112th ANNUAL TECHNICAL MEETING
OKLAHOMA ACADEMY OF SCIENCE
UNIVERSITY OF SCIENCE AND ARTS OF OKLAHOMA, CHICKASHA

PROGRAM SUMMARY

Wednesday, 1 November 2023

5:00 p.m. Executive Council Meeting (Zoom)

Friday, 10 November 2023

7:30 a.m. Registration for Technical Meeting in Austin Hall

Concurrent Scientific Paper Sessions in Austin Hall (8:30 - 11:00 a.m.)
Section A Biological Sciences (Botany) – Room 108
Section A Biological Sciences (Zoology) – Room 202
Section C Physical Sciences – Room 101
Section D Social Sciences – Room 209
Section E Science Communication and Education – Room 101
Section G Applied Ecology and Conservation – Room 107
Section H Microbiology – Room 206
Section J Biochemistry and Molecular Biology – Room 213
Section L Mathematics, Statistics, & Computer Science – Room 209
Section M Environmental Sciences – Room 107
Section N Biomedical Sciences – Room 213

Section Business Meetings in Austin Hall (either 10:45 or 11:00)
Section A Biological Sciences (Botany & Zoology) – 11:00-11:15 in Room 202
Section C Physical Sciences – 10:45-11:00 in Room 101
Section D Social Sciences – 10:45-11:00 in Room 209
Section E Science Communication and Education – 11:00-11:15 in Room 108
Section G Applied Ecology and Conservation – 10:45-11:00 in Room 107
Section H Microbiology – 11:00-11:15 in Room 206
Section I Engineering Sciences – 11:00-11:15 in Room 101
Section J Biochemistry and Molecular Biology – 11:00-11:15 in Room 213
Section L Mathematics, Stats, & Comp. Science – 11:00-11:15 in Room 209
Section M Environmental Sciences – 11:00-11:15 in Room 107
Section N Biomedical Sciences – 10:45-11:00 in Room 213

Academy Business Meeting – 11:30-12:00 in Austin Hall Room 206 – All OAS members are encouraged to attend and visitors are welcome.

Academy Luncheon & Speaker – 12:00 in Ballroom of Student Center (2nd Floor) – lunch ticket required

Poster Session for All Sections – 1:30-3:30 in Fieldhouse

REFRESHMENTS

Morning break stations are provided from 9:30-10:00 in the Emerson Room (109) on the 1st Floor of Austin Hall.

LUNCHEON SPEAKER
Stacey A. Gunter, Ph.D.

Dr. Stacey Gunter is currently the Acting Center Director of the USDA, Agricultural Research Service (ARS), Oklahoma and Central Plains Agricultural Research Center located in El Reno, Oklahoma, providing leadership to 85 employees at 4 locations across the state. During his 30-year career, he has taught courses in ruminant nutrition and management, and conducted research in grazing livestock nutrition. Stacey has three research activities in respiratory gas flux by grazing beef cattle. First, the effect of sire selection on inheritance and progeny methane emissions. Second, the effects of diet type and intake rate on ability to predict metabolizable energy intake using respiratory gas flux. Last, the ability of domestic seaweeds to mitigate enteric methane emissions. He received his B.S. in Animal Science from Oregon State University (1987), a M.S. in Animal Science from the University of Nevada-Reno (1989), and Ph.D. in Animal Nutrition (1993) from Oklahoma State University. For 18 months, he was a post-doctoral research associate at the Clayton Livestock Research Center with New Mexico State University where they researched receiving diet formulations for staring cattle in feedlots. He joined the faculty of the Cooperative Extension Service at the University of Maine in 1994 as a Beef Cattle Specialist and in 1996 he moved to the Southwest Research & Extension Center in Hope. In 2008 he joined ARS as a Research Leader and ruminant nutritionist in Woodward, Oklahoma. Stacey and his wife, Robin, reside in Woodward and have 2 grown children, Tanner and Madeline.

SPECIAL THANKS

A well-deserved special thanks to the University of Science and Arts of Oklahoma and the USAO planning committee, with special recognition for Dr. Rachel Jones and Dr. Jason Shaw.

UPCOMING MEETINGS

2024 Fall Field Meeting (joint meeting with the Oklahoma Native Plant Society) TBA
2024 Annual Technical Meeting, University of Oklahoma Health Sciences Center, November 1, 2024

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 - $35.00
Non-member - $50.00
Student - $20.00
USAO Students - free
Luncheon tickets (if available) - $25.00

2024 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. Abstract publication fee is $38. *POAS* editor is Dr. Mostafa S. Elshahed, mostafa@okstate.edu.

Executive Director: Inquiries concerning upcoming OAS activities and membership may be directed to Dr. Adam Ryburn, OAS Executive Director, 2501 N. Blackwelder Ave, OKC, OK 73106, (405) 208-5044, aryburn@okcu.edu.

SECTION A: BIOLOGICAL SCIENCES – BOTANY
Austin Hall 108
Section Chair: Jason Shaw

8:30-8:45	*QUANTIFYING THE DIFFERENCES IN *PHILODENDRON MELANOCHRYSUM* IN VITRO UNDER DIFFERENTIAL PH CONDITIONS. Hannah Lucy, Oral Roberts University.
8:45-9:00	*OPTIMIZING PARAMETERS FOR THE SUCCESSFUL BIOLISTIC TRANSFECTION OF HEMP. Joshua Pilote, Oral Roberts University.
9:00-9:15	*BRIDGING DISCIPLINES ON MARS: SOUTHWESTERN OKLAHOMA STATE UNIVERSITY'S FIRST INTERCOLLEGIATE STUDY INTEGRATING BIOLOGY, COMPUTER SCIENCE, AND ARTIFICIAL INTELLIGENCE FOR MICROBIAL ANALYSIS AND PLANT GROWTH ON MARS. Payden Farnsley, Southwestern Oklahoma State University.
9:15-9:30	*THE DISTRIBUTION OF INVASIVE HONEYSUCKLE IN EASTERN OKLAHOMA. Sarah Short, Oklahoma State University - Stillwater.
9:30-9:45	BREAK
9:45-10:00	CHARACTERIZING CLIMATIC AND EDAPHIC NICHES OF THE TEMPERATE NORTH AMERICAN CLADE OF *ASCLEPIAS*. David Kunkel, Oklahoma State University - Stillwater.
10:00-10:15	**SPATIAL PHYLOGENETICS OF VASCULAR PLANTS IN THE SOUTH-CENTRAL US. Sierra Hubbard, Oklahoma State University - Stillwater.
10:30-11:00	FLORA OF OKLAHOMA (Annual Business Meeting)
11:00-11:15	BIOLOGICL SCIENCES SECTION MEETING **(Room 109)**

Posters

Poster 1	*M.A.R.S. ON MARS: MICROBIAL ADDITIONS TO REGOLITH AND SCAT ON MARS. Stevie Langstraat, Southwestern Oklahoma State University.
Poster 2	*A PRELIMINARY INVESTIGATION ON *PHILODENDRON ERUBESCENS*: ASSESSMENT OF PLANTLETS PLACED IN ELEVATED CYTOKININ 6-BENZYLAMINOPUTINE CONCENTRATIONS TO DETERMINE SHOOT MULTIPLICATION, CALLUS, AND VARIEGATION PROMOTION. Alyssa Minsky, Oral Roberts University.
Poster 3	*ANTIMICROBIAL PROPERTIES OF NATIVE OKLAHOMA PLANTS. Lane Paul, East Central University.
Poster 4	*BEYOND BOUNDARIES: HYBRIDIZATION IN *BAPTISIA AUSTRALIS* AND *B. SPHAEROCARPA*. Kaylyn Rawls, East Central University.
Poster 5	*THREE SISTERS GROWN WITH A FOURTH SISTER, ATTRACTIVE OR REPELLENT. Grace Scott-Lang, East Central University.
Poster 6	**THE EVOLUTION AND TAXONOMY OF THE DRYADOIDEAE. Leann Monaghan, University of Oklahoma.
Poster 7	**ECOSYSTEM MULTIFUNCTIONALITY: BENEFITS OF FORB PLANT DIVERSITY TO LOCAL POLLINATORS AND SOIL PROPERTIES FROM WATER RETENTION TO CARBON SEQUESTRATION. Lauren Rosenfelt, University of Oklahoma.
Poster 8	**TOWARDS A PHYLOGENETICALLY-INFORMED TREATMENT OF *HETEROTHECA* CASS. (ASTERACEAE: ASTEREAE). Marisa Szubryt, University of Oklahoma.

SECTION A: BIOLOGICAL SCIENCES – ZOOLOGY
Austin Hall 202
Section Chair: Jason Shaw

8:30-8:45	BREEDING SYNCHRONY, HABITAT, AND SCALE AS PREDICTORS OF EXTRAPAIR PATERNITY IN SCISSOR-TAILED FLYCATCHERS. Michael Husak, Cameron University.
8:45-9:00	BIG, CROWDED, URBAN LIZARDS: BEHAVIORAL CONSEQUENCES IN AUSTRALIA'S LARGEST DRAGON. Baird Troy, University of Central Oklahoma.

*Undergraduate Presentation **Graduate Presentation

SECTION A: BIOLOGICAL SCIENCES – ZOOLOGY (continued)

9:00-9:15 *CONSERVATION OF RPS6 AND IMPL2 IN DROSOPHILA SPECIES. Alejandro Sanchez III, Oklahoma Christian University.

9:15-9:30 *IMPL2 CONSERVATION IN THE INSULIN/TOR (IT) PATHWAY. Faith Wohlever, Oklahoma Christian University.

9:30-9:45 BREAK

9:45-10:00 *PARASITIC WASPS ON MILKWEED IN NEBRASKA. Ryley Hall, Oklahoma State University - Stillwater.

10:00-10:15 *OBJECTIVE COMPARATIVE GENOME SEQUENCE ALIGNMENT OF THE HOMININI SPECIES USING A HIGH-PERFORMANCE COMPUTING ALGORITHM TO REVEAL PHYLOGENETIC INSIGHTS. Christof Rosler, Oral Roberts University.

10:15-10:30 *COMBING INSECT WEBS: UNCOVERING THE DISTRIBUTION OF EMBIOPTERA IN OKLAHOMA. Faith England, Oklahoma State University - Stillwater.

10:30-10:45 **WILDLIFE BIODIVERSITY IN OKLAHOMA OZARK GLADES. Alexander Harman, Oklahoma State University - Stillwater.

10:45-11:00 **IMPACTS BEYOND THE TARGET: UNINTENDED CONSEQUENCES OF PESTICIDES ON BURYING BEETLES. Samantha Hittson, Oklahoma State University - Stillwater.

11:00-11:15 BIOLOGICL SCIENCES SECTION MEETING

Posters

Poster 9 *GENE CONSERVATION OF THE INSULIN/TOR PATHWAY. Laura Byars, Oklahoma Christian University.

Poster 10 *PREDATION IN WESTERN DIAMONDBACK RATTLESNAKES. Kylar Byrd, Makayla Greening, Mckaegan Gregory, Annabelle Hawkins, Madilyn Crisp, Olabode Olayode, Ryan Howes, and Wyatt Norton, Southwestern Oklahoma State University.

Poster 11 *HIGH EVOLUTIONARY CONSTRAINT OF RPS6 AS COMPARED TO LNK. Asmita Giri amd Colby Coker, Oklahoma Christian University.

Poster 12 *RPS6 IS MORE CONSERVED THAN RL IN *DROSOPHILA* SPECIES. Shannon Fagen and Kambryn Duncan, Oklahoma Christian University.

Poster 13 *SLMB CONSERVATION WITHIN THE INSULIN/TOR PATHWAY. Josue Espinal and Paulina Ruelas, Oklahoma Christian University.

Poster 14 *EFFECTS OF TERRITORIAL BEHAVIOR ON HEMATOLOGICAL INDICES, LEUKOCYTE COUNTS, AND OXIDATIVE STRESS IN MALE COLLARED LIZARDS (*CROTAPHYTUS COLLARIS*). Sean Johnson, University of Central Oklahoma.

Poster 15 *COMPARISON OF CONSERVATION AND DIVERGENCE IN GENE RL COMPARED TO GENE GIG. Jenna Knox and Katie McCullock, Oklahoma Christian University.

Poster 16 *CONSERVATION OF IMPL2 IN *DROSOPHILA* SPECIES. Leah Larkpor, Oklahoma Christian University.

Poster 17 *COMPARISON OF SAMPLING METHODS FOR DIVERSITY ASSESSMENTS OF SMALL-MAMMALS IN GYPSUM PRAIRIE OF WESTERN OKLAHOMA. Xander Molina, University of Central Oklahoma.

Poster 18 *IMPL2 CONSERVATION IN THE INSULIN/TOR (IT) PATHWAY. Amber Morgan, Oklahoma Christian University.

