated for the hindlimb suspensory ligament. The objective of this study is to describe the vascular and microvascular architecture of the equine hindlimb suspensory ligament.

**Sponsors:** OSU, CVM, Research Advisory Committee  
**PI/PDs:** Megan Williams, Evan Crisman

**Pharmacokinetic Evaluation of a Cannabidiol Supplement in Horses**

Cannabidiol (CBD) products have gained popularity among horse owners despite limited evidence regarding pharmacokinetics and safety. The purpose of this study was to describe the pharmacokinetic profile and safety of multiple doses of an orally administered cannabidiol product formulated for horses. Oral administration of a cannabidiol product at 0.35 mg/kg or 2.0 mg/kg once daily for 7 days was well-tolerated. Based on plasma CBD levels obtained, dose escalation trials in the horse evaluating safety and clinical efficacy at higher mg/kg dose rates are indicated.

**Sponsors:** Kahm CBD, Las Vegas, NV  
**PI/PDs:** Megan Williams, Todd Holbrook, Lara Maxwell
An *in vitro* evaluation of the effect of thread microgrooving and nanofiber-coating on the acute biomechanical and microstructural performance of stainless steel bone anchors

Bone anchors are widely used in orthopedic surgery. Loosening of the anchor is a recognized issue. This study seeks to evaluate a novel implant surface treatment as a strategy for delivering facilitative molecules to the bone-implant interface. Specifically, our objective is to determine the impact of microgrooving and nanofiber coating on the acute biomechanical and microstructural performance of a 3.5mm bone anchor inserted into cadaveric radii. We hypothesize no difference in performance between unmodified (BA), microgrooved (MG), or microgrooved with polycaprolactone nanofiber coating (NF) bone anchors.

**Sponsor:** College of Veterinary Medicine  
**PI/PDs:** Erik Clary, Rodrigo Roca  
University of Central Oklahoma: Morshed Khandaker

**Comparative analysis of molecular profiles in visceral tumors**

Recent advances in human oncology include personalization of therapeutic regimens based on genomic data. Working from a tissue sample, the cancer’s DNA is sequenced and analyzed for drug-targetable mutations. With this approach, a variety of cancers in human beings are being treated today, including primary abdominal visceral tumors that have historically garnered a poor prognosis. With intent to further the science of this “precision medicine” and to advance therapeutic options for dogs afflicted with visceral cancers, this research will characterize the genomic profile of visceral tumors encountered in clinical canine patients and compare to profiles reported in humans.

**Sponsor:** UC San Diego Department of Surgery  
**PI/PDs:** Erik Clary, Valerie McElliott  
University of California, San Diego: Jason Sicklick

**Oklahoma Animal Diagnostic Laboratory**

**Maintaining Laboratory Designation**

The Oklahoma Animal Disease Diagnostic Laboratory (OADDL) is a member of the National Animal Health Laboratory Network (NAHLN). The goals of this cooperative agreement is to provide funding for laboratory infrastructure and thereby increase NAHLN capacity, support the laboratory quality system and electronic messaging, maintain and upgrade laboratory equipment, and expand testing for foreign animal diseases and emerging pathogens.

**Sponsor:** USDA  
**PI/PD:** Jerry Saliki

**OADDL Testing Support for CVM Vet-LIRN**

The aim of this project is for the Oklahoma Animal Disease Diagnostic Laboratory (OADDL) to screen select bacteria isolated from clinical specimens for antibiotic (multidrug) resistance and investigate adverse events impacting the nation’s food or animal feed supply, in cooperation with the Food and Drug Administration’s (FDAs) College of Veterinary Medicine (CVM) Veterinary Laboratory Investigation and Response Network (Vet-LIRN).

**Sponsor:** FDA Vet-LIRN  
**PI/PD:** Akhilesh Ramachandran
Development of an Interactive Spatial Agrometrics Tool for the Calculation of Livestock (Cattle, Swine and Poultry) Populations in the United States at the County and Parish Level
The goal of this project is to develop an interactive geographic mapping tool that will aid in determining animal population on a county, state and national level. This is a collaborative project between OADDL, Dept. of Geography and Dept. of Agricultural Economics.

Sponsor: NAHLN
PI/PD: Akhilesh Ramachandran

Deep Learning Computations Algorithms for Disease Diagnosis by Genome Sequencing, NAHLN
This study is aimed at exploring an artificial intelligence and machine learning based approach for infectious disease diagnostics. This is a collaborative project between OADDL, Dept. of Pathobiology and Dept. of Computer Sciences.

