

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

**ROGERS STATE UNIVERSITY**

**PROGRAM SUMMARY**

**Thursday, 2 November 2017**

6:00 p.m. Executive Council Dinner/Meeting ..... Executive Board Room  
Dr. Carlyon Taylor Center (DCTC)

**Friday, 3 November 2017**

7:45 a.m. Registration for Technical Meeting ..... Common Area  
- 1:30 p.m. Baird Hall

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

Section A Biological Sciences – Botany ..... BH-202  
Section A Biological Sciences – Zoology ..... BH-202  
Section B Geology ..... BH-125  
Section C Physical Sciences ..... BH-123  
Section D Social Sciences ..... BH-121  
Section E Science Communication and Education ..... BH-Commons  
Section F Geography ..... BH-121  
Section G Applied Ecology and Conservation ..... BH-125  
Section H Microbiology ..... BH-133  
Section I Engineering Sciences ..... BH-127  
Section J Biochemistry and Biophysics ..... BH-129  
Section K Microscopy ..... BH-131  
Section L Mathematics ..... BH-125  
Section M Environmental Sciences ..... BH-123  
Section N Biomedical Sciences ..... BH-129

Special Tables ..... Common Area Baird Hall  
Refreshments ..... Common Area Baird Hall

**PROGRAM SUMMARY**

(Cont.)

**Section Business Meetings**

Section A: Biological Sciences (Zoology and Botany)..... 11:15-11:30, BH-202  
Section B Geology ..... 11:15-11:30, BH-127  
Section C Physical Sciences ..... 11:00-11:15, BH-123  
Section D Social Sciences..... 11:00-11:15, BH-121  
Section E Science Comm. and Edu..... 11:15-11:30, BH Common Area  
Section F Geography..... 11:15-11:30, BH-121  
Section G Applied Ecology and Conservation..... 11:00-11:15, BH-125  
Section H Microbiology..... 11:15-11:30, BH-133  
Section I Engineering Sciences..... 11:00-11:15, BH-127  
Section J Biochemistry and Biophysics ..... 11:15-11:30, BH-129  
Section K Microscopy..... TBD, BH-131  
Section L Mathematics, Stats, & Comp. Science..... 11:15-11:30, BH-125  
Section M Environmental Sciences ..... 11:15-11:30, BH-123  
Section N Biomedical Sciences ..... 11:15-11:30, BH-129

11:30 a.m. Academy Business Meeting.....BH-131  
All OAS members are encouraged to attend. Visitors are welcome.

12:00 p.m. ....Academy Luncheon & Speaker  
Ballroom B (DCTC)  
(Admission by ticket only)

**Mr. C. Michael Carolina**

Executive Director of OCAST

(Oklahoma Center for the Advancement of Science & Technology)

*“Competing in the Knowledge Economy –  
Oklahoma’s Innovation Model.”*

1:30 p.m. Poster Presentations ..... Common Area Baird Hall  
- 3:00 p.m. (Setup anytime before 1:30pm)

## LUNCHEON SPEAKER

### **C. Michael Carolina** **Executive Director, OCAST**

C. Michael Carolina is the executive director of the Oklahoma Center for the Advancement of Science and Technology (OCAST)—the state’s agency for technology development, technology transfer and technology commercialization. He is the agency’s third executive director in its 30-year history. Prior to joining OCAST in 2005, he held management and executive positions with the Western Electric Company, AT&T and Lucent Technologies in Oklahoma City, Morristown, NJ and Basking Ridge, NJ. From his (AT&T) NJ base, Carolina was involved in engineering, interfacing with (AT&T) Bell Laboratories on new product design and introduction, technology transfer and joint venture operations in Europe, Asia and Latin America. His management and leadership positions included engineering director at the 40-acre AT&T/Lucent Technologies facility in Oklahoma City. In 2001, he retired from AT&T/Lucent Technologies after a 25-year career.

Carolina grew up in Wewoka, Oklahoma and holds a B.S. in biological science from Oklahoma State University and M.S. in environmental science (School of Civil Engineering and Environmental Science) from the University of Oklahoma. While with AT&T, he completed the company’s Executive Development Program in Princeton, NJ. He serves on several boards and advisory committees including the Oklahoma Medical Research Foundation (OMRF); the Governor’s Science and Technology Council; the Board of Visitors for the OU Gallogly College of Engineering; the Dean’s Strategic Advisory Council at Oklahoma State University’s College of Engineering, Architecture and Technology; and the Engineering Advisory Council, Department of Engineering and Physics at the University of Central Oklahoma. He is a member of Leadership Oklahoma City, Class 26 (2007).

In February of 2016, Carolina was selected as a (2016) member of the University of Oklahoma’s Gallogly College of Engineering Distinguished Graduates Society. He and his wife, Sharon, reside in Edmond.

## 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
RSU Student -	free
Luncheon tickets (if available) -	\$20.00

**2017 and 2018 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 \$35. *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 in the Common Area of Baird Hall.

## **SPECIAL PANEL DISCUSSION**

**--NOTES--**

### **DEVELOPING SKILLS FOR SUCCESSFUL SUBMISSION OF MANUSCRIPTS FOR PUBLICATION**

10:00-10:45, Room 121

Sheila Strawn, Editor of *Oklahoma Native Plant Record*, will lead a panel discussion on how to improve success rates for researchers submitting articles for publication. Authors, reviewers, and editors are encouraged to participate and share their perspectives, as well as publication experiences and advice for improving manuscripts before and within the submission process.

## **SPECIAL THANKS**

Dr. Larry Rice, President of Rogers State University

Dr. Jerry Bowen, RSU Department of Biology, OAS Meeting Coordinator

Sodexo

## **UPCOMING MEETINGS**

2018 Fall Field Meeting, tba

2018 Annual Technical Meeting on November 9 at Southwestern Oklahoma State University

**SECTION A: BIOLOGICAL SCIENCES – BOTANY  
BH-202**

**Section Chair: Chad King  
University of Central Oklahoma**

- 9:15 \*\*VARIATION OF INTERNODE CELLULAR ARCHITECTURE IN *PANICUM VIRGATUM* (SWITCHGRASS) DUE TO GENOTYPE AND ENVIRONMENT. David James Thomas (University of Oklahoma), Laura E. Bartley (University of Oklahoma), Tom Juenger (University of Texas at Austin), and Jason Bonnette (University of Texas at Austin).
- 9:30 \*RAISING AWARENESS FOR AN ENDANGERED SPECIES (THE SEASIDE ALDER) THROUGH PRODUCT MARKETING. Andrea Lashley and Stanley A. Rice (Southeastern Oklahoma State University).
- 9:45 A TWELVE-YEAR RECORD OF EARLIER BUDBURST IN OKLAHOMA DECIDUOUS TREES. Stanley A. Rice (Southeastern Oklahoma State University).
- 10:00 \*\*MONITORING STANDS OF GREEN ASH (*FRAXINUS PENNSYLVANICA*, MARSHALL) AT ARCADIA LAKE, OKLAHOMA COUNTY, OKLAHOMA.. Joe Buck and Chad King (University of Central Oklahoma).
- 10:15 PATTERNS OF HERBIVORE DAMAGE IN POST OAKS (*QUERCUS STELLATA*) IN SOUTHERN OKLAHOMA. Stanley A. Rice (Southeastern Oklahoma State University), Erica A. Corbett (Southeastern Oklahoma State University), and Sarah N. Henry (Oklahoma Medical Research Foundation).
- 10:30 \*RE-GROWTH AFTER FIRE IN A CROSS-TIMBERS FOREST IN OKLAHOMA. Haylee Story, Sonya Ross, Stanley A. Rice (Southeastern Oklahoma State University).
- 10:45 EVOLUTION AT THE TIPS: *ASCLEPIAS* PHYLOGENOMICS AND NEW PERSPECTIVES ON LEAF SURFACES. Mark Fishbein (Oklahoma State University), Shannon C. K. Straub, Julien Boutte (Hobart and William Smith Colleges), Aaron Liston (Oregon State University), Richard C. Cronn (USDA Forest Service), and Kimberley Hansen (Oregon State University).
- 11:00 FLORA OF OKLAHOMA INC. (Annual Meeting). Adam Ryburn (Oklahoma City University).

\* Undergraduate \*\* Graduate

**SECTION A: BIOLOGICAL SCIENCES – ZOOLOGY  
BH-202**

**Section Vice-Chair: Michael Husak  
Cameron University**

- 8:30 \*STATUS OF THE TEXAS KANGAROO RAT (*DIPDOMYS ELATOR*) IN OKLAHOMA. Addison G. Allen, Brandi S. Coyner, Janet K. Braun, and Michael A. Mares (Sam Noble Oklahoma Museum of Natural History).
- 8:45 \*TEMPERATURE REGULATES FORAGING BEHAVIOR IN THE RED HARVESTER ANT, *POGONOMYRMEX BARBATUS*. Anna Parakevopoulos, Karl Roeder, and Diane Roeder (Cameron University).
- 9:00 \*\*LONG-TERM PERSISTENCE AND EVOLUTIONARY DIVERGENCE OF A MARINE FISH POPULATION WITH A VERY SMALL EFFECTIVE POPULATION SIZE. Victor Andreev (Oklahoma State University), Mikhail Fokin (Zoological Institute, Russian Academy of Science), Nikolai Mugue (Russian Federal Research Institute of Fisheries and Oceanography), and Petr Strelkov (St. Petersburg State University).

Posters

- Poster 1 CONVERSION OF THE OKLAHOMA COLLECTION OF GENOMIC RESOURCES FROM ULTRA-COLD TO LIQUID NITROGEN STORAGE. Brandi S. Coyner, Addison G. Allen, Cameron D. Siler, and Janet K. Braun (Sam Noble Oklahoma Museum of Natural History).
- Poster 6 \*VARIATION IN CHILL COMA RECOVERY TIMES IN MALE AND FEMALE YELLOW-FACED BUMBLE-BEES (*BOMBUS VOSNESENSKII*). Laura E. Jardine (Oklahoma City University), K. Jeannet Oyen (University of Wyoming), Zach Parsons (University of Wyoming), James P. Strange (USDA Agricultural Research Service), & Michael E. Dillon (University of Wyoming).
- Poster 7 \*DIVERSITY OF RIFFLE FISHES IN THE UPPER BLUE RIVER, OKLAHOMA. Jonathan R. Lucas (East Central University).

\* Undergraduate \*\* Graduate

**SECTION B: GEOLOGY  
BH-125**

**Section Chair: Kevin Blackwood  
East Central University**

- 10:15 \*\*ANALYSIS OF TRAVERTINE DEPOSITION ALONG THE BLUE RIVER, JOHNSTON COUNTY, OKLAHOMA. Kevin Blackwood, Camille Schlegel, Stacy Gantt-Blackwood, and Corky Corcoran (East Central University).

**SECTION C: PHYSICAL SCIENCES  
BH-123**

**Section Chair: Karen Williams  
East Central University**

- 8:30 USING ULTRASOUND TO ANALYZE CALIBRATED ABSORBERS. Karen Williams (East Central University).
- 8:45 DARK MATTER AT THE SUB-ATOMIC PARTICLE LEVEL. Weldon Wilson (University of Central Oklahoma).
- 9:00 \*THE EFFECTS OF TEMPERATURE ON THE ATTENUATION COEFFICIENT OF ULTRASOUND. Maranda Robin Clymer (East Central University).
- 9:15 \*SOFTBALL BAT PERFORMANCE AFTER CONTACT WITH SOFTBALL. Breecia Crawford (East Central University).
- 9:45 \*WRITING A VELOCITY DENSITY FUNCTION WITH EDGEWORTH EXPANSION. Matthew Henry (East Central University).
- 10:00 \*NONLINEAR HUMAN POPULATION GROWTH MODELING - LOWER BIAS. Chris Fickess (University of Central Oklahoma).
- 10:15 \*NONLINEAR HUMAN POPULATION GROWTH MODELING - UPPER BIAS. Cole Prather (University of Central Oklahoma).

Posters

- Poster 2 COMPUTATIONAL INVESTIGATIONS OF BROMINE OXIDES. Daniel M. McInnes and Aljan Ranjit (East Central University)
- Poster 8 \*HIGH TEMPERATURE SYNTHESIS OF TITANITE. Austin Walker and Dwight L. Myers (East Central University).

**SECTION D: SOCIAL SCIENCES  
BH-121**

**Section Chair: Tom Hancock  
University of Central Oklahoma**

- 8:30 \*\*EVALUATION OF THE INTERROGATION DECISION-  
MAKING MODEL. Blake Nesmith and Thomas Hancock (University  
of Central Oklahoma).
- 8:45 \*\*THE ROLE OF INTEREST AND MOTIVATION. Cassandra L.  
Olmstead, Thomas Hancock, Cayla M. Checorski, and Cassidy  
McKnight. (University of Central Oklahoma)
- 9:00 \*\*NON-CONSCIOUS MIMICRY AND ITS EFFECT ON RAPPORT  
AND RECALL. Fulani Petties and Robert D. Mather (University of  
Central Oklahoma).
- 9:15 \*\*TESTING FOR AUTOMATIC BIAS TO SHOOT BLACKS AND  
LATINOS DURING WEAPON IDENTIFICATION.. Justin D.  
Durham and Robert D. Mather (University of Central Oklahoma).
- 9:45 \*ENHANCING STUDENT LEARNING USING COGNITIVE  
SCIENCE. Shi Rui Yeoh, Tiara Travis, Paul Cook, Samuel Lawrence,  
and Nesreen Alsbou (University of Central Oklahoma).

Posters

- Poster 9 \*SEXUAL ASSAULT AND THE LONGEVITY OF  
RELATIONSHIPS. Jaely Deleon and Robert D. Mather (University  
of Central Oklahoma).
- Poster 10 \*CHILDREN'S PERCEPTION OF THREATS. Leila Mazkoori and  
Robert D. Mather (University of Central Oklahoma).
- Poster 11 \*EFFECTS OF MUSIC LYRICS ON NARCISSISM SCORES.  
Morgan Nicoll and Robert D. Mather (University of Central  
Oklahoma).

**SECTION E: SCIENCE COMMUNICATION & EDUCATION**

Posters

- Poster 12 \*VISUALIZING BIOART: A SCIENTIFIC, EDUCATIONAL,  
AND ARTISTIC INTERPRETATION OF BIOMOLECULES.  
Darby M Heard and Alisha D Howard (East Central University).

**SECTION G: APPLIED ECOLOGY & CONSERVATION  
BH-125**

**Section Chair: Richard Butler  
Seminole Public Schools**

- 10:30 \*\*LEARNING FROM THE RECENT PAST: MODELLING PRESENT SUITABILITY OF CROSS TIMBERS. William Hammond (Oklahoma State University), Justin Dee (Oklahoma State University), Monica Papeş (University of Tennessee-Knoxville), Stephen Hallgren (Oklahoma State University), and Henry Adams (Oklahoma State University).
- 10:45 \*\*COASTAL MIGRATION OF THE BLACK LAND CRAB ON GRAND CAYMAN ISLAND. Kinsey Tedford and David Bass (University of Central Oklahoma).

**SECTION H: MICROBIOLOGY  
BH-133**

**Section Chair: April Nesbit  
East Central University**

- 8:30 \*\*CULTIVATION-INDEPENDENT MEASURES OF MYXOBACTERIA GLOBAL DIVERSITY AND DISTRIBUTION. Brian Bill (University of Oklahoma).
- 8:45 \*\*NATURAL PRODUCT MINING OF THE MAMMALIAN MICROBIOME. Emily N. Junkins (University of Oklahoma).
- 9:00 \*\*A PUTATIVE PHYTASE, CARP, IS DIFFERENTIALLY REGULATED BY MULTIPLE PROMOTERS AND PLAYS AN IMPORTANT ROLE IN CA<sup>2+</sup> RESPONSE OF *PSEUDOMONAS AERUGINOSA*. Michelle King (Oklahoma State University), Mariette Barbier (West Virginia University), and Marianna A. Patrauchan (Oklahoma State University).
- 9:15 \*COMPREHENSIVE ANALYSIS OF BIOACTIVITY IN PROBIOTICS. Reid J. Reding, Brandon S. Reed, and Jeffrey McCormack (Oklahoma Christian University).
- 9:30 \*CULTIVATION OF FASTIDIOUS ANAEROBIC ORGANISMS FROM THE EQUINE GUT MICROBIOME USING THE ICHIP DEVICE FOR NON-TRADITIONAL CULTIVATION. Shaylin Daji, Nisha Patel, and Paul Lawson (University of Oklahoma).
- 9:45 BREAK
- 10:00 \*CULTURE DEPENDENT APPROACH TO ISOLATION OF ANTIBIOTIC-PRODUCING ACTINOBACTERIA RECOVERED FROM THE GREAT SALT PLAINS OF OKLAHOMA. Sara A. Alexander, Nisha B. Patel, and Paul A. Lawson (University of Oklahoma).
- 10:15 \*GENERATING AN IMPROVED COMPLIMENTED STRAIN FOR THE PUTATIVE CA<sup>2+</sup>-BINDING PROTEIN CARP AND INDUCING POINT MUTATIONS FOR CA<sup>2+</sup>-BINDING AFFINITY STUDIES. Daniel McLeod, Michelle King, and Marianna Patrauchan (Oklahoma State University).
- 10:30 \*MOLECULAR CHARACTERIZATION OF FOODBORNE PLANT PATHOGENS IMPORTED FROM CENTRAL AMERICA. Matt Broge, J Grimm, C Soden, K Karki, C Biles, A Howard, and B Bruton (East Central University).

