

OFFICIAL PROGRAM  
OF THE  
107th ANNUAL TECHNICAL MEETING

# OKLAHOMA ACADEMY OF SCIENCE

Affiliated with the  
American Association for the Advancement of Science



November 2, 2018

Southwestern Oklahoma State University  
Weatherford

**107<sup>th</sup> ANNUAL TECHNICAL MEETING  
OKLAHOMA ACADEMY OF SCIENCE**

**SOUTHWESTERN OKLAHOMA STATE UNIVERSITY  
Weatherford**

**Thursday, 1 November 2018**

6:30 p.m. Executive Council Dinner/Meeting..... Bonny Board Room  
Memorial Student Center (MSC 2<sup>nd</sup> Floor)

**Friday, 2 November 2018**

7:45 a.m. Registration for Technical Meeting.....MSC 2<sup>nd</sup> Floor

**Concurrent Scientific Paper Sessions (8:30 - 11:00 a.m.)**

Section A Biological Sciences – Botany & Zoology ..... SCI 301 (pg. 5)  
Section B Geology ..... SCI 304 (pg. 6)  
Section C Physical Sciences .....CPP 321 (pg. 7)  
Section D Social Sciences..... SCI 112 (pg. 8)  
Section E Science Communication and Education ..... CPP 321 (pg. 8)  
Section F Geography..... SCI 112 (pg. 8)  
Section G Applied Ecology and Conservation ..... SCI 304 (pg. 9)  
Section H Microbiology ..... SCI 327 (pg. 10)  
Section I Engineering Sciences .....CPP 259 (pg. 12)  
Section J Biochemistry and Biophysics ..... CPP 259 (pg. 13)  
Section K Microscopy ..... SCI 320 (pg. 14)  
Section L Mathematics ..... CPP 208 (pg. 15)  
Section M Environmental Sciences..... SCI 301 (pg. 16)  
Section N Biomedical Sciences ..... SCI 327 (pg. 17)

Ugly Bug Contest (judges needed)..... MSC 2<sup>nd</sup> Floor  
Special Tables ..... MSC 2<sup>nd</sup> Floor  
Refreshments ..... MSC 2<sup>nd</sup> Floor

**Section Business Meetings**

Section A Biological Sciences – Botany & Zoology ..... 11:00-11:15, SCI 301  
Section B Geology..... 11:15-11:30, SCI 304  
Section C Physical Sciences ..... 11:00-11:15, CPP 321  
Section D Social Sciences..... 11:00-11:15, SCI 112  
Section E Science Comm. and Edu..... 11:15-11:30, CPP 321  
Section F Geography ..... 11:15-11:30, SCI 112  
Section G Applied Ecology and Conservation ..... 11:00-11:15, SCI 304  
Section H Microbiology..... 11:00-11:15, SCI 327  
Section I Engineering Sciences..... 11:15-11:30, CPP 259  
Section J Biochemistry and Biophysics ..... 11:00-11:15, CPP 259  
Section K Microscopy ..... 11:00-11:15, SCI 320  
Section L: Mathematics, Stats, & Comp. Science ..... 11:15-11:30, CPP 208  
Section M Environmental Sciences ..... 11:15-11:30, SCI 301  
Section N Biomedical Sciences ..... 11:15-11:30, SCI 327

11:30 a.m. Academy Business Meeting.....CPP 312  
All OAS members are encouraged to attend. Visitors are welcome.

12:00 p.m.....Academy Luncheon & Speaker  
Memorial Student Center Ballroom (MSC 2<sup>nd</sup> Floor)  
(Admission by ticket only)

**Mr. Kevin R. Mohr**

Chief of Interpretation & Operations  
Washita Battlefield National Historic Site

*“The 150th of the Washita:  
The Science Behind the Details.”*

**Poster Session for All Sections (1:30 - 3:00 p.m.)**  
MSC 2<sup>nd</sup> Floor (Setup anytime before 1:30pm)

## LUNCHEON SPEAKER

### “The 150th of the Washita: The Science Behind the Details”

On November 27, 1868, Lt. Colonel George Armstrong Custer led the 7th U.S. Cavalry on a surprise dawn attack on a Cheyenne village led by Peace Chief Black Kettle. The event was an example of the tragic clash of cultures that occurred during the Great Plains Wars. It is also a place of remembrance and reflection for those who died here.

**Presented by Mr. Kevin R. Mohr**  
Chief of Interpretation & Operations  
Washita Battlefield National Historic Site

Mr. Mohr began his National Park Service career as a park guide at Carlsbad Caverns National Park in New Mexico in 2007. Three years later, he joined the staff at Everglades National Park as the Volunteer Coordinator. Mr. Mohr arrived in Western Oklahoma as the new Chief of Interpretation and Operations at the Washita Battlefield National Historic Site in September 2014. Prior to his government employment, Mr. Mohr was a Peace Corps Volunteer in Senegal, West Africa, from 2004 to 2006. Mohr holds a Master of Arts degree in Recreation from the University of New Mexico and a Bachelor of Science degree in Recreation and Physical Education from Catawba College in North Carolina. Although he mostly grew up in Florida and was born in Wisconsin, he and his two kids now call Cheyenne, Oklahoma, home.

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## SPECIAL THANKS



Dr. Randy Beutler, President of Southwestern Oklahoma State University

Dr. Peter M. Grant, Dean of College of Arts and Sciences, OAS Meeting Coordinator

## UPCOMING MEETINGS

- 2019 Fall Field Meeting, tba
- 2019 Annual Technical Meeting on November 8 at the University of Central Oklahoma

## GENERAL INFORMATION

**Name Badges:** Name badges, provided upon registration, must be worn at all times by all individuals attending Academy section programs, business meetings, and luncheon. If your badge is not visible, you may be asked to leave by the persons in charge. Lost badges may be replaced at the registration desk upon verification of your registration documents. **All presenters must register and wear an official name badge.**

**On-site Registration Fees:**

|                                 |           |
|---------------------------------|-----------|
| Member                          | - \$30.00 |
| Non-member                      | - \$45.00 |
| Student                         | - \$15.00 |
| SWOSU Student                   | - free    |
| Luncheon tickets (if available) | - \$20.00 |

**2018 and 2019 Dues are Payable:** The OAS registration desk will accept dues payments.

|                                |            |
|--------------------------------|------------|
| Professional                   | - \$30.00  |
| Graduate/Undergraduate Student | - \$20.00  |
| Family                         | - \$35.00  |
| Life                           | - \$600.00 |

**Guidelines for Abstract Publication:** Abstracts may be published in the *Proceedings of the Oklahoma Academy of Science*, subject to the editorial policies as stated in the most recent issue of the *POAS* and the review of the Editorial Board. Specific formatting instructions for abstracts may be found at [www.oklahomaacademyofscience.org](http://www.oklahomaacademyofscience.org). Abstract publication fee is \$38. *POAS* editor is Dr. Mostafa S. Elshahed, [mostafa@okstate.edu](mailto:mostafa@okstate.edu).

**Executive Director:** Inquiries concerning upcoming OAS activities and membership may be directed to Dr. David Bass, OAS Executive Director, Campus Box 90, University of Central Oklahoma, Edmond OK 73034, 405-974-5772, [dbass@uco.edu](mailto:dbass@uco.edu).

**Assistance or Information:** Look for individuals with OAS badges or host ribbons. These are faculty and staff assigned to assist you.

**No Smoking:** Please, no smoking in any of the buildings on the campus.

**Refreshments:** Light refreshments during morning breaks will be on the 2<sup>nd</sup> Floor of the Memorial Student Center (MSC).

SECTION A: BIOLOGICAL SCIENCES  
SCI 301

Section Chair: Michael Husak, Cameron University  
Section Vice-Chair: Michael Dunn, Cameron University

– ZOOLOGY –

- 8:30 \*AN EXPLORATION OF HOW DRAINAGE, STREAM ORDER AND SEASON AFFECT ABUNDANCE OF TWO CADDISFLY FAMILIES (HYDROPTILIDAE AND LEPTOCERIDAE) IN SOUTHEAST OKLAHOMA STREAMS. Theresa Stein. Southwestern Oklahoma State University.
- 8:45 \*ANNOTATION OF THE ATPSYNBETA GENE IN *DROSOPHILA ELEGANS*. Sidney Wilkins<sup>1</sup>, Amy Giemza<sup>1</sup>, Lindsey J. Long<sup>1</sup>, and the Genomics Education Partnership (GEP)<sup>2</sup>. <sup>1</sup>Oklahoma Christian University, <sup>2</sup>Washington University in St. Louis.
- 9:00 \*UNDERSTANDING GENE EXPRESSION REGULATION THROUGH CHARACTERIZATION OF TRANSCRIPTION START SITES IN *DROSOPHILA ELEGANS*. Amy Giemza<sup>1</sup>, Sidney Wilkins<sup>1</sup>, Lindsey J. Long<sup>1</sup>, with the Genomics Education Partnership (GEP)<sup>2</sup>. <sup>1</sup>Oklahoma Christian University, <sup>2</sup>Washington University in St. Louis.
- 9:15 \*USE OF ENCLOSURE SPACE BY LONG-TAILED MACAQUES AT MINDY'S MEMORY PRIMATE SANCTUARY. Tesa J. Martin<sup>1</sup>, Kyle J. Copp<sup>1</sup>, Madison A. Snow<sup>1</sup>, Huyen Tran<sup>2</sup>, Tephillah Jeyaraj-Powell<sup>2</sup>, and Laurie Kauffman<sup>1</sup>. <sup>1</sup>Oklahoma City University, <sup>2</sup>University of Central Oklahoma.

– BOTANY –

- 9:30 \*\*THE FLORA OF BEAVER COUNTY: WESTERN GREAT PLAINS VASCULAR PLANTS OF THE OKLAHOMA PANHANDLE. Nikolai Starzak and Mark Fishbein. Oklahoma State University.
- 9:45 CLIMATIC CORRELATES OF EARLIER BUDBURST IN OKLAHOMA DECIDUOUS TREES, 2006-2017. Stanley A. Rice. Southeastern Oklahoma State University.
- 10:00 **BREAK**
- 10:15 FLORA OF OKLAHOMA INC. (Annual Meeting). Adam Ryburn (Oklahoma City University).
- 11:00 Section Meeting

SECTION A: BIOLOGICAL SCIENCES  
Continued

Posters

- Poster 1 \*\*THE USE OF UV-REFLECTIVE MORPHOLOGY IN ARCTIC CAMOUFLAGE. Sarah C. Vrla. University of Central Oklahoma.
- Poster 2 \*A QUALITATIVE SURVEY OF ULTRAVIOLET (UV) REFLECTIVE MORPHOLOGY IN RATTLESNAKES. Taylor C. Gray and Sarah C. Vrla. University of Central Oklahoma.
- Poster 3 \*THE FISH THAT ISN'T: IS THERE FOOD FRAUD IN THE SUSHI INDUSTRY? Tara O'Neill and Ahmed Alshaikhsalama. Collin College.
- Poster 4 \*ESTABLISHMENT OF A LONG-TERM SMALL MAMMAL MARK-RECAPTURE STUDY AT UCO'S SELMAN LIVING LAB TO IDENTIFY FACTORS IMPACTING POPULATION AND COMMUNITY PERSISTENCE. Claire Smith<sup>1</sup>, Francisca M. Mendez-Harclerode<sup>2</sup>, Gloria M. Caddell<sup>1</sup>, Chad B. King<sup>1</sup>, and Michelle L. Haynie<sup>1</sup>. <sup>1</sup>University of Central Oklahoma, <sup>2</sup>Bethel College.
- Poster 28 EVIDENCE OF ELK (*CERVUS ELAPHUS*) PREDATION BY A SOLITARY COYOTE (*CANIS LATRANS*) IN SW OKLAHOMA AND CONTINUED RESEARCH. Brandon McDonald and Sarah Vrla. University of Central Oklahoma

SECTION B: GEOLOGY  
SCI 327

Section Chair: Kevin Blackwood, East Central University

- 11:15 Section Meeting

**SECTION C: PHYSICAL SCIENCES  
CPP 321**

**Section Chair: Weldon Wilson, University of Central Oklahoma  
Section Vice-Chair, Karen Williams, East Central University**

- 9:15 \*EXTRACTION AND CHARACTERIZATION OF DIHYDROXYACETONE FROM SUGAR CANE. William Gathright and Amanda J. Nichols. Oklahoma Christian University.
- 9:30 A SEMICLASSICAL DERIVATION OF THE ANOMALOUS MAGNETIC MOMENT OF THE ELECTRON. W. J. Wilson. University of Central Oklahoma.
- 11:00 Section Meeting

**Posters**

- Poster 11 \*COMPUTATIONAL STUDY OF VOLATILE ALUMINUM HYDROXIDE. Uendi Pustina and Dwight L. Myers. East Central University.
- Poster 12 \*HIGH TEMPERATURE STUDY OF THE REACTION OF SILICON, TITANIUM AND YTTRIUM OXIDES. Lizbeth Robles-Fernandez, Fernando Salazar-Salas, and Dwight L. Myers. East Central University.

**SECTION D: SOCIAL SCIENCES  
SCI 112**

**Section Chair: Jaelyn Maass, University of Central Oklahoma  
Section Vice-Chair: J. Adam Randall, University of Central Oklahoma**

11:00 Section Meeting

**Posters**

- Poster 9 ARE HIGH ACHIEVERS LESS LIKELY TO COMMIT TO ORGANIZATIONS? INVESTIGATING THE ROLE OF SUPPORT IN THE ACHIEVEMENT STRIVING-COMMITMENT RELATIONSHIP. Lenzi Arnold and Jennifer L. Kisamore. University of Oklahoma-Tulsa.
- Poster 10 DEMONSTRATING PHYSIOLOGICAL AND PSYCHOMETRIC MEASURES OF STRESS: AN ACTIVE LEARNING EXERCISE. Jennifer L. Kisamore<sup>1</sup> and Hannah E. Harris<sup>2</sup>. <sup>1</sup>University of Oklahoma-Tulsa, <sup>2</sup>University of Oklahoma.

**SECTION E: SCIENCE COMMUNICATION & EDUCATION  
CPP 321**

**Section Chair: Kathleen Coughlan, Redlands Community College**

- 8:30 REFLECTIONS AND ANALYSIS OF PEER REVIEW IN JUNIOR PHYSICS LAB. Karen Williams. East Central University.
- 8:45 CREATIONIST AND NON-CREATIONIST STUDENTS IN SOME COLLEGE BIOLOGY CLASSES DO NOT DIFFER IN BIBLICAL KNOWLEDGE. Stanley A. Rice. Southeastern Oklahoma State University.
- 11:15 Section Meeting

**SECTION F: GEOGRAPHY  
SCI 112**

**Section Chair: Brad Watkins, University of Central Oklahoma**

11:15 Section Meeting

**SECTION G: APPLIED ECOLOGY & CONSERVATION  
SCI 304**

**Section Chair: Zach Jones, Southwestern Oklahoma State University  
Section Vice-Chair: Jerry Bowen, Rogers State University**

- 10:00 \*TIMING OF AVIAN MIGRATION ONSET THROUGH THE OKLAHOMA CITY AREA 1995-2017 USING NOAA WEATHER DATA. Jennifer Prophet and Zach Jones. Southwestern Oklahoma State University.
- 10:15 \*THE EFFECTS OF BEHAVIORAL INTERACTIONS ON THE FEEDING HABITS OF AMPHIPOD SPECIES. Arissa Mercer. Southwestern Oklahoma State University.
- 10:30 NATIVE BEE BIODIVERSITY, OKA'YANALI AND PONTOTOC RIDGE PRESERVES. Jose Montalva and Leah S. Dudley. East Central University.
- 10:45 \*\*USING GROUNDWATER FAUNA TO DETERMINE SUBTERRANEAN HYDRAULIC CONNECTIONS IN KARSTIC AQUIFERS: A CASE STUDY FROM THE ARBUCKLE MOUNTAINS. Kevin Blackwood, Justin Harris, Laramie Edens, Kay Woodring, and Stacy Gantt-Blackwood. East Central University.
- 11:00 Section Meeting

**Posters**

- Poster 7 \**BOMBUS PENNSYLVANICUS* AND *BOMBUS GRISEOCOLLIS* VISITATION AND ABUNDANCE ACROSS SITES DIFFERING IN WATER AVAILABILITY. Joseph Sims, Leah Dudley, and Jose Montalva. East Central University.
- Poster 8 \*EDGE EFFECT IN OVIPOSITION OF MOTHS OF LEAF-TYING CATERPILLARS. Norbu Gurung and George Wang. East Central University.