Sponsor: NAHLN
PI/PD: Akhilesh Ramachandran

Development of Metagenome Based In-Silico Approach for Diagnosis of Bovine Respiratory Disease
Pilot study to evaluate a metagenome based in-silico approach for diagnosis of Bovine Respiratory Disease Complex caused by selected bacterial and viral etiologies. The ultimate goal of the proposed research is to develop a novel disease diagnostic system capable of simultaneously detecting all virus and bacteria-specific genetic markers from metagenomic data generated from infected tissues.

Sponsor: OSU College of Veterinary Medicine
PI/PD(s): Akhilesh Ramachandran
OSU Center for Health Sciences

FY2021 Research Abstracts
Choosing a Direction: Neural Models of Decision Making
Using innovative software and microscope methods, we have recently been able to modify, augment, and improve this "conventional" model of Caenorhabditis elegans locomotion. Our method accurately captures images of Ca2+ reporter fluorescence in muscle cells and individual muscle groups at high resolution and speed. Utilizing this method to develop a C. elegans model for movement disorders will permit us to identify subtle changes in locomotion pattern and muscle function resulting from the administration of drugs, at early and late stages of the disorder progression. We will use a combination of commercial and proprietary compounds for discovery of those able to mitigate the neuromuscular deficits associated with these disorders.

**Sponsor:** University of Tulsa, USAF
**PI/PD:** Jacob Manjarrez

Nutrition to Optimize, Understand, and Restore Insulin Sensitivity in HIV for Oklahoma (NOURISH OK)
The overall objective of this research is to develop and test an integrative “food as medicine” intervention framework to improve insulin sensitivity among HIV patients affected by food insecurity.

**Sponsors:** OUHSC, NIH
**PI:** Gerwald Koehler

Intestinal Microbiome and Regeneration in Opioid Misuse
Research will investigate in detail what effects the misuse of opioids has on the microbiome and the intestinal stem cells. The composition and products of the bacterial populations as well as the number and regenerative activity of the intestinal stem cells will be determined when they are exposed to an opioid in the intestine. The outcome of this study will help to better understand the relationship of the gut microbiome with intestinal stem cells and how this relationship can be disturbed by opioids. This project could also lead to the discovery of new ways to treat or prevent opioid side effects and may even provide new information for opioid addiction research.

**Sponsor:** Oklahoma Center for Adult Stem Cell Research (OCASCR)
**PI:** Gerwald Koehler

OK INBRE 2021 Summer Research Mentorship
The University of Oklahoma Health Sciences Center (OUHSC) hosts four Summer Undergraduate Research Programs (SURP) aimed at preparing and encouraging undergraduate students to pursue careers in biomedical research or health related sciences. The programs are OK-INBRE, SURE, CURE and NARCH. OUHSC SURPs introduce outstanding undergraduate students to the rigorous academic preparation required to achieve these goals through participation in intensive, hands-on research experiences in the laboratories of biomedical faculty mentors. Students spend their summer in an experienced biomedical research lab and work with other students and faculty to pursue their own projects over the course of an eight-week period. On the final day, students show off their progress at a poster session to the research community. A Celebration Luncheon follows where student accomplishments are acknowledged by their advisors, awards are presented, and a former summer student returns to campus to present a Keynote Address. Students participating in our intensive programs receive generous stipends to allow pursuit of their research activities full-time (40 hours/week) without distraction.

**Sponsor:** OUHSC
**PI:** Franklin Champlain
Standardizing Cadaveric-Based Lab Experiences and Assessments for Multiple Campus Medical Schools
Oklahoma State University College of Osteopathic Medicine (OSU-COM) and the Cherokee Nation established the first college of osteopathic medicine in the United States to be located adjacent to a tribal health facility, in Tahlequah, Oklahoma. The inaugural class entered in 2020, but because of the COVID-19 pandemic, the second class, to enter in the Fall of 2021, will be the first to experience a regular first year of instruction. The Tulsa and Tahlequah campuses are about 68 miles apart. Minimum admissions criteria and limits for resident and out of state applicants are set by the state of Oklahoma and are uniform across campuses. OSU-COM’s goal is to provide our students a uniform opportunity for success on both campuses.

As part of their training, students on the two campuses will take the same Clinical Anatomy Course, which includes lectures and dissections of cadaveric specimens. We seek to maintain uniform standards and experiences between the campuses, and to evaluate whether the course as designed is successful at achieving this. The proposed study will allow us to determine whether we are successful in designing a lab course that indeed provides uniform opportunity. The results can be used to guide improvements if such are found to be necessary, and the design of other courses.