Poster 19 *HEMATOLOGICAL INDICES AND LEUKOCYTE DIFFERENTIALS IN HATCHLING COLLARED LIZARDS (*CROTAPHYTUS COLLARIS*). Imana Stetson, University of Central Oklahoma.

Poster 20 *FLY BY EVOLUTION. Hope Swor, Oklahoma Christian University.

Poster 21 *GIG AND SLMB HAVE MISLEADING GENETIC INTERACTIONS. Jackson Taubel, Oklahoma Christian University.

Poster 22 *THE EFFECT OF FEMALE MATE CHOICE ON OFFSPRING SEX RATIOS IN A FRESHWATER AMPHIPOD SPECIES. Joseph Alcuitas, Rachel Uhlig, Jarrett Smith, and Ryan Agyemang, Southwestern Oklahoma State University.

*Undergraduate Presentation **Graduate Presentation

SECTION A: BIOLOGICAL SCIENCES – ZOOLOGY (continued)

Poster 23 *LNK IS LESS CONSERVED THAN SLMB IN THE INSULIN SIGNALING PATHWAY. Kaybre Wright and Lauren Yarnell, Oklahoma Christian University.

SECTION C: PHYSICAL SCIENCES
Austin Hall 101
Section Chair: Benjamin Tayo; Vice-Chair: Amanda Nichols

9:00-9:15 DETECTION OF DNA NUCLEOBASES USING SINGLE-LAYER TI3C2 MXENE AND GRAPHENE: COMPUTATIONAL STUDIES. Benjamin Tayo, University of Central Oklahoma.

10:45-11:00 PHYSICAL SCIENCES SECTION MEETING

Posters

Poster 24 *SOLAR CYCLE VARIABILITY AND IT'S EFFECT OF GEOMAGNETIC ACTIVITY. Dalton Chase, Cameron University.

Poster 25 *SYNTHESIS OF AZOLINES VIA MICROWAVE & ULTRASONIC RADIATION. Diana Dao, Cameron University.

Poster 26 *STUDY OF IONOSPHERIC DRIFT USING IONOSONDE DATA. Landon Holley, Cameron University.

Poster 27 *INVESTIGATION OF QUENCHING OF FLUORESCENCE STUDIES OF AF 647 DYES IN PRESENCE OF GRAPHENE OXIDE NANOCOLLOID (GONC). Wyatt Johnson, Cameron University.

Poster 28 *ANALYZING LIGHT CURVE DATA OF AN EXOPLANET USING ROBOTIC TELESCOPE DATA. Jennifer Lane, Cameron University.

Poster 29 *INVESTIGATION OF PHOTOPHYSICS AND HYDRODYNAMIC PROPERTIES OF CY 5 DYES IN REVERSE MICELLE WITH THE PRESENCE OF GRAPHENE OXIDE. Nathalie Moro, Cameron University.

Poster 30 *IMAGE PROCESSING OF ROBOTIC TELESCOPE DATA FROM MICROOBSERVATORY. Thomas Richards, Cameron University.

Poster 31 **ELECTROMECHANICAL TRANSLOCATION OF DNA THROUGH NANOPORE MEMBRANES. Micah Watson, Jeffery Moore, Fernando Salazar, and Kevin Knop, University of Central Oklahoma.

Poster 32 THE EFFECTS OF SOFTWARE BASED TFT FILTERING OF 400-500NM EMISSIONS. Douglas Bryhan, East Central University.

Poster 33 LIGHT-SHIFT-INDUCED BEHAVIORS BEHAVIORS IN MOMENTUM-SPACE QUANTUM WALKS. Jerry Clark, East Central University.

Poster 34 ISOLATION AND PURIFICATION OF CARVONE. Charles Crittell, East Central University.

Poster 35 ENERGETICS OF CHLORINE-SUBSTITUTED PHENYLDIAZENES. Daniel McInnes, East Central University.

SECTION D: SOCIAL SCIENCES
Austin Hall 209
Section Chair: John Geiger; Vice-Chair: Dustin Williams

10:00-10:15 THE EFFECT OF DIFFERENT PSYCHOLOGY CLASSES ON PSYCHOLOGICAL MISCONCEPTIONS IN STUDENTS. John Geiger, Cameron University.

10:15-10:30 STROBOSCOPIC LIGHT AND THE ENHANCEMENT OF EMPLOYEE OUTCOMES: PRELIMINARY FINDINGS. Jennifer Kisamore, University of Oklahoma - Tulsa.

10:45-11:00 SOCIAL SCIENCES SECTION MEETING

Posters

Poster 12 **A SCOPING REVIEW OF HEALTH INEQUITIES IN ALCOHOL USE DISORDER. Shaelyn Ward and Josh Autaubo. Oklahoma State University Center for Health Sciences.

*Undergraduate Presentation **Graduate Presentation

SECTION D: SOCIAL SCIENCES (continued)

Poster 13 *ARE YOU A NEGATIVE NANCY? EXAMINING UNHEALTHY COLLEGE COPING STRATEGIES DURING COVID. Alyssa S. Hunt and Lyndee B. Jimboy. University of Central Oklahoma.

Poster 14 **CONSISTENCY OF NEW RESEARCH WITH A 2006 SLEEP MEDICINE PRACTICE PARAMETER FOR YOUNG CHILDREN. Brittney-Hien Le. Oklahoma State University Center for Health Sciences.

Poster 15 **THE CURRENT STATE OF HEALTH INEQUITIES IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A SCOPING REVIEW. J. Tyler Babek, Jack Rea, Reece M. Anderson, Rigel Bacani, Jordan Staggs, and Matt Vassar. Oklahoma State University Center for Health Sciences.

SECTION E: SCIENCE COMMUNICATION & EDUCATION
Austin Hall 101

9:45-10:00 *UNLOCKING THE POWER OF BIOINFORMATICS: PRACTICAL APPLICATIONS FOR UNDERGRADUATE RESEARCHERS. Evonn Annor, Oral Roberts University.

10:00-10:15 **EMERGENCE OF ECOFEMINISM AMID ENVIRONMENTAL DEGRADATION: HOW HAS SETTLER-COLONIALISM IMPACTED SCIENCE EDUCATION?. Grace Payne, University of Central Oklahoma.

11:00-11:15 SCIENCE COMMUNICATION & EDUCATION SECTION MEETING **(Room 108)**

Posters

Poster 36 USE OF OPEN EDUCATIONAL RESOURCES IN THE CHEMICAL PRINCIPLES CLASSROOM. Randall Maples, East Central University.

SECTION G: APPLIED ECOLOGY & CONSERVATION
Austin Hall 107
Section Chair: Rickey Cothran; Vice-Chair: Renan Bosque

9:45-10:00 *EFFECTS ON HERPETOFAUNA POPULATION BY TRAFFIC OF SURVEY LOCATION. Ethan Korn, University of Science and Arts of Oklahoma.

10:00-10:15 *CO-EXPOSURE TO TWO POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) ALTERS GROSS ORGAN MASS AND METABOLIC RATE OF CHICK EMBRYOS. Yulianis Pagan, University of Central Oklahoma.

10:15-10:30 IS THE FROSTED ELFIN REALLY FROSTED? EVALUATING THE CONSERVATION STATUS OF *CALLOPHRYS IRUS* (LEPIDOPTERA: LYCAENIDAE) IN OKLAHOMA. Jose Montalva, East Central University.

10:30-10:45 EFFECTS OF IN OVO EXPOSURE TO TWO ALGAL TOXINS ON EMBRYONIC GROWTH, METABOLIC RATE, AND HEART RATE. Chris Goodchild, University of Central Oklahoma.

10:45-11:00 APPLIED ECOLOGY & CONSERVATION SECTION MEETING (Room 108)

Posters

Poster 37 *WOODY BRUSH FIRE RESPONSES IN A WESTERN OKLAHOMA RANGELAND. Brady Bridges, Payten Holley, Ambrosio Aldrich, Tatum Cummings, and Ryan Kellar, Southwestern Oklahoma State University.

Poster 38 *EFFECTS OF IN OVO EXPOSURE TO POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) ON HEPATIC TRANSCRIPTIONAL SHIFTS IN THE CHICK EMBRYO. Damon Corvelo, University of Central Oklahoma.

Poster 39 *JUNIPER STAND CHARACTERISTICS OF BURNED AND UNBURNED TREES FOLLOWING A PRESCRIBED FIRE IN WESTERN OKLAHOMA. Skylar Croskey, Carson Day, Jarrett Smith, Emmerson McDonald, Caleb Nolen, and Joseph Trevino, Southwestern Oklahoma State University.

Poster 40 *IMPACT OF FIRE ON THE RODENT COMMUNITY IN WESTERN OKLAHOMA GRASSLANDS. Ethan Haggard, Tyson Eastwood, Jarrett Justin, Clayton Kilgore, and Faith Gregory, Southwestern Oklahoma State University.

*Undergraduate Presentation **Graduate Presentation

SECTION G: APPLIED ECOLOGY & CONSERVATION (continued)

Poster 41 *HOW DOES ALTERED PRECIPITATION INFLUENCE PLANT DOMINANCE AND DIVERSITY IN A PRAIRIE ECOSYSTEM?. Emily Nguyen, University of Oklahoma.

Poster 42 *TERRESTRIAL MAMMALS OF THE OKC METRO AREA. Zachary Woods, Southern Nazarene University.

Poster 43 **THE EFFECTS OF DROUGHT ON CANOPY FUNCTION AND STRUCTURE. Mariela Encarnacion, University of Oklahoma.

Poster 44 **ECOLOGICAL DISTURBANCE IN THE ANTHROPOCENE: LEGACY EFFECTS OF ORPHANED WELLS ON VEGETATIVE COMMUNITIES AND METABOLIC PHENOTYPE OF FREE-LIVING RODENTS. Jess Warr, University of Central Oklahoma.

Poster 45 **EFFECTS OF BIS(2-ETHYLHEXYL)-2,3,4,5-TETRABROMOPHTHALATE (TBPH) FLAME RETARDANT ON HEART RATE, METABOLIC RATE, AND ORGAN DEVELOPMENT OF WHITE LEGHORN CHICKEN EMBRYOS. Jennifer Wilson, University of Central Oklahoma.

SECTION H: MICROBIOLOGY
Austin Hall 206
Section Chair: Erika Lutter; Vice Chair: Janaki Iyer

8:30-8:45 *THE HEALING POWER OF DANDELIONS: EXPLORING ANTI-CANCER AND ANTI-BACTERIAL PROPERTIES OF DANDELION SEED EXTRACT. Ashley Nguyen, Oklahoma City University.

8:45-9:00 *CHANGES IN BLADDER CANCER CELLS WHEN INFECTED WITH UROPATHOGENIC *ESCHERICHIA COLI*. Alejandro Lopez, Northeastern State University.

9:00-9:15 *DEFINING UPSTREAM PROTEIN KINASES IN ATYPICAL MAPKS IN *DICTYSTELIUM DISCOIDIUM*. Clauddia Dodd, Oklahoma State University - Stillwater.

9:15-9:30 *MODULATION OF CYTOKINE PRODUCTION BY UROPATHOGENIC *ESCHERICHIA COLI* AND *KLEBSIELLA PNEUMONIAE*. Jacob Castaneda, Northeastern State University.

9:30-9:45 BREAK

9:45-10:00 *THE ROLE OF PHOSPHATE AND CALCIUM-REGULATED PROTEIN, PCRP, IN RESISTANCE OF A HUMAN PATHOGEN, *PSEUDOMONAS AERUGINOSA*, TO POLYMYXIN B. Maha Achour, Oklahoma State University - Stillwater.

10:00-10:15 *EVALUATING CYTOKINE RESPONSES IN BLADDER CELLS INFECTED WITH UROPATHOGENIC *ESCHERICHIA COLI* AND *KLEBSIELLA PNEUMONIAE*. Tia Tafla, Northeastern State University.

10:15-10:30 **THE ROLE OF DIFFERENTIALLY-REGULATED GENES IN THE OUTCOME OF MURINE PHAGOCYTE-CRYPTOCOCCAL INTERACTION. Ayesha Nair, Oklahoma State University - Stillwater.

10:30-10:45 **HOST PROTEIN PHOSPHOLIPASE C IS MANIPULATED BY *CHLAMYDIA TRACHOMATIS* DURING INFECTION. Noopur Dasgupta, Oklahoma State University - Stillwater.

10:45-11:00 **DEFINING FUNCTIONAL REGIONS AND UPSTREAM PROTEIN KINASES OF ATYPICAL MAPK ERK2 IN *DICTYOSTELIUM DISCOIDEUM*. Ramee Aranda, Oklahoma State University - Stillwater.

11:00-11:15 MICROBIOLOGY SECTION MEETING

Posters

Poster 46 *EVALUATING THE IMPACT OF REDOX POTENTIAL ON GROWTH CAPACITY OF ANAEROBIC GUT FUNGI. Emma England, Oklahoma State University - Stillwater.