**SECTION H: MICROBIOLOGY  
SCI 327**

**Section Chair: Kristhi Sankaranarayanan, University of Oklahoma  
Section Vice-Chair: Charlie Biles, East Central University**

- 10:00 \*\*ANTIFUNGAL ACTIVITY OF DENDRITIC CELL LYSOSOMAL PROTEINS AGAINST *CRYPTOCOCCUS NEOFORMANS*. Benjamin Nelson, Savannah Beakley, Brittney Conn, Emma Maritz, Sierra Posey, and Karen L. Wozniak. Oklahoma State University.
- 10:15 \*EFFECT OF STORAGE TEMPERATURE ON BIOACTIVITY OF A COMMERCIAL *SACCHAROMYCES BOULARDII* PROBIOTIC FORMULATION. Reid Reding and Jonathan Hunt. Oklahoma Christian University.
- 10:30 \*\*HEIRLOOM MICROBES: THE HISTORY AND LEGACY OF ANCIENT DAIRYING BACTERIA. Shannon Fulton<sup>1</sup>, Paul Lawson<sup>1</sup>, Soninkhishig Tsolmon<sup>2</sup>, Christina Warinner<sup>3</sup>, Jessica Hendy<sup>3</sup>, Matthäus Rest<sup>3</sup>, Sanjeet Kumar<sup>3</sup>, Bjorn Reichhardt<sup>3</sup>. <sup>1</sup>University of Oklahoma, <sup>2</sup>Mongolian Dietetic Association, <sup>3</sup>Max Planck Institute for the Science of Human History.
- 11:00 Section Meeting

**Posters**

- Poster 13 \*BACTERIOPHAGE—A POTENTIAL REPLACEMENT FOR ANTIBIOTICS. Abbey Renner and Madison Snow. Southwestern Oklahoma State University.
- Poster 14 \*DETERMINATION OF YFAX PROTEIN FUNCTION IN *ESCHERICHIA COLI*. Brenna Hefley, Samantha Perry, and April Nesbit. East Central University.
- Poster 15 \**PSEUDOMONAS SYRINGAE* MOTILITY APPENDAGES: ROLES IN SURFACE COLONIZATION AND SURVIVAL. Jennifer L. Abshire and Regina S. McGrane. Southwestern Oklahoma State University.
- Poster 16 \*ANTIMICROBIAL ACTIVITY OF PHYTOPATHOGEN BIOSURFACTANTS AGAINST HUMAN PATHOGENS. Kade Ezell and Regina S. McGrane. Southwestern Oklahoma State University.

## SECTION H: MICROBIOLOGY

### Continued

- Poster 17 **\*\***CLONING AND EXPRESSION OF *CHLAMYDIA TRACHOMATIS* INCLUSION MEMBRANE PROTEINS. Colleen (Denver) La Force, Kriti Shukla, Prakash Sah, Christina Bourne, and Erika Lutter. Oklahoma State University and University of Oklahoma.
- Poster 18 **\*\***INVESTIGATING THE ROLE OF *PSEUDOMONAS SYRINGAE* MOTILITY IN COLONIZATION OF ABOVE GROUND PLANT TISSUES. Gloria Farinango and Regina S. McGrane. Southwestern Oklahoma University.

## SECTION I: ENGINEERING SCIENCES

### CPP 259

**Section Chair: Gang Xu, University of Central Oklahoma**

**Section Vice-Chair: Nesreen Alsbou, University of Central Oklahoma**

- 8:30 \*IN-CAR IoT LIFE DETECTOR. Ka Hei Samuel Chan and Nesreen Alsbou. University of Central Oklahoma.
- 8:45 \*EFFICIENT VEHICLE TO VEHICLE COMMUNICATION PROTOCOLS FOR REAL TIME DATA COLLECTION. Kyle Levy, Anindita Das, Jonathan Houry, and Nesreen Alsbou. University of Central Oklahoma.
- 9:00 \*IoT SEMI-TRUCK MONITORING & SAFETY SYSTEMS. Mohamed Afify, Mohamed Keblwei, and Nesreen Alsbou. University of Central Oklahoma.
- 9:15 \*IDEAS FOR A MORE EFFECTIVE WIRELESS SENSOR NETWORK. Stephen Gilstad, Joshua Haley, Nesreen Alsbou. University of Central Oklahoma.
- 9:30 \*RADIO WAVES TO ELECTRICITY: TESLA'S BLUEPRINT. Sean Jesse. East Central University.
- 9:45 \*IMPROVING LIFESPAN AND PRIVACY IN COMMUNICATION BETWEEN WIRELESS SENSOR NODES. Kevin Ghale, DeCarlo Brewer, Phu Dang, and Nesreen Alsbou. University of Central Oklahoma.
- 10:00 \*CLOUD-BASED SMART PARKING SYSTEM. Mohamad Keblawi, Mohamed Afify, and Nesreen Alsbou. University of Central Oklahoma.
- 11:15 Section Meeting

**SECTION J: BIOCHEMISTRY AND BIOPHYSICS  
CPP 259**

**Section Chair: Juapeng Deng, Oklahoma State University  
Section Vice-Chair: Ellie Nguyen, Oklahoma State University**

- 10:30 **\*\*STRUCTURE OF POXVIRUS A6 PROTEIN REVEALS A MECHANISM FOR STABILIZING OPEN-ENDED CRESCENT MEMBRANE.** Prabhat Kumar Pathak, Shuxia Peng, and Junpeng Deng. Oklahoma State University.
- 11:00 Section Meeting

**Posters**

- Poster 21 **\*\*TOWARDS STRUCTURAL ANALYSIS OF THE COMPLEX OF MYXOMA VIRUS HOST RANGE PROTEIN M62 AND M63.** Juhi Chaturvedi. Oklahoma State University.
- Poster 22 **\*\*STRUCTURAL ANALYSIS OF THE E3 PROTEIN FROM VACCINIA VIRUS.** Sikta Patnaik. Oklahoma State University.
- Poster 23 **\*KINETIC STUDIES OF PAPAINE.** Micah Godfrey and Charles Crittall. East Central University.
- Poster 24 **\*OSMOADAPTIVE STRATEGIES IN HALOPHILIC PROTISTS.** Dylan Ward. Northeastern State University.
- Poster 29 **\*IN-SILICO ANALYSIS AND HOMOLOGY MODELING OF -CARBONIC ANHYDRASES FROM AN EMERGING PATHOGEN, *RHODODOCOCCLUS HOAGII*.** Elah Marie Alcuitas and Vijayakumar Somalinga. Southwestern Oklahoma State University.

**SECTION K: MICROSCOPY  
SCI 320**

**Section Chair: Bill Meek, Oklahoma State University**

- 9:00-Noon UGLY BUG CONTEST (Memorial Student Center, 2<sup>nd</sup> Floor)
- 10:30 **ACQUISITION OF A DIRECT ELECTRON DE-12 CAMERA FOR OU'S JEOL 2010F TRANSMISSION ELECTRON MICROSCOPE.** Scott D. Russell and Preston R. Larson. Samuel Roberts Noble Microscopy Laboratory, University of Oklahoma, Norman.
- 10:45 **ARRESTED NEUROMUSCULAR DEVELOPMENT OF *DROSOPHILA MELANOGASTER* MUTATION 18507.** Dohyung Markus Kim<sup>1</sup>, Ranish Timilsina<sup>1</sup>, Tingting Gu<sup>1,2</sup>. <sup>1</sup>University of Oklahoma, <sup>2</sup>Samuel Roberts Noble Microscopy Laboratory, University of Oklahoma
- 11:00 Section Meeting (Oklahoma Microscopy Society)



**SECTION L: MATHEMATICS, COMPUTER SCIENCE, AND  
STATISTICS  
CPP 208**

**Section Chair: Quan Tran, University of Science and Arts of OK  
Section Vice-Chair: Nicholas Jacob, East Central University**

- 8:30 SPIRALING INTO CONTROL: REGULAR POLYGONS.  
Andrew Wells. East Central University.
- 8:45 SUM-LIST-COLORING GRAPHS. Michelle A. Lastrina. East  
Central University.
- 9:00 T-SNE DIMENSIONAL REDUCTION. Nicholas Jacob. East  
Central University.
- 9:15 BREAK
- 9:30 \*\*PROOFS THROUGH THE AGES. Kendra Parker. East  
Central University.
- 9:45 \*VERTEX-MINIMAL PLANAR GRAPHS WITH A  
PRESCRIBED AUTOMORPHISM GROUPS. Carlie J Triplitt.  
University of Science and Arts of Oklahoma.
- 10:00 \*GROUP TESTING FOR HIGH CLOSENESS CENTRALITY  
VERTICES IN NETWORKS. Apar Tiwari and Dipesh Shrestha.  
East Central University.
- 10:15 \*UTILIZING XLSFORM AND FORMHUB TO DIGITIZE THE  
DATA FOR PONTOTOC ANIMAL WELFARE SOCIETY.  
Billy Andrew. East Central University.
- 10:30 \*MNIST DATASET ANALYSIS. Reid Kinder. East Central  
University.
- 10:45 \*TWITTER MODEL TO ENHANCE ECU'S SOCIAL MEDIA  
PRESENCE. Starla Demings. East Central University.
- 11:00 \*VERIFYING GRAD'S 13TH MOMENT APPROXIMATION.  
Tessa Neeley. East Central University.
- 11:15 Section Meeting

**SECTION M: ENVIRONMENTAL SCIENCES  
SCI 301**

**Section Chair: Charles Crittell, East Central University  
Section Vice-Chair: Dan McInnes, East Central University**

11:15 Section Meeting

**Posters**

- Poster 5 \*TRANSPORT OF THE "NEW-HORIZON"  
CARBONACEOUS—METAL OXIDE NANOHYBRIDS IN  
WATER-SATURATED POROUS MEDIA. Hope Cline<sup>1</sup>,  
Dengjun Wang<sup>2</sup>, and Chumming Su<sup>2</sup>. <sup>1</sup>East Central University;  
<sup>2</sup>Groundwater, Watershed, and Ecosystem Restoration Division,  
U.S. Environmental Protection Agency.
- Poster 6 \*ASSESSMENT OF IRON OXIDE NANOPARTICLES AS  
CHEMICAL TRACERS IN OKLAHOMA GROUNDWATER.  
Kelsey H. Anderson, Brian Bigelow, Rabeka Lashbrook, and  
Randall D. Maples. East Central University.

**SECTION N: BIOMEDICAL SCIENCES**  
**SCI 327**

**Section Chair: Landon Moore, University of Oklahoma**  
**Section Vice-Chair: Bill Luttrell, Oklahoma Christian University**

- 8:30 \*CHARACTERIZING EARLY DEVELOPMENTAL DEFECTS IN AN AVIAN MODEL OF MATERNAL PKU. Jailene Canales, Austin McDonough, Morgan Massey, and Nikki J Seagraves. University of Central Oklahoma.
- 8:45 \*ANALYSIS OF PROLIFERATION AND MIGRATION IN PHENYLALANINE, RETINOIC ACID, AND 4-DIETHYLAMINO BENZALDEHYDE TREATED CELLS. McKayla Muse, Kayley Pate, Gabriel Rucci, and Nikki Seagraves. University of Central Oklahoma.
- 9:00 \*CARBON BLACK INDUCES AUTOPHAGY AND INFLAMMASOME ACTIVITY IN MURINE MACROPHAGES. Hadley LaMascus. Oklahoma Christian University.
- 9:15 \*MOLECULAR STUDIES OF A SARCOIDOSIS-ASSOCIATED GENETIC VARIANT IN ANXA11. Abigail Voth<sup>1</sup>, Lindsey Long<sup>1</sup>, and Courtney Montgomery<sup>2</sup>. <sup>1</sup>Oklahoma Christian University, <sup>2</sup>Oklahoma Medical Research Foundation.
- 9:30 \*RAD4 IS REQUIRED FOR MAINTENANCE OF DNA INTEGRITY. Brandon Reed, Whitney Bohannon, and Lindsey Long. Oklahoma Christian University.
- 11:15 Section Meeting

**Posters**

- Poster 19 CLONING, SEQUENCING, AND IDENTIFICATION OF PHAGE P13, AN UNKNOWN *SALMONELLA* OR EHEC (ENTEROHEMORRHAGIC *E. COLI*) BACTERIOPHAGE. Ryan Sloan<sup>1</sup>, W.J. Reddig<sup>1</sup>, Divya Jaroni<sup>2</sup>, and Earl L. Blewett<sup>1</sup>. <sup>1</sup>Oklahoma State University-Center for Health Sciences, <sup>2</sup>Oklahoma State University-College of Agriculture.
- Poster 20 \*\*EXTRUSION AS A MECHANISM FOR IMMUNE RESPONSE EVASION IN A *CHLAMYDIA TRACHOMATIS* MURINE INFECTION MODEL. Charlotte Key, Tim Snider, Erika Lutter, and Jennifer Shaw. Oklahoma State University.
- Poster 25 \*EVALUATION OF DNA EXTRACTION PROTOCOLS FUNCTIONALITY FROM DRIED TESTUDINE BONE. Mariah Ewy, Alisha Howard, and Kenneth Andrews. East Central University.

**SECTION N: BIOMEDICAL SCIENCES**  
**Continued**

- Poster 26 \*OKN RELIEVES OXIDATIVE STRESS INDUCED BY SEPSIS-ASSOCIATED ENCEPHALOPATHY. Tyler McKenzie<sup>1</sup>, Debra Saunders<sup>2</sup>, Nataliya Smith<sup>2</sup>, Shania Do<sup>2</sup>, William Towler<sup>2</sup>, Marvin Cruz<sup>2</sup>, and Rheel Towner<sup>2</sup>. <sup>1</sup>Redlands Community College, <sup>2</sup>Oklahoma Medical Research Foundation.
- Poster 27 \*EFFECTS OF UV EXPOSURE ON ΔRAD4, A NUCLEOTIDE EXCISION REPAIR PATHWAY PROTEIN. Whitney Bohannon, Brandon Reed, and Lindsey Long. Oklahoma Christian University

## ABSTRACTS

(sorted by presenter's last name)

**Absire, Jennifer L.** and Regina S. McGrane (Southwestern Oklahoma State University)

### \*PSEUDOMONAS SYRINGAE MOTILITY APPENDAGES: ROLES IN SURFACE COLONIZATION AND SURVIVAL

*Pseudomonas syringae* is a bacterial phytopathogen that causes disease in economically important crops. *P. syringae* is found in many different environments, each with varying levels of moisture. Therefore, the appendage it relies on for motility varies. The removal of genes encoding for these motility factors significantly impairs pathogenicity. The objective of this project was to evaluate the impact of *P. syringae* motility related appendages on colonization of varying environments. To characterize the role of flagella and pili, movement of deletion mutants was observed in saturated, liquid, and natural surface environments. Flagella mutants had significantly reduced motility in both saturated and liquid conditions, whereas pili mutants had significantly reduced motility in saturated conditions only. This indicates that flagella are the most relied upon appendage for motility and that pili have minor impacts. Similarly, on simulated natural surfaces flagella were the primary movement appendage. To characterize the impact of flagella and pili on colonization of plants, attachment to leaves and seeds as well as growth on leaves were evaluated. Mutants lacking flagella or both flagella and pili were impaired in leaf colonization but showed seed attachment similar to the wild type. However, mutants lacking both the flagella and pili had greater levels of attachment to leaves. To characterize the impact of flagella and pili on antibiotic sensitivity, mutants and the wild type were evaluated using a Kirby-Bauer sensitivity assay. Mutants were more sensitive to ciprofloxacin than the wild type, which is opposite to observations made in a different *P. syringae* strain. These results indicate that removal of the genes encoding for motility factors such as pili and flagella, directly impacts pathogenicity. Limiting the motility of *P. syringae* could halt or decrease the symptoms associated with this disease-causing pathogen and increase crop yields of host plants.