Sponsor: AACOM
PI: Kent Smith

CENTER FOR INDIGENOUS HEALTH RESEARCH AND POLICY (CIHRP)

Community Organization for Natives: COVID-19 Epidemiology, Research, Testing and Services (CONCERTS)
Address COVID-19 morbidity and mortality disparities among underserved and vulnerable populations. The two-year community-engaged Testing Research Projects will examine SARS-CoV-2 infection patterns and efforts to increase access and effectiveness of diagnostic methods through the Rapid Acceleration of Diagnostics for Underserved Populations (RADx-UP) initiative. The overarching goal is to understand factors that have led to disproportionate burden of the pandemic on these underserved populations so that interventions can be implemented to decrease these disparities

Sponsor: Washington State University, NIH
PI: Valarie Blue Bird Jernigan

Food Pharmacy
Individuals living with chronic diseases and/or food insecurity often face significant challenges to healthy eating including the high cost of healthy foods, lack of access to fresh fruits and vegetables (e.g. "food deserts"), and transportation barriers. Programs that promote clinic-community partnerships such as "Food Pharmacies" or "Food Rx Programs" can address these challenges by providing nutrition education, connecting patients to local resources, and supporting healthy eating patterns. Food pharmacies or Food Rx programs entail the following components. First, a provider identifies an at-risk patient via a diagnosis of a diet-related health condition (e.g. diabetes, obesity, hypertension) or a qualifying income level. The provider then writes a prescription for the consumption of subsidized nutrient rich foods, including fruits and vegetables. The patient is able to redeem the prescription with a partnering food supplier such as a local grocery store or farmer’s market, either within the community or on-site at the health clinic. This approach to increasing healthy food consumption is still relatively new, therefore clinical outcome data are limited. However emerging research has shown these programs increase fruit and vegetable consumption, reduce body mass index, and reduce Ale levels
among diabetic patients. The programs also increase food security, improve disease management, and increase healthy eating knowledge. The Center for Indigenous Health Research and Policy at Oklahoma State University will develop a culturally tailored food pharmacy pilot intervention, the "Food is Medicine" study, and evaluate its impact on BMI, hypertension, diet, self-rated health, and food security among AI adults in both an urban and a rural health clinic in Oklahoma.

**Sponsor:** ANTHEM  
**PI:** Valarie Jernigan

**CLINICAL RESEARCH**

**Project ECHO and Community Health Workers: Supporting Families to Make Healthy Lifestyle Choices**
In this pilot project, the OSU-CHS Pediatric Obesity Medicine TeleECHO team plans to train a cohort of 12 CHW from the HAN and CNEP to support children and families in healthy lifestyle changes. We plan to do this with a single day intensive virtual training and on-going didactic and case-based learning through our TeleECHO platform. Desired outcomes for this project include collaboration building; improve knowledge, skills and self-efficacy of CHW to provide healthy lifestyles education to children and families; promote health behavior change of children and families; and to gather the necessary data to inform a larger CHW project.

**Sponsors:** OSU Foundation and Ardmore Institute of Health  
**PI/PD:** Colony Fugate, Tara Jackson

**Helping Connections Program (Project ECHO)**
With a population in such need and a duty to reach and support our heroic health care workers ECHO provides a platform to sustain individuals and agencies wishing to support the needs of health care workers. OSUCHS ECHO team will provide regular (every other week) to support resilience, self-care and organizational opportunities addressed at health care workers. This initial scoop will allow for targeted didactics aimed at supporting individuals and organizations on the front line of caring for patients and communities during COVID. However, as clinicians and ECHO partners we recognize that the emotional impacts extend beyond primary care and hospital medicine clinicians and employees to mental health care workers and others. The scoop of this ECHO will certainly allow for other community health and mental health care workers to learn and be supported by the ECHO line.

The Hub team will focus both on individual self-care didactics and exercises that participants can engage in; as well as agency and organizational efforts to support self-care and resilience in the workplace setting. Our Hub Team is uniquely suited to provide these didactic presentations with members from psychiatric medicine, counseling services and our health and wellness manager here at OSUCHS.