Poster 47 *AN EXPLORATION INTO HOW HABITAT TRANSITION IMPACTED THE EVOLUTIONARY TRAJECTORY AND GENOMIC REPERTOIRE OF THE PHYLUM ACIDOBACTERIOTA. Ella McReynolds, Oklahoma State University - Stillwater.

Poster 48 *UNDERSTANDING ANTIBIOTIC RESISTANCE IN CYSTIC FIBROSIS PATIENTS. Rebecca Wilson, Oklahoma State University - Stillwater.

Poster 49 *THE ROLE OF CALCIUM SENSOR EFHP IN REGULATING PYOVERDINE PRODUCTION IN A HUMAN PATHOGEN, *PSEUDOMONAS AERUGINOSA*. Lorelei Winton, Oklahoma State University - Stillwater.

*Undergraduate Presentation **Graduate Presentation

SECTION H: MICROBIOLOGY (continued)

Poster 50 ****_CHLAMYDIA TRACHOMATIS_** INCLUSION MEMBRANE PROTEIN CT226 INTERACTION WITH HOST PROTEINS TMOD3 AND FLII. Tanisha Goyal, Oklahoma State University - Stillwater.

Poster 51 ****CHARACTERIZATION OF _FUSOBACTERIUM NUCLEATUM_** STRAINS ISOLATED FROM ORAL SQUAMOUS CELL CARCINOMA PATIENTS. Serene Lim, Oklahoma State University - Center for Health Sciences.

Poster 52 ****DESIGNING AN ORAL MUCOSAL VACCINE FOR ENHANCED PROTECTION AGAINST _CLOSTRIDIOIDES DIFFICILE_. Joseph McCreary, Oklahoma State University - Center for Health Sciences.

Poster 53 ****EXPLORING ANAEROBIC GUT FUNGI IN TORTOISES: NOVEL GENERA AND INSIGHTS INTO EVOLUTIONARY HISTORY. Carrie Pratt, Oklahoma State University - Stillwater.

Poster 54 ****CHARACTERIZATION OF HOST RESPONSES OF CUFI5 AND A549 CELLS FOLLOWING _PSEUDOMONAS AERUGINOSA_** INVASION. Yingxin Zhang, Oklahoma State University - Stillwater.

Poster 55 HARMFUL ALGAL BLOOMS (HAB) IN LAKE ECOSYSTEMS: PAST, PRESENT, AND FUTURE. Emma Mills, Oklahoma State University - Stillwater.

SECTION I: ENGINEERING SCIENCES
Section Chair: Gang Xu; Vice Chair: Nesreen Alsbou

11:00-11:15 ENGINEERING SCIENCES SECTION MEETING (Room 101)

Posters

Poster 56 *E&M SIGNAL TESTER. Justice Barlow, Joshua Brooks, Megan Dalton, and Rick Ma, University of Central Oklahoma.

Poster 57 *OPTICAL IMAGING SYSTEM FOR TRACKING ACTIVE CELL MOVEMENT. Xuan Fey Chew, University of Central Oklahoma.

Poster 58 *EFFICIENT LOW-COST MICROWAVE IMAGE RECONSTRUCTION USING DELAY AND SUM BEAMFORMING IN THE FREQUENCY DOMAIN. Colton Cox, University of Central Oklahoma.

Poster 59 *CREIC DATA CENTER COOLING. Danner Mcsperitt, Tristan Danielson, Julio Gonzalez, and Nolan Fox, University of Central Oklahoma.

Poster 60 *INTEGRATED PHASE CHANGE THERMAL MANAGEMENT SYSTEM FOR ELECTRIC VEHICLES. Colin Mekler, Tate Lacey, and Rebecca Petty, University of Central Oklahoma.

Poster 61 *DEVELOPING AND ENHANCING A SMART MECHANICAL SYSTEM WITH IOT CAPABILITIES FOR IMAGING AND MOTION DETECTION. Kaleb McIntyre, Brady Wright, and Carl Ompad, University of Central Oklahoma.

Poster 62 *SPEECH STRATEGY FOR COCHLEAR IMPLANT WITH NOISE REDUCTION. Josue Ponce, Mohamed Bingabr, Jordan Wiley, and Jason Houpt, University of Central Oklahoma.

Poster 63 *HYDRAULIC BASE SHOCK TUBE CHANBERS FOR BRAIN PHATOM MODEL. Micah Watson, University of Central Oklahoma.

Poster 64 *MICROWAVE MEDICAL IMAGING SYSTEM. Nathan Wiley, University of Central Oklahoma.

Poster 65 *DEVELOPING THREE-DIMENSIONAL DETECTOR FOR PROTON, ELECTRON, AND PHOTON DOSIMETRY IN RADIATION THERAPY. Giovanni Winters, Oscar Galindo, Ethan Wright, and Sadguru Panchal, University of Central Oklahoma.

Poster 66 ****POWER DISSIPATION OF ADIABATIC LOGIC CIRCUIT FOR FINFET AND MOSFET TRANSISTORS. Ayodeji Olanite, Univeristy of Oklahoma.

*Undergraduate Presentation **Graduate Presentation

SECTION J: BIOCHEMISTRY AND MOLECULAR BIOLOGY
Austin Hall 213
Section Chair: Feng Feng; Vice Chair: Subhas Das

8:30-8:45 *NUCLEOTIDE MOTIF FREQUENCY COMPARISON BETWEEN *HOMO SAPIEN* AND *PAN PANISCUS*. Derick DuFriend, Oral Roberts University.

8:45-9:00 *EVOLUTIONARY CONSERVATION OF GIG AND SLMB IN *DROSOPHILA*. Heather Sparks, Oklahoma Christian University.

9:00-9:15 **INVESTIGATING PROTEIN INTERACTIONS AT THE REPLICATION FORK IN DNA POLYMERASE EPSILON FILS MUTANTS. Lydia Ostmo, Northeastern State University.

11:00-11:15 BIOCHEMISTRY AND MOLECULAR BIOLOGY SECTION MEETING

Posters

Poster 67 *ADENOVIRUSES FOUND IN BATS IN WEST TEXAS. Jadance Black, Cameron University.

Poster 68 *INVESTIGATION OF L-LYXONIC ACID EFFECT ON CYTOCHROME BD-1 OXIDASE EXPRESSION. Eli Grasso, East Central University.

Poster 69 *DETERMINING THE ROLE OF CYSTEINE 130 ON RUNX2 STABILITY AND FUNCTION. Lauren HerrNeckar, East Central University.

Poster 70 *GENETIC OPTIMIZATION OF HTLV-I TAX. Bailey Howe, East Central University.

Poster 71 *APIGENIN INDUCES APOPTOSIS IN MBA-MD 231 CELLS IN VITRO. Jayme James, Oral Roberts University.

Poster 72 *INVESTIGATION OF BOVINE LEUKEMIA VIRUS (BLV) PREVALENCE IN OKLAHOMA HERDS. Jordan Odell-Brown, East Central University.

Poster 73 *BIOINFORMATIC TARGETING TO DETERMINE THE MOLECULAR ETIOLOGY OF CANINE ANASARCA. Reia Storch, East Central University.

Poster 74 *PURIFICATION OF THE HULWCAS13A ENZYME — GROUNDWORK FOR MUTAGENESIS. Elijah Woodward and Jimena Ramirez, East Central University.

SECTION L: MATHEMATICS, COMPUTER SCIENCE, AND STATISTICS
Austin Hall 209
Chair: Pierre Tiako; Vice-Chair: Hyacinthe Aboudja

8:30-8:45 *MATCHING-BASED COALITION FORMATION FOR MULTI-ROBOT TASK ASSIGNMENT UNDER PARTIAL UNCERTAINTY. Brenden Latham, East Central University.

8:45-9:00 TOPOLOGICAL DATA ANALYSIS ON NBA TEAMS. Andrew Wells, East Central University.

9:00-9:15 EXPLORATIONS IN SIM: A GAME ON K6. Michelle Lastrina, East Central University.

9:15-9:30 DATA PRE-PROCESSING AND VISUALIZATION OER. Nicholas Jacob, East Central University.

11:00-11:15 MATHEMATICS, COMPUTER SCIENCE, AND STATISTICS SECTION MEETING

SECTION M: ENVIRONMENTAL SCIENCES
Austin Hall 107
Chair: Cheyanne Olson; Vice-Chair: Dan McInnes

9:00-9:15 *ANALYZING DIETARY DIVERSITY AND THE ECOLOGICAL SIGNIFICANCE OF THE GREEN SUNFISH (*LEPOMIS CYANELLUS*) IN AQUATIC ECOSYSTEMS OF THE GREAT PLAINS REGION. Jamie Eastep, Oklahoma State University - Stillwater.

9:15-9:30 *WATER QUALITY AND ASSOCIATED PHYSICAL PARAMETERS OF THE BLUE RIVER OF OKLAHOMA. Peyton HerrNeckar, East Central University.

11:00-11:15 ENVIRONMENTAL SCIENCES SECTION MEETING

*Undergraduate Presentation **Graduate Presentation

SECTION M: ENVIRONMENTAL SCIENCES (continued)

Posters

Poster 75 *INVESTIGATING POTENTIAL DETERMINANTS OF AIRPORT WILDLIFE STRIKES IN OKLAHOMA. Arissa Casey, University of Science and Arts of Oklahoma.

Poster 76 *AN EXPLORATORY STUDY ON THE EFFECTIVENESS OF COMMON CLEANING PRODUCTS IN REDUCING ATP LEVELS. Luke West, East Central University.

Poster 77 *AN INNOVATIVE SYSTEM FOR STREAMLINING VECTOR ANALYSIS. Luke Woodward, East Central University.

Poster 78 *REMOVAL OF NUTRIENTS FROM ORGANICALLY CONTAMINATED WATER USING BIOCHAR. Craig Zimmermann, Rogers State University.

SECTION N: BIOMEDICAL SCIENCES
Austin Hall 213
Section Chair: Hannah King

9:30-9:45 *ANTI-CANCER COMPOUNDS SECRETED BY *GANODERMA LUCIDUM*. Diego De La Torre, Oral Roberts University.

9:45-10:00 *CYTOTOXICITY OF 6-GINGEROL ON COLORECTAL CANCER CELL VIABILITY. Katherine Dempsey, Oral Roberts University.

10:00-10:15 *CYTOTOXICITY OF *HERICIUM ERINACEUS* MUSHROOM SECRETIONS AGAINST U-87 MG GLIOBLASTOMAS. Natalia Ramirez, Oral Roberts University.

10:15-10:30 *THE CLONING AND EXPRESSION OF SJOGREN'S DISEASE-ASSOCIATED AUTOANTIGENS IN A BACULOVIRUS EXPRESSION SYSTEM. Makayla Tillett, Oklahoma City University.

10:45-11:00 BIOMEDICAL SCIENCES SECTION MEETING

Posters

Poster 79 *ANNEXIN A2 EXPRESSION IN PROSTATE CANCER CELLS. Charles Gates, Langston University.

Poster 80 *UNDERSTANDING THE METABOLIC ADAPTATION TO NUTRIENT STRESS IN PANCREATIC CANCER. Malachi Newton, Uzziah Urquiza, Colter Esparza, Darren Powers, and Pragya Sharma, Southwestern Oklahoma State University.

Poster 81 *DETERMINING LACTIC ACID THRESHOLDS BETWEEN DIFFERENT ATHLETIC TYPES WITH THE CORRELATION BETWEEN BODY FAT, HEART RATE, AND BLOOD OXYGEN LEVELS. Caleb Smith, University of Science and Arts of Oklahoma.

Poster 82 *DEVELOPING IN OVO AND EX OVO METHODS FOR EXAMINING CARDIOTOXICITY OF ALTERNATIVE FLAME RETARDANTS. Lawrence VanDyke, University of Central Oklahoma.

Poster 83 *EXPOSURE TO 'ALTERNATIVE' FLAME RETARDANTS ALTERS RAT AORTIC SMOOTH MUSCLE CELL FUNCTION IN VITRO AND DECREASES HEART RATE IN OVO. Alex Webb, University of Central Oklahoma.

Poster 84 **BIOFILM FORMATION AND VANCOMYCIN SUSCEPTIBILITY OF ENVIRONMENTAL CLOSTRIDIOIDES DIFFICILE ISOLATES. Jessica Gray, Oklahoma State University - Center for Health Sciences.

Poster 85 **IDENTIFICATION OF THE METALLOPROTEASE ADAMTS7 INTERACTION PARTNERS USING YEAST TWO-HYBRID SYSTEM. Bhuvanesh Kumar Raju, Oklahoma State University - Center for Health Sciences.