**Afify, Mohamed,** Mohamed Kehlwei, and Nesreen Alsou (University of Central Oklahoma)

### \*IoT SEMI-TRUCK MONITORING & SAFETY SYSTEMS

The Trucks accidents are deadly and cost the companies a lot of money each year. We are designing a system to prevent the Truck accidents by design a mechanical device to enhance the safety system of the trucks by implementing a blind spot system and LIDAR system to detect the obstacles and alert the driver. We also installing a system that can detect the sudden braking of the vehicle in front of the truck to except any distance a few seconds before. We designing a medical vest also to give readings of the driver health conditions to prevent accidents as heart attacks or the driver falling in sleep.

**Alcuitas, Elah Marie** and Vijayakumar Somalinga (Southwestern Oklahoma State University)

### \*IN-SILICO ANALYSIS AND HOMOLGY MODELING OF -CARBONIC ANHYDRASES FROM AN EMERGING PATHOGEN, *RHODOCOCOCCUS HOAGII*

*Rhodococcus hoagii* are acid-fast, soil-dwelling coccobacilli that are important pathogens of livestock causing granulomatous pneumonia and an emerging pathogen responsible for respiratory infections primarily in immunocompromised humans. *R. hoagii* pathogenesis is linked to a repertoire of plasmid encoded virulence factors that are responsible for inhibiting phagocytosis. In addition to plasmid encoded virulence factors, *R. hoagii* also contains virulence associated proteins that are not well characterized. One such protein that is associated with virulence is carbonic anhydrase. Carbonic anhydrases are essential proteins that catalyze the reversible hydration of carbon dioxide to bicarbonate. The goal of this study is to identify and characterize carbonic anhydrases in *R. hoagii*. We have identified two different -carbonic anhydrases, RhCanA and RhCanB from *R. hoagii* using BLAST analysis that show high homology to mycobacterial carbonic anhydrases Rv1284 and Rv3588c respectively. RhCanA is an 18.1 kDa protein while RhCanB is a 21.9 kDa protein with no N-terminal signal peptide indicating its cytoplasmic localization. Sequence alignment of *R. hoagii* with mycobacterial carbonic anhydrase homologs shows conserved domains typical of beta carbonic anhydrases including metal coordinating cysteine and histidine residues along with conserved residues that are important for protein-protein interactions. Homology modeling of RhCanA and RhCanB was done using Swiss model and models generated were validated using model validation tools. Overall structure analysis of RhCanA and RhCanB reveals that both proteins have / fold typical of -class of carbonic anhydrases. Analysis of active site of RhCanA shows Cys35, Cys91 and His87 that are involved in metal ion in the active site of -class carbonic anhydrases. Furthermore, active site analysis also revealed the presence of Asp37 and Arg39 residues involved in salt bridge formation that is critical for catalysis. RhCanB reveals a unique Arg55 residue involved in catalytic regulation similar to Rv3588c from *M. tuberculosis*.

**Anderson, Kelsey H.,** Brian Bigelow, Rabeka Lashbrook, and Randall D. Maples (East Central University)

### \*ASSESSMENT OF IRON OXIDE NANOPARTICLES AS CHEMICAL TRACERS IN OKLAHOMA GROUNDWATER

It is important to be able to assess the risks of contamination of groundwater associated with the aquifer recharge process. Nanoparticles such as magnetite (Fe<sub>3</sub>O<sub>4</sub>) may offer several advantages over traditional chemical tracers including stability in undesirable conditions, detection at low concentrations, and ability to functionalize to suit a variety of different uses. This study begins assessing the potential of iron oxide nanoparticles as chemical tracers in groundwater using columns packed with glass beads, limestone, sandstone and dolostone from the local area and used water from local sources including tap water, creek water and the Arbuckle-Simpson aquifer as small scale

environmental simulations. We then measured the recovery of the nanoparticles after flowing through the columns.

**Andrew, Billy** (East Central University)

**\*UTILIZING XLSFORM AND FORMHUB TO DIGITIZE THE DATA FOR PONTOTOC ANIMAL WELFARE SOCIETY**

Pontotoc Animal Welfare Society (PAWS), located in Ada Oklahoma, still collects paper-based data for their daily operations. With a PetSmart Charities grant and support from the McNair Scholars Program at East Central University, we were able to obtain electronic data collection equipment and develop specialized forms for data entry utilizing KoboToolBox. Creating a working and efficient electronic form is vital in making this a viable method for data transfer and entry for PAWS, other humane societies, and small businesses. For non-profit organizations and small businesses, it is crucial to minimize the operating costs. KoboToolBox is free to use for research and humanitarian reasons, making it the perfect choice for this project. In the future, FormHub will be considered for small business and other types of originations. FormHub will be used much like KoboToolBox but is open source and can be implemented by the organization. We plan to analyze possible database methods. This includes Access and Open Office to build a specialized database to fit the needs of PAWS. The new databases will allow the employees at PAWS to manipulate the data, make simple print outs for the adopters, and keep it updated to provide better adoption rates.

**Arnold, Lenzi** and Jennifer L. Kisamore (University of Oklahoma-Tulsa)

**ARE HIGH ACHIEVERS LESS LIKELY TO COMMIT TO ORGANIZATIONS? INVESTIGATING THE ROLE OF SUPPORT IN THE ACHIEVEMENT STRIVING-COMMITMENT RELATIONSHIP**

High achievers are sometimes viewed as a turnover risk. The current study tests this assumption by investigating whether high achievers display more affective commitment when they perceive their career goals are supported in the workplace. This study also examines whether employees view supervisor and organizational support separately. Using network sampling, data was collected from a total of 201 people, 177 of which provided complete, useable data. Results indicate that achievement striving does have a significant positive relationship with affective commitment and that perceived supervisor and organizational support are distinct, yet related, constructs. Data, however, did not support the prediction that the relationship between achievement striving and affective commitment would be moderated by perceived supervisor and/or organizational support. Implications of the findings are discussed and directions for future research are suggested.

**Blackwood, Kevin**, Justin Harris, Laramie Edens, Kay Woodring, and Stacy Gantt-Blackwood (East Central University)

**\*\*USING GROUNDWATER FAUNA TO DETERMINE SUBTERRANEAN HYDRAULIC CONNECTIONS IN KARSTIC AQUIFERS: A CASE STUDY FROM THE ARBUCKLE MOUNTAINS**

Geology plays a significant role in both the storage and transport of groundwater, as well as the distribution and diversification of subterranean and aquatic organisms. The effect that stratigraphic and structural features might have on hydrogeology is by acting as either conduits or barriers to groundwater flow. Determining whether hydrologic connections exist between two terranes can be difficult, especially when time and hydraulic gradients might not be sufficient for the injection of chemical tracers or pumping tests might not be practical. By using endemic groundwater fauna (such as cave amphipods) as biological tracers, hydrogeological parameters may be deduced by comparing genotypic and phenotypic relationships between populations on either side of potential groundwater barriers due to allopatric isolation. Cave amphipods and groundwater isopods both occur in relative abundance within the study area, but cave amphipods are the most reliable for determining groundwater connections due to their restriction to the phreatic environment. Groundwater isopods have been documented traversing the vadose environment over films of water and may be capable of navigating around potential groundwater barriers. Therefore, groundwater isopods may be unreliable as biological tracers. Looking at examples from the Arbuckle Mountains of southern Oklahoma, we examine genotypic and phenotypic relationships of endemic groundwater fauna, using DNA barcoding and taxonomic methods. By employing these techniques, we can assess the effectiveness of various types of stratigraphic and structural features as either pathways or as barriers in a region heavily altered by structural deformation and modified by karst processes.

**Bohannon, Whitney**, Brandon Reed, and Lindsey Long (Oklahoma Christian University)

**\*EFFECTS OF UV EXPOSURE ON  $\Delta$ RAD4, A NUCLEOTIDE EXCISION REPAIR PATHWAY PROTEIN**

Ultraviolet (UV) light exposure often causes DNA damage of genomes of various organisms. The DNA damage repair pathway most often used to repair the UV-induced damage nucleotide excision repair (NER). The NER pathway normally repairs DNA adducts created by UV exposure; however, when the pathway is disrupted, the damage is not repaired and can lead to an increased risk for skin cancer and other skin diseases. An important gene of interest in *S. cerevisiae* for the NER pathway is RAD4. Rad4 forms a heterodimer with Rad23, recognizes and binds the damaged DNA, and recruits the NER machinery to the site of damage to initiate repair. Using a yeast model system, we assayed the consequence of deleting RAD4 from the yeast genome using viability and mutation frequency assays. The  $\Delta$ rad4 cells and wild type (wt) cells were exposed to varying doses of UV prior to plating cells on complete medium (YPD) plates. As previously reported, we found the  $\Delta$ rad4 strain was more sensitive to UV exposure when compared to the wt strain. Using a reverse mutation canavanine assay, we found  $\Delta$ rad4 had a higher DNA mutation frequency when compared to wt cells both before and after exposure to UV. These results are consistent with the function of Rad4. When mutated, decreased viability and increased mutation frequency may be due to defective functions in recognition and binding of damaged DNA. Ultimately, this defect leads to deficiency in excising the damaged areas. In the future, we plan to further dissect

the NEF2 complex (RAD4 and RAD23) by examining the effect on viability and DNA mutation frequency in both single and double mutant strains.

**Canales, Jailene**, Austin McDonough, Morgan Massey, and Nikki J Seagraves (University of Central Oklahoma)

**\*CHARACTERIZING EARLY DEVELOPMENTAL DEFECTS IN AN AVIAN MODEL OF MATERNAL PKU**

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], brain and growth restriction when a mother with Phenylketonuria [PKU] does not control her dietary intake of Phenylalanine [Phe]. In this study, we aim to establish and characterize an avian model of MPKU. We focused on early developmental defects. **METHODS:** We investigated the effect of 2500 $\mu$ M Phe exposure by in-ovo yolk injection. Following the injection, the embryos underwent further development for 48 hours until dissection was performed. At HH14-17, India ink was injected into the yolk as a contrast dye. Images were taken of embryos and they were scored based on Drake et. al (2006.) **RESULTS:** Embryos exposed to high Phe displayed gross morphological changes including developmental and growth delays, anterior and posterior abnormalities, and torsion defects. **FUTURE STUDIES:** Histological analysis is underway to determine changes in heart development. Currently there is no data interrogating the mechanism by which Phe causes heart defects. We plan to utilize this model to define the mechanism of Phe cardiac teratogenicity which is critical for improving MPKU treatments and outcomes.

**Chan, Ka Hei Samuel** and Nesreen Alsobou (University of Central Oklahoma)

**\*IN-CAR IoT LIFE DETECTOR**

To prevent numbers of children died because of getting trapped in hot vehicles, an IoT life detector is a life saver. By detecting lives in a dangerous environment, alerting the parent and nearby department of rescue, and acting on the vehicle, lives could be saved. First, to detect a human-being trapped in the car by providing privacy to the user, a camera could not be used. We can utilize an array of sound sensors, carbon dioxide sensor, temperature sensor, and a combined motion detector to classify if the object in the back seat is a human being. Second, we can utilize IoT device to alert parent and rescuing department if there is a life in danger. Third, we can embed a system on top of the car controlling system or ECU of a vehicle to compile any life-saving actions, for example, rolling down the windows, or starting the engine and turning on the air conditioner.

**Chaturvedi, Juhí** (Oklahoma State University)

**\*\*TOWARDS STRUCTURAL ANALYSIS OF THE COMPLEX OF MYXOMA VIRUS HOST RANGE PROTEIN M62 AND M63**

Pox viruses exists throughout the world and has its implications in humans. There are several host range factors of pox viruses. M62 a novel host range factor that controls productive myxoma virus replication in rabbit cells and in a wide variety of human cells. M62 plays an essential role in initiating later stages of

the virus life cycle. M63 another genome of Myxoma virus, enhances the activity of M62. SAMD9 is a novel cellular binding partner of M62 has anti-viral and antineoplastic properties. Several human diseases have been linked to deletions and deleterious mutations of SAMD9 gene. M62 and M63 forms a heterotrimeric complex during myxoma virus infection in human, murine cells and in rabbit cells. When myxoma virus infects rabbit cells the expression of both M62 and M63 is required for viral replication. However infecting human cells only M62 is essential for virus replication. This protein-protein interaction between viral M62 and host SAMD9 provides a model system o further investigate the functional role of the cellular protein. We are aiming to determine the mechanism by which M62/M63 work as complex for inhibiting SAMD9. To do this, we designed various approaches towards this goal. Our data indicates that the complex is formed, SEC chromatogram and SDS-PAGE indicates complex formation, which will be further subjected to crystallization to check the mechanism of interaction between M62 and M63.

**Cline, Hope<sup>1</sup>**, Dengjun Wang<sup>2</sup>, and Chumming Su<sup>2</sup> (<sup>1</sup>East Central University; <sup>2</sup>Groundwater, Watershed, and Ecosystem Restoration Division, U.S. Environmental Protection Agency)

**\*TRANSPORT OF THE “NEW-HORIZON” CARBONACEOUS—METAL OXIDE NANOHYBRIDS IN WATER-SATURATED POROUS MEDIA**

Nanotechnology is unprecedentedly advancing our broad societal goals in areas including, but not limited to: medicine, agriculture, energy, electronics, and environmental applications. Recently, the focus of interest in nanomaterial (NMs) research and development has shifted from single-component NMs to multicomponent nanohybrids (NHs). The goal of developing NHs is to maximize existing functionality and achieve novel functionality that cannot be obtained by manipulating the singular NM system. Increasing production and use of multifunctional NHs necessitate fundamental understandings of environmental remediation and potential environmental/human health impacts. However, to date, the fate and transport of nanohybrids in subsurface environments are largely unknown. In this research, water-saturated sand-packed column experiments were conducted to investigate the transport of the most commonly used carbonaceous—metal oxide nanohybrids (i.e., carbon nanotube-titanium dioxide (CNT-TiO<sub>2</sub>) and graphene oxide-TiO<sub>2</sub> (GO-TiO<sub>2</sub>)) in the absence and presence of environmentally relevant concentrations of natural organic matter (0, 1, 5, and 10 mg C/L Suwannee River humic acid (SRHA)). Our results show that without SRHA, both CNT-TiO<sub>2</sub> and GO-TiO<sub>2</sub> NHs exhibit a very limited mobility in porous media. Interestingly, upon adding a minute amount of SRHA (1 mg C/L), the mobility of both NHs is increased; and their mobility is further elevated with increasing concentrations of SRHA (from 1 to 10 mg C/L). At a specified SRHA concentration, the mobility of CNT-TiO<sub>2</sub> is lower than that of GO-TiO<sub>2</sub> NHs. The findings of our research advance the current understanding regarding impact of physicochemical factors on the transport of the next-generation NHs in the subsurface environments.