**Sponsor:** Oklahoma Department of Mental health and Substance Abuse Services (ODMHSAS)  
**PI:** Tara Jackson

**Beyond Observational Cohort Study of Cabenuva Utilization, Outcomes, and Patient Experience in the United States.**
Chronic human immunodeficiency virus (HIV) infection in adults continues to be characterized by increased development of resistant virus, increased transmission of resistant virus and issues associated with the long-term toxicity of anti-retroviral therapy (ART), despite advances in development of new ART, which provides extensive insight in management of HIV-infected individuals. Cabotegravir (CAB) is a potent integrase inhibitor (INI) and rilpivirine (RPV) is a potent non-nucleoside reverse transcriptase inhibitor (NNRTI). A two-drug regimen (DR) with CAB plus RPV long acting (LA) product offers many potential advantages over daily oral regimens including better tolerability, improved compliance,
adherence, less likely to develop resistance, and overall treatment satisfaction in virologically suppressed subjects. This is a single-arm, open-label, multicenter, short term facilitation study to evaluate the effect of an implementation strategy on the degree of acceptability, appropriateness, feasibility, fidelity and sustainability of clinical practices to deliver the CAB+RPV LA regimen to HIV infected subjects and to also measure subject satisfaction by recording timeliness of visits, length of visit and their education. Approximately 135 subjects will be enrolled in the study and the total duration of the study will be approximately 52-weeks.

**Sponsor:** ViiV -GSK  
**PI/PD:** Madhuri Lad, DO (Katherine Cook, DO)

### MET61 Immunogenicity and Safety Study of an Investigational Quadrivalent Meningococcal Conjugate Vaccine Administered in Healthy Infants and Toddlers

The primary objective of this study is to demonstrate the non-inferiority of the vaccine seroresponse to meningococcal serogroups A, C, Y, and W following administration of 2 doses of MenACYW conjugate vaccine compared to 2 doses of MENVEO® when given concomitantly with routine pediatric vaccines to infants and toddlers 6 to 7 months of age and 12 to 13 months of age.

The secondary objectives of the study are:

- To demonstrate the non-inferiority of the percentage of participants with antibody titers to meningococcal serogroups A, C, Y, and W ≥ 1:8 following administration of 2 doses of MenACYW conjugate vaccine compared to 2 doses of MENVEO® when given concomitantly with pediatric routine vaccines to infants and toddlers at 6 to 7 months of age and 12 to 13 months of age.
- To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the second vaccination at 12 to 13 months of age with MenACYW conjugate vaccine or MENVEO®.
- To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days and 6 months after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO®.
- To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the second vaccination at 20 to 23 months of age with MenACYW conjugate vaccine or Menactra®.
- **Sponsor:** Pfizer  
- **PI/PD:** Colony Fugate, DO

### PARAGLIDE

A multicenter, randomized, double-blind, double-dummy, parallel group, active controlled 8-week study to evaluate the effect of sacubitril/valsartan (LCZ696) versus valsartan on changes in NT-proBNP and safety and tolerability of in-hospital initiation of LCZ696 compared to valsartan in HFrEF patients with acute decompensated heart failure (ADHF) who have been stabilized during hospitalization (PARAGLIDE).

The purpose of this study is to assess the effect of sacubitril/valsartan (LCZ696) vs. valsartan on changes in NT-proBNP and outcomes, safety and tolerability in patients with HFrEF (left ventricular ejection fraction (LVEF) > 40%) who have been stabilized during hospitalization for acute decompensated heart failure and initiated in-hospital or within 30 days post discharge.

**Sponsor:** Novartis  
**PI/PD:** Matt Wilkett, DO
Cangaroo
A Multi-Center Registry Evaluating Participants who Receive CanGaroo® Envelope or No Envelope During CIED Implantation.

This prospective, multi-center study will enroll up to 500 participants who are undergoing their initial CIED implant with either a CanGaroo envelope or no envelope.

Once a participant is enrolled in one of the two cohorts, each participant will have their medical history data reviewed and data will be recorded in the CRF including baseline demographics, medications, and diagnoses.

The details of the CIED procedure including any complications/AEs that occur during the procedure will be captured on the appropriate CRF.

Information collected at the follow-up visits will include documentation of post-procedure status, including any complications, adverse events, or revision/reoperation procedures that occur during the follow-up period. This information will also be collected for any unscheduled follow-ups, visits, or care encounters that occur up to 3 months post-procedure. For participants that agree and qualify for optional long-term follow-up, the same information will be collected at additional follow-up points every six months for up to five years.

Sponsor: Aziyo Biologics, INC
PI/PD: Matt Wilkett, DO

Pathways
Tobacco and Marijuana Exposure among Youth with Asthma: Health Correlates and Intergenerational Pathways.
Sponsor: Internal
PI/PD: Ashley Clawson, PhD

ViiV-DTG
A multi-site observational study to assess safety and effectiveness of prenatal exposure to Dolutegravir in HIV positive pregnant women.