Poster 86 **PROBIOTIC EFFECTS OF *LACTOCOCCUS LACTIS* AND *LEUCONOSTOC MESENTEROIDES* ON MORPHOLOGY, FECUNDITY, AND LONGEVITY IN *CAENORHABDITIS ELEGANS*. Brenda Tinoco-Bravo, Oklahoma State University - Center for Health Sciences.

*Undergraduate Presentation **Graduate Presentation

2023 Annual Technical Meeting Abstracts
(sorted by presenter's last name)

Maha Achour, Tarosha B. Salpadoru, and Marianna A. Patrauchan (Oklahoma State University-Stillwater)

THE ROLE OF PHOSPHATE AND CALCIUM-REGULATED PROTEIN, PCRP, IN RESISTANCE OF A HUMAN PATHOGEN, *PSEUDOMONAS AERUGINOSA*, TO POLYMYXIN B

Pseudomonas aeruginosa (Pa) is a Gram-negative human pathogen and a leading cause of acute and chronic infections. It is known to cause airway blockage in patients with Cystic Fibrosis (CF) – leading to high morbidity and mortality. This pathogen has been of particular interest due to its multi-drug resistance, including "last resort antibiotic", polymyxin-B (PMB). Studies have shown that elevated calcium (Ca2+) and lowered phosphate (Pi) alter bacterial susceptibility to antimicrobial treatment – implying their regulatory role in Pa resistance. Previously, we showed that elevated Ca2+ levels, detected in airways of CF patients, enhance PMB resistance through novel Ca2+-dependent mechanisms. We have also shown that the upregulation of putative phophonatase PA2803, is mediated by both Ca2+ and Pi -- designating it as PcrP (phosphate and calcium-regulated protein). Although studies of pcrP deletion mutant supported its role in Pa PMB resistance, PcrP function remains unclear. Via enzymatic studies, we found that PcrP has no phosphonatase activity, and therefore explored its potential protein-binding function. By using protein-pull down assays in the presence or absence of Ca2+ and Pi starvation conditions, we identified several putative binding partners of PcrP followed by bacterial two-hybrid system (B2HS) for validation. The Beta-Galactosidase activity of the co-transformed constructs was assayed both qualitatively and quantitatively to evaluate the strength of protein-protein interactions. B2HS supported the earlier observed dimerization of PcrP and validated the interaction of PcrP with hypothetical protein PA3518 and Acyl-carrier protein 3, Acp3. Based on sequence analysis, PA3518 may have a role in heavy metal (notably, Cu2+) sensitivity. Acp3's interaction with Catalase shows it may be involved with reactive oxygen species (ROS) regulation in cells. Collectively, we showed that PcrP reduces Ca2+-dependent ROS production in Pa. Thus, the interaction of PcrP with Acp3 may contribute to Pa resistance to ROS and therefore enhance its resistance to PMB.

Evonn Annor and Julianna Goelzer (Oral Roberts University)

UNLOCKING THE POWER OF BIOINFORMATICS: PRACTICAL APPLICATIONS FOR UNDERGRADUATE RESEARCHERS

Bioinformatics has revolutionized biological research, providing a powerful toolkit for analyzing and interpreting vast amounts of biological data. This presentation introduces undergraduate researchers to the practical applications of bioinformatics tools through a series of mini case studies. The presentation demonstrates the use of Wash U Epigenome Browser to visualize the organization of the entire genome within a nucleus, providing insights into gene regulation and cellular processes. Next, it demonstrates how NCBI BLAST can be used to select a suitable model organism for a specific research question based on sequence conservation. Finally, it extracts the DNA sequence of an enhancer or promoter region using Wash U Epigenome Browser and NCBI BLAST, designing a guide RNA (gRNA) for CRISPR-Cas9 gene editing. These case studies highlight the versatility of bioinformatics tools in addressing diverse biological questions and designing experiments, empowering undergraduates to make significant contributions to biological research and innovation.

Ramee G. Aranda and Jeffrey Hadwiger (Oklahoma State University-Stillwater)

DEFINING FUNCTIONAL REGIONS AND UPSTREAM PROTEIN KINASES OF ATYPICAL MAPK ERK2 IN *DICTYOSTELIUM DISCOIDEUM*

In eukaryotic cell signaling, mitogen-activated protein kinases (MAPKs) mediate cellular processes like cell growth, differentiation, and movement. In *Dictyostelium discoideum*, a social amoeba, there are only two of these MAPKs, Erk1 and Erk2. These MAPKs are involved in a developmental lifecycle in which starved cells aggregate to form multicellular structures including fruiting bodies. Erk1 is a typical MAPK responsible for developmental kinetics and aggregate size while Erk2 is an atypical MAPK required for chemotaxis and multicellular development as well as the translocation of a transcription factor GtaC. Not much is known about atypical MAPKs like Erk2 however, it is known that Erk2 is activated within 30 seconds after stimulation by a chemoattractant and that its function is required for a burst of Erk1 activation in a secondary response to chemoattractants. Atypical MAPKs have a conserved C-terminal motif (CTM) not found in other MAPKs. To test the specificity and function of this motif and other regions of MAPKs, a series of MAPK chimeras (composed of Erk1 and Erk2 sequences) have been created and expressed in strains lacking one or the other MAPK. Testing the function and regulation of these chimeras will help define regions of typical and atypical MAPK specificity. Recent results suggest the CTM motif is necessary for most Erk2 functions except for growth on bacteria but the CTM motif does not confer Erk2 function to the Erk1 MAPK. Kinase dead mutants are still phosphorylated despite lacking kinase activity suggesting the presence of an unknown upstream protein kinase. Therefore, this research aims to also identify unknown upstream protein kinases using phosphoproteomic data to find proteins phosphorylated in response to chemotactic signals that also result in Erk2 activation.

Justice Barlow, Joshua Brooks, Megan Dalton, and Rick Ma (University of Central Oklahoma)

E&M SIGNAL TESTER

E&M signaling is used primarily within the telecommunications sector and is the sole focus of this project. E&M signaling commonly refers to “ear and mouth” and can also stand for “recEive and transMit” [1]. Namely, this type of signaling is primarily responsible for connecting telephones to Private Branch Exchanges (PBXs). More specifically the Federal Aviation Administration (FAA) uses E&M signaling to evaluate communication systems within the aviation sector. The main goal of this project is to develop a new device for the FAA that can perform effective E&M testing for their communications systems. This new device would replace the current device—the Halcyon-704A 400 series and would have many innovative features as well as advanced technology that would be more up to date with current systems. These include: a colored LCD display, independent battery circuit to promote portability, a thermal management system, and PCBs to control the device. The current device, the Halcyon-704A 400 series, runs a variety of signal tests that are being phased out and the device is both bulky and not user-friendly. However, E&M signal testing is still in use by many sectors within the aviation industry. This project shares the process of creating a new device that can run all E&M signal tests with a lightweight, user-friendly design. Overall, the creation of this device would promote a more user-friendly means of conducting the necessary E&M signaling tests for the FAA and would contain more current technology than its predecessor—the Halcyon.

Jadance L. Black and Dana N. Lee (Cameron University)

ADENOVIRUSES FOUND IN BATS IN WEST TEXAS

Bats are known reservoirs of various viruses including rabies, henipaviruses, ebola, and many more not yet identified. There is a demand for more research into discovering new types of viruses that bats carry since these viruses could potentially be zoonotic. Adenoviruses are among the types of viruses that can be zoonotic. Adenoviruses are double-stranded DNA viruses that can cause various respiratory illnesses in humans. It is important to determine if there are more species of bats that carry Adenoviruses as there have already been Adenoviruses detected in Myotis velifer species found in Oklahoma. In this study, 94 guano samples were collected from *Antrozous pallidus* (36), *Corynorhinus townsendii* (3), *Eptesicus fuscus* (3), *Lasiurus cinereus* (2), *Mormoops megalophylla* (4), *Myotis velifer* (2), *Myotis yumanensis* (5), *Parastrellus hesperus* (9), and *Tadarida brasiliensis* (30) in west Texas. I extracted DNA from the guano samples and performed nested PCR on them to amplify a 280-base pair long section of the DNA polymerase gene found in all Adenoviruses. After amplifying the DNA, there were 6 samples found positive for an Adenovirus. These 6 samples were collected from *Antrozous pallidus* (3), *Myotis yumanensis* (1), and *Tadarida brasiliensis* (2). Future work will be completed on the PCR products to sequence them and determine if the Adenoviruses detected are novel or previously identified strains.

Brady Bridges, Payten Holley, Ambrosio Aldrich, Tatum Cummings, and Ryan Kellar (Southwestern Oklahoma State University)

WOODY BRUSH FIRE RESPONSES IN A WESTERN OKLAHOMA RANGELAND

When prescribed fire is utilized to control invading tree species in rangelands in concert with grazing, it can provide an increase in grass cover concomitant with a reduction in tree cover. However, over time a lack of woody browsing may lead to increases in brush cover that may outcompete grass species in ways that keep a grassland in a sub-climax ecological stage where grasses and associated grassland species fail to predominate a locality where historically they would have been the dominant features. Following a recent prescribed fire to reduce woody species’ abundance, we measured post-fire Smooth Sumac (*Rhus glabra*) characteristics along a transitional sumac edge from within-stand, stand-edge, and outside-stand quadrats. Key aspects we measured at all three transition stages included stem counts (both fire-killed and alive post-fire), bare ground percentage, basal and canopy level woody stem counts, and stem heights for both live and dead stems. Our results indicated that the ratio of dead to live sumac stems was not different along the stand transition, however the relative height of alive vs. dead stems increased from within-stand through stand-edge to outside-stand quadrats. Stem counts and heights overall were greatest within-stand quadrats on average, while bare ground was greatest at stand-edge quadrats. Apparently, prescribed fire in the absence of woody browsers may invigorate sumac stand expansion and persistence.

Douglas Bryhan and Yadav Ranjit (East Central University)

THE EFFECTS OF SOFTWARE BASED TFT FILTERING OF 400-500NM EMISSIONS

Recently, concerns have been raised in the scientific community about potentially damaging 400-500 nm output from the LED backlights. This technology is widely used in smart phones, tablets, and other devices that include compact video output modules. One solution to the potential problem of excessive 400-500 nm output is the use of a software setting that is claimed to modify the output from the video module in a way that will reduce the undesirable 400-500 nm output. Data was taken via an Ocean Optics Spectrometer allowing for a comparison of the output from a typical modern Smartphone to baseline backgrounds both with and without the “eye protection” software being used.

Laura Byars[1], Shayle Woods[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

GENE CONSERVATION OF THE INSULIN/TOR PATHWAY

The Insulin/TOR pathway is a crucial pathway in the metabolic regulation of homeostasis, placing emphasis on conducting research to investigate pertinent genes. Over time, genetic divergence has arisen, in turn lessening genomic conservation in particular species. Genomic conservation was investigated through a comparison between two genes heavily involved in the Insulin/TOR pathway, gig and RpS6 in *Drosophila*. Both genes serve important functions in the pathway, with gig taking priority with its involvement in multiple negative-feedback loops, whereas RpS6 is involved in translation. It was hypothesized that gig will have a higher rate of evolutionary conservation in the Insulin/TOR pathway compared to RpS6 due to their respective functions. The evolutionary differences between these two genes were examined through the annotation of genomic markers of both genes across 5 different *Drosophila* species, such as splice sites, exonic positions, protein sequences, and genomic neighborhood, with *D. melanogaster* used as a baseline species. Divergence was quantified and calculated in a comprehensive meta-analysis based on annotation findings and were compiled to determine genomic conservation. It was determined that RpS6 experienced higher levels of conservation than gig across differentially diverged species.

Kylar Byrd, Makayla Greening, Mckaegan Gregory, Annabelle Hawkins, Madilyn Crisp, Olabode Olayode, Ryan Howes, Wyatt Norton, and Renan Bosque (Southwestern Oklahoma State University)

PREDATION IN WESTERN DIAMONDBACK RATTLESNAKES

The western diamondback rattlesnake (*Crotalus atrox*) displays an intricate diamond pattern on its dorsal surface, a feature that has long captivated scientific curiosity regarding its role in predator deterrence. This study investigates the evolution of these striking patterns to determine if they function as effective signals for predator avoidance. Utilizing Plasticine replicas designed to mimic the rattlesnake's natural appearance, we conducted our experiment to assess the efficacy of these diamond patterns in deterring predators. We recorded predation attempts by closely examining the bite marks left on the replicas and categorized these predation attempts into two groups: mammalian predations and avian predations, aiming to elucidate potential differences in the snake's interactions with these distinct predator types. Environmental conditions can play a pivotal role in predation attempts. To account for that, we measured the amount of light availability in the snakes' habitats and compared the backgrounds against which the replicas were placed with the coloration patterns of the replicas themselves. This allowed us to discern whether the coloration patterns served as a form of camouflage, or conversely, whether they acted as conspicuous signals to potential predators. Understanding the influence of environmental variables on predator activity was essential to our research. We deployed data loggers to continuously monitor air temperature in the study area, recognizing that variations in this parameter may influence predator behavior and, consequently, predation attempts. In addition, we installed camera traps to identify potential predators of *Crotalus atrox*. Our investigation provides a multifaceted exploration of the intricate diamond patterns in western diamondback rattlesnakes, aiming to unravel the interplay between coloration, environmental variables, predator behavior, and predation attempts. This research provides valuable insights into the evolutionary significance of these patterns and their role in predator deterrence, shedding light on the complex dynamics of predator-prey interactions.