**Copp, Kyle J.**<sup>1</sup>, Tesa J. Martin<sup>1</sup>, Madison A. Snow<sup>1</sup>, Huyen Tran<sup>2</sup>, Tephillah Jeyaraj-Powell<sup>2</sup>, and Laurie Kauffman<sup>1</sup> (<sup>1</sup>Oklahoma City University, <sup>2</sup>University of Central Oklahoma)

**\*USE OF ENCLOSURE SPACE BY LONG-TAILED MACAQUES AT MINDY'S MEMORY PRIMATE SANCTUARY**

In terms of behavioral benefits, naturalistic environments have shown promise for primates in captivity. With the goal of providing data which supports the use of particular structures to stimulate and encourage natural behaviors, we investigated how 11 male long-tailed macaques (*Macaca fascicularis*), located at Mindy's Memory Primate Sanctuary in Newcastle, Oklahoma, use their enclosure space. Data was collected on usage of the ground, platform, firehose, stumps, warm house, and enclosure wall space. We also compared the patterns of enclosure space use of former pet macaques versus former lab macaques. Data collection included use of a video camera to record and narrate for 15 minute periods. Our initial hypothesis was that there would be no differences in use of enclosure space or structures. We found no significant difference between former pet and lab monkeys with use of a 2x7 mixed ANOVA. However, there was significant difference in structure use although not as we had hypothesized. We will communicate our results with the primary sanctuary in order to provide an environment which will enhance the macaque's overall health.

**Demings, Starla** (East Central University)

**\*TWITTER MODEL TO ENHANCE ECU'S SOCIAL MEDIA PRESENCE**

This research analyzes East Central University's social media data from Twitter to promote the awareness of the Mathematics and Computer Science Department. The design we have created is a program to analyze twitter data to calculate the most popular tweet about ECU and repost it with a time stamp. Using sentiment analysis and Text-blob, emotion behind extracted tweets will be calculated. With the analyzed data we will create word clouds that consist of the most popular words of a given time period and posted as well. We are implementing several different Python programming techniques in order to attain these goals, and with full success this program will run consistently on a calendar-based time system without human interaction.

**Ewy, Mariah**, Alisha Howard, and Kenneth Andrews (East Central University)

**\*EVALUATION OF DNA EXTRACTION PROTOCOLS FUNCTIONALITY FROM DRIED TESTUDINE BONE**

There are numerous papers written about DNA extraction out of bones and animal tissue. The variety of DNA extraction protocols and the lack of performance consistency across different organisms argues for a lack of robustness. A total of 3 different protocols have been evaluated attempting to extract DNA from dried testudine bone, or shell. The first evaluated protocol is the Armed Forces DNA Identification Laboratory (AFDIL) protocol. This protocol was written to obtain DNA from skeletal remains for identification. The second evaluated protocol was written by Cold Spring Harbor Laboratory and titled Using DNA Barcodes to Identify and Classify Living Things. This protocol was created to isolate DNA from plant, fungal, or animal samples. The

third protocol evaluated was the Nature Protocol titled Ancient DNA Extraction from Bones and Teeth. The goal of this protocol is to maximize recovery of PCR-amplifiable DNA from bone and teeth, while limiting the amount of contaminants that can inhibit PCR. All protocols were altered slightly to fit the resources available in the lab where the experiments were conducted. Each extraction protocol was unique in its methodology. Polymerase Chain Reaction (PCR) was performed with all DNA extraction products to amplify specific single segments of DNA.

**Ezell, Kade** and Regina S. McGrane (Southwestern Oklahoma State University)

**\*ANTIMICROBIAL ACTIVITY OF PHYTOPATHOGEN BIOSURFACTANTS AGAINST HUMAN PATHOGENS**

Antimicrobials play a major role in the fight against bacterial growth in many areas of the modern world. Without the benefits of antimicrobials, the medical field, food industry, and the overall well-being of all life would be significantly impacted. The gram negative, bacterial, phytopathogen *Pseudomonas syringae* produces the biosurfactants syringafactin and rhamnolipid while colonizing plant tissue. These biosurfactants lower surface tension, act as lubricants for bacterial swarming motility, and increase diffusion of plant nutrients. Our lab has observed repulsion of *P. syringae* deletion mutants lacking biosurfactant production and leaf colonizing bacteria when inoculated on swarming agar media in close proximity to wild type *P. syringae*. We hypothesize that biosurfactants may be important for *P. syringae* competition in the environment through repulsion of nearby bacteria. The effects of syringafactin and rhamnolipid on bacterial human pathogens have not been studied. The objective of this work is to evaluate the motility of human pathogens in the presence of *P. syringae* and to determine if biosurfactants are responsible for repulsion or growth inhibition. To evaluate the impact of *P. syringae* on the behavior of human pathogens, strains were inoculated in close proximity to *P. syringae* and swarming motility was observed. Results show that *P. syringae* repelled all but two gram negative human pathogens tested but did not impact gram positive human pathogens. Repelled gram negative strains were also challenged with purified syringafactin and rhamnolipid. Results demonstrate that syringafactin plays a role in observed repulsion. Preliminary studies suggest syringafactin may also inhibit the survival of gram negative human pathogens. Collectively, this work supports the proposal that *P. syringae* utilizes biosurfactants to outcompete closely related bacteria. Due to the potential antimicrobial properties possessed by syringafactin, *P. syringae* could be used to make antibiotics that attack gram negative bacteria that live in competition with *P. syringae*.

**Farinango, Gloria** and Regina S. McGrane (Southwestern Oklahoma University)

**\*\*INVESTIGATING THE ROLE OF *PSEUDOMONAS SYRINGAE* MOTILITY IN COLONIZATION OF ABOVE GROUND PLANT TISSUES**

It is well known that a high priority of our society is sustainable crop production; unfortunately, there are numerous crop pathogens that negatively impact our society's goals. Among the crop pathogens is *Pseudomonas syringae*, which is a bacterium that infects many other important crops, such as common bean,

tomato, onion, and cantaloupe. Previous research has demonstrated that *P. syringae* pathogenicity is directly associated with its motility via pili and flagella, which mobilizes the bacteria throughout leaves allowing it to reach nutrients and water. Due to the significant effect of this pathogen on leaves, researchers have focused on its colonization of leaf tissues; therefore, little is known about how *P. syringae* reaches leaf tissue. The goal of this study is to understand the importance of the pili, flagella, and surface lubricating biosurfactants in movement from soil to above ground tissues. We hypothesize that *P. syringae* uses active motility to colonize the radicle, stem, and primary leaves during transmission from below ground to above ground tissues. To test our hypothesis, we compared strain colonization at each stage of the common bean plant growth cycle by quantifying bacterial populations. A parent strain was compared to mutants lacking pili filament, pili retraction, flagella filament, or biosurfactant synthesis proteins. Our results indicate that strains lacking pili filament, pili retraction, flagella filament proteins, or biosurfactants syringafactin or rhamnolipid were reduced in colonization of radicles and stems compared to the parent strain. All strains have the same capacity to colonize the leaves. These results show that motility mediated by pili and flagella contributes to *P. syringae*'s ability to colonize radicle and stem tissues but not leaves. This understanding could provide the means to prevent bacterial movement to aboveground tissues where disease occurs and consequently improve the crops yield.

**Fulton, Shannon**<sup>1</sup>, Paul Lawson<sup>1</sup>, Soninkhishig Tsolmon<sup>2</sup>, Christina Warinner<sup>3</sup>, Jessica Hendy<sup>3</sup>, Matthäus Rest<sup>3</sup>, Sanjeet Kumar<sup>3</sup>, Bjorn Reichhardt<sup>3</sup> (<sup>1</sup>University of Oklahoma, <sup>2</sup>Mongolian Dietetic Association, <sup>3</sup>Max Planck Institute for the Science of Human History)

#### **\*\*HEIRLOOM MICROBES: THE HISTORY AND LEGACY OF ANCIENT DAIRYING BACTERIA**

Human communities have utilized microbes for thousands of years as exemplified by the development of dairy products such as yoghurts and cheeses. The adoption of dairy foods into the adult human diet, and its consequent effect on the human genome, is a clear example of gene-culture co-evolution. The mechanisms of this process are not well understood, although we know that milk must have been heavily processed in order to create digestible products, with microbes likely playing a key role. Modern dairy production methods use microbial strains that are highly regulated in order to maintain hygiene standards and reproducibility. Subsequently, we remain unaware of the vast microbial diversity involved in ancient food preparation, and the impact this microbial diversity may have had on flavors and textures. With food globalization and industrialization, traditional methods of dairying and their unique microbial cultures are now being rapidly lost. It is known that lactic acid bacteria (LAB) are primarily responsible for the natural fermentation of animal milk and its by-products. Therefore, this study focuses on the screening of LAB in traditional dairy products from Central Asia (Mongolia) using culture dependent isolation of representation organisms to explore their genetic identification and deposit in microbial culture collections. Various dairy products, including raw and boiled animal milk, were collected from nomadic herding communities in Mongolia. A

series of enrichments were designed to enable characterization of the LAB communities of the cow and yak derived Mongolian dairy samples. Two growth mediums, MRS and M17, containing different carbohydrate sources and nutritional components were selected for incubation in a reduced oxygen environment at 27.9°C and 45°C in order to select for mesophilic and thermophilic LAB, particularly *Streptococcus thermophilus*. Species belonging to the genera *Lactobacillus*, *Streptococcus*, *Enterococcus*, *Lactococcus*, *Pediococcus*, *Leuconostoc*, *Weissella*, *Carnobacterium*, *Gluconobacter*, *Lelliottia*, *Bacillus*, *Anoxybacillus* and *Brevibacillus* were recovered.

**Gathright, William** and Amanda J. Nichols (Oklahoma Christian University)

#### **\*EXTRACTION AND CHARACTERIZATION OF DIHYDROXYACETONE FROM SUGAR CANE**

Dihydroxyacetone is a chemical interest because of its ability to react with the amino acids in the outer layer of skin, giving the skin a bronzed look. As a result of its behavior, dihydroxyacetone is the typical active ingredient in self-tanners. Industry usually synthetically makes the compound, but it is naturally found in sugar beet and sugar cane. No published extraction procedure for dihydroxyacetone from sugar cane or sugar beets could be found. Preliminary methods were developed in order to isolate and characterize dihydroxyacetone from sugar cane and commercial sugar beet deer feed. Reflux boiling in ethanol was used as the extraction technique. Characterization techniques included high-performance liquid chromatography (HPLC) analysis and Fourier-transform infrared spectroscopy (FTIR) analysis. A preliminary characterization method was developed that used gelatin to mimic the self-tanning process on skin. Color changes of the gelatin 'skin' was observed between the extracted dihydroxyacetone and commercial self-tanners. One research area of chemical education focuses on the development of experiments appropriate for an undergraduate laboratory. These experimental methods can be used in a personal care products-themed lab component of an introductory chemistry course.

**Ghale, Kevin**, DeCarlo Brewer, Phu Dang, and Nesreen Alsou (University of Central Oklahoma)

#### **\*IMPROVING LIFESPAN AND PRIVACY IN COMMUNICATION BETWEEN WIRELESS SENSOR NODES**

In modern communication, wireless transfer of information is the preferred method to transmit data from one point to another. However, wireless transfer between the nodes is susceptible to attack by unknown adversaries with sufficient resources. With this in mind, our research focuses on enhancing the security, privacy, and the lifespan in wireless transfer among sensor nodes. In enhancing the lifespan of the sensor nodes, we have planned to implement a mobile data collector equipped with learning automation, topology control, and installed solar panels on the sensor nodes. As for privacy and security, we implement data encryption and anonymity protocol using generated pseudonyms at each node for enhanced privacy. Furthermore, old pseudonyms are wiped after each transfer, and new pseudonyms are assigned for every new transfer.

**Giemza, Amy**<sup>1</sup>, Sidney Wilkins<sup>1</sup>, Lindsey J. Long<sup>1</sup>, with the Genomics Education Partnership (GEP)<sup>2</sup> (<sup>1</sup>Oklahoma Christian University, <sup>2</sup>Washington University in St. Louis)

**\*UNDERSTANDING GENE EXPRESSION REGULATION THROUGH CHARACTERIZATION OF TRANSCRIPTION START SITES IN *DROSOPHILA ELEGANS***

Every living organism is composed of genes. The position of these genes on a chromosome is important for proper regulation of gene expression. Alteration of positioning or gene regulatory elements can lead to diseases such as cancer. Understanding the mechanisms of gene regulation can help explain why genes are misregulated in diseases and, furthermore, how to abrogate this misregulation. Because highly important DNA sequences are often conserved throughout evolution, our strategy was to identify gene regulatory elements in various species related to *Drosophila melanogaster* as the genome of this species is fully annotated. Transcription start sites (TSSs) are where transcription of DNA into RNA begins which ultimately leads to the production of proteins. Our specific research focused on identifying TSS positions for several genes and compiling the data to distinguish trends for the regulatory elements that surround the TSS of genes that are classically “on” or “off.” To pinpoint the location of the putative TSS for the *D. melanogaster* unc-13 ortholog in *D. elegans*, we aligned the *D. melanogaster* unc-13 sequence to the *D. elegans* genome to search for homology. The identified search region was further scrutinized using lines of evidence derived from experimentation to identify the exact location of the TSS. Core promoter motifs in the region were also evaluated to investigate the possibility of alternative TSSs. Of particular interest, unc-13 had low sequence homology with the *D. melanogaster* ortholog and supplementary evidence was unsuccessful in definitively identifying the TSS for all isoforms of the gene. Ultimately, the data supported that only a few of the isoforms of unc-13 were conserved in the evolution of this species.

**Gilstad, Stephen**, Joshua Haley, Nesreen Alsobu (University of Central Oklahoma)

**\*IDEAS FOR A MORE EFFECTIVE WIRELESS SENSOR NETWORK**

A wireless sensor network consists of many sensor nodes that are used to gather information and send the data back to a base station. Ever since wireless sensor networks were established, one of the main concerns for them is the duration of their lifetime. This is because the batteries of the individual sensors cannot be replaced most of the time due to inconvenience or harsh climates. So far, we have come with a few basic ideas that could potentially become solutions for enhancing the lifetime of a network. We have done this by researching multiple scholarly journals dealing with this topic, and comparing the work done by each individual team, and then using their insights as a guideline for coming up with our own solution. In the near future we hope to find an idea to stick with, and then further research and eventually produce a formal plan for making an effective network.

**Godfrey, Micah** and Charles Crittell (East Central University)

**\*KINETIC STUDIES OF PAPAINE**

Papain is an enzyme found in papaya plants. It is a thiol protease and contains a sulfhydryl group in the active site. The substrate, N $\alpha$ -benzoyl-arginine-p-nitroanilide (BAPNA), is used, which is hydrolyzed by papain to form a bright yellow product, p-nitroaniline. The reaction is monitored spectrophotometrically by measuring the rate of formation of the p-nitroaniline product as a function of the increase in absorbance of the solution at the  $\lambda$ max of p-nitroaniline (400 nm) over time at various substrate concentrations. Lineweaver-Burke double reciprocal plots are used to determine Vmax and KM of the enzyme. The effect of pH on enzyme activity will also be explored.

**Gray, Taylor C.** and Sarah C. Vrla (University of Central Oklahoma)

**\*A QUALITATIVE SURVEY OF ULTRAVIOLET (UV) REFLECTIVE MORPHOLOGY IN RATTLESNAKES**

Communication in the ultraviolet (UV) has an array of adaptive functions such as foraging, social signaling, sexual selection, nectar-location, territory marking, etc., and is known to occur in a wide variety of taxa including plants, insects, reptiles, birds, and mammals. Communication in the UV requires some form of signaling mechanism, in the form of UV reflective morphology as well as a visual system capable of interpreting wavelengths in the upper UV range (390nm). For this survey, we used a UV-photography protocol to investigate UV-reflection of rattlesnakes (Family Viperidae). This method incorporates the UV-reflective standard Fluorion to visually discriminate between UV-reflectivity and absorption while also allowing us to estimate the degree of reflectivity observed. Using this approach, we examined UV-reflective morphology in a variety of rattlesnake species. Here we present our preliminary findings of species that exhibit some degree of UV reflective morphology. These results qualitatively suggest UV-reflection among these species, though further study is needed to determine if any of these morphologies have any adaptive significance or are the product of neutral selection.