The purpose of this study is to assess the safety and effectiveness of DTG use in HIV positive pregnant women. This is a 3-year multi-site prospective observational study. Approximately, 250 HIV positive pregnant women from potential European AIDS Treatment Network (NEAT ID) sites across Europe will be enrolled. The enrollment period will be over 2 years with a follow-up period of 1 year for outcomes. The data collected will be that obtained during routine standard of care assessments; and the subjects will not undergo any interventional study procedures.

Sponsor: GSK
PI/PD: William Po, MD

Merck V591-002
A Study to Assess Safety, Tolerability, and Immunogenicity of V591 (COVID-19 Vaccine) in Healthy Participants (V591-001)

This study was terminated and modifications to the dosing regimens and clinical/laboratory procedures were implemented for trial discontinuation according to Protocol Amendment 04. Per protocol, certain panels were never enrolled and/or the second dose of study intervention was not administered.

Sponsor: Merck
PI/PD: Paul Rock, DO, PhD
INTERNAL MEDICINE

Ryan White Title III HIV Capacity Development and Planning Grants
Provide a comprehensive system of HIV primary medical care, essential support services, and medications for low-income people with HIV. The program funds grants to states, cities, counties, and local community-based organizations to provide care and treatment services to people with HIV to improve health outcomes and reduce HIV transmission among hard-to-reach populations.

Sponsor: DHHS/HRSA
PI/PD: Damon Baker, Madhuri Lad

MEDICAL STUDENT RESEARCH

Data sharing Practices and Reproducibility of Addiction Clinical Trials
The proposed research is relevant to public health because the identification of key factors and conditions that promote data sharing in addiction science is ultimately expected to lead to more transparent and reproducible research. Should the reproducibility of addiction research be improved, clinicians and patients will have increased confidence in the therapies used to treat patients. Thus, the proposed research is relevant to the part of the National Institutes of Health (NIH) mission that pertains to promoting the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science.

Sponsor: NIH
PDs/PIs: Matt Vassar

RURAL HEALTH

NCWR Addiction medicine Fellowship Project
The OSU-CHS National Center for Wellness and Recovery (NCWR) will lead this project and address all three HHS and HRSA priorities. Using a systematic, population-level approach, NCWR aims to strategically reduce risks and addiction in rural communities, specifically addressing the opioid crisis, mental health, and addiction disorders. NCWR will target the need for Addiction Medicine specialists in rural and underserved communities by increasing the number of board-certified AM physicians. During their training, the NCWR fellows will also provide SUD/OUD services via telehealth technology.

Sponsor: DHHS/HRSA
PI/PDs: Samuel Martin (510621)

Rural Communities Opioid Response Program – Neonatal Abstinence Syndrome
To reduce the incidence of NAS and SUD/OUD by improving local conditions and creating systems of change in high risk rural communities. To strengthen and expand NAS SUD/OUD prevention, treatment, and recovery services throughout the Tulsa MSA.

Sponsor: DHHS/HRSA
PIs/ PDs: Julie Croff

McCurtain Needs Assessment Project
To utilize the Center for Rural Health of Oklahoma State University Center for Health Sciences to develop and implement an evaluation of the planned McCurtain County rural health framework pilot.

Sponsor: OSDH
PI: Denna Wheeler
Ending the Epidemic: Reducing the HIV/STI Burden Among Rural Oklahoma Men  
**Sponsor:** OCAST  
**PI:** Randolph Hubach