## SECTION H: MICROBIOLOGY

Continued

10:45 \**PROTEINIPHILUM ALASKENSIS* SP. NOV., ISOLATED FROM ALASKAN PETROLEUM PIPELINE EFFLUENT. John Aric Peterson, Crystal Nicole Johnson, and Paul Lawson (University of Oklahoma).

### Posters

Poster 13 \*ISOLATION AND CHARACTERIZATION OF *ALTERNARIA* SPP. FROM MELONS IMPORTED FROM MEXICO.. Jacob Grimm, Erin Dempsey, Matt Broge, and Charlie Biles (East Central University).

Poster 14 \*EVALUATION OF THE BLUE RIVER FOR PRESENCE OF *CAMPYLOBACTER JEJUNI*. Gunner Parent and April Nesbit (East Central University).

Poster 15 \*IMPORTED SPECIES OF PATHOGENIC *FUSARIUM* SPECIES FROM CENTRAL AMERICA DIFFER FROM *FUSARIUM* SPECIES IN OKLAHOMA. Cierra Soden, Matt Broge, Alisha Howard, Benny Burton, and Charles Biles (East Central University).

Poster 23 \*ELEVATED CALCIUM INCREASES RHAMNOLIPID PRODUCTION IN *PSEUDOMONAS AERUGINOSA*. Mandy Truelock, Michelle King, and Mariana Patrauchan (Oklahoma State University).

Poster 24 \*UTILIZING *GALLERIA MELLONELLA* TO TEST THE VIRULENCE OF *PSEUDOMONAS AERUGINOSA*. Leah Kafer, Michelle King, and Marianna Patrauchan (Oklahoma State University).

## SECTION I: ENGINEERING SCIENCES

BH-127

**Section Chair: Nesreen Alsbou**  
**University of Central Oklahoma**

8:30 \*SMART PARKING MOBILITY MODELING. Mohammed Alhashem, Mohamed Rishad Abdul Samad, Min Bo Sim, and Nesreen Alsbou (University of Central Oklahoma).

8:45 \*A SMART STREET LIGHTING SYSTEM USING SOLAR ENERGY. Shi Rui Yeoh, Samuel Ka Hei Chan, and Nesreen Alsbou (University of Central Oklahoma).

9:00 \*ARTIK CLOUD-BASED SMART PARKING SYSTEM FOR MINIMUM PARKING DELAYS. Mohamed Afify and Nesreen Alsbou (University of Central Oklahoma).

9:15 \*DYNAMIC RESPIRATORY PHANTOM. Amjad Barghouthi, Mohamed Afify and Nesreen Alsbou (University of Central Oklahoma).

9:45 \*PROBING MECHANICAL TENSION IN ENGINEERED DERMAL-EQUIVALENT TISSUE. Ting Wei Law, Erin Drewke, Melville Vaughan, and Gang Xu (University of Central Oklahoma).

10:00 \*RADIO WAVES TO ELECTRICITY: TESLA'S BLUEPRINT. Sean K.C. Jesse (East Central University).

10:15 \*ENLARGING SMART TRASH CAN. Mohamed Rishad Abdul Samad, Mohammed Alhashem, Alaeddin Abuabed, and Nesreen Alsbou (University of Central Oklahoma).

10:30 \*\*DEVELOPMENT OF CONTINUOUS FUNCTIONAL ELECTSPUN NANOFIBER YARN WITH CURVED ELECTRODE USING POLYCAPROLACTONE (PCL). Bipin Pallipparambil Varghese, Alaeddin Abuabed, and Morshed Khandaker (University of Central Oklahoma).

10:45 \*\*EFFECT OF MICRO-GROOVING ON THE STRESS SHIELDING OF TITANIUM: EXPERIMENTAL AND NUMERICAL INVESTIGATION. Harsha Jamadagni, H. Karaman, Fatih Karpat, D. Lokesh Raj, and M. Khandaker (University of Central Oklahoma).



**SECTION J: BIOCHEMISTRY AND BIOPHYSICS  
BH-129**

**Section Chair: John Gustafson  
Oklahoma State University**

- 8:30 **\*\*A CLOSER LOOK AT A TEA TREE OIL-SELECTED *STAPHYLOCOCCUS AUREUS* SMALL COLONY VARIANT.** Nathaniel J. Torres, Steven D. Hartson, Janet Rogers, Khadija A. Abdulhafid, and John E. Gustafson (Oklahoma State University).
- 8:45 **\*\*DRAFT GENOME AND ANTIBIOTIC SUSCEPTIBILITY PROFILES OF TWO ISOGENIC *ELIZABETHKINGIA* STRAINS ISOLATED FROM HORSES IN OKLAHOMA.** William L. Johnson (Oklahoma State University), Nathaniel J. Torres (Oklahoma State University), Scot E. Dowd (Mr. DNA - Molecular Research LP), Ainsley Nicholson (Centers for Disease Control and Prevention), Akilesh Ramachandran (Oklahoma State University).
- 9:00 **\*MTORC1 IS NECESSARY AND SUFFICIENT TO STIMULATE GLS ACTIVITY IN OSTEOBLASTS.** Joshua C. Hardage (East Central University and Duke University), Yilin Yu (Duke University), and Courtney M. Karner (Duke University).

Posters

- Poster 17 **\*DESIGN AND SYNTHESIS OF COLLYBOLIDE PROBES FOR DEVELOPING NON-ADDICTIVE PAINKILLERS.** Rhonda H. Weigand (Redlands Community College), Nicholas P. Massaro (University of Oklahoma), and Indrajeet Sharma (University of Oklahoma).

**SECTION K: MICROSCOPY  
BH-131**

**Section Chair: Matt Lundwall  
Oklahoma Microscopy Society**

- 8:30 **\*THE ROLE OF NF-Y AND HY5 IN FLORAL DEVELOPMENT.** Andrew Willoughby and Ben Holt (University of Oklahoma)
- 8:50 **\*\*SYNTHESIS AND CHARACTERIZATION OF IRON OXIDE NANORODS.** Menuka Adhikari and Yolanda Vasquez (Oklahoma State University).
- 9:10 **ELECTRON MICROSCOPY.** Matt Lundwall (Oklahoma Microscopy Society, Past-President 2016-2017).
- 9:40 **\*\*ZINC OXIDE AND ZINC OXIDE/ZINC SULFIDE NANORODS COATED COTTON AS A FLAME RETARDANT MATERIAL.** Yi-Wei Wang, Ruiqing Shen, Qingsheng Wang, and Yolanda Vasquez (Oklahoma State University).
- 10:00 **\*\*INTRA-EPIDERMAL NERVE FIBER RECONSTRUCTION AND QUANTIFICATION IN THREE-DIMENSIONS.** Michael Anderson and Kenneth Miller (Oklahoma State University Center for Health Sciences).

\*\* Timpano Award Contestant

**SECTION L: MATHEMATICS, COMPUTER SCIENCE, AND  
STATISTICS  
BH-125**

**Section Chair: Andrew Wells  
East Central University**

- 8:30 THE ENDLESS PATTERNS OF REGULAR POLYGONS. Andrew Wells (East Central University).
- 8:45 THE USE OF SMALL WIRES, GATES, AND CIRCUITS THAT DEFY QUANTUM FORCES TO PRESERVE NEWTONIAN PHYSICS. Patrick Harrington (Northeastern State University).
- 9:00 GRAPH CONSTRUCTION VIA SEIDEL SWITCHING. Michelle A. Lastrina (East Central University).
- 9:15 PRINCIPLE COMPONENT ANALYSIS: MAKING BIG DATA MANAGEABLE. Nicholas C. Jacob (East Central University).
- 9:30 \*UTILIZING XLSFORM AND FORM-HUB TO DIGITIZE THE DATA FOR PONTOTOC ANIMAL WELFARE SOCIETY. Billy Andrew (East Central University).
- 9:45 \*ZIKA: A GEOGRAPHICAL APPROACH TO MODELING. Leon Hamby, Amanda Kramer, and Kay Woodring (East Central University).

**SECTION M: ENVIRONMENTAL SCIENCES**

Posters

- Poster 18 \*EVALUATING IRON OXIDE NANOPARTICLE MOBILITY IN OKLAHOMA GROUNDWATER.. Kelsey H Anderson and Randall D Maples (East Central University).
- Poster 19 \*EVALUATION OF WATER BUDGETS AS SURFACE WATER RESOURCE MANAGEMENT TOOLS FOR THE SUSTAINABLE STEWARDSHIP OF THE USAO HABITAT LOWER POND. Jaclyn McCasland (University of Science and Arts of Oklahoma).

**SECTION N: BIOMEDICAL SCIENCES  
BH-129**

**Section Chair: Nikki Seagraves  
University of Central Oklahoma**

- 9:30 \*\*ANALYSIS OF TRANSCRIPTOMICS: IMPLICATIONS OF DIFFERENTIALLY EXPRESSED GENES IN AN AVIAN MODEL OF MATERNAL PKU. Jamie N Watson and Nikki J Seagraves.
- 9:45 \*EXTRACELLULAR VESICLES TARGET T-CELL FUNCTION IN B CELL CHRONIC LYMPHOCYTIC LEUKEMIA. Whitney Hall (Oklahoma Christian University), H. Mahmud (Stephenson Cancer Center), G. Maiti (Stephenson Cancer Center), A. Mille (Stephenson Cancer Center) and A. Ghosh (Stephenson Cancer Center, University of Oklahoma Health Sciences Center).
- 10:00 \*ANALYSIS OF PROLIFERATION IN PHENYLALANINE, RETINOIC ACID, AND 4-DIETHYLAMINOBENZALDEHYDE TREATED CELLS. Kayley Pate and Nikki J Seagraves (University of Central Oklahoma).
- 10:15 \*THE EFFECT OF PHENYLALANINE, RETINOIC ACID, AND DIETHYLAMINOBENZALDEHYDE. McKayla Muse, Gabriel Rucci, and Nikki J Seagraves (University of Central Oklahoma).
- 10:30 \*GLYCATED CHITOSAN INHIBITS HUMAN DERMAL FIBROBLAST-MEDIATED COMPACTION AND CONTRACTION OF COLLAGEN LATTICES. Tu Doan (University of Central Oklahoma).
- 10:45 \*CHARACTERIZING EARLY DEVELOPMENTAL DEFECTS IN AN AVIAN MODEL OF MATERNAL PKU. Jailene Canales, Morgan Massey, Austin McDonough, and Nikki J Seagraves (University of Central Oklahoma).

Posters

- Poster 3 CLONING, SEQUENCING, AND IDENTIFICATION OF UNKNOWN *SALMONELLA* OR EHEC (ENTEROHEMORRHAGIC *E. COLI*) BACTERIOPHAGE 3. Raina Hahn (Bixby High School), Riley Pritzlaff (Owasso High School), B.J. Reddig (Oklahoma State University – Center for Health Sciences), P.K. Litt (Oklahoma State University), and E.L. Blewett (Oklahoma State University – Center for Health Sciences).

**SECTION N: BIOMEDICAL SCIENCES**

Posters (continued)

- Poster 4 CLONING, SEQUENCING, AND IDENTIFICATION OF PHAGE 7, AN UNKNOWN *SALMONELLA* OR ENTEROHEMORRHAGIC *E. COLI* (EHEC) BACTERIOPHAGE. Riley Pritzlaff (Owasso High School), Raina Hahn (Bixby High School), B.J. Reddig (Oklahoma State University – Center for Health Sciences), P.K. Litt (Oklahoma State University), and E.L. Blewett (Oklahoma State University – Center for Health Sciences).
- Poster 20 \*REDEFINING HTLV AND HOST PROTEIN-PROMOTER INTERACTIONS IN MAGNETIC PROMOTER PULL-DOWN ASSAYS. Conner Anderson and Alisha Howard (East Central University).
- Poster 21 \*THE BACTERIAL DIVERSITY FOUND IN THE RHIZOSPHERE BETWEEN SOIL SAMPLES TAKEN FROM ECOLOGICAL NICHE USING 16S RRNA GENES. Ashley Kennedy, Brian Forrester, and Diana Spencer (Tulsa Community College).
- Poster 22 \*GAIT ANALYSIS OF A HEALTHY MAN WITH TRANSTIBIAL LIMB LOSS AND A MATCHED CONTROL TO CHARACTERIZE AND COMPARE GAIT PERFORMANCE. Hanna Landry (Redlands Community College), K. Veirs (University of Oklahoma Health Sciences Center), J. Day (University of Oklahoma Health Sciences Center), and C. Dionne (University of Oklahoma Health Sciences Center)

## ABSTRACTS

(sorted by presenter's last name)

**Abernethy, Casey** and Sung Kun Kim (Northeastern State University)

### \*TEMPERATURE EFFECT OF IONIC LIQUID ON ENZYMES

Thermal stability of the enzyme metallo-beta-lactamase, Bla2, was tested with ionic liquids, which all contain the water-miscible, aprotic 1-ethyl-3-methylimidazolium cation, [emim]. The presence of ionic liquids, in general, enhanced the stability of Bla2 at high temperature (90 oC). The difference in the thermal stability depended on the counter anions. Two ionic liquids were particularly promising as a thermal stabilizer, i.e., [emim][BF4] and [emim][TF] with about 80 % remaining enzymatic activity. To understand the interaction between [emim] and Bla2, we used the Autodock program. The docking at the active site of Bla2 showed that [emim] fits into the active site with a weak binding energy. The binding may make some contributions to enzymatic inhibition, but more contributions may be made to stabilize the protein by holding the structure at high temperature. All of these results suggest that the ionic liquids, [emim][BF4] and [emim][TF], should be good candidates for long-term storage under high temperature conditions.

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

### \*ARTIK CLOUD-BASED SMART PARKING SYSTEM FOR MINIMUM PARKING DELAYS

People usually waste plenty of time inside parking lots searching for empty parking spots. To overcome this problem, we are working on designing an ARTIK Cloud Based System that will be initially implemented in one parking lot at the University of Central Oklahoma. The research goal is to make the faculties and students life easier by guiding them to empty parking spots with a minimum delay.

**Alexander, Sara**, Nisha B. Patel, and Paul A. Lawson (University of Oklahoma)

### \*CULTURE DEPENDENT APPROACH TO ISOLATION OF ANTIBIOTIC-PRODUCING ACTINOBACTERIA RECOVERED FROM THE GREAT SALT PLAINS OF OKLAHOMA

More than a hundred thousand people die as a result of antibiotic resistant infections each year. Despite drug resistance continuing to pose a significant threat to global health, the discovery of new antibiotics is still insufficient. With more than half of clinically relevant antibiotics being derived from natural products, bioprospecting secondary metabolites produced by microorganisms remains an important tool to combat the consequences of resistance. Actinobacteria are a diverse and ubiquitous phylum of Gram-stain-positive, G+C rich bacteria that are known to produce thousands of secondary metabolites exhibiting antimicrobial activity, including clinically relevant drugs

such as Vancomycin and Tetracycline. However, only an estimated 10% of potential antimicrobial metabolites have been successfully isolated. Streptomyces is the most notable antibiotic producing Actinobacteria, however less common Actinobacteria, such as Actinoplanes and Amycolatopsis, as well as halophilic strains of Actinobacteria, have also been shown to be promising sources. In this investigation, samples obtained from the Great Salt Plains in Cherokee, Oklahoma were investigated for antimicrobial activity using a culture dependent approach. Samples were chemically and physically pre-treated and grown on specialized isolation media, such as humic acid vitamin agar, in order to select for Actinobacteria. Isolates recovered were identified using 16S rRNA gene sequencing, with those showing

**Allen, Addison**, Brandi S. Coyner, Janet K. Braun, and Michael A. Mares (Sam Noble Oklahoma Museum of Natural History)

### \*STATUS OF THE TEXAS KANGAROO RAT (*DIPODOMYS ELATOR*) IN OKLAHOMA

The Texas kangaroo rat (*Dipodomys elator*) was described in 1894 (Merriam 1894) based on specimens collected in northern Texas. In 1905, two specimens were collected in southwestern Oklahoma near Chattanooga, Comanche County (Bailey 1905). These two specimens remained the only recorded specimens of the species in Oklahoma until 1969, when a specimen was reported from just north of the Red River in extreme southern Cotton County (Baumgardner 1987). A number of researchers (e.g., Baumgardner 1987; Moss and Mehlich-Cifelli 1990; Stangl et al. 1992) have suggested the species has been extirpated from Oklahoma, but relatively little effort has been made to determine its presence in the state. In 2014, we began a 3-year project to extensively survey 7 counties in southwestern Oklahoma, targeting specific habitats known to be associated with *D. elator*. Upon completion, this survey will provide the most extensive documentation to date for the presence (or absence) of this species of greatest conservation need in the state and will provide critical information to state and federal agencies regarding the conservation status of the species.