Arissa Casey (University of Science and Arts of Oklahoma)

INVESTIGATING POTENTIAL DETERMINANTS OF AIRPORT WILDLIFE STRIKES IN OKLAHOMA

Wildlife strikes at airports can negatively impact both the aircraft and local wildlife populations. Wildlife strikes are not only caused by avian species, depending on the location, many different species might be reported. In fact, some of the most hazardous species in risk assessments include deer species and domestic dogs. Wildlife managers at airports are tasked with creating up-to-date management plans to lower the risk and impact of aircraft strikes. There are many useful approaches for the safe management of these areas, and much is now based upon statistical risk assessment and proper land use. The COVID-19 pandemic was responsible for negatively impacting both aircraft movements and flight-strike frequencies, causing a notable impact in statistical results for strikes over time. In regards to the aforementioned proper land use, which wildlife managers strive to achieve at airports, it is imperative to mention that wildlife may be drawn to airports not only due to on-site conditions such as high grass and aesthetically pleasing edible shrubbery but also other alluring locations surrounding the airport such as landfills and parks. Many of the impacts of wildlife strikes have been documented, as well as the more tangible wildlife attractants at airports; this investigation seeks to not only describe some of the more abiotic determinants of strike hazards but also describe correlations between specific species and aircraft strikes that have taken place in Oklahoma between 2011 and 2021.

Jacob Castaneda, Jonathan Crosse, and Janaki K Iyer (Northeastern State University)

MODULATION OF CYTOKINE PRODUCTION BY UROPATHOGENIC *ESCHERICHIA COLI* AND *KLEBSIELLA PNEUMONIAE*

Urinary tract infections (UTIs) are common bacterial infections that affect people of all age groups, especially women. In response to infection, host cells promote the expression of pro-inflammatory cytokines like tumor necrosis factor (TNFa), interleukin (IL) 1β, and IL6. The most common etiological agents that cause UTIs are uropathogenic *Escherichia coli* (UPEC) and *Klebsiella pneumoniae* (*K. pneumoniae*). Many studies demonstrate that UPEC induces cytokine production in infected bladder cells. This study aims to investigate how different strains of *K. pneumoniae* affect cytokine production. Since bladder

cells express pattern recognition receptors that identify the presence of different pathogen-associated molecular patterns, we hypothesize that infected bladder cells will produce cytokines upon infection with *K. pneumoniae*. We obtained uropathogenic strains of *K. pneumoniae* (Kp) from BEI resources and determined the antimicrobial resistance and growth characteristics of three strains: Kp UCI-19, Kp UCI-20, and Kp UCI-41. Out of the three strains, Kp UCI-19 and Kp UCI-41 displayed resistance to multiple antibiotics that are generally used for the treatment of UTIs. We analyzed the production of IL1β and IL6 in infected bladder cells after 6 and 24 hours by enzyme-linked immunosorbent assays (ELISAs). IL1β production was significantly increased in bladder cells upon infection with all three strains, whereas IL6 showed no significant induction upon infection. Thus the hypothesis was not supported. Kp UCI-20 displayed the least amount of induction of IL-1β and IL-6. Bladder cells infected with heat-killed Kp UCI-20 showed a significant increase in IL6 indicating that viability of bacteria was a requirement for interfering with IL-6 production in bladder cells. Further testing will be designed to assess the mechanism of IL-6 cytokine suppression by Kp UCI-20. These studies will enable us to accomplish our long-term goal of designing non-antibiotic based effective therapies to treat UTIs.

Dalton Chase and Susmita Hazra (Cameron University)

SOLAR CYCLE VARIABILITY AND IT'S EFFECT OF GEOMAGNETIC ACTIVITY

Variation of Suns magnetic field and its activities are governed by an 11-year cycle, called the solar cycle. This solar cycle is believed to be part of a more extensive 112-year cycle known as the Gleissberg Cycle. Within the solar cycle, fluctuations in solar activity significantly influence the Sun's surface, resulting in sunspots due to the stretching and intertwining of magnetic fields. The highly active Sun during solar maxima emits higher volume of radiation, higher energetic charge particles with magnetic flux and thus create hazardous space weather and can affect Earth's atmosphere too. In this research, we are presenting the variability of solar activity and its effects on the earth's magnetosphere. We have studied sunspot numbers, F10.7 flux, solar wind speed, and Coronal Mass Ejection (CME). For solar activity, we are using GOES, ACE satellite data. For geomagnetic activities we are using Kp, DsT index data. In this research we aim to categorize geomagnetic activity and identify the stage in the larger solar cycle. Furthermore, we seek to aid building a framework for future predictive models of solar cycle intensities. These finding will be helpful in enhancing our ability to predict future solar cycle activities.

Xuan Fey Chew (University of Central Oklahoma)

OPTICAL IMAGING SYSTEM FOR TRACKING ACTIVE CELL MOVEMENT

Imaging technique has always been important as it assists visualizing data into an output for visualization and data analysis. With that in mind, every data has unique requirements and calibration, depending on the imaging system as well as what sort of data is desired. Currently, there are few methods with the existing optical imaging systems that are able to record and produce images that are necessary for cell movement analysis. However, there are no dedicated optical imaging systems regarding in VIVO analysis of speed and velocity with active movement independent cells with flagella. We proposed two parts solutions, the optical imaging recording system and image processing program, finalized into a manual. The recording system aims to visualize and record the basic function of recording cellular movement with flagella movement through a fluid. The cellular movements that will be recorded will be with *Chlamydomonas reinhardtii* wild type, which a lot of research has been made and potentially can be a drug delivery system. The second part aims to develop image processing methods to extract cell movement information that are necessary for characterizing algae cells. Preliminary findings show that different systems require different calibration and data aren't always suited for the program in data analysis. With the proposed solution, it will therefore provide biomedical researchers with a user-friendly optical imaging system that is able to record high quality images of cell movements and provide necessary information.

Jerry H. Clark (East Central University)

LIGHT-SHIFT-INDUCED BEHAVIORS BEHAVIORS IN MOMENTUM-SPACE QUANTUM WALKS

Over the last decade there have been many advances in studies of quantum walks (QWs) including a momentum-space QW recently realized in our spinor Bose-Einstein condensate system. This QW possessed behaviors that generally agreed with theoretical predictions; however, it also showed momentum distributions that were not adequately explained by the theory. We present a theoretical model which proves that the coherent dynamics of the spinor condensate is sufficient to explain the experimental data without invoking the presence of a thermal cloud of atoms as in the original theory. Our numerical findings are supported by an analytical prediction for the momentum distributions in the limit of zero-temperature condensates. This current model provides more complete explanations to the momentum-space QWs that can be applied to study quantum search algorithms and topological phases in Floquet-driven systems.

Asmita Giri[1], Colby Coker[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

HIGH EVOLUTIONARY CONSTRAINT OF RPS6 AS COMPARED TO LNK

This study focused on the evolutionary constraint of the RpS6 gene in the Insulin/TOR signaling pathway in *Drosophila*, with *D. melanogaster* as the reference species. Evolutionary constraint was investigated by analyzing the position of the RpS6 and Lnk gene in the signaling pathway and observing genetic interactions to assess constraint. First, gene linkage maps were used to

compare genetic interactions between both genes in the Insulin/TOR pathway. In order to compare the constraint of both genes, a computer program was used to annotate both genes in multiple species of *Drosophila*. Additionally, the comparison was made with the analysis of genomic sequencing of the various *Drosophila* species, which includes the genomic neighborhoods for each species and comparing them in context to *D. melanogaster*. Also, protein alignments were analyzed, and divergence scores were assigned to each species. In the Insulin/TOR pathway RpS6 has more connections and occurs later in the pathway we hypothesized that RpS6 has high evolutionary constraint as compared to Lnk. Divergence scoring and results indicated RpS6 has higher evolutionary constraint compared to Lnk, which supported our hypothesis.

Damon Corvelo, Yulianis Pagan, Hallum Ewbank, and Christopher G. Goodchild (University of Central Oklahoma)

EFFECTS OF IN OVO EXPOSURE TO POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) ON HEPATIC TRANSCRIPTIONAL SHIFTS IN THE CHICK EMBRYO

Marine oil spills are known to cause immense damage to ecosystems, and this is known to affect avian populations as well. Most avian crude oil toxicity research has examined the physiological and behavioral changes that afflict the adult birds. However, nesting birds can expose their eggs to crude oil attached to the nesting material and their feathers. Eggshell oiling can result in polycyclic aromatic hydrocarbons (PAHs), toxic chemicals that occur naturally in crude oil, being transferred to the internal eggs contents, leading to embryonic exposure. Previous research in our lab has documented liver hypertrophy in chick embryos exposed to PAHs in ovo. Liver hypertrophy and concomitant shifts in hepatic gene expression of detoxification enzymes have been observed in adult birds exposed to crude oil. However, currently there is a lack of understanding of hepatic transcriptional shifts in chicken embryos exposed to PAHs. To test whether avian embryos can upregulate detoxification enzymes to metabolize PAHs in ovo, we exposed white leghorn chicken embryos to one of six PAHs (Fluoranthene, Anthracene, Pyrene, Benzo[a]pyrene, Chrysene, and Phenanthrene) on embryonic day 3. On embryonic day 18, we collected embryonic livers and examined mRNA expression of a suite of detoxification enzymes (IL6, GPx, GR, GST, SOD, Actin, and GAPDH) using qPCR. Preliminary analysis suggests that in ovo exposure to some PAHs alters hepatic expression of some detoxification enzymes.

Colton Cox, Nesreen Alsbou, and Imad Ali (University of Central Oklahoma)

EFFICIENT LOW-COST MICROWAVE IMAGE RECONSTRUCTION USING DELAY AND SUM BEAMFORMING IN THE FREQUENCY DOMAIN

The goal of the research presented is to design and develop a low-cost and time-efficient method for the reconstruction of images using frequency domain delay and sum beamforming in the microwave band. Microwave image reconstruction is an innovative field with many applications, including medical imaging for the detection of cancerous tissue and other irregularities. The focus of this project was to design system hardware to maximize both the time and cost efficiency of the image reconstruction process, as well as explore methodologies for improving the accuracy of microwave imaging systems. This presentation will illustrate the design and development process for the integration of algorithmic concepts and hardware to accomplish the goals of the research. The use of low-cost and readily available materials illustrates the potential cost effectiveness of this approach, and the design process illustrates the potential for both usability and efficiency in microwave imaging systems. Furthermore, potential variations in the algorithms used and hardware extensibility are explored, highlighting the versatility and potential of the methods used in this project.

Maverick Stephenson, Charles Crittell, and Daniel McInnes (East Central University)

ISOLATION AND PURIFICATION OF CARVONE

Carvone is a monoterpene and can be found in a variety of plants including spearmint (*Mentha spicata*), dill (*Anethum graveolens*) and caraway (*Carum carvi*). In addition to its application in the food industries for fragrances and flavoring, it has been shown to possess antifungal, antiparasitic, antibacterial, anti-inflammatory, and anticancer activities. In this paper, carvone was isolated from caraway seeds with a Soxhlet extraction using hexanes. The crude extract was purified by column chromatography using silica gel as the stationary phase and hexanes as the mobile phase. The final product was then characterized by IR and NMR.

Skylar Croskey, Carson Day, Jarrett Smith, Emmerson McDonald, Caleb Nolen, and Joseph Trevino (Southwestern Oklahoma State University)

JUNIPER STAND CHARACTERISTICS OF BURNED AND UNBURNED TREES FOLLOWING A PRESCRIBED FIRE IN WESTERN OKLAHOMA

Prescribed burning is a management tool used in Pyric Herbivory that can assist maintenance of native grassland communities by bringing nutrients to the topsoil, removing shade competitors of grasses, and providing stimulus for restorative growth. One of the primary woody invaders affecting our regional native grassland systems is the Eastern Red Cedar (*Juniperus virginiana*). In this project we evaluated burned and unburned trees following a prescribed fire to better understand the ways in which tree stand structure affects prescribed fire success in killing invasive junipers. Our hypothesis was that tree stand attributes will affect whether a prescribed fire kills or leaves trees alive. We measured tree sizes, fire-ladder presences, neighboring tree densities, and neighboring tree spatial arrangements. Overall, spatial arrangement of neighboring trees was the only variable to emerge as different between burned and unburned tress in our study. Coupled with earlier work conducted at the same site, our results

indicate that prescribed fires with higher juniper mortality rates are more likely to occur in stands where critical space for air movement in the immediate vicinity of individual trees exists during a fire.