10/24 Healthy Brain and Child Development National Consortium  
Neurodevelopmental processes are shaped by dynamic interactions between genes and environments. Maladaptive experiences early in life can alter developmental trajectories, leading to harmful and enduring developmental sequelae. Pre- and postnatal hazards include maternal substance exposure, toxicant exposures in pregnancy and early life, maternal health conditions, parental psychopathology, maltreatment, structural racism, and excessive stress. To elucidate how various environmental hazards impact child development, it is imperative that a normative template of developmental trajectories over the first 10 years of life be established based on a sufficiently large and demographically diverse sample of the US population. To accomplish this, the Healthy Brain and Child Development National Consortium (HBCD-NC) has been formed to deploy a harmonized, optimized, and innovative set of neuroimaging (MRI, EEG) measures complemented by an extensive battery of behavioral, physiological, and psychological tools, and biospecimens to understand neurodevelopmental trajectories in a sample of 7,500 mothers and infants enrolled at 24 sites across the United States (US). The HBCD-NC will carry out a common research protocol under direction of the HBCD-NC Administrative Core (HCAC) and will assemble and distribute a comprehensive and well-curated research dataset to the scientific community at large under the direction of the HBCD-NC Data Coordinating Center (HDCC). The overarching goal of the HBCD-NC is to create a comprehensive, harmonized, and high-dimensional dataset that will characterize typical neurodevelopmental trajectories in US children and that will assess how biological and environmental exposures affect those trajectories. A special emphasis will be placed on understanding the impact of pre- and postnatal exposure to opioids, marijuana, alcohol, tobacco and/or other substances. To address these broad objectives, the sample of women enrolled will include: 1) a racially, ethnically, and socioeconomically diverse cohort that is representative of the US population; 2) pregnant woman with use of targeted substances (opioids, marijuana, alcohol, tobacco); and 3) demographically and behaviorally similar women without substance use in pregnancy to enable valid causal inferences. In addition, the HBCD-NC will identify key developmental windows during which both harmful and protective environments have the most influence on later neurodevelopmental outcomes. The large, multi-modal, longitudinal, and generalizable dataset that will be produced for the first time by this study will provide novel insights into child development using state-of-the-art methods. The HBCD-NC study will inform public policy to improve the health and development of children across the nation.  
**Sponsor:** NIH, National Institute on Drug Abuse (NIDA)  
**PI’s:** Julie Croff, Jennifer Hays-Grudo, Amanda Morris

**PSYCHIATRY AND BEHAVIORAL SCIENCE**

**Child and Adolescent Psychiatry**  
Clinical Services will fulfill its land grant mission of providing education, research, and extension services to the public.  
**Sponsor:** Youth Services of Tulsa  
**PI:** Tessa Chesser (520121)

**Oklahoma Methamphetamine Data Initiative**  
The proposed Oklahoma Methamphetamine Data Initiative (OMDI) will analyze national and local drugs and crime data to examine methamphetamine (meth)-related violent and other crime trends and inform narcotics law enforcement intervention strategies. The partnership between the School of Forensic
Sciences and the Department of Psychiatry and Behavioral Sciences is supported by state, local, and tribal agencies. OMDI goals are to: establish procedures and metrics to evaluate the relationship between meth and violent crime; identify static and dynamic factors associated with violent crime stemming from meth use or distribution to improve community surveillance in Oklahoma; develop a regularly updated dashboard for law enforcement prevention/intervention deployment; and demonstrate the utility of this model for other states, rural areas, and Indian Country. Research questions include: where are meth use and violent crime intersections more prevalent; are there cultural and geographic differences (e.g., American Indian and rural communities); are there upstream factors (socio-environmental factors) that mediate violent crime; and does identifying patterns in traditional and new data aid community surveillance, intervention, and prevention? The cross-sectional and longitudinal research design leverages data to correlate and forecast meth-related violent crime. These include CDC’s WONDER data on drug overdoses and Behavioral Risk Factor Surveillance System (BRFSS), FBI’s National Incident Based Reporting System (NIBRS) on crimes, the Oklahoma State Courts Network (OSCN) on criminal cases, and Google Trends data on meth-related searches. Data will be extracted using a publicly available application-programming interface and a new Graphic User Interface. Statistical techniques include hierarchical regression, structural equation modeling, and time series models. Dissemination will be via medical, forensic, criminal justice, and police publications and conferences, and federal, state, and local law enforcement briefings.

**Sponsor:** Department of Justice  
**PI:** Jason Beaman

**Native Elder Research Center (NERC)**  
**Sponsor:** University of Colorado Denver, DHHS/NIG/NIA  
**PI:** Anna Mazur
Tillman County TeleEMS