**Anderson, Conner** and Alisha Howard (East Central University)

### \*REDEFINING HTLV AND HOST PROTEIN-PROMOTER INTERACTIONS IN MAGNETIC PROMOTER PULL-DOWN ASSAYS

Human T-cell leukemia virus type 1 (HTLV-1) is the oldest known human retrovirus affecting over 20 million people worldwide. HTLV-1 is a causative agent of Adult T-cell leukemia/lymphoma (ATL/L) for which there is currently no known cure for. This project investigated amplification of the viral promoter utilizing different polymerase samples (*Thermus aquaticus*). The amplicon was also designed to attach to magnetic beads upstream of the HTLV-1 promoter region facilitating protein-DNA interaction identifications. Various polymerase samples and assorted buffers were obtained through several companies or generated in house (ECU). A plasmid, coding for Taq polymerase was

transformed into BL21 (DE3) pLysS and expressed. Expression was monitored with SDS-PAGE and purified similar to established protocols. Amplification in controlled PCRs allowed comparison of reaction efficiencies. An analysis of various streptavidin coated magnetic beads was also conducted. Results indicated that Taq-Pol expressed in the lab was suitable for promoter amplification via PCR, making large volume production feasible. Results of the project also indicated that magnetic beads vary significantly in binding efficiency to the biotinylated promoter region. Based on the results, streptavidin coated magnetic beads provide the ability to isolate the promoter region of HTLV via magnetic pull-down assays. Utilizing this method will help us to understand viral-host protein-DNA and protein-protein interactions. These interactions are suspected to play an important role in the activation of the HTLV retrovirus in humans. Understanding of this process helps our comprehension, not only of viral life cycle and patient prognosis, but overall understanding of dynamic regulation in endogenous genes as well.

**Anderson, Kelsey** and Randall D Maples (East Central University)

**\*EVALUATING IRON OXIDE NANOPARTICLE MOBILITY IN OKLAHOMA GROUNDWATER.**

Engineered nanoparticles are used in many applications due to their unique physical and chemical properties. For example, nanomaterials are used as corrosion resistant lightweight coatings and have numerous other uses as well. Iron oxide nanoparticles (IONs) have been used in environmental remediation (nanoremediation) due to their low synthesis cost and their strong adsorption of heavy metals and organic contaminants. Many questions remain regarding the long-term fate of these engineered particles and their possible harmful effects on ecosystems and humans. Will these particles continue to travel through the groundwater, does the salinity of the water affect what happens, will the particles aggregate out in soil or on the surfaces of stone or rocks or will something else occur? To investigate these questions, we assembled a column packed with 0.1  $\mu\text{m}$  silica glass beads to simulate soil and rock in a natural environment. We prepared simulated groundwater using common water ions Na, Mg, Ca, Fe, Cl and so forth according to USGS standards for fresh water as well as slightly, moderately, and heavy saline water. We also used de-chlorinated tap water and water from Big Sandy Creek. We measured the percent recovery of IONs using visible-ultraviolet and fluorescence spectroscopy.

**Andreev, Victor** (Oklahoma State University), Mikhail Fokin (Zoological Institute, Russian Academy of Science), Nikolai Mugue (Russian Federal Research Institute of Fisheries and Oceanography), and Petr Strelkov (St. Petersburg State University)

**\*\*LONG-TERM PERSISTENCE AND EVOLUTIONARY DIVERGENCE OF A MARINE FISH POPULATION WITH A VERY SMALL EFFECTIVE POPULATION SIZE**

The effective population size is a crucial characteristic of numerically small populations, positively correlated with their ability to persist in a changing environment and to evolve. Information about the lower bounds of effective population size of natural populations is both theoretically interesting and practically important. We studied Kildin cod, an isolated population of Atlantic cod *Gadus morhua* from marine lake, comparing it with the parental Barents Sea population by a set of 20 microsatellite and protein loci. Overall, the genetic variability in Kildin cod was low (mean allelic richness and heterozygosity: Kildin cod 1.6, 0.26; marine cod 11.6, 0.73). We detected a single locus, the glucose-6-phosphate isomerase-1, which demonstrated a unique variation in the lake. At this locus, about 75 % of the lacustrine fishes carried an allele not found in the sea. The obtained genetic estimates of  $N_e$  of Kildin cod (less than a hundred) were much smaller than what is considered as the smallest  $N_e$  of a viable population. At the same time, Kildin cod is known to be healthy and productive. Based on the results of bottleneck tests, we hypothesize that Kildin cod has experienced founder-flush dynamics that lead to loss of genetic variation during the founder phase and purging of genetic load and the rise of adaptation during flush phase.

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

**\*UTILIZING XLSFORM AND FORM-HUB TO DIGITIZE THE DATA FOR PONTOTOC ANIMAL WELFARE SOCIETY**

Pontotoc Animal Welfare Society (PAWS) in Ada Oklahoma still collects data on paper. With a PetSmart grant and help from McNair Scholars Program, we have obtained equipment and developed specialized form for data entry utilizing an open source program, Form-Hub. Creating a working and efficient form will be the key in making this a viable methodology for data transfer and entry for PAWS, other humane societies and small businesses. For non-profit organizations and small businesses, it is crucial to have the least operating cost as possible. For Form-Hub to work there needs to be a server, these are expensive devices. To keep it on a small budget, ideas like using Amazon Web services and the use of a micro-server like a Raspberry PI 3 B will be explored.

**Barghouthi, Amjad**, Mohamed Afify and Nesreen Alsbou (University of Central Oklahoma)

#### \*DYNAMIC RESPIRATORY PHANTOM

In our research we are planning to design a 3D platform and a lung phantom that has different cancerous tumor sizes. The goal is to use the phantom to detect motion artifacts in CT. We will be using motion modeling to model the respiration motion of the patients which produces image artifacts during the scanning process. These artifacts cause erroneous calculations of the volume and characterization of the tumors and critical structures in treatment planning and variations in the CT-number values and the associated densities of the associated tissues. This phantom will be made of foam substance that mimics lung tissue and gel like substance that has a density equivalent to water and normal tissues. This phantom system is compatible and safe to be used under x-rays of the cancer treatment devices. The design and reconstruction of this phantom system is still in process. This phantom moves in 3D using three mobile platforms that are driven by different stepper motors which will allow complicated motions that can simulate the lung movement. When we complete our project and research successfully we will be investigating image artifacts induced by phantom motion and develop techniques that enhance CT image quality thereby allowing radiotherapy planners to accurately calculate the volume of the tumors and reduce the uncertainty in CT numbers

**Bill, Brian** (University of Oklahoma)

#### \*\*CULTIVATION-INDEPENDENT MEASURES OF MYXOBACTERIA GLOBAL DIVERSITY AND DISTRIBUTION

Members of the Myxococcales share a distinct lifestyle: vegetative cells grow in rippling swarms that degenerate into mounds as nutrients become scarce. As the cell density within the mounds increases, the cells aggregate to form macro structures called “fruiting bodies,” inside which a small proportion of cells develop into spores. Upon germination, the life cycle begins again. Furthermore, many Myxobacteria are predators and produce a diversity of secondary metabolites which serve the function of lysing prey cells. Current knowledge of the biogeography of Myxobacteria is based on the presence or absence of Myxobacteria across environments using cultivation-based approaches; however, these studies are limited by the high proportion of uncultivated groups of Myxobacteria. We studied the global distribution and relative abundance of Myxobacteria without the bias of cultivation by using culture-independent techniques. Approximately 81,000 publicly available 16S rRNA gene sequence libraries were compiled, clustered into OTUs using QIIME and the SILVA reference database, and classified into a consistent ontology describing the biome and each sample type. Myxobacteria were present in 20% of these 16S rRNA gene libraries. They were most diverse in tropical forests, semi-arid deserts, and agricultural-associated biomes, and from plant material, soil, the rhizosphere, and compost. The diversity followed a

traditional latitudinal gradient, with samples close to the equator being more diverse than towards the poles. In soil, the diversity of Myxobacteria was surprisingly high, with a median of 21 OTUs/sample and a maximum of 65 OTUs. Interestingly, these co-occurring OTUs showed a high degree of evenness in each sample. High co-occurrence frequencies and genomic and functional variation among Myxobacteria supports the idea that members of the order Myxococcales have evolved mechanisms to partition a shared environment into niches.

**Blackwood, Kevin**, Camille Schlegel, Stacy Gantt-Blackwood, and Corky Corcoran (East Central University)

#### \*\*ANALYSIS OF TRAVERTINE DEPOSITION ALONG THE BLUE RIVER, JOHNSTON COUNTY, OKLAHOMA

The Blue River is a tributary of the Red River, which flows intermittently in its upper-reaches in Pontotoc County and is sustained by springs of the Arbuckle-Simpson aquifers in northern Johnston County. Travertine waterfalls are common between the cities of Connerville and Milburn, but many of these waterfalls appear to be eroding, with little evidence of travertine deposition occurring at present. This may be indicative of water quality issues as travertines will not form in organically polluted waters. On May 29th, 2017, 10 pairs of artificial substrates and microscope slides were deployed on waterfall faces for a duration of 50 days, between the southern boundary of the Blue River WMA and the northern boundary of The Nature Conservancy Oka Yanali Preserve. The substrates were weighed before and after deployment to 1/100th of a gram to determine whether or not chemical deposition is occurring. The slides were used to determine whether or not biological factors may be aiding in chemical deposition by acting as a nuclei or by up-taking CO<sub>2</sub> from solution. Grab sample measurements were also obtained on-site to record water quality, which occurred above normal base flow conditions. All but two of the substrates were recovered from river. Upon retrieval, only the most downstream substrate showed evidence of travertine deposition, containing a very thin layer of aragonite. No evidence of biologically facilitated deposition could be determined from the slides. These results could be attributed to both loss of water quality and greater frequency of flooding events.

**Broge, Matt**, J Grimm, C Soden, K Karki, C Biles, A Howard, and B Bruton (East Central University)

#### \*MOLECULAR CHARACTERIZATION OF FOODBORNE PLANT PATHOGENS IMPORTED FROM CENTRAL AMERICA.

Plant pathogens are often carried into other countries through insects, animals, farm machinery, or plant transmission. Latent plant pathogens, such as *Diaporthe* sp., enter the surface of the melon fruit (*Cucumis melo* L. var. *cantalupensis* Naudin) early in development. The fruit is picked at maturity and then sent to market. The fruit continues to mature and at this time the

pathogen quickly causes interior fruit rot often discovered by the consumer when cutting the fruit open. The purpose of this research is to investigate whether *Diaporthe* species imported on melons from Central America are the same as those already identified in melons grown in Oklahoma. Four *Diaporthe* spp. have recently been taxonomically classified that attack melon; *D. cucurbitae*, *D. melonis*, *D. sojiae*, and *D. ueckerae*. Melons from Costa Rica, Honduras, and Guatemala were purchased at local grocery stores and melons were taken from fields throughout Oklahoma. The melons were washed in 10% bleach, dried and stored on a dry bench. After 4-10 days, sunken surface lesions were detected and the melons dissected using a sterile knife. Samples of the diseased tissue was placed on an agar plate containing either potato dextrose or malt extract. After 4-10 days, the fungus growing from the tissue was subcultured to another agar plate. After 7 to 14 days, the fungal pycnidia were examined microscopically for alpha and beta spores characteristic of *Diaporthe* species. Fungal hyphae was then separated from agar and DNA was extracted. Polymerase chain reactions (PCR) were performed using ITS tagged M13 Primer sequence and products were confirmed using agarose gel electrophoresis. Purified PCR products were sent to Eurofins Scientific for Sanger DNA Sequencing. *Diaporthe* spp. were isolated from melons imported from Guatemala, Costa Rica, Honduras, and from those grown in Oklahoma.

**Buck, Joe** and Chad King (University of Central Oklahoma)

**\*\*MONITORING STANDS OF GREEN ASH (*FRAXINUS PENNSYLVANICA*, MARSHALL) AT ARCADIA LAKE, OKLAHOMA COUNTY, OKLAHOMA.**

Throughout the United States, millions of ash trees have been killed by the exotic invasive, emerald ash borer (EAB) (*Agrilus planipennis*), resulting in hundreds of millions of dollars of damage. At the time of this writing, thirty-one states have confirmed EAB sightings. Our study aims to locate, measure, and monitor stands of green ash (*Fraxinus pennsylvanica*, Marshall), located in a bottomland forest adjacent to Arcadia Lake in Edmond, Oklahoma. Confirmation of EAB in Oklahoma (Delaware County) in 2016, has provided us the impetus to establish a thorough understanding of the distribution of green ash trees, and to surveil the stands for potential EAB colonization. To date, 411 green ash trees have been tagged and assigned GPS waypoints for the monitoring of individual trees. Diameter at breast height (DBH; 1.37m) has been recorded for all individuals for estimates of basal area. A subset of 84 ash trees were cored to estimate the age structure of green ash. Additionally, 100m line transects were established to better understand forest composition and tree ages adjacent to the green ash stand. Green ash trees in the study area range from 17 – 69 years old, with a median age of 24. Individual ash trees have a DBH range of 5.2 – 35.1 cm, and a median DBH of 13.5 cm. In addition to green ash, we identified 17 associate species and obtained DBH and age measurements. The age of individuals from the transects range from 16 – 80

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years old, and have a median age of 29 years. To date, no EAB or evidence of EAB presence has been observed.

**Canales, Jailene**, Morgan Massey, Austin McDonough, 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.

**Clymer, Maranda** (East Central University)

**\*THE EFFECTS OF TEMPERATURE ON THE ATTENUATION COEFFICIENT OF ULTRASOUND**

Attenuation is an important property of ultrasound that needs to be known in its many different applications, such as food processing, sanitizing, extraction, and imaging in medicine. This property factors in the amount of energy lost with distance traveled (Williams, 2017). I observed the effects of temperature on the attenuation coefficient of ultrasound. Due to the diverse physiochemical properties of oils, I expected to see a clear connection between temperature and the attenuation of ultrasound within different oils. With the results, I hope to inform future research and users of ultrasound of an important factor that should be considered and noted when determining a medium's attenuation coefficient. Using an Ultrasonic Echoscope, a 1 MHz frequency transducer, and a computer with A-Scan software, I obtained different values of factors found within Beer's law:  $I = I_0 e^{-\alpha x}$ . I repeated this at a range of depths and temperatures to solve for multiple attenuation coefficient values,  $\alpha F$ . With Graphical Analysis, I plotted multiple attenuation coefficient vs temperature graphs at small temperature intervals. Once I collected all my data and composed the graphs, I observed that though there is a connection between the

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attenuation coefficient and temperature, there needs to be a broad range of temperatures for this to be seen. These graphs helped me achieve equations that show a relationship between the ultrasound attenuation coefficient and temperature for the mediums I used. I accomplished this by using three different oils: sunflower oil, coconut oil, and corn oil.

**Coyner, Brandi**, Addison G. Allen, Cameron D. Siler, and Janet K. Braun (Sam Noble Oklahoma Museum of Natural History)

#### CONVERSION OF THE OKLAHOMA COLLECTION OF GENOMIC RESOURCES FROM ULTRA-COLD TO LIQUID NITROGEN STORAGE

Established in 2006, the Oklahoma Collection of Genomic Resources (OCGR) is the Sam Noble Oklahoma Museum of Natural History's newest collection. The collection currently houses more than 40,500 tissue samples from almost 17,000 individuals of more than 840 species of mammals, birds, amphibian, reptiles, and fish. The OCGR has a strong representation of mammals from Argentina, reptiles and amphibians from the Philippines, and all vertebrates from of the Great Plains. With Institute of Museum and Library Services funding, we converted our entire frozen tissue collection from ultra-cold (-80°C) to liquid nitrogen (-185°C). Conversion was needed: 1) to prevent catastrophic loss of the collection due to power loss, 2) to ensure long-term viability and to maximize research potential of genetic samples, and 3) to allow for continued growth of the collection.