Diana Dao and Elizabeth Ann Nalley (Cameron University)

SYNTHESIS OF AZOLINES VIA MICROWAVE & ULTRASONIC RADIATION

The functional group heterocycles is crucial, particularly in medicinal chemistry. They play a crucial role in drug synthesis, but they also contribute to the structure of a wide range of pharmaceuticals, vitamins, natural products, and biomolecules. With green technology, microwave and ultrasonic, chemical reactions can be completed within minutes. The role of azolines in heterocycles is significant due to the biological activity of their derivatives, which include analgesic, antifungal, anticancer, and other properties. In this research, a clean green method was established to synthesize derivatives of aldehydes and produce different azolines using microwave and ultrasonic energy as the energy source.

Noopur Dasgupta and Erika Lutter (Oklahoma State University-Stillwater)

HOST PROTEIN PHOSPHOLIPASE C IS MANIPULATED BY *CHLAMYDIA TRACHOMATIS* DURING INFECTION

Chlamydia trachomatis is an obligate intracellular pathogen and the most common leading cause of bacterial sexually transmitted disease in the United States. Given its intracellular nature, it is known to depend on the host for its replication and survival; however, the extent of host cell signaling modulation is not known. Previously, our lab has successfully shown the recruitment of multiple isoforms of Protein Kinase C (PKC) to the Chlamydial inclusion. Upstream of PKC is Phospholipase C (PLC) which plays a significant role in cell signaling, membrane trafficking and cell proliferation. PLC is also known to be utilized by many bacterial pathogens for their growth and replication. Here we show the recruitment of PLC-γ1 & PLC-γ2 to the Chlamydial inclusion. We hypothesize that PLC manipulation is important for *C. trachomatis* growth and exit but how changes in PLC activation benefit *C. trachomatis* is not clear. To confirm the role of PLC we used known PLC inhibitor and siRNA depletion of the protein to see its effect on inclusion forming units (IFUs) and extrusions. We saw that both the inhibitor and siRNA depletion of PLC showed a decrease in IFUs and extrusions. The long-term goal of this project is to see how siRNA depletion of PLC γ1 and PLCγ2 alters PKC activity.

Diego De La Torre and William P Ranahan II (Oral Roberts University)

ANTI-CANCER COMPOUNDS SECRETED BY *GANODERMA LUCIDUM*

Cancer is a leading cause of death worldwide; while many therapies are available, there is no cure. One of the most common cancer treatments is chemotherapy. While chemotherapy is an effective way to kill cancer cells, it is also harmful to non-cancerous cells. Humans have used remedies found in nature to treat health conditions for millennia. The majority of drugs available today come directly from plants or are modifications to the naturally occurring compounds. This project aims to find a naturally occurring product that has selective cytotoxicity toward cancer cells. *Ganoderma lucidum*, the medical mushroom was cultured in vitro. Mushroom secretions were gathered and analyzed using a fast-protein liquid chromatography system (FPLC). A low molecular weight protein-containing polysaccharide was isolated. Tests were performed with the secretions on 96 well cytotoxicity assays and Matrigel. Viability data indicate that the isolated compound effectively reduces epithelial cancer cell viability while enhancing the viability of non-cancerous mammary epithelia. Future studies will focus on the molecular makeup of the compound and effective dosage range.

Katherine Dempsey and Joel Gaikwad (Oral Roberts University)

CYTOTOXICITY OF 6-GINGEROL ON COLORECTAL CANCER CELL VIABILITY

Colorectal cancer is the third most common type of cancer and the second leading cause of cancer-related deaths in America. Common treatment options include invasive surgeries and chemotherapy but are often accompanied by complications of sepsis, bowel stress, and reduced immunity. Therefore, the search continues for natural therapeutic alternatives that differentiate between healthy and cancerous tissues. *Zingiber officinale*, commonly known as the ginger root, has been used for centuries in ancient Chinese and Indian Ayurvedic medicine due to its well-known anti-inflammatory and antioxidant properties. It was hypothesized that the main bioactive compound in ginger, 6-gingerol, may possess anticancer properties that would reduce the cell viability of colorectal cancer in a dose-dependent manner. Microscopic observations of HT-29 cells treated with gingerol were consistent with apoptotic morphology. Cell viability and caspase activity assays further supported the theory that gingerol induces apoptosis in cancer cells. In comparison, HEK293T cells displayed increased cell viability when treated with gingerol. Analysis of both qualitative and quantitative data suggest that gingerol is able to selectively target tumorigenic cells while promoting viability in noncancerous cells.

Clauddia Dodd, Ramee Aranda, and Jeff Hadwiger (Oklahoma State University-Stillwater)

DEFINING UPSTREAM PROTEIN KINASES IN ATYPICAL MAPKS IN *DICTYSTELIUM DISCOIDIUM*

MAPKs, or mitogen-activated protein kinases, are found in eukaryotic organisms and usually play important roles in signal transduction pathways and gene regulation. MAPKs are usually regulated by MAPK kinases (MAP2Ks), which will phosphorylate the MAPK to make it active and MAP2Ks are also regulated by phosphorylation. Research has shown that one

subgroup of MAPKs, found only in organisms with cell movement, are not phosphorylated by conventional MAP2Ks and this group has been referred to as atypical MAPKs. In *Dictyostelium*, Erk2 is an atypical MAPK that is not phosphorylated by a conventional MAP2K and so we assume it is phosphorylated by another type of protein kinase. *Dictyostelium*. Through rigorous research, Erk2 was shown to be essential for chemotactic responses (the movement of cells to a chemical signal), including those important in foraging for food sources and multicellular development. In a recent study, researchers identified many proteins that are phosphorylated during chemotactic responses and one of these is likely to be the protein kinase that regulates Erk2 activation. However, determining which protein kinase regulates Erk2 must still be determined. Thus, the proposed project is to take significant steps toward discovering the protein kinase that phosphorylates Erk2.

Derick DuFriend, Christof Rosler, Evonn Annor, Rita Njoroge, Stephen Wheat, and Julianna Goelzer (Oral Roberts University)

NUCLEOTIDE MOTIF FREQUENCY COMPARISON BETWEEN *HOMO SAPIEN* AND *PAN PANISCUS*

Motifs, or commonly occurring short segments of repeating base pairs are found throughout genomes of all kinds. These repeating sequences perform various functions from providing binding sites for transcription factors, act as promoter regions, help regulate DNA packaging, and assist in RNA splicing. We chose to look at several common transcription factor binding sites that act as motifs: C-Myc, POUIF1, SOX2, TBP, KLF4, SRY, NR1D1, ELF1, and STAT3 to determine if they are conserved across both the genome assemblies of *Homo sapiens* and *Pan paniscus* to determine if their frequency is similar or not. To complete this, consensus sequences were taken from the JASPAR database matrices. We defined a consensus sequence as a nucleotide in a specified position with a frequency greater than 50% of the time. From these sequences, we utilized our TITAN short sequence recognition script to search the genome assemblies for each motif and compile a list of their locations. The lack of difference in raw number of matches between each motif shows that these functional sequences have a high degree of conservation between the genomes. Further study is required to determine the frequency of other hominoids and similar families.

Shannon Fagen[1], Kambryn Duncan[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

RPS6 IS MORE CONSERVED THAN RL IN *DROSOPHILA* SPECIES

This project aimed to investigate the evolutionary changes of genes within the insulin/TOR (IT) pathway in *Drosophila* species. The IT signal transduction pathway is critical to the biological function of metabolism, growth, and cell function. A previous study analyzed how the position of a protein in the pathway and the number of interactions affect gene conservation. The study also suggests the IT pathway is conserved across *Drosophila* species. The divergence and conservation of species in the IT pathway were analyzed between the genes RpS6 and rl. Greater conservation was expected in RpS6 than in rl because RpS6 has a greater quantity of protein interactions than rl. In order to investigate this, each gene was annotated across several *Drosophila* species. The level of divergence from the original gene in *D. melanogaster* was measured using a standardized divergence scoring system. By comparing levels of divergence among it was concluded that divergence is shown in rl than in RpS6. Thus, RpS6 is more conserved across *Drosophila* species than rl.

Jamie Eastep, Lindsey Bruckerhoff, and Keith Gido (Oklahoma State University-Stillwater)

ANALYZING DIETARY DIVERSITY AND THE ECOLOGICAL SIGNIFICANCE OF THE GREEN SUNFISH (*LEPOMIS CYANELLUS*) IN AQUATIC ECOSYSTEMS OF THE GREAT PLAINS REGION

Green Sunfish (*Lepomis cyanellus*) are opportunistic predators, that readily consume a variety of invertebrates, with insects comprising a significant part of their diet. The consumption of insects by Green Sunfish has ecological implications, as they play a role in influencing insect populations in their habitats. Additionally, their ability to consume a variety of prey items contributes to their success as a species in a wide range of aquatic environments. Diet variability in fish is thought to be influenced by consumer body size due to gape limitations and indeterminate growth. However, prey availability and energetic benefits should also play a role, as suggested by optimal-foraging theory. In this study, our objective was to investigate the effects of body size of Green Sunfish on the number of unique prey items, variation in prey selection, and mean body size of prey. We hypothesized that as Green Sunfish increased in body size, there would be an increase in the number of unique prey items, variation in prey selection, and mean body size of prey. To test this hypothesis, we analyzed stomach contents from over 300 Green Sunfish in streams across the Kansas River Basin in the Flint Hills ecoregion of Kansas. Additionally, we conducted a mesocosm experiment to examine changes in diet variability with fish body size. This research is significant as green sunfish populations are growing due to habitat alterations and they likely serve as important meso-predators in streams.

Mariela Encarnación, Xiangming Xiao, Emily Nguyen, and Lara Souza (University of Oklahoma)

THE EFFECTS OF DROUGHT ON CANOPY FUNCTION AND STRUCTURE

Grasslands are important biomes covering 34% of Earth's surface and are water limited ecosystems, meaning soil water availability determines their distribution in space1,2. The seasonality of precipitation and the synchrony between the wet and warm seasons affects the dominance of grasses and woody vegetation2. Drought can impact grassland ecosystem function by causing changes in structure, by altering plant functional group composition. Previous studies3-4 found that drought affects C4/C3 composition, decreasing C4 dominance while promoting C3 dominance/abundance. Thus, we observed canopy

reflectance, the Normalized Difference Vegetation Index (NDVI) (hereby serving as function), functional group composition and Leaf Area Index (LAI) (hereby serving as structure) to understand how drought affects grassland vegetation dynamics across two years. Specifically, we asked: (1) Do different precipitation patterns across the growing season and between years influence canopy structure and function? (2) Does canopy spectral reflectance vary across the growing season and between years in a precipitation gradient? Our experimental design consists of 7 levels of precipitation each with 3 replicates totaling 21 plots and establish a gradient of: −100%, −80%, −60%, −40%, −20% rainfall exclusion, 0% change in precipitation and precipitation addition +50%, in a fully factorial randomized block design. For this project, we focused on the extreme treatments (-100%, 0% and +50%) for ecosystem structure and function responses. Ecosystem structure and function were found to be impacted by drought and interannual variation in background precipitation. Specifically, we found that NDVI is lower not only in our drought treatments but also in 2022 than 2023. Similarly, canopy reflectance is influenced by drought treatments and interannual variation. Drought reduces reflectance relative to precipitation addition plots while interannual variation is reduced during the peak of the growing season. Likewise, ecosystem structure was found to have interannual differences. Drought reduces structure and function, and this effect differs across seasons/year.

Emma E. England, Carrie J. Pratt, Mostafa S. Elshahed, and Noha H. Youssef (Oklahoma State University-Stillwater)

EVALUATING THE IMPACT OF REDOX POTENTIAL ON GROWTH CAPACITY OF ANAEROBIC GUT FUNGI

The anaerobic gut fungi (AGF, phylum Neocallimastigomycota) inhabit the alimentary tract of herbivores. They play an important role in digesting plant biomass to fermentation end products for their host uptake. The AGF are strict anaerobes, a trait regarded as an adaptation for survival in the oxygen-devoid herbivorous gut, where highly negative redox predominates. Nevertheless, while studies have shown that multiple AGF taxa could survive transient exposure to oxygen, the capacity of AGF to grow under various levels of redox potential is currently unknown. Here, we evaluated the capacity of three strains isolated from wild mammals (*Aklioshbomyces papillarum*), domesticated mammals (*Orpinomyces joyonii*), and tortoises (*Testudinimyces gracilis*) to grow in media with various levels of redox potential (-200 mV, -100 mV, and 0 mV). Redox potential levels were controlled by varying the concentration of reductant (cysteine hydrochloride), and growth was measured by quantifying gas accumulation in the headspace. Growth of all strains was observed under highly reduced redox potential (-200 mV) that mimics conditions in the mammalian herbivorous gut. Surprisingly, all three AGF strains readily grew at comparable levels at the redox potential of -100 mV, conditions associated with dysbiosis in the herbivorous gut. No growth was observed at a redox potential of 0 mV. Our results establish an upper limit for AGF growth under different redox potentials, indicate a similar response of multiple AGF taxa to redox potential variation, and suggest that loss of the ability to grow under high redox conditions (0 mV and above) is a common ancestral trait in the phylum Neocallimastigomycota.