**Gunung, Norbu** and George Wang (East Central University)

**\*EDGE EFFECT IN OVIPOSITION OF MOTHS OF LEAF-TYING CATERPILLARS**

Oviposition by moths in forest habitats can be affected by different factors. The distance from the edge of a forest has been demonstrated to be correlated with many ecological processes (edge effect). We conducted an experiment at the Nature Conservancy's Pontotoc Ridge Preserve in Pontotoc County, OK to examine the edge effect in occurrence of leaf-tying caterpillars on red oak trees (*Quercus rubra*). We selected 20 trees along the edge of the forest (EDG) and 20 trees in the interior of the forest (INT). We created five artificial leaf ties on each tree and monitored the arthropod occupants in them for two months. We measured the DBH of each tree and the number of branches, as well as environmental factors including leaf surface temperature and canopy cover. We also measured the average leaf size and toughness of each tree. We have found



that leaf-tying caterpillar occurrence on EDG trees was higher during early season.

**Hefley, Brenna**, Samantha Perry, and April Nesbit (East Central University)

#### \*DETERMINATION OF YfAX PROTEIN FUNCTION IN *ESCHERICHIA COLI*

*Escherichia coli* is a common microbe found in human intestines. Some proteins in *E. coli* still have an unknown function. YfaX protein is predicted to be a transcription factor, and it is the first gene in the yfaXWVU operon. Two of the other genes in the yfaXWVU operon encode for enzymes that have been shown in vitro to metabolize rhamnonate and lyxonate for entry into cellular respiration. Therefore, we tested the effect of rhamnonate on YfaX function in vivo. Because we could not buy lyxonate, we used ascorbate, which is predicted to degrade to lyxonate. We ran growth curves with these sugars and found that *E. coli* cannot grow with either rhamnonate or ascorbate under aerobic conditions. *E. coli* could grow slowly with ascorbate under anaerobic conditions. With this information, we ran gene expression assays and discovered that cells growth with ascorbate under anaerobic conditions had the highest expression of the yfaX promoter. However, there was not difference in gene expression with or without YfaX when grown in ascorbate under anaerobic conditions. Interestingly, we did find a difference in gene expression with and without YfaX when cells were grown with glucose under anaerobic conditions. This suggests that while ascorbate affects expression of the yfaX promoter under anaerobic conditions, it is through a different mechanism than YfaX protein. In comparison, YfaX protein regulates the yfaX promoter in the presence of glucose under anaerobic conditions. Thus, the yfaX promoter is controlled by multiple factors, one of which appears to be the YfaX protein. In the future, we will need to repeat the gene expression assays and growth curves to confirm our results.

**Jacob, Nicholas** (East Central University)

#### T-SNE DIMENSIONAL REDUCTION

Dimensional reduction techniques give a way to explore multidimensional data in new light, generating easier to read graphics. Methods utilized are hoped to retain the internal structure of the data while providing simplification to describe the data in simple ways or run complicated algorithms. A relatively new technique, t-Distributed Stochastic Neighbor Embedding will be introduced and compared with other popular techniques.

**Jesse, Sean** (East Central University)

#### \*RADIO WAVES TO ELECTRICITY: TESLA'S BLUEPRINT

The main source for this project came from a blueprint from Nikola Tesla's designs that was presented online along with the main parts needed, which is what most of the build is based on. The objectives of this project included first being able to confirm that it was possible to create electricity (direct current in this case) by means of converting radio waves through the device created, optimization of the creation to produce a better range of electricity generated, and then using the device as a supplemental source of electricity for low-power

appliances such as LEDs, rechargeable batteries, and cell phones. Testing has included the use of a wire antenna, loop antenna, and t.v. antenna at several locations and different times, adjustment of each antenna for the best possible reception (each done separately), and then recording of the amperages and voltages shown by a multimeter connected to the device. Average power calculated from the readings taken has fallen in between 50-400  $\mu$ W, which is relatively low, but the device works.

**Keblawi, Mohamad**, Mohamed Afify, and Nesreen Alsou (University of Central Oklahoma)

#### \*CLOUD-BASED SMART PARKING SYSTEM

We propose a "Smart Parking" system based on Cloud intelligent system and the resource allocation. Growing Cities and Universities always having parking challenges and they need creative ideas to solve this issue. On campus a plenty of time is wasted due to searching for empty parking spots Our proposed system will be implemented on campus in different parking spots. The smart system will communicate with a cloud platform to help users find empty parking spots online and navigate to it through a designed android app. The app will determine how many parking spots are available and will be updated periodically by using the google maps platform for navigation.

**Key, Charlotte**, Tim Snider, Erika Lutter, and Jennifer Shaw (Oklahoma State University)

#### \*\*EXTRUSION AS A MECHANISM FOR IMMUNE RESPONSE EVASION IN A *CHLAMYDIA TRACHOMATIS* MURINE INFECTION MODEL

*Chlamydia trachomatis* is an obligate intracellular organism that is the leading cause of preventable blindness and sexually transmitted bacterial infections. *C. trachomatis* exhibits a biphasic developmental cycle involving infectious elementary bodies (EB) and non-infectious, replicative reticulate bodies (RBs). At the end of its developmental cycle, EBs disseminate to neighboring cells either via host cell lysis or a novel mechanism of exit, called extrusion. It has been hypothesized that extrusions serve as a means of immune response evasion due to enclosure within host membrane. In addition, extrusions filled with multiple EBs may serve as a mode for high dose delivery of infectious organisms to tissues, rather than individual EBs from lysed host cells. Herein, female mice were intra-vaginally infected with either a *C. trachomatis* serovar L2 wild type strain or a mutant strain containing a silenced CT228 gene, which produces significantly more extrusions in vitro, relative to the wild type. All mice were characterized for, i.) time course of infection, ii.) systemic and mucosal immune response to infection, and iii.) degree of reproductive tissue damage following clearance of infection. In comparison to the wild-type strain, mice infected with the mutant strain revealed an increase in the time needed to clear infection and a reduction in the systemic anti-*Chlamydia* antibodies. These data suggest that EB antigen within extrusions dampen recognition by the immune system. Therefore, further research is warranted to quantitate and characterize immune cell populations recruited to the reproductive tracts of mice infected with wild type versus the mutant strain.

**Kim, Dohyung Markus<sup>1</sup>**, Ranish Timilsina<sup>1</sup>, and Tingting Gu<sup>1,2</sup> (<sup>1</sup>University of Oklahoma, <sup>2</sup>Samuel Roberts Noble Microscopy Laboratory, University of Oklahoma)

#### ARRESTED NEUROMUSCULAR DEVELOPMENT OF *DROSOPHILA MELANOGASTER* MUTATION 18507

The development of muscle and nervous tissue is coordinated via molecular control mechanisms that specify muscle patterning and neuronal connections. If these specialized coordination systems fail to operate properly, it can lead to an inability to coordinate complex actions in the body, resulting in death. However, the control mechanisms are still not fully understood. In our lab, through studying the metamorphic development of muscle and nervous system in a genetic model organism, *Drosophila melanogaster*, we try to understand what the key genes and signaling pathways are involved in this complex developmental progress. During metamorphosis, *Drosophila melanogaster* undergoes significant morphological and behavioral changes. As larva enters the roaming stage and begins pupariation, significant morphological changes occur, such as the formation of appendages and the segmentation of the body. At the end of the metamorphosis, pupa begins the eclosion process which involves a series of precisely controlled behavior. These morphological and behavioral changes require the proper development of muscle and nervous system during metamorphosis. Previously we identified a mutant named 18507, which failed to complete metamorphosis. This mutant exhibits the lack of coordinated muscular movement at eclosion. We hypothesized that the behavior defects were due to the disruption of the coordination of the muscle and nervous system development during metamorphosis. Through careful staged dissection, fluorescent immunostaining, and microscope imaging, we observed significant defects on the neural and muscular tissue of mutation 18507 at the end of metamorphic development. These defects include an elongated VNC, increased intervals between abdominal muscle striations, and a “raggedness” in these muscle striations. These alterations may inhibit mutant 18507 to coordinate their muscle movements necessary for the completion of the eclosion behavior. Our future work will focus on identify the mutation 18507 and the interaction between mutant 18507 and some known key signal pathways such as ecdysone signaling pathway.

**Kinder, Reid** (East Central University)

#### \*MNIST DATASET ANALYSIS

Teaching a computer to classify data accurately through multi-layer neural network processing is known as deep learning. The MNIST dataset was used to explore and compare machine learning processes to deep learning through packages such as SKLearn, and Tensorflow. Through SKLearn, different dimensional reduction techniques were used to manipulate the dataset, such as Principal Component Analysis (PCA) and T-Distributed Stochastic Neighbor Embedding (t-SNE). PCA and t-SNE were used to reduce the number of dimensions of the dataset, while conserving certain characteristics of the data. Finally, K-Nearest Neighbors (KNN) was used to classify the data after dimensional reduction. After this classification, a graphical representation of the

data was presented. An accuracy greater than 85% on the test set was achieved through this method. Tensorflow was also successfully applied to the data set. Through Tensorflow, we reached a result of greater than 95%.

**Kisamore, Jennifer L.<sup>1</sup>** and Hannah E. Harris<sup>2</sup> (<sup>1</sup>University of Oklahoma-Tulsa, <sup>2</sup>University of Oklahoma)

#### DEMONSTRATING PHYSIOLOGICAL AND PSYCHOMETRIC MEASURES OF STRESS: AN ACTIVE LEARNING EXERCISE

A major factor that contributes to organizational health, safety and wellness is employee experiences of stress. In Summer 2018, students in ODYN 5283: Employee Health, Safety and Wellness learned about different ways stress can be measured including both assessments of both physiological and psychological states. To facilitate learning about strengths and weaknesses of different assessments methods, students were given the opportunity to complete several self-report measures (e.g., Oldenburg Burnout Inventory, Spector’s Physical Symptom Inventory) and to provide saliva samples for cortisol testing under stressed (pop quiz) and relaxed (meditation) conditions. Participation in these exercises was voluntary; students used code numbers so the instructor was not able to link results to specific students. Feedback regarding scores on the psychometric and physiological measures was provided to students which also included information regarding the distribution of scores within the class for these different measures. Students were also given the opportunity to complete an anonymous online evaluation of the activities. A total of 14 of the 16 members of the course completed the online evaluation. Results suggest that students overwhelmingly found both the psychometric scale and cortisol testing activities to be effective techniques for teaching course content. Three separate items regarding their enjoyment of the activity, the activity’s ability to facilitate understanding of the measurement of stress, and their overall perception of the effectiveness of the activity were used for evaluation of both the psychometric scale and cortisol testing activities. In both cases more than 75% of students gave the activities the highest possible endorsement. Responses for the psychometric scale was wholly positive; one participant responded neutrally to all three items regarding cortisol testing. No negative responses were given for either activity. Narrative feedback supported the ratings with students indicating the activity changed the way they view the measurement of stress.

**La Force, Colleen (Denver)**, Kriti Shukla, Prakash Sah, Christina Bourne, and Erika Lutter (Oklahoma State University and University of Oklahoma)

#### \*\*CLONING AND EXPRESSION OF *CHLAMYDIA TRACHOMATIS* INCLUSION MEMBRANE PROTEINS

*Chlamydia trachomatis* is an obligate intracellular human pathogen that resides inside host cells within a parasitophorous vacuole called an inclusion. In order to replicate and grow *Chlamydia* must usurp host cell proteins from within this vacuole. To do this, *Chlamydia* produce and secrete proteins, termed inclusion membrane proteins (Incs), that insert into the inclusion membrane with the N- and C- terminus facing the host cytosol. Currently, *C. trachomatis* is predicted to have 50 Incs, however very few of these have known functions. Very little knowledge about their function can be gained via bioinformatics analysis since

they lack similarity to any proteins outside of *Chlamydia*. This has made characterizing Incs or identifying possible functions very difficult. The goal of this project is to clone and express the C-terminus of certain Incs which will be used to produce purified protein for future crystallography studies. This study focuses on the CT229-CT224 operon which is only found in human pathogens. Here, we present the cloning strategy of each Inc into the expression plasmid pET28a which will generate a C-terminus Inc fusion to a 6X His tag. To date CT226, CT227 and CT228 have been successfully cloned, verified by sequencing, and transformed into BL21 for expression studies. Protein production with these constructs has been induced with IPTG. Progress with the CT226 construct has proceeded to successful solubilization after expression, and re-folding is evident from the defined elution from size exclusion chromatography as an apparent trimer, in addition to strong amide bond signals in Fourier-transform infrared spectroscopy indicating approximately half of the protein adopts a helical conformation. By assessing their structures, insights may be gained as to possible functions based on similarity to other characterized proteins.

**LaMascus, Hadley** (Oklahoma Christian University)

**\*CARBON BLACK INDUCES AUTOPHAGY AND INFLAMMASOME ACTIVITY IN MURINE MACROPHAGES**

In a society characterized by industrialization, globalization, and pollution, airborne toxins pose an increasingly ubiquitous threat to the Earth's atmosphere and to public health. Carbon black (CB) is defined as an elemental carbon clump under 100 nanometers and is particularly prevalent due to its creation when burning fossil fuels. CB has been shown to induce inflammation, oxidative stress, aggravation of asthma, decreased cellular propagation, fragmented mitochondria, and increased reactive oxygen species in human lung cells in previous unpublished research. In addition to the aforementioned dangers, certain NPs such as rare earth oxides have been shown to deregulate autophagy, a necessary pro-survival mechanism. To test the cellular toll of CB in macrophages and investigate CB-induced lysosomal activity and autophagy, CB was applied to RAW246.7 cells and displayed decreased lysosomal number with exposure to LysoTracker Red. Tandem-RFP-GFP-LC3 transfected RAW cells presented an increased ratio of red-to-green puncta per field of view when comparing CB treatment with a mock treatment, indicating an increase in autophagic flux. In addition to visualization data, comparisons of mock treatment and CB treatment showed a 3-fold induction of interleukin-1 beta and caspase 1 protein levels at 48 hours of CB exposure in Western blot replicates. A 1.5 and 2-fold statistically-significant induction of LC3 protein at 24 and 48 hours respectively was observed in a Western blot triplicate. A positive control treatment group of 20  $\mu$ M of chloroquine matched the LC3 induction of the CB treatment. Taken together, these results indicate RAW246.7 inflammasome activation, decreased lysosomal number, and increasing autophagosome presence with exposure to CB.

**Lastrina, Michelle A.** (East Central University)

**SUM-LIST-COLORING GRAPHS**

Sum-list-coloring is a form of vertex coloring in which we first assign a list of colors to each vertex of a graph and then choose a color from each list so that a proper coloring is obtained. We seek to minimize the sum of varying list sizes for a given set of graphs on a small number of vertices. In this talk we introduce the necessary background, illustrate sum-list-coloring via example, and summarize results for graphs on at most five vertices.

**Levy, Kyle, Anindita Das, Jonathan Khoury, and Nesreen Alsbou** (University of Central Oklahoma)

**\*EFFICIENT VEHICLE TO VEHICLE COMMUNICATION PROTOCOLS FOR REAL TIME DATA COLLECTION**

A dedicated short range communication system has been developed for the purpose of inter-vehicle communication in order to provide a safer highway system by predicting traffic conditions from real time data collected from the vehicle. An on board unit is used to collect the data from a diagnostic device attached to the vehicle. Currently the diagnostic devices are only developed to work with a Ford vehicle. A common communication protocol will be developed in order to collect the data from any vehicle necessary by analyzing the controller area network system that communicates with engine control unit of each vehicle. The data is then transmitted to a road side unit and ultimately back to a data server. For the network we will be analyzing the existing communication protocols for vehicle to vehicle communication on the dedicated wifi bandwidth of 5.9 GHz. We will then develop a communication protocol of our own that will optimize both the Bluetooth internal network and the WiFi external network. An in depth analysis of the performance of each leg of the network system will be performed. The capacity of the network, environmental effects, throughput, and the delay of the data will be analyzed. The environmental effects will consist of the electromagnetic field produced by the vehicles and the reduction of noise introduced by the fields into the communication networks. In order to perform the analysis we propose the use of IxChariot software which will allow us to simulate the potential traffic on the communication network and test all of the parameters listed above on the physical system. The physical system makes use of the LocoMate equipment to create a communication network and an onboard diagnostic device to transmit the data to the network. Simulation of the network will be accomplished using NS3 and SUMO.