**Crawford, Breecia** (East Central University)

#### \*SOFTBALL BAT PERFORMANCE AFTER CONTACT WITH SOFTBALL

The purpose of my research was to determine if a softball bats performance improved after extended use in batting balls. Using x-ray technology, video analysis, bat compression testing, and bat performance factor testing (BPF), a Demarini softball bat's "sweet spot" was analyzed. The x-ray technology allowed the walls of the bat to be seen and magnified for analysis of breakdown in the layers of composite material that made up the barrel. As the bat was used, the composite layers became looser due to the impact between ball and bat. Bat compression testing was used to determine the stiffness of the barrel. More compression in the barrel of the bat leads to better performance. Video analysis of a Rawlings Pro Leather softball as it struck the Demarini bat after exiting a pitching machine provided beneficial values used to obtain velocity of the ball after impact. Values found in the video analysis went directly into equations that determined the BPF, a test performed by manufactures to pass strict bat regulations. BPF must be below 1.20 in order for the bat to pass inspections and be used in official games. The expected outcome of the experiment was the bat's performance would improve after continuous impacts with softball. Results found would be beneficial to bat manufactures to determine the life expectancy of bats before they fail regulation tests.

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**Daji, Shaylin**, Nisha Patel, and Paul Lawson (University of Oklahoma)

#### \*CULTIVATION OF FASTIDIOUS ANAEROBIC ORGANISMS FROM THE EQUINE GUT MICROBIOME USING THE ICHIP DEVICE FOR NON-TRADITIONAL CULTIVATION

Cultivation is an invaluable tool in microbiology that allows for the characterization of an organism's morphological, physiological, biochemical, and chemotaxonomic traits. Currently, only a small fraction of all microorganisms have been identified and described. The Ichip diffusion device is a non-traditional cultivation method developed to recover "uncultivable" organisms in situ in an aerobic environment. In this study, a culture-dependent approach will be used to grow anaerobic fastidious organisms in situ using a modified Ichip device protocol in order to identify novel bacteria from the equine gastrointestinal tract. In the laboratory, organisms often fail to grow due to their specific growth substrates not being provided. The principle behind this approach is that organisms are encouraged to grow on the material they naturally inhabit and vital nutrients will migrate into the agar present in the Ichip device thus further increasing the probability of continued growth when transferred to a range of substrates present in agar plate growth experiments. The Ichip device will be inoculated with a diluted equine fecal sample and the Ichip will be placed in a fecal slurry grown at physiological conditions in the anaerobic chamber. Candidate novel isolates identified (below 97% 16S rRNA sequence similarity), will be subjected to a panel of morphological, physiological, biochemical, chemotaxonomic (fatty acid, polar lipids, peptidoglycan), and more in depth phylogenetic analysis. In this approach, we envision that underrepresented microbes in equine intestinal microbiome will be further characterized and studied to determine their health function in horses. Using the Ichip diffusion device, a greater range of organisms located in different phylogenetic groups will be recovered from the equine gut microbiome by providing organisms with natural growth conditions compared to traditional isolation methods.

**Deleon, Jaely** and Robert D. Mather (University of Central Oklahoma)

#### \*SEXUAL ASSAULT AND THE LONGEVITY OF RELATIONSHIPS

Many people experience sexual assault in their lives. Surprisingly, it is something that has become more and more known in the college world, but it can also be experienced in different parts of a person's life. Whether it is experienced in childhood, teenage years, college or as an adult, it could ultimately influence the individual's life. It is important to understand that sexual assault is something much more than violating someone else's body, but it also impacts their life after the assault. This experience can influence how the victim perceives relationships and how they behave in an educational and work setting. The purpose of this study, which is still a work in progress, is to see if there is a connection between sexual assault and the longevity of relationships formed by the victims after their experience. This is important because if after

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the results are shown, if there is a correlation between the two, further research could be done to try and help the victims.

**Doan, Tu** (University of Central Oklahoma)

**\*GLYCATED CHITOSAN INHIBITS HUMAN DERMAL FIBROBLAST-MEDIATED COMPACTION AND CONTRACTION OF COLLAGEN LATTICES**

Fibroblasts, cells that play a role in wound healing, use both tractional force and contraction in fibroproliferative diseases like Dupuytren's Contracture (DC). Finding inhibitors of these cellular processes could be beneficial to control these diseases. The stress-relaxed collagen lattice is an in vitro 3D model used to study fibroproliferative processes in a tissue-like environment. Glycated Chitosan (GC) inhibits migration, a mechanism fibroblasts use to remodel collagen lattices; our goal was to investigate whether GC incorporated into the collagen would affect fibroblasts' ability to reorganize the lattice. Lattices with GC or vehicle control (water) were incubated at 37°C for 12 days; compaction (defined as lattice height reduction) was measured daily. To determine the amount of tension generated, lattices were mechanically released from the substratum on day 12. Fibroblasts were unable to compact and contract GC-collagen lattices to the same extent as vehicle control lattices. This result agreed with our previous experiments using SWNT-GC (GC conjugated with single-walled carbon nanotubes)-collagen lattices. This suggests that GC is the factor that further inhibits the migratory properties and will inhibit lattice height reduction more than SWNT-GC. This study could provide future therapies for a less invasive method to help treat recurrence of DC.

**Durham, Justin** and Robert D. Mather (University of Central Oklahoma)

**\*\*TESTING FOR AUTOMATIC BIAS TO SHOOT BLACKS AND LATINOS DURING WEAPON IDENTIFICATION.**

Cultural stereotypes portray, specifically, young Black males as being violent and criminal (Devine, 1989). Previous research has found that participants are quicker and more accurate during weapon identification and in the decision to shoot when primed with Black faces. Importantly, participants have greater false positive error rates correctly identifying tool images when primed with Black faces rather than White faces (Greenwald, Oakes, & Hoffman, 2003; Payne, 2001). These findings indicate an automatic bias to shoot Black men, however, psychological researchers do not know if this pervasive phenomenon occurs exclusively for one social group. Most research on racial bias focuses on prevalent stereotypes associated with Black males compared to White males; however, lacks evidence of the shooter bias among other racial groups. It is true there exists a cultural stereotype toward young Black males as violent and criminal (Devine, 1989; Correll et al., 2002). It is also true there are negative cultural stereotypes toward other minority groups. Limited research indicates both Black and Latino males are stereotypically associated with threat and

violence more than Whites and Asians (Sadler et al., 2012). Some reports have shown that Latinos are shot and killed more by police than Whites but less than Blacks (Geller 1982). The current project will test whether Latino faces produce accuracy rates and error rates identifying a weapon that are more similar to Black faces rather than White faces. Participants will complete a weapon identification task on a computer in which they press a button when an image of a firearm appears and a different button for a non-weapon image. We expect a bias toward Black primes that will be consistent with previous research. In addition, we hypothesize that results will indicate an implicit racial-response bias when primed with Latino faces that is similar, but not equal to, Black primes.

**Fickess, Chris** (University of Central Oklahoma)

**\*NONLINEAR HUMAN POPULATION GROWTH MODELING - LOWER BIAS**

In finding a model of the human population growth there were various phases for finding the best fit. To generate the equations the Law of Mass Action was used to create the power law, exponential, and logistic models. Once the equations were formulated the data sets of the human population were tested against the new functional forms as well as tested against other known nonlinear models. The technique for testing the formulas was done using Excel's solver add-on, which will adjust the unknown variables to different values until it has created the best values, which makes the sums of squares closest to zero. Then to justify that this is a close fit the Coefficient of Determination was used to see how close to one the fit is to the actual data. Plotting the forecast models to the actual data set you can see that the logistic model and exponential model for the population growth is not the best model for the population growth.

**Fishbein, Mark** (Oklahoma State University), Shannon C. K. Straub, Julien Boutte (Hobart and William Smith Colleges), Aaron Liston (Oregon State University), Richard C. Cronn (USDA Forest Service), and Kimberley Hansen (Oregon State University)

**EVOLUTION AT THE TIPS: *ASCLEPIAS* PHYLOGENOMICS AND NEW PERSPECTIVES ON LEAF SURFACES**

Leaf surface features, including trichomes and epicuticular waxes, may function in plant defense and water conservation. Trends in the evolution of leaf surfaces during evolutionary radiations have been little explored. We use a comparative approach with milkweed species (*Asclepias*, Apocynaceae) to test hypotheses about the ancestral condition of leaf surfaces and evolutionary trends. We estimate the phylogeny of *Asclepias* using plastid genome sequences and use this phylogeny to reconstruct the evolutionary history of trichome density on upper and lower leaf surfaces as well as the origin and loss of dense epicuticular waxes. We find that the ancestor is reconstructed as

waxless and sparsely hairy, a macroevolutionary optimal trichome density is supported, and the rate of evolution of trichome density has accelerated.

**Grimm, Jacob**, Erin Dempsey, Matt Broge, and Charlie Biles (East Central University)

**\*ISOLATION AND CHARACTERIZATION OF *ALTERNARIA* SPP. FROM MELONS IMPORTED FROM MEXICO.**

Plant pathogenic fungi are the leading cause of plant diseases in the world. Variation in the population of a specific pathogen species determines how widespread the disease may progress in a certain crop. *Alternaria* spp. are known pathogens on several plant species including cucurbits. On melons, *Alternaria* fruit rot is a soilborne pathogen that begins as small brown lesions, soon becoming black lesions that may extend into the seed cavity area. The disease is often confused with *Cladosporium* rot and associated with injury, sunburn, or extended storage. Melons (*Cucumis melo* L. var. *cantalupensis* Naudin) imported from Mexico were purchased from a local grocery store, surface disinfected with bleach and stored on disinfected table tops for 7 days. Several slightly sunken lesions were observed. The melons were dissected with a sterile knife and small infected fruit tissue pieces were placed on Potato Dextrose Agar (PDA). After 2 weeks of growth under a 12 hr light/dark regime at 25° C, the colonies appeared dark brown-black. Microscopic examination indicated that the majority of the isolates were *Alternaria* spp. Isolates were placed in 15% glycerol and stored at -70°C until molecular analysis could be conducted. Left over melons without noticeable lesions were placed in a 4°C walk-in refrigerator. After one month, extensive *Alternaria* growth was observed on the stored melons. The isolates stored at 70°C were thawed and 50 µl of the spore suspension transfer to a PDA plate. The fungi were allowed to grow for 7 to 10 days as previously described. A small portion of the hyphae was removed from the Petri dish and used for DNA extraction (DNA Barcoding 101: standard silica protocol). ITS primers were used to isolate DNA sequences from the different isolates. The DNA analysis confirmed that the fungal genus was *Alternaria*. Further DNA analysis is in process.

**Hahn, Raina** (Bixby High School), Riley Pritzlaff (Owasso High School), B.J. Reddig (Oklahoma State University – Center for Health Sciences), P.K. Litt (Oklahoma State University), and E.L. Blewett (Oklahoma State University – Center for Health Sciences)

**CLONING, SEQUENCING, AND IDENTIFICATION OF UNKNOWN *SALMONELLA* OR EHEC (ENTEROHEMORRHAGIC *E. COLI*) BACTERIOPHAGE 3**

Bacteriophages are a common type of viruses that infect and kill bacteria. *Salmonella* and enterohemorrhagic *E. coli* [EHEC] bacterial infections are a common cause of foodborne illnesses. Bacteriophages were isolated from the environment and shown to kill both of these pathogens. Preparations of these

bacteriophages can be sprayed onto food processing machinery and leafy greens in order to reduce bacterial contamination thus preventing foodborne illness. In this project we cloned DNA fragments from one of the bacteriophages, Phage 3, and sequenced the DNA. We sequenced more than 2,000 bp and used this DNA sequence data and phylogeny software to compare our phage with existing phage in GenBank. We identified Phage 3 as a *Salmonella*-type phage and inferred it's relationship with other bacteriophage.

**Hall, Whitney** (Oklahoma Christian University), H. Mahmud (Stephenson Cancer Center), G. Maiti (Stephenson Cancer Center), A. Mille (Stephenson Cancer Center) and A. Ghosh (Stephenson Cancer Center, University of Oklahoma Health Sciences Center)

**\*EXTRACELLULAR VESICLES TARGET T-CELL FUNCTION IN B CELL CHRONIC LYMPHOCYTIC LEUKEMIA**

Introduction: B-cell chronic lymphocytic leukemia (CLL) is still incurable despite aggressive therapies. While various microenvironmental factors are known to influence CLL progression, exploring the role of extracellular vesicles (EVs) in CLL pathobiology has just begun. We now know that CLL plasma contain elevated levels of EVs including microvesicles (MVs; 0.1–1.0µm) and exosomes (Exos; 30–<100nm). While our earlier work shows the ability of CLL MVs to activate CLL bone marrow stromal cells, their interactions with T-cells remain largely undefined. Of relevance, CLL patients are also known to have T-cell dysfunction. Thus, we studied the impact of CLL EVs on T-cell function. Methods: MVs/Exos were purified from CLL plasma or used culture media of CLL B-cells and Meg-01 (megakaryocytes) cells by differential centrifugations. Levels of MVs/Exos were determined by estimating protein content. Primary T-cells from normal peripheral blood mononuclear cells and CLL B-cells from CLL patients' blood were purified using specific kits. A human T-cell line (Jurkat) was also cultured for few experiments. Results: Fluorescent microscopic observations suggest that EVs from CLL plasma, CLL B-cells, and Meg-01 cells are able to integrate into the T-cells. Interestingly, different T-cell types show specific affinity towards MVs, Exos, or both. On the other hand, CLL B-cell derived EVs show more affinity towards T-cells than EVs from other sources. Importantly, circulating EVs from certain CLL patients inhibited normal T-cell activation in vitro. Conclusion: Our initial studies suggest that circulating EVs in CLL are likely to target T-cells which may contribute significantly in CLL pathogenesis.

**Hammond, William** (Oklahoma State University), Justin Dee (Oklahoma State University), Monica Papeş (University of Tennessee-Knoxville), Stephen Hallgren (Oklahoma State University), and Henry Adams (Oklahoma State University)

**\*\*LEARNING FROM THE RECENT PAST: MODELLING PRESENT SUITABILITY OF CROSS TIMBERS**

Anthropogenic climate change forecasts increasing temperatures, drought intensity, and drought duration in the Cross Timbers, an ecoregion covering some 7 million hectares in the south-central US. Drought and heat associated with increased tree mortality of forested ecosystems is well documented globally. For the Cross Timbers there is evidence from the 1950s and 2000s of elevated background mortality of codominant *Quercus marilandica* and *Q. stellata*, with greater mortality in *Q. marilandica* often observed. The Cross Timbers, which occupy a westernmost position on the dry edge of the US temperate deciduous hardwood forest, could be considered a study system for early detection of drought impacts from climate change in this ecosystem. Identifying areas of reduced environmental suitability will better inform field study of stress responses for these keystone species of the Cross Timbers. Utilizing occurrence data from a mid-1950s survey, we developed an ecological niche model for these co-dominant Cross Timbers oak species. We used bioclimatic, soil, and topographic variables to train a MaxEnt species distribution model and project species ranges to the present-day. Projecting present suitability from past occurrence and environmental data allows for rigorous model validation with observational studies, field measurements of tree stress, and remote sensing information. We report that suitability for codominant oaks in this ecosystem is on the decline. This model serves to estimate areas that are most sensitive to tree mortality events of codominant oaks, and field validation supported model predictions. We present here our novel method as a case study for building testable ecological niche and species distribution models.

**Hardage, Joshua** (East Central University and Duke University), Yilin Yu (Duke University), and Courtney M. Karner (Duke University)

**\*MTORC1 IS NECESSARY AND SUFFICIENT TO STIMULATE GLS ACTIVITY IN OSTEOBLASTS**

Osteoblasts are secretory cells whose primary function is to produce and secrete Type 1 Collagen and other proteins that comprise and mineralize the bone matrix. Metabolically, how osteoblasts generate biomass and energy to sustain matrix production is not well understood. Previously, we identified glutamine metabolism as a critical regulator of WNT-induced osteoblast differentiation and bone formation by entering the TCA cycle to alleviate the energy deficit associated with WNT-induced bone formation. WNT stimulates glutamine metabolism by activating the enzyme glutaminase (GLS) which catalyzes the first, rate limiting step in glutamine metabolism. How WNT regulates GLS

activity and glutamine metabolism is unknown. Here we present data demonstrating the mammalian target of rapamycin complex 1 (mTORC1) pathway is both necessary and sufficient to stimulate GLS activity during osteoblast differentiation. We used the active site mTOR inhibitor Torin1 to inhibit all mTOR activity during osteoblast differentiation. Torin1 treatment completely eradicated both GLS activation and osteoblast differentiation in response to WNT. Conversely, disinhibition of the mTOR pathway by deletion of the *Tsc2* gene in calvarial osteoblasts greatly increased GLS protein expression and activity. Moreover, pharmacological activation of mTOR with three distinct small molecules that activated the upstream kinases PI3K (PI3K activator) or AKT (SC79) or mTORC1 directly (MYH1485) was sufficient to increase GLS protein expression and activity in vitro. Mechanistically, quantitative PCR and Phos-tag western blot analyses indicated that GLS is not regulated transcriptionally rather it may be the result of direct phosphorylation by mTOR. Finally, we evaluated SC79 for efficacy in vivo. Two-month old C57Bl/6 female mice were injected intraperitoneally for 4 hours with SC79. This regimen stimulated mTORC1 activity and increased GLS protein levels in bone extracts. Collectively, our data suggest targeting mTOR activity may be a viable strategy to modulate GLS activity and stimulate osteoblast differentiation and bone formation in vivo.