Faith England, Alex Harman, and W. Wyatt Hoback (Oklahoma State University-Stillwater)

COMBING INSECT WEBS: UNCOVERING THE DISTRIBUTION OF EMBIOPTERA IN OKLAHOMA

There is limited information available regarding the presence of Embioptera in Oklahoma, as only a few records exist. The known occurrences state are confined to the southwestern region, specifically the Wichita Mountain Range, where *Ansembia texana*, in its apterous form, has been observed. The main objective of this study is to determine the distribution of Embioptera in Oklahoma, thereby enhancing our understanding of the species. To achieve this, we will survey various state parks throughout Oklahoma, employing aspirators, black lights, and Burlese funnels. We anticipate discovering *Ansembia texana* in southwest Oklahoma, and have already detected the presence of the exotic *Hapleombia tarsalis* in Stillwater, Oklahoma. Furthermore, we anticipate encountering the exotic *Oligotoma nigra*, a species that has been found as far north as Michigan. Embioptera remains one of the least explored insect orders, and this research contributes to expanding knowledge of these insects, particularly in the south-central United States.

Josue Espinal[1], Paulina Ruelas[1], Lindsey Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

SLMB CONSERVATION WITHIN THE INSULIN/TOR PATHWAY

The insulin/TOR pathway plays a key role in the growth, metabolism, and aging of an organism. The investigations observed the evolution of the insulin/TOR pathway by analyzing the evolution of the slmb gene throughout various *Drosophila* species. Previous research has shown that genes with more connections evolve slower relative to those that have less connections (Alvarez-Ponce, David, et al. 2009 genome Res.). We hypothesized that yhe evolutionary conservation of Supernumerary limbs (slmb) is more conserved than Lnk throughout the *Drosophila* species.

Payden Farnsley, Stevie Langstraat, Rachel Uhlig, Kade Flores, Lisa Boggs, and Sherry Westmoreland (Southwestern Oklahoma State University)

BRIDGING DISCIPLINES ON MARS: SOUTHWESTERN OKLAHOMA STATE UNIVERSITY'S FIRST INTERCOLLEGIATE STUDY INTEGRATING BIOLOGY, COMPUTER SCIENCE, AND ARTIFICIAL INTELLIGENCE FOR MICROBIAL ANALYSIS AND PLANT GROWTH ON MARS

With the increasing public demand for space exploration, astrobiology research is a growing scientific field, as colonies on extraterrestrial planets come closer to reality. For these colonies to be a success, efficient nutrient cycling in different

environments must be studied. The NASA-affiliated Plant the Moon competition challenges research teams across multiple educational divisions to grow food in simulated Mars soil (regolith) – produced by the Exolith Lab at the University of Central Florida – within a given growth period. Multiple students at Southwestern Oklahoma State University have participated in this challenge and have studied the interactions between microbes, Mars regolith, mammal fecal matter, and the growth of plants that provide food production. With Mars regolith behaving differently than Earth soil, parameters involving the growth of crops have been tested on top of soil additives. In addition to documenting total plant yield, soil pH, seedling germination rates, and chlorophyll content have been assessed. These characteristics of plant growth have been tested in many crops including, but not limited to, lettuce, spinach, basil, and radishes. With the ever-growing field of computer science and artificial intelligence, a joint research project between two departments will perform parameter testing on soil additive concentrations and specific growth conditions, among other things. Using multiple parameter tests, we anticipate finding the best combination of growth conditions and concentrations for crop yield in extraterrestrial soils used in space exploration. Beyond these implications for food and waste management, the results we find may be beneficial to organic farmers and home gardeners.

Charles R. Gates[1],[2], Amit Kumar Tripathi[1], Jamboor K. Vishwanatha[1], and Pankaj Chaudhary[1] ([1]Langston University; [2]University of North Texas Health Science Center)

ANNEXIN A2 EXPRESSION IN PROSTATE CANCER CELLS

Metastasis is a major cause of morbidity in prostate cancer patients, the primary mortality in this disease is metastasis to the bone tissue. Despite substantial efforts to understand prostate cancer metastasis, the mechanisms that are involved in preparing the metastatic niche for colonizing the prostate cancer cells are still not known. Therefore, there is an urgent need to identify essential regulators of bone metastasis in prostate cancer for therapeutic targets. Annexin A2 (AnxA2), a calcium-dependent phospholipid binding protein, is overexpressed in the poorly differentiated high-grade adenocarcinomas of prostate cancer. Phosphorylation of AnxA2 at tyrosine 23 (pAnxA2-Y23) is an important event for the localization of AnxA2 to the cell surface. At the cell surface, However, the cell surface expression of AnxA2 in prostate cancer is unknown. Therefore, in the present study, we have demonstrated the cell surface expression of AnxA2 in prostate cancer cells to delineate the mechanism of bone metastasis. Prostate cancer cell lines, PC3 and DU145 were grown, Immunoblotting was used to detect the expression of pAnxA2-Y23 and AnxA2 proteins in cells. Our results demonstrated expression of pAnxA2-Y23 is very high in prostate cancer cells (PC3 and DU145 cells) compared to normal prostate epithelial (PWR1E, and RWPE1 cells). However, the expression of total AnxA2 in both prostate normal and cancer cell lines is comparable. In addition, our membrane wash experiment showed that a large amount of AnxA2 is present at the cell surface of the PC3 and DU145 cell lines. In normal prostate epithelial cells, even though the expression of total AnxA2 is comparable to PC3 and DU145 prostate cancer cells, membrane localization of AnxA2 is very low. Our results clearly suggest that the cell surface expression of AnxA2 is high in prostate cancer cells due to increased phosphorylation of AnxA2 at tyrosine 23.

Mackenzie Lee, Jessica Sefranek, John Geiger, and Jeff Seger (Cameron University)

THE EFFECT OF DIFFERENT PSYCHOLOGY CLASSES ON PSYCHOLOGICAL MISCONCEPTIONS IN STUDENTS

People often come into Psychology with misconceptions about certain terms. For example, the entertainment industry often portrays Schizophrenia as having multiple personalities or Dissociative Identity Disorder. To identify the rates of these misconceptions 132 participants answered a four question multiple choice test to identify examples of Schizophrenia, Negative Reinforcement, Anti-Social Personality Disorder, and whether Psychopaths can be diagnosed as such in the DSM-V. It was hypothesized that high rates of misidentification still exist for these concepts, but having the appropriate psychology course would reduce these misconceptions. A majority of participants misidentified Anti-Social PD and Negative Reinforcement as well as the Psychopath questions. A Kruskal-Wallis ANOVA showed that having a Personality or Abnormal Psychology course reduced incorrect answers on the Psychopaths questions, and a General Psychology course reduced incorrect answers on that question, as well as misidentification of Negative Reinforcement.

Christopher G. Goodchild and Yulianis Pagan (University of Central Oklahoma)

EFFECTS OF IN OVO EXPOSURE TO TWO ALGAL TOXINS ON EMBRYONIC GROWTH, METABOLIC RATE, AND HEART RATE

The occurrence of harmful algal blooms is predicted to increase as the climate changes, increasing the risk of exposure to algal toxins for waterfowl and shorebirds. Previous studies indicate that mother birds exposed to algal toxins transfer these toxins to their eggs. While there is some evidence that in ovo exposure to algal toxins can alter cardiac development and function in other taxa, no study has examined whether such effects occur in avian embryos. In this study, we used white leghorn chicken (*Gallus gallus*) embryos to examine the developmental toxicity of two algal toxins: microcystin and cylindrospermopsin. Specifically, we investigated whether in ovo exposure to algal toxins interferes with avian embryonic growth, heart rate, and metabolic rate. Preliminary results suggest in ovo exposure to cylindrospermopsin and to lesser extent microcystin impair embryonic development.

Tanisha Goyal[1], Christina Bourne[2], and Erika Lutter[1] ([1]Oklahoma State University-Stillwater; [2]University of Oklahoma)

CHLAMYDIA TRACHOMATIS INCLUSION MEMBRANE PROTEIN CT226 INTERACTION WITH HOST PROTEINS TMOD3 AND FLII

Chlamydia trachomatis is an obligate intracellular pathogen that is transmitted sexually in humans. It is estimated that it results in more than 3 million STI infections in USA including pelvic inflammatory disease, ectopic pregnancy, and reduced fertility. Bacteria has a distinctive biphasic life cycle, its reproductive stage creates a parasitophorous vacuole, also known as an inclusion. Chlamydia produces inclusion membrane proteins which decorate the inclusion membrane and mediate host-pathogen interactions. Previous studies have identified that the Inc CT226 interacts with the host actin remodeling protein TMOD3 and the host inflammasome associated protein FLII. We hypothesize that Inc CT226 is interacting with host proteins FLII and TMOD3 at the leucine rich regions. The aim is to verify the regions of Inc CT226, FLII and TMOD3 that interact using the bacterial two hybrid system and pulldowns. Purified proteins of predicted interacting regions of CT226, FLII and TMOD3 will be purified for structural analysis, binding assays, and crystallography.

Eli Grasso and April Nesbit (East Central University)

INVESTIGATION OF L-LYXONIC ACID EFFECT ON CYTOCHROME BD-1 OXIDASE EXPRESSION

Escherichia coli is a widely utilized model organism in a vast number of biological investigations, yet the functions of roughly 1,264 of its genes have yet to be demonstrated. One such gene whose purpose has not been entirely established encodes for putative DNA-binding transcriptional regulator YfaX. The gene yfaX has been identified as being part of an operon responsible for the metabolism of L-lyxonate. This investigation sought to determine whether there is a link between YfaX putative transcription factor and expression of cydA promoter, which controls expression of cytochrome bd-1 oxidase that is involved in electron transport chain. The YfaX protein was of interest because previous labs have shown that it binds cydA promoter in vitro, and cydA expression decreases in the presence of L-lyxonic acid. Lyxonate may be a product of vitamin C degradation in human intestines. It is possible that a higher concentration of vitamin C may result in an increased concentration of lyxonate; this may disrupt overgrowth of *E. coli* in the intestines, preventing potential unforeseen health risks. The potential link was tested using an yfaX deletion mutant in a strain with cydA promoter fused to the reporter gene lacZ that allows measurements with β-galactosidase assays with growth in different sugars. Although cydA expression decreases in the presence of L-lyxonic acid, the deletion of yfaX did not have an effect. Moving forward, future investigation will utilize a fusion of lacZ to the yfaX promoter region for the purpose of determining if the yfaX gene responds to L-lyxonic acid as predicted by the role of other genes in that operon.

Jessica Gray, Monica Vuong, Joe McCreary, and I-Hsiu Huang (Oklahoma State University-Center for Health Sciences)

BIOFILM FORMATION AND VANCOMYCIN SUSCEPTIBILITY OF ENVIRONMENTAL *CLOSTRIDIOIDES DIFFICILE* ISOLATES

Clostridioides difficile is a gram-positive, spore-forming bacteria capable of causing disease, referred to as *Clostridioides difficile* Infection (CDI), which may include symptoms such as severe diarrhea and colitis. CDIs are considered an urgent threat in the United States by the CDC, due to the severity of symptoms and the recurrent nature of these infections. CDIs are thought to be iatrogenic, but accumulating evidence suggests that environmental transmission may play an important role as well. Environmental *C. difficile* isolates were previously isolated from fish markets, hospital wastewater, and wastewater treatment plants in southern Taiwan. Through Genotypic analysis, these environmental isolates were shown to be closely related to those prevalent among humans and animals infected with *C. difficile*. To gain a better understanding of the virulence capabilities of these environmental isolates, a series of studies including growth rates, spore production, and cytotoxicity were performed. In this study, we focused on the biofilm-forming capabilities and any added resistance granted against Vancomycin compared to planktonic cells. The biofilm formation ability of these isolates was observed over 72 hours, then biofilm mass was measured using a crystal violet staining assay. We observed a diverse range of biofilm formation abilities and biofilm morphology, but we did not detect any significant correlation between the robustness of the biofilms and the presence of toxin genes. To determine Vancomycin susceptibility, certain environmental *C. difficile* isolates were grown for 48 hours and treated with Vancomycin. Survival rates were compared against planktonic samples similarly treated with Vancomycin. We observed significantly higher survival rates among cells in biofilm formation. Our results contribute to the characterization of multiple environmental *C. difficile* isolates obtained from water and seafood samples in southern Taiwan.