**McDonald, Brandon and Sarah Vrla** (University of Central Oklahoma)

**EVIDENCE OF ELK (*CERVUS ELAPHUS*) PREDATION BY A SOLITARY COYOTE (*CANIS LATRANS*) IN SW OKLAHOMA AND CONTINUED RESEARCH.**

Coyotes are capable of killing elk calves and deer fawns; however, the taking of larger prey has been demonstrated only through cooperative hunting strategies. Walters et al. (2005) gave the first verifiable account of an individual coyote killing an adult elk in the Wichita Mountains Wildlife Refuge in southwestern Oklahoma. Provided here is photographic evidence of the rare observation and

raises many questions regarding coyotes in general and coyote populations inhabiting the Wichita Mountains. This attack is unique, involving a solitary coyote and large ungulate but the manner in which it occurred is an anomaly in particular. Verified coyote attacks on large ungulates involve coordinated efforts by multiple coyotes utilizing a series of attacks to various parts of the body, often the posterior, resulting in multiple injuries. Once injured, the prey animal is tracked over the course of hours and days until the prey animal becomes weak and unable to flee or defend itself. The attack involved only one strike by the coyote to secure the elk by the throat and after a brief struggle, the elk expired. This mode of hunting is more typical of larger apex predators (e.g., wolf, cougar, etc). This raises many biological questions. Presented here are photographs of the attack and goals of our project examining the foraging ecology of coyotes in the area of the documented attack.

**McKenzie, Tyler**<sup>1</sup>, Debra Saunders<sup>2</sup>, Nataliya Smith<sup>2</sup>, Shania Do<sup>2</sup>, William Towler<sup>2</sup>, Marvin Cruz<sup>2</sup>, and Rheal Towner<sup>2</sup> (<sup>1</sup>Redlands Community College, <sup>2</sup>Oklahoma Medical Research Foundation)

#### \*OKN RELIEVES OXIDATIVE STRESS INDUCED BY SEPSIS-ASSOCIATED ENCEPHALOPATHY

Introduction: Sepsis-associated encephalopathy (SAE) is an oxidative stress-related disease of the brain caused by the introduction of bacteria, and it causes an increased permeability of the blood brain barrier (BBB). Neuroinflammation can lead to cognitive impairment which is linked with age. Methods: Lipopolysaccharide (LPS) induced rat models were used to compare OKN treated, untreated, and saline injected negative controls. OKN is a spin trapping compound for reactive oxygen and nitrogen species that prevents further damage to tissue from free radicals. Various Magnetic Resonance Imaging (MRI) techniques such as contrast enhancement, MRI perfusion, and MR spectroscopy were used to scan the brain for signs of a compromised BBB, vascular alterations, and metabolite changes, respectively. Results: MRI contrast enhancement showed that the OKN treatment was lowering MRI intensity within the cortex, hippocampus, thalamus, and peri-rhinal cortex. LPS-injected untreated rats had a greater MRI intensity post-contrast injection for week one. It was observed with MR spectroscopy that metabolites within the brain had also stabilized with the OKN treatment indicating the reduction of damaged tissue. Low perfusion rates were examined during post-LPS injection of both week one and three, which signaled constriction of the vessels within the brain. Conclusion: We can conclude the BBB and vascularity is negatively affected long-term by LPS. SAE promotes neuroinflammation which affects BBB permeability, vasoconstriction, and decreased brain metabolites. OKN proved to be an effective treatment with the rat models for minimizing the effects of SAE within the brain. Funding: OK-INBRE and NIH RO1NS092454.

**Mercer, Arissa** (Southwestern Oklahoma State University)

#### \*THE EFFECTS OF BEHAVIORAL INTERACTIONS ON THE FEEDING HABITS OF AMPHIPOD SPECIES

Species that live in the same area and use the same resources present a paradox for understanding species coexistence. Many mechanisms can promote species

coexistence in these situations. Competition may provide insight into species co-occurrence patterns because it affects presence and abundance of different species. This study examines two undescribed amphipod species in the genus *Hyaella* and how competition affects food preferences. Feeding habits of amphipods may be altered by interactions with other amphipod species by exploitation (one species being better at finding and using resources) or interference (physically excluding competitors). The species studied are cryptic species—species that are difficult to tell apart—and differ in just a few characteristics. Despite size distribution overlap, species B has a larger mean body size than species C. They also differ in pigmentation patterns, species B being spotted and species C, striped. Species B is a better competitor and species C is better at avoiding predators. However, we do not know the mechanism by which species B outcompetes species C. We hypothesized that species C will use high-quality algae patches when alone and that species B at high densities will interfere with species C, displacing it from the high-quality algae patch. Species were placed together in arenas containing foraging patches varying in algal content. We tested if species C patch use changed based on interactions with species B at different densities. Our results showed a pattern of species C reducing use of high-quality food patches when a high density of species B was present. Species C used the high-quality patches more often than low quality patches. This result was significant in the high-density treatment. This study gives insight into the role of interspecific competition in shaping resource use and patterns of coexistence.

**Montalva, Jose** and Leah S. Dudley (East Central University)

#### NATIVE BEE BIODIVERSITY, OKA'YANALI AND PONTOTOC RIDGE PRESERVES

There are around 20,000 species of bees in the world, many of which play an important role in the pollination of plant species. It has been estimated that 90% of flowering plants must be pollinated by some biotic vector and approximately 75% of these plants serve humans directly as food. From this point of view, bees, besides being a key element in ecological dynamics, also play a preponderant role in human society and economy. For example without crop pollination by bees, possible food shortage with subsequent societal domino effects could result. Additionally, studies of ecosystem service estimate that bees provide valuable monetary input, supporting our economy. Here, we collect and identify local bee species. Our study sites, located in South-Central Oklahoma, were Nature Conservancy preserves: Oka'Yanahli and Pontotoc Ridge. Collections, using entomological nets, were made twice weekly from May to September 2018. Specimens were subsequently pinned and labeled with collection information. To date we have identified 44 bee species belonging to 5 different families. Out of over 500 collected samples, half have been identified to species, thus, we expect that our list is presently conservative. Knowing the diversity of our pollinators could and should be fundamental. Oklahoma is poorly represented relative to the rest of the United States and this list helps to rectify this deficiency. Our lack of local knowledge is alarming, especially given the honey bee *Apis mellifera* colony collapse disorder and an inability to quantify

the decrease in native pollinators. Management plans that consider native bees, landscape ecology and environmentally friendly practices are encouraged.

**Muse, McKayla**, Kayley Pate, Gabriel Rucci, and Nikki Seagraves (University of Central Oklahoma)

\*ANALYSIS OF PROLIFERATION AND MIGRATION IN PHENYLALANINE, RETINOIC ACID, AND 4-DIETHYLAMINOBENZALDEHYDE TREATED CELLS

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], and brain and growth restriction when a mother with Phenylketonuria [PKU] does not control her dietary intake of Phenylalanine [Phe]. However, the mechanisms responsible for Phe-induced CVMs are poorly understood. Our lab has preliminary evidence that high levels of Phe could inhibit Retinoic Acid [RA] signaling, which typically promotes the expression of genes such as proliferation, migration, and differentiation. Proliferation and migration of the neural crest cells are important in formation of the outflow tract (OFT) and aortic arch arteries (AAA). We hypothesize that Phe inhibits migration and proliferation, which may contribute to the defects seen in MPKU. We also looked at the effects of exposure to RA and 4-diethylaminobenzaldehyde [DEAB], a known RA inhibitor. We conducted in-vitro proliferation and migration assays on several cell types to determine if proliferation and migration was affected by Phe, RA, and DEAB exposure. Images were analyzed with ImageJ and GraphPad Prism. Present research suggests that Phe exposure causes a significant decrease in proliferation of cells. It is also shown that RA increases or does not affect proliferation, and that DEAB decreases cell proliferation. In this way, Phe is similar to DEAB, which suggests that it also acts as an RA inhibitor. This could contribute to the CVMs observed in MPKU. The results of migration studies showed that Phe acted similar to DEAB, where the rate of migration was slower than that of RA, which is known to increase migration. This suggests that Phe may act as an inhibitor of migration. This is significant because it eludes to a potential mechanism that Phe could affect RA signaling, thus resulting in the types of defects observed in human MPKU.

**Neeley, Tessa** (East Central University)

\*VERIFYING GRAD'S 13TH MOMENT APPROXIMATION

In the late 1940's Harold Grad published an academic paper titled "On the Kinetic Theory of Rarefied Gases". In this paper Grad outlines a method to write a probability density function for particles in phase space known as the Grad 13th Moment Approximation. This approximation is based on a Maxwellian distribution. However, by examining the book Tensor Methods of Statistics by Peter McCullagh, we see it is possible to write an analogous probability function using a Gaussian distribution. McCullagh uses Edgeworth expansion (which uses a Gaussian distribution) to draw similar conclusions to Grad. We attempt to verify the validity of Grad's approximation by using Parseval's Relation.

**Nelson, Benjamin**, Savannah Beakley, Brittney Conn, Emma Maritz, Sierra Posey, and Karen L. Wozniak (Oklahoma State University)

\*\*ANTIFUNGAL ACTIVITY OF DENDRITIC CELL LYOSOMAL PROTEINS AGAINST *CRYPTOCOCCUS NEOFORMANS*

Cryptococcal meningitis is caused by the opportunistic fungal pathogen *Cryptococcus neoformans*. This infection causes over 275,000 yearly deaths among those living with HIV/AIDS or otherwise immunocompromised. Resolution of the disease and clearance of *C. neoformans* requires uptake, antigen processing, and presentation to stimulate an adaptive immune response. Initial interactions of the fungus begin in the lung and occur with phagocytes, such as macrophages and dendritic cells (DCs), with destruction of the pathogen inside a mature lysosome. We have previously shown that purified DC lysosomal extracts can kill *C. neoformans* in vitro including purified proteins from the extracts such as cathepsin B. Furthermore, several individual molecular weight fractions of the extract also have anti-cryptococcal activity leading us to hypothesize that there are other proteins from the lysosomal extract that kill the pathogen. Mass spectrometry data revealed more than 3000 proteins in the extract, and we chose proteins with potential antimicrobial activity to test against *C. neoformans*. Cryptococcal inhibition assays were conducted with ten of the proteins and four were found to inhibit cryptococcal growth: nitric oxide synthase trafficking (NOSTRIN), human neutrophil elastase (HNE), myeloperoxidase (MPO), and metalloproteinase 25 (MMP25). Cytotoxicity assays using a murine macrophage cell line (J774A.1) showed low cytotoxic effects at the doses required for antifungal activity. These data show that proteins identified from the DC lysosomal extract have antifungal activity and could potentially be used therapeutically. Future studies will examine the mechanism of antifungal activity and will also assess the potential for each to be used therapeutically in a model of cryptococcal infection.

**O'Neill, Tara** and Ahmed Alshaihsalama (Collin College)

\*THE FISH THAT ISN'T: IS THERE FOOD FRAUD IN THE SUSHI INDUSTRY?

Food fraud is any activity that misrepresents the food you buy and includes mislabeling or substituting one species of fish for another. Recent findings have revealed that such mislabeling and fraudulent substitutions rather widespread in the fish industry. The purpose of this study was to research if this mislabelling is practiced in the North Dallas commercial venues.

**Parker, Kendra** (East Central University)

\*\*PROOFS THROUGH THE AGES

Proofs from antiquity to the twentieth century have changed in structure and form but the ultimate goal of unassailable knowledge remains. Three main examples are used to develop this point: Euclid's Bridge of Asses, the Fundamental Theorem of Calculus, and Godel's Incompleteness Theorem. Other proofs such as Pythagorean Theorem and continuity applied to Zeno's Paradox will be examined. Through from different eras and different branches of mathematics Euclid, Newton and Godel have much in common. They made

amazing discoveries and history making breakthroughs in their field. Their contributions are infinite.

**Pathak, Prabhat Kumar**, Shuxia Peng, and Junpeng Deng (Oklahoma State University)

**\*\*STRUCTURE OF POXVIRUS A6 PROTEIN REVEALS A MECHANISM FOR STABILIZING OPEN-ENDED CRESCENT MEMBRANE**

Cellular membranes are maintained as closed compartments, broken up only transiently during membrane reorganization or lipid transportation. However, open-ended membranes, likely derived from scissions of the endoplasmic reticulum, persist in vaccinia virus-infected cells during the assembly of the viral envelope. A group of viral membrane assembly proteins (VMAPs) were identified as essential for this process. To understand the mechanism of VMAPs, we determined the 2.2-Å crystal structure of the largest member, named A6, which is a soluble protein with two distinct domains. The structure of A6 displays a novel protein fold composed mainly of alpha helices. The larger C-terminal domain forms a unique cage that encloses multiple glycerophospholipids with a lipid bilayer-like configuration. The smaller N-terminal domain does not bind lipid but negatively affects lipid binding by A6. Mutations of key hydrophobic residues lining the lipid-binding cage disrupt lipid binding and abolish viral replication. Our results reveal a protein modality for enclosing the lipid bilayer and provide molecular insight into a viral machinery involved in generating and/or stabilizing open-ended membranes.

**Patnaik, Sikta** (Oklahoma State University)

**\*\*STRUCTURAL ANALYSIS OF THE E3 PROTEIN FROM VACCINIA VIRUS**

E3 protein from vaccinia virus is a key host-range protein, which suppresses the innate antiviral immune response of the infected cells. In response to the viral infection, Protein Kinase R (PKR) of the host cell initiates the immune response via a cascade of reactions. E3 attacks PKR to suppress the immune response but the mechanism of PKR inhibition by E3 is unknown. Interaction studies of PKR and E3 suggested a physical interaction between the kinase domain of PKR and E3 that has biochemical relevance. Further analysis of the interaction revealed that the inhibition of PKR activation by the E3 protein does not correlate with the dsRNA binding ability of PKR or E3.

**Prophet, Jennifer** and Zach Jones (Southwestern Oklahoma State University)

**\*TIMING OF AVIAN MIGRATION ONSET THROUGH THE OKLAHOMA CITY AREA 1995-2017 USING NOAA WEATHER DATA**

Timing and duration of avian migration patterns may be linked to large-scale climate patterns and reflect long-term shifts in average regional temperatures. The National Centers for Environmental Information (NCEI) provides a publicly-available archive of National Oceanic and Atmospheric Administration (NOAA) weather radar data scans occurring every ten minutes dating back to 1995. Our primary data of interest are 1) the measure of reflectivity: the amount of power returning to a radar after hitting water, and 2) radial velocity: the

movement of water relative to radar position. Aerial density and flight direction will be collected annually and compared to global and regional temperatures to determine effects on seasonal migrations. For the current study, we used KTLX (Oklahoma City) weather radar data to determine time, duration, intensity and direction of fall avian migration. Our analysis currently includes data from 1995-2017, with the fall migrations beginning in September and the spring migrations beginning in March. The global average temperature change over this time range was 2.358°C. More data will be analyzed within this range in order to develop more accurate results regarding the effect of temperature change on fall and spring migratory onset. In addition to migratory information, we have observed fine lines of insects caught in outflow air masses as well as regular sunrise takeoffs of waterfowl overwintering near Lake Hefner. We also have encountered radar signals caused by wind turbines, but this has not noticeably affected avian flight behavior or our data collection on the scale and altitudes being sampled.