**Harrington, Patrick** (Northeastern State University)

**THE USE OF SMALL WIRES, GATES, AND CIRCUITS THAT DEFEY QUANTUM FORCES TO PRESERVE NEWTONIAN PHYSICS**

The shrinking size of computer circuit wires has led manufacturers to make changes with respect to manufacturing techniques to address problems caused by quantum forces at work on small scale circuits. The developers of Quantum Cellular Automata gates have also been at work on this problem, from a different perspective. Our work seeks to compare the two.

**Heard, Darby** and Alisha D Howard (East Central University)

**\*VISUALIZING BIOART: A SCIENTIFIC, EDUCATIONAL, AND ARTISTIC INTERPRETATION OF BIOMOLECULES**

This project represents an intersection of biology and art into one entity of Bioart using three aims. The first utilizes the bioinformatics of 3-Dimensional modeling to determine the structure of the Human T-cell Leukemia viral oncoprotein Tax from its protein sequence. Tax creates protein-protein interactions with CREB which binds to an off-consensus cAMP responsive element (CRE) in the viral promoter DNA. Tax also binds to the GC rich DNA immediately flanking either side of the CRE. The resulting complex attracts the coactivator CREB-binding protein (CBP) or the paralogous p300, causing the activation of transcription (Mick and Currer). These binding points are essential to determining the structure of Tax via bioinformatics. The second project goal provides an educational application of 3D printing in the sciences;

the molecules selected are geared towards use for class or outreach. Within the learning environment, it is suggested that tactile learning holds more success than 2D figures. Modeling has the advantage of utilizing multiple senses in the learning process. Even being able to rotate an object allows new details to be considered (Horowitz). 3D printing provides an advantageous method by which biologically accurate models can be generated. The project culminated in the development of a bioart show entitled “Multipotent,” which reflects visualizing regenerative research in 2D and 3D space. Fine arts and STEM often do not mingle in preconceived notions. At face value they appear disparate, however, in many ways they work in tandem. It is at this juncture where I conceptualize my work. With the advent of biotechnology and regenerative medicine, the manipulation of biology and the very way which our bodies function has been dissected and reconstructed. Within the last few decades, artists have begun addressing these issues. Bioart initiates a deeper investigation of the sciences by using an artist's unique perspective and experience.

**Henry, Matthew** (East Central University)

#### \*WRITING A VELOCITY DENSITY FUNCTION WITH EDGEWORTH EXPANSION

A system of particles in a non-equilibrium state will have a probability density function on the phase space describing the positions and momenta as well as macroscopic properties such as temperature, pressure, stress and heat. The Grad 13th moment approximation is centered at equilibrium and identifies these macroscopic properties as the moments of the momenta. Utilizing generalized Hermite Polynomials to account for the non-equilibrium state severely complicates the tensor analysis. We provide a closed form expression of the non-equilibrium centered 13th moment expansion by utilizing a contraction of the stress tensor. It is the hope that this approximation will provide a solution to the Boltzmann Equation.

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

#### PRINCIPLE COMPONENT ANALYSIS: MAKING BIG DATA MANAGEABLE

Big data is present in our daily interactions with technology. Not all data is useful and Principle Component Analysis can help you decide what data is useful. The mathematics behind the method of PCA method will be presented. An emphasis on how the method can be applied to large data sets including examples run on real data will be explored.

**Jamadagni, Harsha**, H. Karaman, Fatih Karpat, D. Lokesh Raj, and M. Khandaker (University of Central Oklahoma).

#### \*\*EFFECT OF MICRO-GROOVING ON THE STRESS SHIELDING OF TITANIUM: EXPERIMENTAL AND NUMERICAL INVESTIGATION

Micron sizes grooves can control the cell settlement on the implant surface or be used to direct tissue generation at the implant/bone interface. The effect of shape, size and the type of material of the microgrooves on the mechanical stimulus transfer from the implant to bone at physiological loading is not known yet. Therefore, this study evaluated both experimentally and numerically the effect of surface modification on a titanium implant to the load transfer characteristics from implant to bone for examining stress shielding parameters. This study measured the effect of micron grooves on titanium to the mechanical stability of titanium using a rabbit model. This study also developed a finite element model based on the in vivo test model to examine the stress shielding parameters. A 2 mm diameter and 12 mm length medical grade titanium was used as the implant. A total eighteen parallel circumferential microgrooves ( $71.31 \pm 13.62 \mu\text{m}$ ,  $n=4$ ) at a distance 0.5 mm from an edge of titanium rod were cut by a saw machine. Two groups of titanium samples were prepared: without grooves (control) and with microgrooves. Each group of samples was implanted in the femoral condyle of rabbits. The animal was euthanized after 8 weeks of surgery. The fracture strength was calculated by dividing the maximum pull-out force at the point of failure of implant by the surface area of titanium in contact with bone. The results showed that the mean values of fracture strength were significantly higher for grooved titanium samples ( $1.32 \pm 0.45 \text{ MPa}$ ,  $n=3$ ) compared to control samples ( $0.22 \pm 0.16 \text{ MPa}$ ,  $n=6$ ) ( $P < 0.05$ ). The load-displacement graph from the pull out tension tests were used to measure the frictional coefficient between Ti and bone. This study developed a finite element analysis model to measure the effect of the micro-grooving on the stress shielding effect of the adjoining bone with the implant. It was found from the FEA model that the stress along the interface of microgrooves on titanium were higher in compare to non-groove area because of the change of the geometry along the groove. The number of microgrooves in the model has significant effect on the stress transfer between implant and adjoining material. The more the number of microgrooves, the smaller the total deformation of implant/bone interface. The unequal load sharing due to micro-grooving causes an increase in stiffness of the adjacent bone to the implant.

**Jardine, Laura** (Oklahoma City University), K. Jeannet Oyen (University of Wyoming), Zach Parsons (University of Wyoming), James P. Strange (USDA Agricultural Research Service), & Michael E. Dillon (University of Wyoming)

#### \*VARIATION IN CHILL COMA RECOVERY TIMES IN MALE AND FEMALE YELLOW-FACED BUMBLE-BEES (*BOMBUS VOSNESENSKII*)

Rate of recovery following chill coma varies among invertebrates, and has been linked to distributions of diverse organisms. Despite the ecological implications of chill coma recovery time (Trec) it has rarely been measured for bumblebees and has never been measured in male bees. We specifically investigated the potential gender-based differences in recovery time of male and female *Bombus vosnesenskii*, a native pollinator. A relatively rapid recovery time is extremely advantageous as it provides bumble-bees with an extended period to forage and a more rapid opportunity to defend themselves from predators after a cold period. This is especially important in males as they will not return to the nest after emerging and are forced to survive cold periods without the protection that female workers experience in the hive's more controlled microclimate. We developed a high-throughput method to test differences in the chill coma recovery times of male and female bumble-bees. We chilled bees at -4° Celsius (beneath their known lower critical thermal tolerance limit) for 2 hours. Bees were then held at 22C, and recovery time was taken as the time to display coordinated muscle movement. Ecologically, this is the point at which they are able to return to their normal behaviors. Here we show variation in recovery time in male and female bumblebees at various geographic locations. Preliminary analyses suggest that the rate of recovery following chill coma is significantly (about one minute) slower for males than it is for females. Additionally, there are significant differences in rate of recovery for bumble-bees from different geographic locations.

**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 I have based most of my build 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 powering something with said energy with potential conversions using a transformer.

**Johnson, William** (Oklahoma State University), Nathaniel J. Torres (Oklahoma State University), Scot E. Dowd (Mr. DNA - Molecular Research LP), Ainsley Nicholson (Centers for Disease Control and Prevention), Akilesh Ramachandran (Oklahoma State University), and John E. Gu

#### \*\*DRAFT GENOME AND ANTIBIOTIC SUSCEPTIBILITY PROFILES OF TWO ISOGENIC *ELIZABETHKINGIA* STRAINS ISOLATED FROM HORSES IN OKLAHOMA

Emerging bacterial pathogens from the *Elizabethkingia* genus are commonly found in the environment, and the potential of these isolates to cause opportunistic infections in animals remains poorly understood. Here we

describe the first genomes and antibiograms of two closely related *Elizabethkingia* strains (OSUVM1 and OSUVM2) isolated from horses in Oklahoma. OSUVM1 was isolated from an equine endoscope swab, OSUVM2 was isolated from guttural pouch aspirate. Both isolates were identified as *Elizabethkingia* using MALDI-TOF mass spectrometry. Genomic DNA was extracted using the Quiagen High Yield gDNA kit following the manufacturer's instructions. Purified gDNA was sequenced using Illumina HiSeq and PacBio systems, assembled, and annotated using the Rapid Annotations using Subsystems Technologies server. Minimum inhibitory and bactericidal concentrations were determined using 2-fold serial dilutions following CLSI guidelines. The draft genome of OSUVM1 contains 4,153,767bp in 4 contigs, 3,782 predicted coding sequences, and 68 predicted RNA sequences. OSUVM2 contains 4,109,384bp in 10 contigs, 3,757 predicted coding sequences, and 57 predicted RNA sequences. OSUVM1 and OSUVM2 are highly similar, with >99% nucleotide identity. Phylogenetic analysis based on SNPs suggests that OSUVM1 and OSUVM2 are closely related to each other, and are closely related to clinical isolates from Wisconsin, Tennessee, and Illinois. This phylogenetic analysis further revealed that both isolates are most related to the *Elizabethkingia anophelis* subspecies *endophytica* grouping within the *Elizabethkingia* genus. Both strains had similar resistance patterns for fusidic acid, vancomycin, and clindamycin. Here we demonstrate that two *Elizabethkingia* strains isolated from horses in Oklahoma are isogenic, and are closely related to three outbreak strains isolated from the Midwest. The antimicrobial susceptibility further supports the conclusion that OSVM1 and OSUVM2 are isogenic. These results underscore the importance of surveillance in detecting this emerging pathogen, and suggest that *Elizabethkingia* infection should be taken into consideration in veterinary practice, along with clinical practice.

**Junkins, Emily** (University of Oklahoma)

#### \*\*NATURAL PRODUCT MINING OF THE MAMMALIAN MICROBIOME

With the rise of drug-resistant microorganisms and the stagnant progress in antimicrobial development, new strategies must be used to uncover novel drug targets. Mammalian roadkill has recently been shown to have a microbiome harboring bacteria capable of producing compounds that inhibit human pathogens; however, the mammalian microbiome is vast and variable, and roadkill microbiomes are relatively unexplored. Accessibility to mammalian microbiomes has considerable practical and ethical concerns that opportunistic sampling circumvents. This project seeks to cultivate a representative subset of roadkill microbiome diversity and screen isolates for the production of bioactive compounds. Samples were collected from the mouth, ear, and rectum of each animal. 16S rRNA gene sequencing characterized the microbial community, while colony picking built an isolate library. Multiple media and temperature conditions throughout a one-week time series was used to isolate colonies. Isolates were screened for bioactivity by measuring zones of

inhibition each organism produced by each isolate on an overlay of the human pathogens *Klebsiella pneumoniae*, *Enterococcus faecium*, *Pseudomonas aeruginosa*, and *Candida albicans*. To date, two animals have yielded a total of ~2100 isolates of which ~3.8% produce bioactive compounds, this is expected to rise as isolates continue to be screened (remaining 20%) and many isolates are redundant. Between raccoon (*Procyon lotor*) and opossum (*Didelphis virginiana*) samples, orifice and incubation time dictate the diversity seen on the plate and the emergence of bioactive isolates. The raccoon yielded most isolates from the mouth while isolates from the rectum were the most diverse phylogenetically and observed at later incubations (96-144 hr). Additionally, the most bioactivity was observed from the rectum isolates. The isolates from the opossum, though much less in number, showed the majority (75%) of bioactive isolates originating from the ear at later (120 hr) incubation times, indicating that bioactivity arises during prolonged incubation times (96-144 hr).

**Kafer, Leah**, Michelle King, and Marianna Patrauchan (Oklahoma State University)

**\*UTILIZING GALLERIA MELLONELLA TO TEST THE VIRULENCE OF PSEUDOMONAS AERUGINOSA**

*Pseudomonas aeruginosa* is an opportunistic pathogen that infects burn wounds, as well as lungs of patients with Cystic Fibrosis. Our lab has shown that elevated calcium (Ca<sup>2+</sup>) increases the production of virulence factors in *P. aeruginosa* such as, alginate, pyocyanin, pyoverdine, extracellular proteases, and rhamnolipid. Based on these observations, we hypothesize that if *P. aeruginosa* is exposed to elevated Ca<sup>2+</sup> then it will be more virulent. To test this hypothesis, we are optimizing a virulence model using *Galleria mellonella*. *Galleria mellonella*, better known as the wax worm, has been used as a virulence model for bacterial pathogens due to its short life span and low monetary value. It was also tested for *P. aeruginosa*. Here we aim to optimize this model to study the role of Ca<sup>2+</sup> in regulating *P. aeruginosa* virulence. We hypothesize that *P. aeruginosa* grown at 5 mM Ca<sup>2+</sup> will be more virulent, produce higher CFU load and cause death in worms sooner than those grown without Ca<sup>2+</sup>. The first goal is to determine the pathogen's LD<sub>50</sub>. For this we injected the wax worms with PAO1. These worms were placed in an incubator at 37 °C for up to 60 hours, observing for death, melanization, and activity every 2 hours. After 60 hours, the worms were homogenized, and CFU were determined. Our next goal will be to investigate the role of 3 proteins in the virulence of *P. aeruginosa*. These 3 proteins, EfhP, CarP, and CalC are important for maintenance of the intracellular Ca<sup>2+</sup> response in *P. aeruginosa*. We hypothesize that the mutants lacking the corresponding genes, when grown at elevated Ca<sup>2+</sup>, will exhibit a significantly lower virulence. This project will enable identification of proteins involved in Ca<sup>2+</sup> regulation of *P. aeruginosa* virulence and ability to cause infections.

\* Undergraduate \*\* Graduate

**Kennedy, Ashley**, Brian Forrester, and Diana Spencer (Tulsa Community College)

**\*THE BACTERIAL DIVERSITY FOUND IN THE RHIZOSPHERE BETWEEN SOIL SAMPLES TAKEN FROM ECOLOGICAL NICHES USING 16S RRNA GENES**

Soil microbes are a key component of natural and managed ecosystems and the bacterial diversity in soils taken from the rhizosphere of different plants in specific ecological niches has allowed us to begin to identify factors that shape the microbial communities and the organisms that are present in those communities. Information about possible future bioresources, bacterial nutrient availability in different areas, and the effect pH levels have upon bacterial presence, could allow for the creation of new natural fertilizers through a better understanding of nitrogen fixing bacteria. Agricultural studies continue to investigate safe, effective ways to feed seven billion of us. We investigated the ecological space of the rhizosphere of three different trees from three different biomes; a Douglas Fir Tree from a temperate coniferous forest, an Acacia Tree from the Sonoran Desert, and a Black Mulberry Tree from a temperate grassland. Methods included a culture dependent and culture independent approach, and DNA was isolated from each soil sample. Since the use of the 16S rRNA gene to study bacterial phylogeny and taxonomy has been one of the most widely used genetic markers, the culture dependent approach relied upon the individual 16S rRNA gene analysis and the culture independent used metagenomics pyrosequencing analysis of the same gene to accurately describe the bacteria present in each sample. The metagenomics results showed the experimentally derived number of different bacterial phyla present in each sample, and the culture dependent studies allowed for individual organism focus. Specifically, in our hands, *Pseudomonas* organisms were most easily cultured and sequenced while the metagenomic data revealed that the majority of the soil bacteria (~80%) in both samples were from the phyla Proteobacteria, Acidobacteria, Actinobacteria, Bacteroidetes, and Verrucomicrobia.