Tillman County, Oklahoma, is a USDA-designated persistent poverty county that experienced hospital closure in 2015, and the next nearest emergency room is a 45-minute ambulance ride. Our overall objective in this application is three-fold, and aligned with each of Telligen's key aims this cycle as we work to sustain virtual, real-time mobile emergency physician access for the local EMS team. 1. The Oklahoma State University Center for Health Sciences (OSU-CHS) educates and trains osteopathic physicians, scientists, and health care professionals, with an emphasis on providing health care for rural and underserved areas of Oklahoma. OSU-CHS is located in a modern, well-appointed academic health center campus complex and supports a substantial alignment of personnel, facilities, equipment, and services. The CHS College of Osteopathic Medicine (COM) partners with OSU Medical Center, which operates a 195-bed hospital and 29 outpatient clinics with 100 full-time clinicians. OSU-COM’s mission is to educate physicians for rural and medically underserved communities (MUC), with nearly 55% of graduates practicing in MUCs. The OSU medical school is accredited by the Commission on Osteopathic College Accreditation (COCA) of the American Osteopathic Association (AOA). The Oklahoma Office of Rural Health (OORH) is housed under the OSU-CHS Center for Rural Health (CRH) and is engaged in research and advocacy related to healthcare quality, public policy and population health. The OORH is the state designated entity that administers the State Office of Rural Health (SORH) Grant. This grant fund supports rural hospitals and communities by collecting and disseminating information on the current state of rural health, coordinating rural health activities, advising policymakers, and providing technical assistance for community health needs and other quality healthcare improvements. 2. Decreased health outcomes and negative economic results of rural hospital closures remain a concern in Oklahoma where 9 rural hospitals have closed in the past 15 years. Post closure, rural communities face healthcare obstacles associated with physician shortages, limited emergency medicine access, and fragmented unscheduled care capabilities. According to Oklahoma State University Center for Rural Health (OSU CRH) research, 85% of all hospital closures across the country over the past 15 years had a hospital emergency room within 25 miles with an average distance of 14 miles, while 8% of reported rural closures had a next nearest hospital emergency room over 30 miles. These particular closures occur in communities with high or persistent levels of poverty that lack access to social capital. While alternative care options will often develop in the wake of hospital closures such as urgent care centers, retail clinics, and telemedicine, these developments do not occur in closure communities where next nearest hospital is greater than 25 miles. Further, the literature suggests that 20-40% of EMT calls are not urgent, and patients’ decisions to use EDs for low acuity needs is spurred by the lack of accessible timely ambulatory care. This suggests the need for innovative rural care delivery models to both reduce ED overload by decreasing low acuity cases and increasing health outcomes of urgent cases by providing quick time to treatment. One such method is the use of emergency medical technicians (EMTs). Previous studies demonstrate improved health outcomes and reduced emergency room overload through using EMTs and telemedicine. What remains unknown is the quality and efficacy of video telemedicine to provide real-time, virtual emergency physician consults via teleEMS for residents living further than 30 miles from the nearest hospital. As the cost of healthcare continues to increase while rural hospitals continue to close and health disparities between urban and rural residents widen, there is a critical need to determine the efficacy of new methods such as telemedicine using between EMTs and hospital physicians to triage patients, refer to other treatment options, and/or provide treatment en route to the ED. Without mitigation, the decline in health outcomes and overuse of EDs for rural residents will continue, and the efficacy of telemedicine in emergent situations and the benefits of physician feedback to EMTs will remain unknown. Tillman County, Oklahoma, is a USDA-designated persistent poverty county that experienced hospital closure in 2015, and the next nearest emergency room is a 45-minute ambulance ride. The county is home to approximately 7,400 residents, approximately 23% of which is Hispanic, and has broadband adoption rates significantly lower than state average. Our six-month pilot
for the state’s first rural teleEMS pilot program ends June 30, 2021, yet there is much work to build upon.