**Pustina, Uendi** and Dwight L. Myers (East Central University)

**\*COMPUTATIONAL STUDY OF VOLATILE ALUMINUM HYDROXIDE**

Reactivity and compatibility of oxides with other materials and with each other plays a significant role in choice of materials for developing Thermal Barrier Coatings (TBCs) or Environmental Barrier Coatings (EBCs) for use in combustion environments. We are performing a computational study of the gas phase molecule aluminum hydroxide. The ultimate goal of this study is to obtain a reliable value of the enthalpy of formation of aluminum(III) hydroxide. The software we are using is the GAMESS ab initio package. Presently we are to the stage of optimizing the geometry of the molecule. Results to date will be presented.

**Reding, Reid** and Jonathan Hunt (Oklahoma Christian University)

**\*EFFECT OF STORAGE TEMPERATURE ON BIOACTIVITY OF A COMMERCIAL *SACCHAROMYCES BOULARDII* PROBIOTIC FORMULATION**

The commercial probiotic industry is rapidly expanding and gaining traction among the common population. Many people see advertisements for probiotics making claims that they will contribute to better overall health and potentially help restore health after dealing with gastrointestinal issues, etc. Probiotics have helped many infections such as *C. difficile* and ulcerative colitis by restoring the gut microbiota after antibiotics have killed many of the beneficial microorganisms. Probiotics do this by competing with the pathogen for resources necessary to sustain life and by interfering with important metabolic pathway steps. Furthermore, the probiotics promote a healthy gut flora in general, which helps to eliminate symptoms caused by pathogenic species. Many manufacturing companies state that the probiotics need to be stored in a refrigerated area to maintain their efficacy; however, often times consumers forget to keep them in a refrigerator. The experiment at hand measured the viability of a commercial preparation of *Saccharomyces boulardii* probiotic under varied storage conditions (4°C, 23°C, and 30°C) once a week over a four-week period to assess the necessity of specific storage conditions.

**Reed, Brandon,** Whitney Bohannon, and Lindsey Long (Oklahoma Christian University)

**\*RAD4 IS REQUIRED FOR MAINTENANCE OF DNA INTEGRITY**

UV radiation exposure can cause bulky adducts (such as cross-linked thymine bases) in DNA. The cell uses the Nucleotide Excision Repair (NER) pathway as the primary mechanism to repair these adducts. Normally, these adducts are repaired; however, when not repaired, these adducts lead to diseases such as xeroderma pigmentosum and an increased risk of skin cancer. In *S. cerevisiae*, RAD4 encodes for protein that is a component of the NER pathway. Rad4 forms a heterodimer complex with Rad23 to form Nuclear Excision Repair Factor 2 (NEF2), which is necessary for the recognition of the damaged bases. After DNA damage recognition, the remaining repair machinery is recruited to remove the bulky adduct and restore the DNA integrity. It has been shown that deletion of the RAD4 gene in *S. cerevisiae* leads to increased UV sensitivity when compared to the wild type (wt) strain, due to the inability of the machinery to recognize and repair lesions caused by UV radiation. We also showed that the  $\Delta$ rad4 strain showed significantly lower viability after UV radiation exposure when compared to the wt strain that was exposed to the same UV dosage. To investigate as to whether this reduction in viability was related to unrepaired DNA mutations, we used a reverse mutation canavanine assay to calculate DNA mutation frequency.  $\Delta$ rad4 cells showed a higher DNA mutation frequency when compared to the wild type strain. These results indicate that RAD4 is critical for DNA damage repair after UV exposure, and failure to repair DNA damage results in DNA mutation and cell death.

**Renner, Abbey** and Madison Snow (Oklahoma City University)

**\*BACTERIOPHAGE--A POTENTIAL REPLACEMENT FOR ANTIBIOTICS**

Bacteriophage (“phage”) are viruses that infect and replicate in bacteria. Since phage infect bacteria very specifically, there is considerable interest in exploiting them as antibacterial agents. Phage are found in natural environments such as soil, where there are complex bacterial ecosystems. We extracted phage from nutrient-rich soil by mixing the soil with a buffer (SM buffer), and filtering out the large particles and living organisms using a 0.45 micron syringe filtration system. Phage were added to cultured bacteria (*Bacillus cereus* or *Serratia marcesens*), mixed with top agar, and plated on LB-media. After incubation, the plates were checked for zones of clearing (“plaques”), indicating the presence of specific bacteriophage.

**Rice, Stanley A.** (Southeastern Oklahoma State University)

**CLIMATIC CORRELATES OF EARLIER BUDBURST IN OKLAHOMA DECIDUOUS TREES, 2006-2017**

As reported last year, deciduous trees in south central Oklahoma have had earlier spring budburst dates, in some cases dramatically earlier, from 2006 to 2017. I have investigated possible climatic correlates of earlier budburst. During the twelve-year period, overall temperatures have not increased, nor have average winter temperatures. Average February temperatures, however, have greatly

increased during that time. All of these tree species open their buds during or soon after February. Budburst dates of these trees are correlated with February temperatures. This same pattern, a correlation with April temperatures, has been reported from Illinois. Phenology of biological events may be correlated with just one of the many components that make up climate.

**Rice, Stanley A.** (Southeastern Oklahoma State University)

**CREATIONIST AND NON-CREATIONIST STUDENTS IN SOME COLLEGE BIOLOGY CLASSES DO NOT DIFFER IN BIBLICAL KNOWLEDGE**

In my general biology and evolution classes in 2016 and 2017, more students (52) accepted either non-theistic or theistic evolution than accepted old-earth or young-earth creationism (39). Fewer evolution students accepted creationism than general biology students. Not surprisingly, these Oklahoma students included many more creationists than in biology classes in other parts of the nation and world. I classified students into Christian (who said the Bible was inspired) and non-Christian. Surprisingly, even many non-Christian students believed in a worldwide Flood (32%). Many of the Christian students were unaware of biologically-relevant Biblical passages that may contradict the religious beliefs of their churches. Examples include an Old Testament prohibition on eating shellfish (only 32% knew this), a command to let the land rest from agricultural production (62%), and that land ownership reverts to its original owner every 50 years (30%). Their Biblical knowledge did not greatly exceed that of non-Christians (25%, 48%, and 32% respectively). The non-Christians knew that the Old Testament considered attacking women and causing a miscarriage to be a property crime rather than manslaughter (43% Christian, 84% non-Christian). Conservative religious beliefs relevant to science appear to be indoctrinated rather than intelligently concluded.

**Robles-Fernandez, Lizbeth,** Fernando Salazar-Salas, and Dwight L. Myers (East Central University)

**\*HIGH TEMPERATURE STUDY OF THE REACTION OF SILICON, TITANIUM AND YTTRIUM OXIDES**

Reactions of titanium oxide and silicon dioxide are of importance in materials used in high temperature environments. There are questions concerning the reaction of titanium dioxide (rutile) with silica. Both are important as potential materials or reaction products in thermal barrier coatings or environmental barrier coatings in combustion environments, as for example in gas turbine technologies. The extent of reaction and temperature range are important questions to answer for this chemical system. Experimental evidence would suggest that a third cation is necessary to have compound formation. Presently we are exploring the reaction of titanium dioxide with silicon dioxide with small amounts of yttrium oxide being added. Mixtures of the three oxides are being subjected to heatings at various temperatures from ca. 1200-1500°C. Samples are characterized before and after heating by means of X-ray diffraction and diffuse reflectance infrared spectroscopy, transmission infrared spectroscopy, and/or diffuse reflectance UV/Vis spectroscopy as appropriate. Results to date will be presented.

**Russell, Scott D.** and Preston R. Larson (Samuel Roberts Noble Microscopy Laboratory, University of Oklahoma)

#### ACQUISITION OF A DIRECT ELECTRON DE-12 CAMERA FOR OU'S JEOL 2010F TRANSMISSION ELECTRON MICROSCOPE

Field emission transmission electron microscopes (FE-TEMs) reach the edge of resolving atomic shells and provide a means of discerning stable nano structures. The FE-TEM's capability to see such structures is limited by: (1) the stability of high voltage cascades and electronics throughout the microscope, (2) resolution of the lenses, (3) interaction of intrinsic and extrinsic electronic and magnetic fields, (4) stability of the specimen to withstand high energy beams, (5) ability of the camera to record images at suitable resolution and (6) myriad other potential problems. FE-TEMs are limited by the weakest link in this high-performance instrument. After resolving a chronic electronic decay that rendered the microscope incapable of performing to expected standards for a number of years, the performance of our microscope proved high enough, once the defect was corrected, that we resolved to improve the performance of the microscope by installing a camera that would be capable of allowing higher performance and stability. In order to record electrons more precisely and sensitively, we decided to give our JEOL 2010F a "new set of eyes" in the form of a direct electron camera. Until recently, the microscope had an aging Gatan 1-megapixel CCD camera (with burn defects from a past owner), a film camera and a Polaroid camera for scanning transmission electron microscopy (STEM), each of which is severely limited in resolving objects that are near the resolution of the microscope. We chose a Direct Electron DE-12 camera, which uses high performance CMOS arrays to record a 4K by 3K display that allows us to more sensitively localize the true track of the electrons that pass through the specimen with fewer electrons needed to obtain a stable image.

**Sims, Joseph,** Leah Dudley, and Jose Montalva (East Central University)

#### \**BOMBUS PENNSYLVANICUS* AND *BOMBUS GRISEOCOLLIS* VISITATION AND ABUNDANCE ACROSS SITES DIFFERING IN WATER AVAILABILITY

Bumble bees, key pollinators of crops and wildflowers across the country and essential for a healthy environment, are declining at an alarming rate; several previously common species are now absent from much of their former territory. *Bombus pensylvanicus* (American bumblebee) and *Bombus griseocollis* (Brown belted bumblebee) abundances were compared across four individual sites varying in water availability from wet to dry: HD, PS, SW, BF. *Bombus* flower visitation was noted and then were captured with mesh nets and immediately preserved in pre-filled vials of 40% ethanol. In the lab, the *Bombus* were classified based on caste, gender and species. Results showed that *Bombus* prefer wet sites compared to dry sites. *Bombus pensylvanicus* were abundant regardless of site; *B. griseocollis*, however, was not captured at the HD site and overall had low numbers. Visitation differed between *Bombus* with *B. pensylvanicus* captured mostly visiting *Lythrum alatum* (Winged loosestrife) and *B. griseocollis* mostly captured while visiting *Cirsium texanum* (Pink thistle). In addition, *B. pensylvanicus* was overall more abundant and generalistic than *B. griseocollis*. The other *Bombus* species reported for the state were not captured

during the census period. Further surveys are necessary to confirm local extinction of the other *Bombus* species. Consideration should be given to conserve *B. griseocollis*.

**Sloan, Ryan**<sup>1</sup>, W.J. Reddig<sup>1</sup>, Divya Jaroni<sup>2</sup>, and Earl L. Blewett<sup>1</sup> (<sup>1</sup>Oklahoma State University-Center for Health Sciences, <sup>2</sup>Oklahoma State University-College of Agriculture)

#### CLONING, SEQUENCING, AND IDENTIFICATION OF PHAGE P13, AN UNKNOWN *SALMONELLA* OR EHEC (ENTEROHEMORRHAGIC *E. COLI*) BACTERIOPHAGE

Bacteriophage have been isolated from the environment that specifically infect bacteria responsible for food poisoning. These bacterial viruses kill *Salmonella* and Enterohemorrhagic *E. coli* and may be useful in the food industry to reduce bacterial food contamination. We cloned and sequenced fragments of genomic DNA from one of these bacteriophage, P13. Bioinformatic analyses showed this bacterial virus was most similar to phage from the *Yersinia* genus and not that similar to phage from the *Salmonella* group.

**Smith, Claire**<sup>1</sup>, Francisca M. Mendez-Harclerode<sup>2</sup>, Gloria M. Caddell<sup>1</sup>, Chad B. King<sup>1</sup>, and Michelle L. Haynie<sup>1</sup> (<sup>1</sup>University of Central Oklahoma, <sup>2</sup>Bethel College)

#### \*ESTABLISHMENT OF A LONG-TERM SMALL MAMMAL MARK-RECAPTURE STUDY AT UCO'S SELMAN LIVING LAB TO IDENTIFY FACTORS IMPACTING POPULATION AND COMMUNITY PERSISTENCE

The purpose of this project is to monitor changes in rodent populations and communities over multiple generations and to determine what factors affect how the populations and communities change over time. In March of 2018, a permanent trapping web was established at the University of Central Oklahoma's Selman Living Lab (SLL). Two additional permanent webs were established in June of 2018. The SLL is located in the gypsum hills of Woodward County in western Oklahoma. Surveys of the three webs will be conducted for three nights, four times a year, for a minimum of five years. During each trip, each animal collected will be processed as follows: species identification; determination of sex, age, body condition, and reproductive condition; standard measurements; marking for permanent identification (done through tattooing); and ear punches (for DNA). In addition to animal data, climate and vegetation data will be obtained during every trip. To date, two trapping surveys have been conducted. In March 2018, a single web was surveyed and 14 individuals representing six species were collected. In June 2018, all three webs were surveyed and 25 individuals (22 new, 3 recaptures) representing eight species were collected. A third survey will be conducted in October. Starting in 2019, surveys will be conducted in January, March, June, and October. The animal, climate, and vegetation data will be used to build mathematical models that can be used to determine which factors have the largest impact on population and community persistence.



**Snow, Madison A.**<sup>1</sup>, Tesa J. Martin<sup>1</sup>, Kyle J. Copp<sup>1</sup>, Huyen Tran<sup>2</sup>, Tephillah Jeyaraj-Powell, and Laurie Kauffman<sup>1</sup> (<sup>1</sup>Oklahoma City University, <sup>2</sup>University of Central Oklahoma)

**\*USE OF ENCLOSURE SPACE BY LONG-TAILED MACAQUES AT MINDY'S MEMORY PRIMATE SANCTUARY**

In terms of behavioral benefits, naturalistic environments have shown promise for primates in captivity. With the goal of providing data which supports the use of particular structures to stimulate and encourage natural behaviors, we investigated how 11 male long-tailed macaques (*Macaca fascicularis*), located at Mindy's Memory Primate Sanctuary in Newcastle, Oklahoma, use their enclosure space. Data was collected on usage of the ground, platform, firehose, stumps, warm house, and enclosure wall space. We also compared the patterns of enclosure space use of former pet macaques versus former lab macaques. Data collection included use of a video camera to record and narrate for 15 minute periods. Our initial hypothesis was that there would be no differences in use of enclosure space or structures. We found no significant difference between former pet and lab monkeys with use of a 2x7 mixed ANOVA. However, there was significant difference in structure use although not as we had hypothesized. We will communicate our results with the primary sanctuary in order to provide an environment which will enhance the macaque's overall health.

**Starzak, Nikolai** and Mark Fishbein (Oklahoma State University)

**\*\*THE FLORA OF BEAVER COUNTY: WESTERN GREAT PLAINS VASCULAR PLANTS OF THE OKLAHOMA PANHANDLE**

Beaver County has the lowest plant collections per area of any county in western Oklahoma, and is located in the understudied shortgrass/mixed-grass prairies of the western Great Plains. The region has a history of high disturbance with a low proportion of protected areas and high risk for climate change induced drought. Through field work and herbarium specimen study, I am documenting a complete list of the vascular plants of the county. 530 plant species have been recorded in Beaver County, and I have developed methods for identifying knowledge gaps in the known flora. Using soil, geological, and hydrological maps, I identified intersections of unique environments as candidates for sampling in the 4700 km<sup>2</sup> county. By querying data from other shortgrass and mixed-grass prairie floras, I produced a checklist of likely plants in Beaver County. Thus far, I have documented 36 new county records in one field season. Preliminary Beaver County floristic data was used to test community assembly hypotheses, by analyzing the phylogenetic relatedness of four communities on a hydrological scale from river bottom to upland dune. The relatedness of exotic species in each community was also analyzed to infer how species naturalize along a western Great Plains hydrological gradient and inform management of an economically important and anthropogenically disturbed region.