**King, Michelle** (Oklahoma State University), Mariette Barbier (West Virginia University), and Marianna A. Patrauchan (Oklahoma State University)

**\*\*A PUTATIVE PHYTASE, CARP, IS DIFFERENTIALLY REGULATED BY MULTIPLE PROMOTERS AND PLAYS AN IMPORTANT ROLE IN CA<sup>2+</sup> RESPONSE OF PSEUDOMONAS AERUGINOSA.**

*Pseudomonas aeruginosa* is an opportunistic pathogen that causes severe acute and chronic infections in humans, particularly, in cystic fibrosis (CF) patients. Our group has shown that calcium (Ca<sup>2+</sup>) induces virulence and antibiotic resistance in *P. aeruginosa*. Earlier we identified a Ca<sup>2+</sup>-regulated protein, CarP, which was predicted to form a 5 bladed β-propeller structure with a phytase-like domain and a putative Ca<sup>2+</sup> binding site in the center of the propeller. We have characterized its role in Ca<sup>2+</sup>-induced production of virulence factors: pyocyanin and pyoverdine, and cell tolerance to elevated

\* Undergraduate \*\* Graduate

Ca<sup>2+</sup>. To further characterize the role of CarP in Ca<sup>2+</sup>-regulated virulence and adaptation to host, we aim to identify the host factors that control the expression of carP. Based on RNA seq data analyses of carP transcription profile, we predicted two promoter regions located at -52 and +6. To study the potential role of these promoters in regulation of carP transcription, we cloned three fragments harboring P1 (-321 to -1), P2 (-212 to +100), or both P1P2 (-321 to +36) into a vector with promoterless lux operon. Overall, P1 promoter showed increased activity during late log and stationary growth phases. However, elevated Ca<sup>2+</sup> induced its activity during early log, and decreased it during later phases. Growth at 5% CO<sub>2</sub> reduced P1 activity and abolished the growth phase-dependent Ca<sup>2+</sup> effect. Furthermore, we studied the role of CarP in *P. aeruginosa* pathogenicity by using *Galleria mellonella* and mouse virulence models. Disruption of carP reduced worm killing by 60% and decreased survival of *P. aeruginosa* in mice by 30%. These data reveal that CarP plays an important role in the pathogen's virulence and survival within a host and advance our knowledge of the molecular mechanisms of Ca<sup>2+</sup> regulation of *P. aeruginosa* virulence and fitness in response to host environments with elevated levels of Ca<sup>2+</sup>.

**Kramer, Amanda**, Leon Hamby, and Kay Woodring (East Central University)

**\*ZIKA: A GEOGRAPHICAL APPROACH TO MODELING**

Zika is a mosquito transmitted virus which has been linked to microcephaly in infants and Guillain Barre syndrome in adults. There is no vaccine available for the virus, and the mild symptoms, similar to the flu, typically go unnoticed. Our aim was to understand and predict how quickly the virus would spread county to county, as it reached Oklahoma, by using a SIR Vector-Host Model. We predict that without other interventions, the transmission of the virus will occur quickly and spread throughout the state.

**Landry, Hanna** (Redlands Community College), K. Veirs (University of Oklahoma Health Sciences Center), J. Day (University of Oklahoma Health Sciences Center), and C. Dionne (University of Oklahoma Health Sciences Center)

**\*GAIT ANALYSIS OF A HEALTHY MAN WITH TRANSTIBIAL LIMB LOSS AND A MATCHED CONTROL TO CHARACTERIZE AND COMPARE GAIT PERFORMANCE**

Introduction: Little is known about gait performance of men with transtibial limb loss (TTLL) after rehabilitation. Despite emerging evidence that individuals with TTLL may experience functional decline over time, interventions to maintain proper gait function are unknown. Evaluating gait patterns using motion analysis gives physical therapists a tool to detect early-on deviations that may lead to functional decline. The purpose of this study was to compare gait of a male with TTLL and an age-matched control using motion analysis. Methods: One consenting, otherwise healthy, male with left TTLL

underwent gait analysis using Qualisys- motion analysis. Investigators applied 55 reflective markers on standardized anatomic locations and recorded six, one-minute, gait trials, three self-paced and three brisk-paced. Velocity and knee joint angles were compared to a control. Results: The male with TTLL demonstrated a greater difference in knee range of motion (ROM) than the control, 13° and 6°, respectively. The male with TTLL had greater velocity in both upper legs whereas the control had greater velocity in both lower legs during the gait cycle. Conclusion: Although deemed healthy after surgery and rehabilitation services, abnormal gait patterns were observed for a male with TTLL. Higher velocity of the upper leg indicates possible lack of eccentric control of the Quadriceps muscles during gait. Periodic sessions with a physical therapist may benefit men with TTLL to prevent a decline in function. Further research is needed to determine if these gait deviations are factors related to decline in function in this population. Funding: Research in this abstract was supported by the National Institute of General Medical Sciences of the National Institutes of Health under award number P20GM103447. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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

**\*RAISING AWARENESS FOR AN ENDANGERED SPECIES (THE SEASIDE ALDER) THROUGH PRODUCT MARKETING**

The seaside alder (Betulaceae: *Alnus maritima*) is an endangered species. One of its three populations occurs in southern Oklahoma. An endangered plant species can be protected by the Fish and Wildlife Service or rescued by planting in a botanical garden. Another way of protecting an endangered plant species is to create an economic value for its sustainable use. An extract from the twigs of the seaside alder, which can be sustainably harvested, has strong antibiotic properties. The extract, when incorporated into a lotion, can create a clear zone of dead bacteria on an agar plate. This demonstrated antibiotic activity can help to sell the product, some of the revenues from which can be used for conservation of the alder.

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

**GRAPH CONSTRUCTION VIA SEIDEL SWITCHING**

The structure of a graph  $G$  can be described by a corresponding adjacency matrix  $A$ . Each such matrix  $A$  has a set of eigenvalues, known as its spectrum. However, the spectrum does not uniquely determine a graph. Pairs of graphs with the same spectrum are called isospectral, while pairs of graphs with the exact same structure are called isomorphic. Seidel switching is a technique for generating pairs of graphs that are isospectral but not isomorphic. In this talk, we introduce the necessary background and terminology, then demonstrate the Seidel switching technique.

**Law, Ting Wei**, Erin Drewke, Melville Vaughan, and Gang Xu (University of Central Oklahoma)

**\*PROBING MECHANICAL TENSION IN ENGINEERED DERMAL-EQUIVALENT TISSUE**

By generating tension and traction force, fibroblast cells play an important role in the wound healing process. However, the magnitude of the tension generated by fibroblast cells during normal and wound healing is still unknown. In this research, we engineered dermal-equivalent model and quantified the mechanical tension. To create dermal-equivalent model, we mixed human dermal fibroblast cells with Type-I collagen and supported the tissue with a 2cm-diameter plastic ring. To quantify the mechanical tension, a 2mm-diameter biopsy punch was used to induce a circular wound onto the fully developed dermal-equivalent lattices. Then, we recorded and analyzed the area expansion of the wound. Furthermore, we examined how TGF- $\beta$  affected the tension generation in the dermal-equivalent model. The results showed that there exist considerable tension in the engineered tissue, and that TGF- $\beta$  promoted more tension generation. Quantitative biophysical information will help us better design and control the functions of the engineered tissue.

**Lucas, Jonathan** (East Central University)

**\*DIVERSITY OF RIFFLE FISHES IN THE UPPER BLUE RIVER, OKLAHOMA**

The objectives of this study were to determine the composition and diversity of the riffle fish community in the upper Blue River of south-central Oklahoma. A riffle is a mesohabitat characteristic of streams with higher gradients and velocities, and riffle fishes and other riffle-dwelling biota are commonly used as indicators of stream health. We used habitat-kick and traditional downstream seine hauls to characterize the riffle fish community in five riffle mesohabitats in mid to late summer of 2017. Riffle specialists including the Bigeye Shiner (*Notropis boops*), Mimic Shiner (*Notropis volucellus*), Orangebelly Darter (*Etheostoma radiosum*), and Orangethroat Darter (*Etheostoma spectabile*) were the most frequently collected species across all sites. Riffle fish species richness generally decreased from upstream to downstream across the sites. Fish species richness was negatively correlated with increased riffle habitat heterogeneity as measured by depth, velocity, and particle size. This research is intended to set a baseline for future long-term monitoring of Blue River riffle fishes, and to aid in the selection of sites for an instream-flow study of the upper Blue River targeting riffle mesohabitats.

**Mazkoori, Leila** and Robert D. Mather (University of Central Oklahoma)

**\*CHILDREN'S PERCEPTION OF THREATS**

The purpose of this literature review is to provide a background on abduction, homicide, and serial homicide of children. Child abduction is defined as an offense of wrongfully removing or retaining a child that is concealed or

\* Undergraduate \*\* Graduate

detained. Homicide is an act usually done with an emotional intent and often targets family and friends rather than strangers. Single homicide targets both males and females equally, and does not appear to have a strong sexual motivation, but is usually an act done out of anger. Serial homicide, however, targets more females than males, and are usually acts of sexual motivation. The literature review will cover previous research over all three topics, as well as provide a background and analyzed review of the Boy Scouts of America program to help prevent child abuse. By identifying the background of child abduction, homicide, and serial homicide, as well as a popular program guide for preventing child abuse and sexual predation, this literature review can pave the way to research ideas and help provide more empirical investigation in the field.

**McCasland, Jaclyn** (University of Science and Arts of Oklahoma)

**\*EVALUATION OF WATER BUDGETS AS SURFACE WATER RESOURCE MANAGEMENT TOOLS FOR THE SUSTAINABLE STEWARDSHIP OF THE USAO HABITAT LOWER POND**

Management of surface water resources is of increasing concern to central Oklahoma as runoff dominated systems have become increasingly unreliable sources due to drought. The purpose of this research is to determine how the empirically derived monthly bulk water storage of the lower pond at the USAO Habitat Area (Chickasha, OK) compares to the expectations of theoretical models used to approximate storage based evapotranspiration calculations. System inputs include direct precipitation on the surface area of the pond (6000-7000 m<sup>2</sup>), and surface runoff from the watershed that drains into the impoundment from an upland mixed grass prairie. Evapotranspiration is the only system output as the pond has no outflow, and groundwater interactions are assumed to be negligible. The National Weather datasets lack the resolution required to describe local weather patterns, and thus the Oklahoma Mesonet was used to calculate the evapotranspiration term for the simple Abtew method, the Hargreaves and Sumani model, and the well established Thornthwaite method. Seasonal pond water storage fluctuations were correlated to changes in water quality via monthly water quality sampling for pH, specific conductance ( $\mu\text{S}/\text{cm}$ ), dissolved oxygen (mg/L), nutrients(NPK; ppm), BOD<sub>5</sub>, and turbidity (NTU) in addition to pond surface area (m<sup>2</sup>) and average depth (m) (n = 25). All of the water budget methods indicate periods of seasonal storage and loss from the pond based on the sensitivity analysis of the temperature driven evapotranspiration. Building a custom model to define the relationships between water quality and quantity for locally managed water resources is essential for water resource policy and decisions regarding cyanobacteria blooms and native fish populations.

\* Undergraduate \*\* Graduate



**McInnes, Daniel M.** and Aljan Ranjit (East Central University)

#### COMPUTATIONAL INVESTIGATIONS OF BROMINE OXIDES

The structural isomers of BrO<sub>2</sub>, Br<sub>2</sub>O, and Br<sub>2</sub>O<sub>2</sub> have been characterized at the HF/6-31G level of theory. An understanding of the properties and reactivity of halogen oxides is important in atmospheric chemistry, and various other applications. An extensive study of the structural isomers of iodine oxides has been done, and this work expands on that investigation.

**McLeod, Daniel**, Michelle King, and Marianna Patrauchan (Oklahoma State University)

#### \*GENERATING AN IMPROVED COMPLIMENTED STRAIN FOR THE PUTATIVE CA<sup>2+</sup>-BINDING PROTEIN CARP AND INDUCING POINT MUTATIONS FOR CA<sup>2+</sup>-BINDING AFFINITY STUDIES.

*Pseudomonas aeruginosa* is an opportunistic pathogen that infects the lungs of cystic fibrosis patients and wounds from surgery or burns. Previously, we found that several virulence factors of *P. aeruginosa* are induced by elevated calcium (Ca<sup>2+</sup>), such as antibiotic resistance, biofilm formation, and the production of pyoverdine and pyocyanin. We identified a hypothetical periplasmic protein, CarP, which has been shown to play a role in regulating several Ca<sup>2+</sup>-induced virulence factors and tolerance to elevated Ca<sup>2+</sup>. Therefore, we hypothesize that this protein plays a role in the Ca<sup>2+</sup> regulatory network of *P. aeruginosa*. To study the role of CarP in Ca<sup>2+</sup> regulation, we used a complementation strain, carP::Tn5/carP, where carP is cloned under an arabinose-inducible promoter. Here we aim to generate an alternative complemented strain, in which carP will be cloned under its native promoter and incorporated into the chromosome. Our second goal is to study Ca<sup>2+</sup> binding of CarP and identify the amino acids that are responsible for this binding. To identify Ca<sup>2+</sup> binding amino acids, we will generate point mutations by PCR, replacing each amino acid that is predicted to bind Ca<sup>2+</sup> with a glutamine, a non-charged amino acid. We will then purify the mutated proteins and measure their ability to bind Ca<sup>2+</sup>. Considering the lack of similarity of CarP with characterized Ca<sup>2+</sup>-binding proteins, we anticipate to identify a novel Ca<sup>2+</sup> binding motif. Obtaining these mutants will also enable future functional studies, characterizing the role of CarP in *P. aeruginosa* virulence.

**Mohamed Rishad, Abdul Samad**, Mohammed Alhashem, and Nesreen Alsbou (University of Central Oklahoma)

#### \*ENLARGING SMART TRASH CAN

The common issue faced by all the trashcans are when trash cans become full, they begin to overflow. We have proposed a solution for overflowing trashcans, which could be simply explained as two in one. A trashcan with a second compressed trashcan attached to its side, that expands when the main trash can is almost full, by using power from solar panels attached to the cover. In the market, there are few smart trashcans, which are able to communicate with

waste management by sending a notification when the trashcan is full. But the problem faced by those Smart trashcans are that in busy cities it's almost impossible to collect the trashcan as soon as it becomes full due to traffic and the cost of fuel to collect a single trash can. In this research paper, I am discussing about Smart trash cans which have the ability to detect the level of trash and communicate with waste management when it's full. When the first trashcan is full, the second trashcan which is attached to the first trashcan will expand by sliding right. This trashcan is environment-friendly and cost-effective.

**Mohamed Rishad, Alhashem**, Mohamed Rishad Abdul Samad, Min Bo Sim, and Nesreen Alsbou (University of Central Oklahoma)

#### \*SMART PARKING MOBILITY MODELING

One major place most people waste time is inside parking lots searching for an empty parking slot. To overcome this issue, we designed an algorithm that will minimize the overall time taken by all cars in a particular time period. First of all, an application is created that can connect to drivers and inform them about the closest empty parking slot. We derived an equation to measure the total delay time in the cars that parked during a time period. Cars that are equipped with the software and also unequipped cars were both considered when the equation was derived.

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

#### \*THE EFFECT OF PHENYLALANINE, RETINOIC ACID, AND DIETHYLAMINO BENZALDEHYDE

Maternal Phenylketonuria (MPKU) is a disease that affects embryos in early stages of development caused by increased levels of phenylalanine (Phe). Offspring show defects in craniofacial and heart development. We hypothesize that Phe acts as an inhibitor of migration, which may contribute to the defects seen in MPKU. This can be investigated by performing cell migration assays, in which different cell types are cultured and then treated with chemicals including: Phenylalanine (Phe), Retinoic Acid (RA), and Diethylaminobenzaldehyde (DEAB). Images were taken at time 0, 12hrs, 24hrs, 48hrs, and 72hrs after treatment and analyzed with ImageJ and GraphPad Prism. The results 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.

**Nesmith, Blake** and Thomas Hancock

**\*\*EVALUATION OF THE INTERROGATION DECISION-MAKING MODEL**

Every individual who is interrogated by police finds themselves in a very complex decision-making process. Should they confess or deny their involvement. Understanding this process is clearly relevant to the criminal justice system. The Interrogation Decision-Making Model (IDMM) uses expected utility theory to explain why individuals choose to confess or deny based upon proximal and distal consequences across time (Yang, Guyll, & Madon, 2017). The model produces a mathematical value to determine the probability of proximal and distal consequences which is then used by suspects to decide if to confess or deny. Even though the model is built upon sound theoretical principles it may not fully account for the dynamic nature of the interrogation process. Strategies used by law enforcement change throughout the course of an interrogation (Kelly, Redlich, & Miller, 2015; Kelly, Miller, & Redlich, 2016), and the probability of certain outcomes change throughout an interrogation. The proposed study will evaluate the usefulness of the IDMM in a non-interrogation setting to examine if the model's principles hold. To mimic the cognitive fatigue associated with interrogations, a computerized implicit learning task consisting of 20 trials will be completed by participants (Posner & Keele, 1968). A computer crash paradigm will be used to assess the decision of participants to lie about restarting the program to compete for a prize (Kassin & Kiechel, 1996). Because of the dynamic nature of interrogations it is hypothesized that the IDMM will not accurately reflect individual's real-world decisions.