3. SMART GOAL 1: In 2019, CMS for the first time allowed reimbursement for ambulance transfers to facilities other than EDs, particularly for services using telehealth or referral to non-hospital EDs. We will build on the work of Persse et al analyzing ETHAN (Emergency Telehealth and Navigation) through the Houston Fire Department, which uses telehealth to provide physician consultations on EMS calls. While this study showed positive outcomes using video conferencing software on EMT tablets, the connectivity in Houston, the fourth largest city in the country, is vastly different from rural Oklahoma where cell service and broadband is not as prevalent. Equipment and service is already in place and operational, but more research is needed beyond our current six-month pilot to further determine if rural connectivity is reliable enough to make tele-EMS feasible, and if participating providers find value in the service. Our preliminary data the first month of the study suggests that 82% of teleEMS calls via FirstNet have a good enough connection to allow for physician consultation. SMART GOAL 2: Similar to Goal 1, we will build off the ETHAN research, Carlos et al’s study on telemedicine in hospital transfers, Tate’s review of language barriers and Bennett et al’s research on paramedicine in rural South Carolina. Our proposed study differs as we work to better understand the utilization habits of patients that frequently use the teleEMS service for low-intensity cases as well as the utilization habits of patients that use the service that identify as Spanish-speaking. We hypothesize there are different teleEMS utilization patterns, depending upon ethnicity of the patients. As far as we are aware, there is no current research on patients’ perceptions of their outcomes from teleEMS. Additionally, according to Tate’s 2015 study, substantial gaps exist in better understanding interactions of Spanish-speaking patients during prehospital care. This goal will be achieved through focus groups and key informant interviews. This preliminary research can be valuable to determine the interest of a virtual, bilingual community health worker program as we work to expand emergency access to at-risk populations while evaluating potential impact on EMS volumes. Hostetter and Klein’s work through the Commonwealth Fund in 2018 suggests Hispanic populations lack trust in the health care system. Our focus groups will be facilitated by a Spanish-speaking second year rural medical student at OSU College of Osteopathic Medicine. SMART GOAL 3: Preliminary interviews conducted on EMT perspectives of telemedicine include their comfort level post-closure, and we will work to achieve a policy recommendation to their regulatory body to expand scope of practice of EMTs through realtime virtual oversight of a physician via telemedicine. Staff have indicated a need to update paramedic and EMT scope of practice to include telemedicine supervision but more field cases are needed. 4. Our mission is to enhance the quality of life for rural and underserved Oklahoma communities through the development of medical and public health workforce programs, research, policy and community engagement. Our long-term vision is to improve the quality of life and health outcomes for rural communities and achieve health equity for rural Oklahoma. Our overall objective in this application is three-fold and aligned with Telligen’s key aims this cycle: to impact health equity through improved coordination of care; to further support an innovative telehealth intervention, and to advance health workforce development of rural EMT and paramedic professionals. This project will allow our center to better identify the efficacy of rural telemedicine in ambulances for use by EMS for unscheduled care access for communities greater than 30 miles from the nearest hospital, which is directly tied to EMT paraprofessional development, reimbursement policy, and improved care coordination for underserved, vulnerable and at-risk rural populations. This project builds off of the work of Oklahoma State University’s “Tier One” research initiative in 2019 that aims to help solve some of society’s most vexing challenges through place-based, community participative research. This study will examine the perceived impact emergency medicine telehealth interventions have on EMTs serving Tillman County, Oklahoma; a USDA persistently impoverished county post-hospital closure where the next nearest hospital was 31 miles away. Advances in information and communication technology (ICT) in the area of video-to-video
communication have led to growth in telemedicine applications in recent years. Telemedicine is well suited to extending the reach of specialist services particularly in the pre-hospital care of acute emergencies where treatment delays may affect clinical outcome. Our central hypothesis is that telemedicine in rural ambulances is an effective healthcare model that will lead to improved perceived health outcomes, and increase health equity among communities with closed rural hospitals. This hypothesis is based on our previous work, the literature, and preliminary data. We are well prepared to undertake this project based on our previous publications on rural health, in addition to our access to rural communities and hospitals. Oklahoma has 12 USDA persistent poverty counties, including Tillman County. It is our mission as a land grant institution to serve rural Oklahoma and contribute to shared community success. Oklahoma continues to struggle with poor health outcomes, low broadband access and adoption, persistent poverty, and rural population declines, which create systemic cycles resulting in eroding local tax bases and a general lack of financial, physical and social infrastructure investment. As a key research and evaluation center of the OSU Center for Health Sciences, this project has significant potential to improve health disparities in our state. By July 1, 2022, OSU Center for Rural Health will make a formal policy recommendation to CMS, BCBS, and OKHCA MCOs to reimburse virtual physician to paramedic consultations via telemedicine for specific codes and patient scenarios TBD by the data during this study. By July 1, 2022, OSU Center for Rural Health will make a formal policy recommendation to the Oklahoma State Department of Health EMS Division to expand the scope of practice for EMT and paramedic professionals while under direct virtual supervision of a state licensed emergency medicine physician. By July 1, 2022, OSU Center for Rural Health will conduct two focus groups of frequent teleEMS patients and Spanish speaking patients to learn how a virtual community health worker program could impact teleEMS call utilization and if patient home-based broadband connection is sufficient.

**Sponsor:** Tillman Community Initiative  
**PI:** Mark Woodring

### MEDICAL EDUCATION

**Cherokee Nation, OSU-COM and SCC Collaborative Partnership for Cancer Research**

Collaborative effort to bring educational opportunities for the students of the OSU-COM (Tahlequah) in training and supporting American Indian students and researchers to meaningfully engage in cancer health disparities research, development of curricula, recruiting students for listening sessions and informing of the development of the Cancer Research Methods Training. Advise on community outreach and engagement in addition to the development of recruitment materials and distribution.

**Sponsor:** NIH, Cherokee Nation  
**PI:** Janel Johnson

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