**Stein, Theresa** (Southwestern Oklahoma State University)

**\*AN EXPLORATION OF HOW DRAINAGE, STREAM ORDER AND SEASON AFFECT ABUNDANCE OF TWO CADDISFLY FAMILIES (HYDROPTILIDAE AND LEPTOCERIDAE) IN SOUTHEAST OKLAHOMA STREAMS**

Since rivers are constantly flowing, one area of the stream is different than the area above and below it. Hence, the organisms present may change in abundance from one area to another because of changes in the stream habitat. Even though the areas are separated, what happens upstream can affect the areas downstream thus keeping it connected. We collected adult caddisflies in the Kiamichi River and Little River drainages using manned and unmanned light traps during both spring and summer months. We focused on two families: Leptoceridae and Hydroptilidae. We collected hydroptilids at all sites and leptocerids at most sites. We used these data to explore if stream order, season and drainage affected the abundance of these two families of caddisflies. We discovered that the abundance of both caddisfly families changed from season to season with lower numbers in the summer. We did not find differences in abundance between stream orders and we did not find differences in abundance between drainages. We conclude that seasonal changes, such as flow and temperature differences can impact the abundance of these caddisfly families.

**Tiwari, Apar** and Dipesh Shrestha (East Central University)

**\*GROUP TESTING FOR HIGH CLOSENESS CENTRALITY VERTICES IN NETWORKS**

Networks created from real-world data contains some inaccuracies or noise due to small changes in the network structure. As a result these changes can significantly affect the analysis results. In this research, we are implementing Group testing based algorithm for networks to find the most important nodes in a network. And then implement efficient software for network analysis (ESSENS) provided by our mentor to run experiments on very large networks that were not previously used. We measure noise and how noise affects these networks by continuously relabeling networks to analyse changes in results and run iterative group testing.

**Triplitt, Carl J** (University of Science and Arts of Oklahoma)

**\*VERTEX-MINIMAL PLANAR GRAPHS WITH A PRESCRIBED AUTOMORPHISM GROUPS**

In 1939, Frucht proved that for any finite group  $SG$ , there exists a graph  $\Gamma$  such that the automorphism group of  $\Gamma$  is isomorphic to  $SG$ . Naturally, this result gave rise to numerous extremal problems in graph theory. For instance, vertex-minimal graphs with a prescribed automorphism group are the subject of prior research by numerous authors. In this talk, we will discuss our proof of a conjecture made in 1980 by Maruševič on the order of vertex-minimal planar graphs with cyclic symmetry of even order. Our proof completes a theorem giving the order of all vertex-minimal planar graphs with cyclic automorphism groups. We will also discuss further our proof regarding the order of vertex-minimal planar graphs with dihedral symmetry.

**Voth, Abigail<sup>1</sup>**, Lindsey Long<sup>1</sup>, and Courtney Montgomery<sup>2</sup> (<sup>1</sup>Oklahoma Christian University, <sup>2</sup>Oklahoma Medical Research Foundation)

**\*MOLECULAR STUDIES OF A SARCOIDOSIS-ASSOCIATED GENETIC VARIANT IN ANXA11**

Sarcoidosis is a disease characterized by the formation of granulomas, which are small accumulations of immune cells in tissues throughout the body. These granulomas can interfere with the tissues or organ function if they continue to grow and are not resolved. The cause of the formation of these granulomas in sarcoidosis patients is unknown. Because the disease often shows a pattern of genetic inheritance, it is likely that variations found in sarcoid patients' DNA may predispose these individuals to developing the disease. A Genome Wide Association Search (GWAS) was performed on both unaffected individuals and sarcoidosis patients to identify variations that were observed with high frequency in sarcoidosis patients, when compared to control groups. Of particular interest, a variant in Annexin 11 (ANXA11) was found in high frequency in sarcoidosis patients. Because Annexin 11 plays a role in promoting cell death, inactivation of Annexin 11 could potentially result in the persistence and growth of the granulomas. We measured cell death in Jurkat T cells overexpressing the wild-type or mutant ANXA11 by flow cytometry using a stain that marked apoptotic cells. We observed that cells overexpressing wild-type ANXA11 had an increase in apoptosis. Conversely, cells overexpressing mutant ANXA11 showed a decrease in apoptosis when compared to the control. These results suggest that the mutant form of ANXA11 renders ANXA11 nonfunctional, causing cells to be more resistant to apoptosis. Consequently, this could contribute to the persistence of granulomas in some sarcoidosis patients. It is unlikely that this mutation in ANXA11 is the sole cause of the sarcoidosis, but it may be a contributing factor. Future experiments involve repeating the assays with additional controls and analyzing the effect of ANXA11 in primary blood monocyte cells.

**Vrla, Sarah C.** (University of Central Oklahoma)

**\*\*THE USE OF UV-REFLECTIVE MORPHOLOGY IN ARCTIC CAMOUFLAGE**

The use of camouflage to reduce the risk of predator detection is a key contributor to the fitness of an organism. Many examples of species changing color to enable them to reduce detection in changing environments can be found in nature. One example is species having a white winter coat to reduce the risk of detection in snowy environments. This phenomenon has been observed in various mammalian species (*Alopex lagopus*, *Mustela* spp., *Lepus* spp., etc.) as well as birds (*Ptarmagin* spp.). However, this phenomenon, as well as the use of white pelage/plumage year-round in snowy environments, has only been investigated in the visible spectrum. Snow has been shown to reflect between approximately 15-95% ultraviolet (UV) light, depending on the amount of soil contamination present. Therefore, there is some evolutionary pressure for species in arctic environments to camouflage in the UV spectrum as well. In this study, I used UV photography to qualitatively assess the presence of UV reflective morphology of the winter coats of color changing species. This method incorporates the UV-reflective standard Fluorion to visually

discriminate between UV-reflectivity and absorption while also allowing us to estimate the degree of reflectivity observed. My findings show UV reflective morphology is used as a mechanism of camouflage in arctic environments.

**Ward, Dylan** (Northeastern State University)

**\*OSMOADAPTIVE STRATEGIES IN HALOPHILIC PROTISTS**

Halophilic protists living in hypersaline environments require specialized strategies to regulate osmosis. The organisms will equilibrate their cells by absorbing salts like potassium (called salt-in strategy), or by accumulating large amounts of organic solutes (called osmolyte-in strategy). Molecular adaptations of only two obligately halophilic protists, *Halocafeteria seosinensis* and *Pharyngomonas kirbyi* have been studied thus far. Their predicted cytoplasmic proteomes show increased hydrophilicity compared to other marine and non-marine protists. In this research, isolated DNA of the halophilic protist *Bicosoeca kenaiensis*, isolated from Great Salt Lake in Utah, was investigated and compared to the salt-in and salt-out strategies of the known organisms to determine its own. Through the use of isoelectric focusing gel electrophoresis, large amounts of proteins in acidic solution indicate the possibility of the use of the salt-in osmoadaptive strategy.

**Well, Andrew** (East Central University)

**SPIRALING INTO CONTROL: REGULAR POLYGONS**

We examine regular nested polygons sharing identical side lengths. The vertices of these polygons trace out curves in two dimensions. We find polar equations to describe these curves.

**Wilkins, Sidney<sup>1</sup>**, Amy Giemza<sup>1</sup>, Lindsey J. Long<sup>1</sup>, and the Genomics Education Partnership (GEP)<sup>2</sup> (<sup>1</sup>Oklahoma Christian University, <sup>2</sup>Washington University in St. Louis)

**\*ANNOTATION OF THE ATPSYNBETA GENE IN *DROSOPHILA ELEGANS***

Because genome organization plays a role in regulation of gene expression, providing context to genome sequencing through gene annotation is crucial. Annotation involves determining the precise locations of coding regions and regulatory elements of genes. Because functionally important DNA sequences are typically conserved throughout evolution, this project aims to fully annotate all genes of particular *Drosophila* species to identify patterns of genome organization. Because the genome of *Drosophila melanogaster* is completely annotated it serves as a reference genome in the annotation of other *Drosophila* species. Within genes, there is a point where the first DNA nucleotide is transcribed into an RNA molecule. This position is called the transcription start site (TSS). Our goal in precisely identifying gene TSSs is to compare conserved regulatory motifs both upstream and downstream of the TSS between genes with different expression patterns to glean information about transcription regulation. This project focused on annotation of the TSS of the *D. melanogaster* ortholog ATP synthase beta subunit (ATPsynbeta) gene in *Drosophila elegans*. First, we identified the type of TSS that was present in *D. melanogaster* at this gene. Next,

the BLAST tool was used to find homology between the first exon of the ATPsynbeta gene of *D. melanogaster* to the DNA sequence surrounding ATPsynbeta ortholog in *D. elegans*. The genome browser, which displays bioinformatic data such as regions where there is high RNA-seq alignment and the locations of core promoter motifs surrounding the putative TSS, was then used to provide supporting evidence for the precise TSS in *D. elegans*. After analysis of several lines of evidence, we were able to identify, with high confidence, the TSS of ATPsynbeta in *D. elegans*. The information gathered from this project was submitted to the investigators at the GEP and will be analyzed along with other TSS data.

**Willaims, Karen** (East Central University)

#### REFLECTIONS AND ANALYSIS OF PEER REVIEW IN JUNIOR PHYSICS LAB

Peer review was implemented in Junior Physics Lab the last two semesters. The effectiveness of peer review on their scores on formal written lab reports will be examined. The class scores will be compared with non-peer review classes.

**Wilson, W. J.** (University of Central Oklahoma)

#### A SEMICLASSICAL DERIVATION OF THE ANOMALOUS MAGNETIC MOMENT OF THE ELECTRON

A semiclassical method is used to obtain the magnetic moment of the electron. The method is accessible to students in a modern physics course and obtains the magnetic moment through the Schwinger term which agrees with the experimental value to within 0.015%.

## OKLAHOMA ACADEMY OF SCIENCE

Established in 1909

“The purpose of the Academy shall be to stimulate scientific research; to promote fraternal relationship among those engaged in scientific work in Oklahoma; to diffuse among the citizens of the State a knowledge of the various disciplines of science; and to investigate and publicize the human, natural and educational resources of the State.” (Article 1, Section 2 OAS Constitution)

### Activities of the Academy

- Publishes *the Proceedings of the Oklahoma Academy of Science, Annals of the Oklahoma Academy of Science and Transactions of the Oklahoma Junior Academy of Science.*
- Hosts the Annual Technical Meeting for the presentation of scientific papers by both professional and collegiate scientists.
- Sponsors symposia on selected topics of timely and vital interest to the State and Nation.
- Arranges spring and fall field meetings in different biogeographic regions of the State.
- Coordinates and promotes the activities of the Oklahoma Junior Academy of Science.
- Supervises the activities of the Oklahoma Collegiate Academy of Science.
- Provides research grants and scholarship awards to outstanding proposals submitted by secondary school and undergraduate college students.
- Provides scientific consultation services to governmental and private agencies throughout the State.

## OKLAHOMA ACADEMY OF SCIENCE PRESIDENTS

|      |                           |      |                            |
|------|---------------------------|------|----------------------------|
| 1910 | H. L. Lane, OU            | 1961 | E. M. Hodnett, OSU         |
| 1911 | D. W. Othern, Okla. City  | 1962 | H. G. Barclay, TU          |
| 1912 | S. W. Reaves, OU          | 1963 | G. A. Moore, OSU           |
| 1913 | C. W. Shannon, OU         | 1964 | A. D. Buck, NOJC           |
| 1914 | No meeting                | 1965 | J. E. Webster, OSU         |
| 1915 | C. W. Shannon, OU         | 1966 | C. R. Williams, PU         |
| 1916 | C. N. Gould, OU           | 1967 | C. D. Riggs, OU            |
| 1917 | L. C. Raiford, ISU        | 1968 | E. A. Reynolds, SWSC       |
| 1918 | No meeting                | 1969 | L. V. Scott, OUHSC         |
| 1919 | No meeting                | 1970 | C. C. Carpenter, OU        |
| 1920 | M. M. Wickham, Norman     | 1971 | P. Buck, TU                |
| 1921 | A. F. Reiter, PU          | 1972 | W. A. Carter, ECSU         |
| 1922 | J. B. Thoburn, Okla. City | 1973 | C. J. Mankin, OU           |
| 1923 | R. O. Whinton, OAMC       | 1974 | N. N. Durham, OSU          |
| 1924 | S. Weidman, OU            | 1975 | B. Shirley, TU             |
| 1925 | (spring) C. E. Sanborn    | 1976 | G. W. Todd, OSU            |
| 1925 | (fall) H. L. Dodge, OU    | 1977 | D. E. Kizer, Noble Fdn     |
| 1926 | J. H. Could, OAMC         | 1978 | G. Odell, OSU              |
| 1927 | C. N. Gould, OU           | 1979 | R. Couch, ORU              |
| 1928 | O. M. Smith, OAMC         | 1980 | G. Wolgamott, SWOSU        |
| 1929 | A. Richards, OU           | 1981 | E. Rice, OU                |
| 1930 | L. Long, Okla. City       | 1982 | E. Grigsby, NSU            |
| 1931 | A. O. Weese, OU           | 1983 | J. Sokatch, OUHSC          |
| 1932 | H. Patterson, OAMC        | 1984 | M. Whitmore, OU            |
| 1933 | J. E. Knowles, PU         | 1985 | J. Black, OBU              |
| 1934 | F. G. Brooks, OCU         | 1986 | J. Wilhm, OSU              |
| 1935 | C. E. Decker, OU          | 1987 | M. K. Patterson, Noble Fdn |
| 1936 | H. J. Harper, OAMC        | 1988 | M. P. Carpenter, OU        |
| 1937 | B. D. Barclay, TU         | 1989 | K. E. Conway, OSU          |
| 1938 | C. M. Perry, OU           | 1991 | J. K. McPherson, OSU       |
| 1939 | H. D. Chase, TU           | 1993 | J. R. Estes, OU            |
| 1940 | G. L. Cross, OU           | 1994 | J. D. Tyler, CU            |
| 1941 | R. W. Jones, OAMC         | 1996 | C. Taylor, SEOSU           |
| 1942 | H. I. Featherly, OAMC     | 1998 | R. J. Tyrl, OSU            |
| 1943 | O. F. Evans, OU           | 2000 | D. Bass, UCO               |
| 1944 | V. G. Heller, OAMC        | 2002 | C. Clifford, NSU           |
| 1945 | J. R. Nielsen, OU         | 2004 | S. Young, SNU              |
| 1946 | O. C. Dermer, OAMC        | 2006 | S. Barber, OCU             |
| 1947 | J. T. Self, OU            | 2008 | U. Melcher, OSU            |
| 1948 | L. S. McLeod, TU          | 2010 | K. R. Hobson, OU           |
| 1949 | J. C. Shirley, PU         | 2012 | C. Clifford, NSU           |
| 1950 | H. Taylor, OCW            | 2014 | S. Rice, SEOSU             |
| 1951 | H. W. Larsh, OU           | 2016 | T. Conley, CU              |
| 1952 | V. B. Monnett, OAMC       | 2018 | A.K. Ryburn, OCU           |
| 1953 | S. P. Massie, LU          |      |                            |
| 1954 | A. N. Murray, TU          |      |                            |
| 1955 | R. E. Olson, OU           |      |                            |
| 1956 | A. M. Stebler, OAMC       |      |                            |
| 1957 | D. E. Howell, OAMC        |      |                            |
| 1958 | G. J. Goodman, OU         |      |                            |
| 1959 | E. Lucas, OU              |      |                            |
| 1960 | P. E. Smith, OUMS         |      |                            |



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