**Nicoll, Morgan** and Robert D. Mather (University of Central Oklahoma)

**\*EFFECTS OF MUSIC LYRICS ON NARCISSISM SCORES**

Narcissism has reached an astonishing increase of 41% across the country over the past 24 years (Twenge, Konrath & Foster et al., 2008). Many factors could contribute to the rise, but in American culture we are bombarded with popular music every time we leave the house. The number of personal pronouns and antisocial words in song lyrics increased substantially from 1980 to 2007 (DeWall, Pond & Campbell et al., 2011). It is possible the variables have a relationship. Participants (N=120) will be University of Central Oklahoma (UCO) students gathered using SONA systems. One online session will be completed by each participant on a desktop computer in the Cognition Lab. The online session will take approximately an hour and consist of answering questions from the Narcissistic Personality Inventory (NPI-13) and the Toronto Empathy Questionnaire (TEQ) (Time 1) on Qualtrics, a survey system. Upon completion of the survey, participants will be prompted to listen to one of four songs through headphones. Three contain at least 46 personal nouns (I, Me, My, We) and one consists of 10 personal nouns to act as a control. All songs were released between the years 2016 and 2017. Succession of the song will

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prompt participants to complete the NPI-13 and TEQ (Time 2). Scores from the NPI-13 and TEQ will be compared from Time 1 to Time 2. The purpose of this study is to further the knowledge of environmental factors contributing to narcissism. The hypothesis is NPI-13 scores will increase from Time 1 to Time 2, and TEQ scores will decrease from Time 1 to Time 2.

**Olmstead, Cassandra L.**, Thomas Hancock, Cayla M. Checorski, and Cassidy McKnight

**\*\*THE ROLE OF INTEREST AND MOTIVATION**

This study proposes to examine the role that interest plays in the motivation to learn. Evaluation of previous research on motivation by Keller (1987) shows a need to restructure the model he proposed and support the restructuring with empirical evidence. Research has shown that interest increases student investment and motivation (Hidi, 2006), decreases the perception of difficulty (Renninger, Ewen, & Lasher, 2002), and can affect student perception of instructor, outcome, and courses (Paswan & Young, 2002). The current study proposes to test this by using interest-based themes to teach psychology concepts. It will consist of three phases intended to mimic college courses, to illustrate the proposed intervention to increase scores and completion of the study. In the first phase, participants will take an online survey to determine their interest. In the second phase, they will view a presentation with one of two interest based themes. In the third and final phase, they will take a test over the presented information. Throughout the phases, participants will be placed into a congruent or incongruent condition based on their interest in the topic theme. The hypothesis is that participants in the congruent conditions will have higher test performance, report more time spent studying, and be more likely to complete all three phases, than those in neutral or incongruent conditions.

**Paraskevopoulos, Anna**, Karl Roeder, and Diane Roeder (Cameron University)

**\*TEMPERATURE REGULATES FORAGING BEHAVIOR IN THE RED HARVESTER ANT, *POGONOMYRMEX BARBATUS***

All organisms require nutrients for survival, growth, and reproduction. These nutrients are acquired in varying quantity when animals forage for food. The abiotic conditions that animals experience can either constrain or provide windows of opportunity for foraging activity. Here we examine how daily fluctuations in abiotic conditions regulate foraging activity of the red harvester ant, *Pogonomyrmex barbatus*. We examine 1) colony differences in time spent foraging and distance traveled per trip, 2) the effect of temperature on travel speed, and 3) the effect of temperature on the time spent engaged in each component of a foraging trip (i.e. outbound trip, foraging duration, return trip). We tracked 20 individual foragers at each of nine colonies and recorded distance to foraging area, time spent travelling and foraging, and temperature during each trip. Ants foraged in the morning at surface temperatures ranging

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from 25-60°C. Colonies foraged at different distances from the nest, which was reflected in travel time to and from the foraging area. Controlling for differences between colonies, travel speed for both outbound and return trips increased with temperature. Likewise, search time was constrained to shorter bouts. Despite increased travel speed, ants foraged in the same location throughout the day, suggesting that distance to foraging areas was not influenced by temperature. Our results highlight the importance of daily temperature cycles in regulating foraging behaviors, which may limit nutrient intake.

**Parent, Gunner** and April Nesbit (East Central University)

**\*EVALUATION OF THE BLUE RIVER FOR PRESENCE OF  
*CAMPYLOBACTER JEJUNI***

Background: *Campylobacter jejuni* is a known bacterial species associated with cattle and poultry, along with other species (2). *C. jejuni* is known to cause campylobacteriosis, an intestinal infection that can have severe effects on young animals and humans (1). The Blue River is a water source for many people and livestock in Southeast Oklahoma, and the Oka' Yanahli preserve includes one mile of the Blue River near the headwaters. Prior to being a preservation, cattle occupied the land and today a chicken plant resides next to the river, and either of these activities could lead to contamination of the Blue River by *C. jejuni*. For the safety and health humans and animals, I sampled for the presence of *C. jejuni* in the portion of the Blue River contained in the Oka' Yanahli preserve. Methods: Sediment and water samples were collected from six locations along the Blue River. Water samples were diluted using serial dilution protocols and placed on *C. jejuni*, BD Campylobacter Bloodfree Selective Medium, petri plates. Plates were grown at 42°C for 24 hours. Eleven bacterial colonies of interest were isolated followed by gram staining and eight biochemical tests. Results were collected and deciphered using Bergey's Manual. Results: Based on initial results, none of the eleven isolated colonies are *C. jejuni*. Future work includes testing additional colonies using standard microbial techniques and 16S bar coding studies to confirm bacteria species. References: 1. Coker, A. O., Isokpehi, R. D., Thomas, B. N., Amisu, K. O., & Obi, C. L. (2002, March). Human Campylobacteriosis in Developing Countries. Retrieved October 18, 2017, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2732465/>. 2. Munroe, D. L., Prescott, J. F., & Penner, J. L. (1983, October). *Campylobacter jejuni* and *Campylobacter coli* serotypes isolated from chickens, cattle, and pigs. Retrieved October 18, 2017, from <https://www.ncbi.nlm.nih.gov/pubmed/6630466>.

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**Pate, Kayley** and Nikki J Seagraves (University of Central Oklahoma)

**\*ANALYSIS OF PROLIFERATION IN PHENYLALANINE, RETINOIC ACID, AND 4-DIETHYLAMINO BENZALDEHYDE 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. It is thought that high levels of Phe could inhibit Retinoic Acid [RA] signaling, which promotes the expression of genes such as proliferation, migration, and differentiation. Previous studies have shown that cardiac neural crest cells are important in formation of the outflow tract (OFT) and aortic arch arteries (AAA). Proliferation of the neural crest cells is a central process in the development of the heart. Study Objective: In this study we aimed to determine if exposure to high Phe levels perturbs cell proliferation. We also looked at the effects of exposure to RA and 4-diethylaminobenzaldehyde [DEAB], which is a known RA inhibitor. Methods: We conducted in-vitro proliferation assays on several cell types to determine if proliferation was affected by Phe, RA, and DEAB exposure. This involved plating and synchronizing the cells, treating them, and staining them with a Click-It Edu. Discussion: Current experimentation is underway. 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.

**Peterson, JohnAric**, Crystal Nicole Johnson, and Paul Lawson (University of Oklahoma)

**\*PROTEINIPHILUM ALASKENSIS SP. NOV., ISOLATED FROM  
ALASKAN PETROLEUM PIPELINE EFFLUENT**

Microbial influenced corrosion (MIC) of pipelines and other associated metal infrastructure is a problem that continues to increase as the population's oil dependency increases. However, little is known about the microbial populations responsible for these corrosive activities. Anaerobic enrichment cultures were constructed with the goal of cultivating and characterizing microorganisms related to MIC. The inoculum was obtained from a pipeline undergoing physical corrosion mitigation on the North Slope of Alaska. A Gram-negative staining organism, strain PE-10T, represented 11% of this microbial population, shared only 93.0% 16S rRNA gene sequence similarity to the closest validated species, *Proteiniphilum acetatigenes* TB107T. Cells of PE-10T were non-motile and non-spore-forming, with optimal growth occurring in proteinaceous media without NaCl, at pH 7.6 and incubated at 37 oC. 16S rRNA gene identification of this strain found it to be 99.5% identical to *Proteiniphilum acetatigenes* MH5T, isolated from oil tars of the Shengli Oil

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Field, China. The characteristic and phenotypic comparisons of these two strains will be done in tandem to establish the significance of any differences between MH5T and PE-10T. The cultivation of this novel species is significant because it represents a cultivated molecular signal from which to approach corrosion studies. The isolation of these two near identical strains from similar locations suggests potential unknown eco-physiological role in petroleum production. For this reason, it is particularly interesting to have potentially linked its presence to another geographically distinct oil field.

**Petties, Fulani** and Robert D. Mather (University of Central Oklahoma)

**\*\*NON-CONSCIOUS MIMICRY AND ITS EFFECT ON RAPPORT AND RECALL**

Non-conscious mimicry is used to build rapport as well as gain the liking of others, during first encounters and when there is a perceived threat to belonging or existing relationships. Mimicry can occur through verbal and nonverbal methods such as physical gestures, mannerisms and taking on the perception of others. This experiment will explore whether the absence or presence of behavioral mimicry effects rapport and recall measured by the number of details recalled, accuracy of details recalled and participants confidence in the accuracy of details recalled. The experimental hypothesis is that behavioral mimicry will result in a greater number of and more accurate recall of details, and that those who are higher in confidence, Need to Belong (NBS) and Interpersonal Expectancy (IES) will be participants in the mimicry condition.

**Prather, Cole** (University of Central Oklahoma)

**\*NONLINEAR HUMAN POPULATION GROWTH MODELING - UPPER BIAS**

From a chemical kinetics model of population growth, a power law equation is derived and fit to human population data. Using Excel's Solver, the parameters of this model were optimized for a specified dataset. After identifying the optimal parameters, this model was forecasted and compared to other known growth models. Each of the models compared were also optimized and forecasted for the respective dataset. These models were then plotted for visual comparison and a table was constructed to analyze each of the parameters, their associated errors, and the R-squared value. From this comparison of seven known models, there are a wide variety of potential forecasts. Some of the models are identical until they reach a critical point and will need to be further investigated. The variations in outcomes reveals the sensitivity of these parameters and are even more clear when comparing the correlation to current census data, as each model has a significant R-squared value.

**Pritzlaff, Riley** (Owasso High School), Raina Hahn (Bixby High School), B.J. Reddig (Oklahoma State University – Center for Health Sciences), P.K. Litt (Oklahoma State University), and E.L. Blewett (Oklahoma State University – Center for Health Sciences)

**CLONING, SEQUENCING, AND IDENTIFICATION OF PHAGE 7, AN UNKNOWN *SALMONELLA* OR ENTEROHEMORRHAGIC *E. COLI* (EHEC) BACTERIOPHAGE**

Bacteriophages are a common type of viruses that infect and kill bacteria. *Salmonella* and enterohemorrhagic *E. coli* [EHEC] bacterial infections are a common cause of foodborne illnesses. Bacteriophages were isolated from the environment and shown to kill both of these pathogens. Preparations of these bacteriophages can be sprayed onto food processing machinery and leafy greens in order to reduce bacterial contamination thus preventing foodborne illness. In this project we cloned DNA fragments from one of the bacteriophages, Phage 7, and sequenced the DNA. We sequenced 2,142bp of DNA. We used this DNA sequence data and phylogeny software to compare our phage with existing phage in GenBank. We identified Phage 7 as a *Salmonella*-type phage and inferred its relationship with other bacteriophage.

**Reding, Reid J.**, Brandon S. Reed, and Jeffrey McCormack (Oklahoma Christian University)

**\*COMPREHENSIVE ANALYSIS OF BIOACTIVITY IN PROBIOTICS**

The makers of probiotic supplements market their products in many ways. One of the main ways they market their products as better than the competition is labeling promising an increased colony forming unit (CFU) count. This study set out to develop an assay to accurately measure the bioactivity of common probiotic supplements found in grocery stores. We hypothesized that commercial probiotics have lower levels of bioactivity than advertised by the probiotic manufacturing companies. We measured the bioactivity of a variety of probiotics, and preliminary data suggested that the level of bioactivity contained in each capsule was tremendously variable. Some formulations contained a much lower CFU count than advertised and some formulations contained a much higher CFU count than advertised. More work is still to be done in terms of refining our assay and experimenting with new methods.

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

**A TWELVE-YEAR RECORD OF EARLIER BUDBURST IN OKLAHOMA DECIDUOUS TREES**

I provide a twelve-year record (2006-2017) of budburst dates for over 350 individuals of 22 deciduous tree species in southern Oklahoma. Budburst occurred in many species three weeks earlier in 2017 than in 2006. Species with early budburst, such as sweetgum and post oak, showed a much greater phenological shift than did species with later budburst, such as pecan. This

three-week phenological shift is much greater than that observed in other parts of North America.

**Rice, Stanley A.** (Southeastern Oklahoma State University), Erica A. Corbett (Southeastern Oklahoma State University), and Sarah N. Henry (Oklahoma Medical Research Foundation)

#### PATTERNS OF HERBIVORE DAMAGE IN POST OAKS (*QUERCUS STELLATA*) IN SOUTHERN OKLAHOMA

We estimate herbivore damage to leaves of twelve post oak trees in southern Oklahoma for the growing season of each of five years, which included a drought year and a flood year. Herbivore damage differed greatly from one year to another, over each growing season, and among trees. This non-random pattern of herbivore damage, however, could not be easily explained. The individual trees may differ in their ability to resist herbivores.

**Soden, Cierra,** Matt Broge, Alisha Howard, Benny Burton, and Charles Biles (East Central University)

#### \*IMPORTED SPECIES OF PATHOGENIC *FUSARIUM* SPECIES FROM CENTRAL AMERICA DIFFER FROM *FUSARIUM* SPECIES IN OKLAHOMA

Plant pathogenic *Fusarium* causes disease on a large range of food crops around the world. This project is investigating the various *Fusarium* isolates that are being brought into the United States from Central America on cantaloupes. Symptoms that occur before harvest include a green margin around the area of infection, large fissures in the netted epidermal tissues, along with the infected lesion area turning tan to brown. White mycelium can occur on the surface when stored at high humidity and warm temperatures. Lesions that develop postharvest and without the external preharvest symptoms, also develop interior spongy, white lesions. Melons (*Cucumis melo* L. var. *cantalupensis* Naudin) imported from Mexico were purchased from a local grocery store, surface disinfected with bleach and stored on disinfected table tops for 7 days. The melons were dissected with a sterile knife and small infected fruit tissue pieces were placed on Potato Dextrose Agar (PDA). On PDA, the colonies appeared peach colored. Microscopic examination indicated that the isolates were *Fusarium* spp. They were placed in 15% glycerol and stored at -70°C until molecular analysis could be conducted. The isolates stored at -70°C were thawed and 50 µl of the spore suspension transfer to a PDA plate. A small portion of the hyphae was removed from the Petri dish and used for DNA extraction. ITS primers were used to isolate DNA sequences from the different isolates. The DNA analysis confirmed that they were *Fusarium* species. GenBank blast search indicated that the isolates from Mexico were a 100% match with *Fusarium* sp. ALO-IIHR. Costa Rica isolates were either *F. proliferatum* var. *proliferatum* or *F. subglutinans*. Oklahoma isolates were *Fusarium solani*. The *F. proliferatum* and *F. subglutinans* have

not been reported as pathogens on cantaloupe. This is the first report of *Fusarium* Fruit Rot in Costa Rica and Mexico.

**Story, Haylee,** Sonya Ross, Stanley A. Rice (Southeastern Oklahoma State University)

#### \*RE-GROWTH AFTER FIRE IN A CROSS-TIMBERS FOREST IN OKLAHOMA

We counted the number of sprouts of woody plant species that grew after a 2011 fire near the Blue River in south central Oklahoma over the course of six years. One of the transects was in a cross timbers forest; the other one was along the Blue River. We found that some woody plant species re-sprouted quickly and maintained a relatively unchanged density of sprouts, while in other species, the number of sprouts increased over time.

**Tedford, Kinsey** and David Bass (University of Central Oklahoma)

#### \*\*COASTAL MIGRATION OF THE BLACK LAND CRAB ON GRAND CAYMAN ISLAND

*Gecarcinus ruricola* (black land crab) is found throughout Grand Cayman, and concern has been expressed regarding their possible declining populations and current distributions. Goals were to determine *G. ruricola* activity levels during the breeding season, identify locations with highest *G. ruricola* numbers, describe distribution of the *G. ruricola* migrating population, note ovigerous crab mass migrations, and estimate crab mortality rates caused by vehicles. Surveys were conducted in summer 2017 along a main highway in Grand Cayman. Overall, high numbers of crab counts occurred on the inland roadside in May and June, and shifted to the coastal side mid-July through August. High and low numbers of crabs were not scattered randomly along on the highway. Non-hierarchical cluster analysis confirmed two main clusters in each sex on the road. Generally, the middle region of the study area exhibited the greatest numbers of migrating crabs. Males and females without eggs were more prevalent at the beginning of this region, while berried females were more often seen towards the end. The clustering of crabs along the highway most likely reflects habitat changes due to increases housing development. Male and non-berried females on the road displayed no random pattern in occurrences throughout the breeding season days, although berried females were more prevalent during nights of high crab activity. It seems the migration season extends over three months, but intensity varies with time. There was a total of 1,434 roadkills counted throughout the study, averaging 6 crabs/100m of road killed each night. Knowledge gained from this study will be valuable to environmental biologists and resource managers. This data will provide Cayman Department of Environment with baseline information and methodology to monitor Cayman's land crab populations and establish a conservation plan. Lastly, this study will provide a greater overall understanding of land crabs and their reproductive migration.

**Thomas, David** (University of Oklahoma), Laura E. Bartley (University of Oklahoma), Tom Juenger (University of Texas at Austin), and Jason Bonnette (University of Texas at Austin)

**\*\*VARIATION OF INTERNODE CELLULAR ARCHITECTURE IN *PANICUM VIRGATUM* (SWITCHGRASS) DUE TO GENOTYPE AND ENVIRONMENT**

Switchgrass (*Panicum virgatum*) is a perennial C4 grass with an extensive North American latitudinal range attracting a lot of attention as a potential feedstock for the production of lignocellulosic biofuel. Switchgrass exhibits local adaptation to unique environmental conditions, providing the opportunity to explore ecotype variation. To determine how switchgrass composition, yield, and stress responses vary with environment, we have designed a common garden experiment in which 400-800 progeny from a 4-way cross of two upland and two lowland switchgrass genotypes are grown at ten different sites from North Dakota to south Texas. My goal is to identify internode anatomical variation and explore optimal stem architectures suited to particular environments across the geographical range of switchgrass. Ecotypes exhibit external phenotypic variation that includes tiller count, height, stress tolerance, and flowering time. However, a detailed analysis of internode anatomical variation has not yet been conducted. Three internodes per tiller of the four parent genotypes of the cross and two F1 individuals have been harvested from southern, central, and northern common garden sites. Transverse sections of internodes have been analyzed from the boundary sites with a new grid sectioning method. Sclerenchyma cell files at the northern site of the lowland AP13 are 32% (20  $\mu$ m) thicker than the upland VS16, a trait that scales positively with embolism resistance (Lens 2016). Additional variable stem traits of interest currently being characterized within this project include sclerenchyma cell wall thickness, epidermal cell layers, chlorenchyma size, and range of vessel diameter. Variation in stem anatomy may be influenced by environmental conditions and genotypic variation that impact stress response, biomass yield, and cell wall composition. Understanding the level of influence these variable traits have on biomass quality can guide switchgrass breeding programs and bioengineering in the future to generate site-specific trait combinations that optimize biomass for biofuel production.

**Torres, Nathaniel J.**, Steven D. Hartson, Janet Rogers, Khadija A. Abdulhafid, and John E. Gustafson (Oklahoma State University)

**\*\*A CLOSER LOOK AT A TEA TREE OIL-SELECTED *STAPHYLOCOCCUS AUREUS* SMALL COLONY VARIANT**

*Staphylococcus aureus* small colony variants (SCV) are associated with chronic and recurring infections that are recalcitrant in antimicrobial therapy. SCVs demonstrate: slower growth rates; defective metabolism and electron transport; and reduced antimicrobial susceptibility. Tea tree oil (TTO) kills bacteria by denaturing proteins and disrupting membrane structure and TTO reduced-

susceptibility (TTORS) *S. aureus* mutants exhibit an “unique” SCV phenotype. Similar to previously described SCVs, all TTORS SCVs investigated were less susceptible to both the cell wall antibiotics vancomycin and oxacillin. A TTORS SCV mutant (TTORS-1) harbored numerous mutations, including a mutation within *acpP* which encodes the acyl carrier protein (ACP) essential for fatty acid biosynthesis. Comparative proteomics revealed that TTORS-1 demonstrated increases in 39 proteins and decreases in 74 proteins compared to parent strain SH1000. In TTORS-1, the fatty acid biosynthesis proteins FabF (3-oxoacyl-synthase) and FabD (malonyl CoA-acyl carrier protein transacylase) and the bifunctional phosphopantothenylcysteine decarboxylase/phosphopantothenate-cysteine ligase were found in greater abundance. This latter enzyme is required for the synthesis of 4'-phosphopantetheine, which when linked to ACP acts as the anchor on which fatty acid biosynthesis takes place. Furthermore, RT-PCR analysis revealed that 4 genes involved with de novo fatty acid biosynthesis as well as one phospholipid biosynthetic gene were also up-regulated in TTORS-1. *S. aureus* SCVs can result from the deletion of *menB* or cold shock protein *cspB*, and *menB* SCVs demonstrate a decrease in citric acid cycle activity. TTORS-1 harbored less menaquinone biosynthetic protein *MenB* (1,4-dihydroxy-2-naphthoyl-CoA synthase), cold shock proteins *CspB* and *CspC*, ATP synthase subunit gamma, and proteins involved with the citric acid cycle. Collectively our data indicates that fatty acid biosynthesis is altered in TTORS-1, as would be expected in an *acpP* mutant. We also demonstrate the reduced synthesis of certain proteins in TTORS-1 mirroring what has been observed in previously described SCV phenotypes.

**Truelock, Mandy**, Michelle King, and Mariana Patrauchan (Oklahoma State University)

**\*ELEVATED CALCIUM INCREASES RHAMNOLIPID PRODUCTION IN *PSEUDOMONAS AERUGINOSA***

*Pseudomonas aeruginosa* is a Gram-negative, opportunistic pathogen known to infect open wounds, burns, and the lungs of Cystic Fibrosis patients. Calcium (Ca<sup>2+</sup>) has been shown to induce virulence factors of *P. aeruginosa* such as pyocyanin production and swarming motility, which is required for biofilm formation. In order to swarm across semi-solid surfaces, *P. aeruginosa* secretes a biosurfactant called rhamnolipid. In addition, rhamnolipid serves as a virulence factor that aids in defense against the host immune response. Based on the observation that swarming motility is induced by Ca<sup>2+</sup>, we hypothesize that rhamnolipid production is also increased in the presence of elevated Ca<sup>2+</sup>. In order to test this, we determined the effect of elevated Ca<sup>2+</sup> on the expression of *rhIA*, the gene essential for rhamnolipid production. For this, we measured the fluorescence of an *rhIA*-gfp translational fusion cloned under the *rhIA* promoter. We observed that fluorescence increased with increasing Ca<sup>2+</sup> levels confirming that Ca<sup>2+</sup> positively regulates *rhIA* production. The next aim will be to test the role of several Ca<sup>2+</sup>-binding proteins EfhP, an EF-hand

containing protein, CarP, a putative Ca<sup>2+</sup> binding  $\beta$ -propeller, and CalC, a putative Ca<sup>2+</sup> transporter, in regulating Ca<sup>2+</sup>-induced rhamnolipid production. The mutants with each of the corresponding genes disrupted, showed significant alterations in Ca<sup>2+</sup>-induced swarming. We will transform these mutants and their genetic complements with the rhla-gfp fusion containing plasmid and monitor fluorescence during growth at varying Ca<sup>2+</sup> concentrations. We anticipate that these mutants will show a reduction in Ca<sup>2+</sup>-dependent rhamnolipid production. This study will identify the members of Ca<sup>2+</sup> regulatory cascade involved in modulating the production of rhamnolipid and therefore, virulence of this important human pathogen.

**Varghese, Bipin Pallipparambil**, Alaeddin Abu-Abed, and Morshed Khandaker (University of Central Oklahoma)

**\*\*DEVELOPMENT OF CONTINUOUS FUNCTIONAL ELECTSPUN NANOFIBER YARN WITH CURVED ELECTRODE USING POLYCAPROLACTONE (PCL)**

A protocol and experimental setup to produce continuous electrospun twisted nanofiber yarn from Polycaprolactone (PCL) was formulated using curved collector. The experimental setup used multiple nozzles provided with a positive potential to atomize the PCL solution. A grounded Stainless steel funnel was used as the collector. By using a curved collector the yarns were able to form continuously and were collected on a spool. The continuous twisting and simultaneous formation of fibers showed superior consistency in the characteristics of the yarn. Images of the twisted yarns were studied in a Scanning Electron Microscope (SEM). The PCL fibers were seen to have a consistent angle of twist. Changing parameters of the system like changing the RPM of the twisting motor. These fibers can be used as building blocks to weave superior structures. Further this protocol was formulated with further automation in mind. Further research will be done to perfect the protocol and automated the system as well. The mechanical properties will also be tested.

**Walker, Austin** and Dwight L. Myers (East Central University)

**\*HIGH TEMPERATURE SYNTHESIS OF TITANITE**

Titanite (sphene) is a mineral which commonly forms where calcium, silicon, and titanium are all present together. Since titanium oxide is present in high temperature applications in turbomachinery, titanite is one possible reaction product when calcium and silicon bearing minerals are ingested into a gas turbine. A study of the reaction of calcium carbonate with silicon dioxide (quartz) and titanium dioxide (rutile) is described in this study. Titanite is observed to form on heating for 24 hour intervals at temperatures of approximately 1300 degrees Celsius and above. Reaction progress over multiple heating cycles shows increasing amounts of titanite by X-ray diffraction. Calcium titanate (perovskite) is observed to form at these temperatures as well. The significance of these reactions with regard to corrosion in gas turbines will be discussed.

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**Watson, Jamie N.** and Nikki J Seagraves

**\*\*ANALYSIS OF TRANSCRIPTOMICS: IMPLICATIONS OF DIFFERENTIALLY EXPRESSED GENES IN AN AVIAN MODEL OF MATERNAL PKU**

Maternal PKU is a disease that affects embryos exposed to high levels of Phenylalanine (Phe) from mothers with PKU. This results in severe cardiac and cranial defects. It is not known which genes in the developing embryo are differently expressed in the presence of high Phe. Methods Fertilized chicken eggs were treated with 2500uM PHE through yolk injection at HH6. Embryos were incubated until HH14 and then dissected. The head/cranial region and the thoracic/cardiac region were dissected. For the control group, 3 embryos were pooled and 2 embryos were used for treated for a total of 3 samples. RNA was isolated and shipped to Applied Biological Materials for enrichment for mRNA, library construction, and sequencing on the Illumina NextSeq500. Data was analyzed with the open source software Galaxy Suite. Results Cufflinks was used determine differential gene expression. In cranial tissue we found 6 differentially expressed genes (q<0.05). In cardiac tissue, we observed 10 differentially expressed genes (q<0.05). Discussion Based upon the RNA-Seq data we have analyzed, in the cardiac tissue there are two differentially expressed genes found in the retinoic acid (RA) pathway, Retinol Binding Protein 4 (RBP4) and Transthyretin (TTR). In review of the literature RA signaling is important in heart development and increases or decreases in levels of RA can cause significant developmental defects.

**Weigand, Rhonda H.** (Redlands Community College), Nicholas P. Massaro(University of Oklahoma), and Indrajeet Sharma(University of Oklahoma)

**\*DESIGN AND SYNTHESIS OF COLLYBOLIDE PROBES FOR DEVELOPING NON-ADDICTIVE PAINKILLERS**

Opiates, such as morphine are prescribed and used by millions of patients each year for the treatment of moderate to severe pain. However, opioid analgesics cause addiction and subsequent abuse that affects the health, social, and economic environment of all societies. Studies suggest that selective kappa-opioid receptor ( $\kappa$ OR) agonists biased towards G-protein signaling could be novel therapeutics for treating pain with reduced side effects. In the quest for biased  $\kappa$ OR ligands, we have identified collybolide a non-nitrogenous sesquiterpene natural product from the mushroom *Collybia maculata*. Deciphering the structural requirements essential for  $\kappa$ OR selectivity through collybolide probes, is the first step in developing selective- and biased- $\kappa$ OR ligands. Therefore, we have developed a novel three components coupling approach for the efficient synthesis of diverse biocores of collybolides. All of the starting materials required for the three components coupling have been synthesized at gram scale. During the process, various synthetic and analytical skills including the Schlenk techniques, low- and high-temperature reactions,

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column chromatography, thin-layer chromatography (TLC), High-Pressure Liquid Chromatography (HPLC), as well as Infrared (IR), nuclear magnetic resonance (NMR) and Mass spectroscopy were applied. The resulting analogues will be submitted for the High-throughput screening at the NIMH Psychoactive Drug Screening Program against 50 CNS receptors to find new hits. Identified high-affinity collybolide probes will be advanced for in vivo use for the development of potential non-addictive painkillers.

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

#### THE ENDLESS PATTERNS OF REGULAR POLYGONS

This talk looks at regular polygons sharing a common side length. Patterns in the heights of the polygons are enumerated and explained. This basic set up provides many questions accessible to undergraduate research.

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

#### USING ULTRASOUND TO ANALYZE CALIBRATED ABSORBERS

My nuclear physics students were finding differences in a new and old set of lead absorbers when used to attenuate gamma rays. In an attempt to determine if the absorbers were different or there was other student error, I used ultrasound to examine them to determine if the absorbers were different. I could look at the velocity of sound to determine if the absorbers were different. The square lead absorbers have some other metal (Al) on the back and their velocity appears slightly different as one would expect. It occurred to me since the mass absorption coefficient of these absorbers was calibrated at the manufacturer, I used one point attenuation coefficient determination to examine the relationship between the ultrasound attenuation coefficient and the mass absorption coefficient for x-rays. I was surprised to find a moderate correlation between these two quantities even with the one point attenuation errors inherent in the method. The ultrasound attenuation at 1MHz in preliminary lead data appears to be linearly correlated with the inverse of the mass attenuation coefficient ( $m = 1.88 \times 10^6 \text{ mdB/MHz}$ ,  $r = .94$ ). This finding was only with four absorbers. More data is needed and more materials should be examined.

**Willoughby, Andrew** and Ben Holt (University of Oklahoma)

#### \*THE ROLE OF NF-Y AND HY5 IN FLORAL DEVELOPMENT

The vast majority of non-animal foods we eat come from flowers. Flowers are not just the sites of plant sexual reproduction; they are designed to attract pollinators or otherwise facilitate pollen dispersal and to protect the developing reproductive organs. In these ways and others, the morphology of flowers is vital to their functions. This project describes novel roles for NUCLEAR FACTOR Y (NF-Y) and ELONGATED HYPOCOTYL5 (HY5) in floral development. Plants with mutations in NF-Y and HY5 genes produce extra perianth floral organs. nf-y mutants produce more stamens on average, while hy5 has less stamens on average. In addition to these organ number phenotypes, both nf-y and hy5 have organ fusion phenotypes: nf-y and hy5 mutants produce

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petaloid stamens and hy5 mutants produce branched stamens. These phenotypes were analyzed with scanning electron microscopy and the genetic relationships of these phenotypes were explored in a nf-y hy5 higher order mutant.

**Wilson, Weldon** (University of Central Oklahoma)

#### DARK MATTER AT THE SUB-ATOMIC PARTICLE LEVEL

It is shown that a careful treatment of the standard semi-classical electron model requires intrinsic mass for the electron that does not arise from the self-energy of known interactions. The analogy with the dark matter concept used in cosmology is presented.

**Yeoh, Shi Rui**, Tiara Travis, Paul Cook, Samuel Lawrence, and Nesreen Alsbou (University of Central Oklahoma)

#### \*ENHANCING STUDENT LEARNING USING COGNITIVE SCIENCE

Our goal for this project is to study the thinking process of college students when they are learning and in the process enhance the way they think using cognitive science. We focus on the think-aloud strategy and the advantage and disadvantage of this method. The think-aloud strategy requires the learner to verbalize his or her thinking when solving a given problem. Our group contains of 6 students and 2 Professors. At the beginning of the research, our task was to review academic journals regarding to the think-aloud strategy. After that, each of us was required to design a case study which focus on the application of the think-aloud strategy to students related to our respective major. As for now, each of us has completed our preliminary case studies. The initial experiments only focused on a scale of one student and we plan to expand the scale of the experiment and hopefully help students improve the way they learn.

**Yeoh, Shi Rui**, Samuel Ka Hei Chan, and Nesreen Alsbou (University of Central Oklahoma)

#### \*A SMART STREET LIGHTING SYSTEM USING SOLAR ENERGY

The aim of this research is to increase the usage of renewable energy around the campus of University of Central Oklahoma (UCO), and in hope lower the pollution level during the process. Our main focus in this project is to utilize solar energy to power the street lights around campus and perhaps increase the amount of solar powered facilities. This is done using solar panel and battery pack. In addition to that, our goal is to reduce energy consumption and improve energy efficiency. This can be done using a Real Time Clock, setting the circuit to raise the intensity of the light during peak hours and lower it during quiet hours. Also, we plan to develop an algorithm that will adjust the angle of the solar panel according to the position of the sun. The purpose of doing so is to harvest as much solar energy as possible.

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