Ethan Haggard, Tyson Eastwood, Jarrett Justin, Clayton Kilgore, and Faith Gregory (Southwestern Oklahoma State University)

IMPACT OF FIRE ON THE RODENT COMMUNITY IN WESTERN OKLAHOMA GRASSLANDS

In Western Oklahoma grasslands, prescribed burns are a commonly used management tool of invasive woody plants, especially Eastern Red Cedar (*Juniperus virginiana*). Fires are a natural disturbance of grasslands and critical in the maintenance of productive rangelands, while small mammals are an important ecological indicator of grassland condition. We sampled rodent communities on local pastures that have either a recent history of repetitive prescribed burns or none. We found that unburned pastures provided more and taller grass cover than burned ones, and that unburned pastures hosted a more homogenous rodent community with greater abundances of fewer species than recently-burned grasslands. Furthermore, rodent species known to

prefer relatively open cover were more frequently found on the pastures subjected to recent prescribed burns, while those favoring dense-cover habitats were more commonly found on the unburned pastures. Evidently, prescribed burns may effectively be used to increase rodent species diversity in Western Oklahoma grasslands.

Ryley Hall[1] and Tom Weissling[2] ([1]Oklaoma State University-Stillwater; [2]University of Nebraska-Lincoln)

PARASITIC WASPS ON MILKWEED IN NEBRASKA

Milkweed (*Asclepias* spp.) has long been studied for its significance to monarch butterflies and pollinators, particularly bees. However, the overlooked role of milkweed flowers in supporting small insects has become a recent focus. Parasitic wasps play a vital role in ecosystem health. A survey was conducted to understand the diversity and abundance of parasitic wasps in common milkweed (*A. syriaca*) flowers around the University of Nebraska-Lincoln's Eastern Nebraska Research and Extension Center (UNL ENREEC). Flowers were sampled on June 27th, enclosed in Ziplock bags, frozen, and processed in the lab, focusing on identifying parasitic wasps. The survey revealed that the family Figitidae was the most frequently collected, with the subfamily Eucoilinae particularly prominent. The genus *Kleidotoma* was the most common among the parasitic wasps. These findings suggest that milkweed flowers provide a suitable habitat for parasitic wasps, as they were found in 14 samples.This research offers insights into conserving parasitic Hymenoptera species by identifying their preferred resources, like milkweed, to support their population growth in ecosystems.

Alexander Harman, Mady Eori, Courtney Duchardt, Bryan Murray, and W. Wyatt Hoback (Oklahoma State University-Stillwater)

WILDLIFE BIODIVERSITY IN OKLAHOMA OZARK GLADES

The Ozark Mountains, while heavily forested, include rocky grasslands with shallow soil known as glades. These glades host isolated populations of many plants and animals characteristic of the Great Plains, such as grassland obligate birds, butterflies, and grasshoppers. These habitats are well studied in Arkansas and Missouri, where these grassland species are rare and threatened, but less so in Oklahoma where such species are abundant in western prairies. This research represents the first year of data from a two-year study with the goals of inventorying the mammals, birds, reptiles, amphibians, butterflies, grasshoppers, and other insects of Oklahoma's Ozark glades, using mapping technology to identify and predict the occurrence of additional glades within the state, and provide management recommendations to preserve glade biodiversity. Our initial surveys detected 71 bird, 17 herp, and 51 butterfly species including many species that are considered "Species of Greatest Conservation Need" by the ODWC, as well as many other poorly known insect species.

Lauren HerrNeckar[1], Guoli Hu[2], and Courtney M. Karner[2] ([1]East Central University; [2]University of Texas Southwestern Medical Center)

DETERMINING THE ROLE OF CYSTEINE 130 ON RUNX2 STABILITY AND FUNCTION

Runt-related transcription factor (Runx2) is essential for osteoblast differentiation and bone matrix production that is necessary for bone development and homeostasis. Autosomal dominant mutations in Runx2 cause the skeletal diseases Cleidocranial Dysplasia (CCD). Interestingly, RUNX2 is up regulated in pathological conditions such as vascular calcification and calciphylaxis, which are associated with and can facilitate Chronic Kidney Disease (CKD). We hypothesized that individual cysteine amino acids in the RUNX2 protein are crucial for its stability and regulation by ROS. With this in mind, we used site-directed mutagenesis to change individual Runx2 cysteines to alanine. This summer project focused on function testing of the C132A variant.

Peyton HerrNeckar and J. Bruce Moring (East Central University)

WATER QUALITY AND ASSOCIATED PHYSICAL PARAMETERS OF THE BLUE RIVER OF OKLAHOMA

The Blue River is a freshwater tributary of the Red River that runs for 141 miles, and is one of two free-flowing streams in Oklahoma, meaning the water is not impounded or diverted. The Blue River is a critical source of water that supports cities such as Durant, as well as the surrounding landscape, such as pasturelands. Changes in water chemistry can impact the health of aquatic biota, and human recreational activities such as swimming and fishing. Water samples were collected in the fall of 2022 and spring of 2023 at five sites on the upper Blue River. This research aims to analyze water samples taken during different seasons, and to compare the results to historical data, as well as identifying any patterns or changes in water chemistry over the seasons, and how land usage might be impacting those results. Nitrate-nitrite as nitrogen concentrations were higher in the spring than fall, and total phosphorus concentrations were lower in the spring compared to fall. The spring averaged 0.561 mg/L nitrate-nitrite as nitrogen and 0.05 mg/L phosphorus compared to 0.41 mg/L nitrate-nitrite as nitrogen and 0.355 mg/L phosphorus in the fall. These results could be due to a range of factors, from seasonal variability to land use upstream and across each of the five sites. Comparing these results to the 2021 Oklahoma Conservation Commission (OCC) for High-Quality Sites, phosphorus results in the fall averaged higher compared to the 0.05 mg/L average for OCC. As well as higher nitrate-nitrite as nitrogen results in the spring compared to the 0.152 mg/L average observed by the OCC. Future research should aim to sample more sites along the Blue River to better characterize water quality and its impacts.

Samantha Hittson, Michael Cavallaro, and W. Wyatt Hoback (Oklahoma State University-Stillwater)

IMPACTS BEYOND THE TARGET: UNINTENDED CONSEQUENCES OF PESTICIDES ON BURYING BEETLES

Neonicotinoids and pyrethroids are some of the most commonly applied and detected insecticides used in agriculture. Residues of these insecticides accumulate in soil and can affect non-target soil-dwelling insects. We determined the comparative toxicity of two neonicotinoids (imidacloprid and thiamethoxam) and two pyrethroids (bifenthrin and tefluthrin) under direct topical application on two *Nicrophorus* spp. based on exposure thresholds for honey bees, *Apis mellifera*. We tested the effects of soil residues on breeding by *Nicrophorus orbicollis*. Burying beetles are sensitive to some compounds and methods to reduce run-off and pesticide drift should be undertaken to protect natural areas that support burying beetles.

Landon Holley and Susmita Hazra (Cameron University)

STUDY OF IONOSPHERIC DRIFT USING IONOSONDE DATA

The environment in the top layer of the Earth's atmosphere, which we call as ionosphere changes from hour to hour and from day to day due to its interaction with Sun. As a part of this research, we are studying ionospheric drift velocity at different latitudes and times using ionosonde data. We are using the data for stations ranging from -30 deg latitude to +30-degree latitude. Our initial analysis shows drift velocity could go up to 150 m/s. We have found the highest changes in velocity happen before or after sunrise, and sunset. Also, drift velocity changes nearer the equator region. The results of this research project will be important in terms of space plasma studies and space weather predictions, which play a significant role in radio and satellite communication as well as GPS navigation.

Bailey Howe and Alisha Howard (East Central University)

GENETIC OPTIMIZATION OF HTLV-I TAX

Human T-cell Leukemia Virus type 1 (HTLV-1) is the retrovirus responsible for the aggressive cancer, Adult T-cell Leukemia. Within this malignant evolution, the virally-encoded oncoprotein Tax acts as a transcriptive promoter in cell signaling pathways through CREB and CBP/p300 recruitment. Despite the extensive research into Tax's interactions with cellular co-activators, potential interactions have yet to be completely explored, likely caused by the difficulty in using conventional molecular modus operandi when characterizing Tax. However, genetically optimizing the oncoprotein through subcloning methods possesses the possibility of facilitating further examination into Tax-coactivator interactions, as well as offering a promising platform for deciphering the intricate molecular events underpinning Tax-induced oncogenesis.

Sierra Hubbard and Mark Fishbein (Oklahoma State University-Stillwater)

SPATIAL PHYLOGENETICS OF VASCULAR PLANTS IN THE SOUTH-CENTRAL US

While traditional measures of biodiversity are typically based on the species present in an area, phylogeny-based measures are able to capture information about the evolutionary history represented in an assemblage of taxa. Investigations of diversity using a phylogenetic framework can reveal the distributions of evolutionary lineages and the relative ages of plant assemblages. The South-Central United States (made up of Oklahoma and Texas) is a floristically diverse region that contains [3]8,000 vascular plant species. This region is also climatically diverse, with strong abiotic gradients in temperature, precipitation, and elevation. The current understanding of spatial phylogenetics in this region comes from a few continental-scale studies utilizing herbarium data. However, the South-Central US has not yet been included in any regional-scale studies, which could potentially reveal finer-scale patterns not apparent across broader study regions. Additionally, much fewer data have been available from Oklahoma and Texas compared to many other regions of North America; this may have led to incomplete conclusions about the spatial phylogenetics of plants in this region. Recent and ongoing digitization and georeferencing efforts have addressed this data gap by mobilizing a wealth of herbarium records from Oklahoma and Texas. In this study, we aim to use these newly available herbarium data to characterize the spatial patterns of phylogenetic diversity (PD) and relative phylogenetic diversity (RPD) seen in the vascular flora of the South-Central US. This approach highlighted regions that contain young plant assemblages in the High Plains and Southwestern Tablelands and identified concentrations of old lineages in the Eastern Temperate Forest and Edwards Plateau. In addition, we tested for associations between PD, RPD, and climatic gradients in precipitation, temperature, and elevation. We found that bioclimatic variables related to precipitation were the best predictors of PD and RPD.

Diane V. Roeder[1], Michael S. Husak[2], Michael T. Murphy[3], and Michael A. Patten[4] ([1]South Dakota State University; [2]Cameron University; [3]Portland State University; [4]Nord University-Norway)

BREEDING SYNCHRONY, HABITAT, AND SCALE AS PREDICTORS OF EXTRAPAIR PATERNITY IN SCISSOR-TAILED FLYCATCHERS

Despite extensive research on passerine extrapair paternity (EPP) over the past 20 years, it remains difficult to predict which traits of individuals, nesting populations, and landscapes drive EPP rates. Two broad categories of drivers, habitat structure and population level factors, have been considered separately or at a single spatial or temporal scale. We used a multi-year nesting data set of scissor-tailed flycatchers (*Tyrannus forficatus*), which have high rates of cuckoldry, to explore how nest density, breeding synchrony, habitat structure, and clutch initiation date affect EPP rates. We further considered synchrony at two temporal scales and habitat structure at two spatial scales. We predicted that visual occlusion from vertical habitat structures on

breeding territories would allow extrapair males to go unnoticed and provide cover for extrapair copulations. Predictions for effects of nest density and fertility synchrony were double-edged: EPP may either increase as extrapair mate availability and ease of comparison with social mates increases or decrease as social mates increase their efforts to assure paternity. We found a combination of population-level factors and habitat structure, including interactions among the latter, at different scales best accounted for variation in EPP. EPP declined within creasing population synchrony. Variation in EPP was also explained by fine-scale habitat measures, including nest tree diameter at breast height, woody vegetation cover, and tree density. Notably, EPP increased with a coarse-scale habitat measure, linear extent of fence or power line, suggesting a role for human alteration of habitat. Fences are used as communal perches by neighbors and floater males, potentially increasing interactions between asynchronous individuals. Our study demonstrates that breeding synchrony influences the probability of EPP and that habitat structure on individual territories is a strong predictor of paternity that acts independently of breeding density or synchrony at our scale of measurement.

Nicholas Jacob (East Central University)

DATA PRE-PROCESSING AND VISUALIZATION OER

For a course in Data Pre-Processing and Visualization at East Central University, I developed an Open Educational Resource using Jupyter notebooks and python programming language. I will discuss the successes and failures of the project. I will highlight the tools used to create the project. And discuss next steps in using and improving the project.

Jayme James (Oral Roberts University)

APIGENIN INDUCES APOPTOSIS IN MBA-MD 231 CELLS IN VITRO

Breast cancer is the most common type of cancer among women. There are around 264,000 new cases each year (Basic Information About Breast Cancer, 2022). As the prevalence of breast cancer increases, the desperation for new treatments is also rising. In this project, MDA-MB 231, a breast cancer cell line, was used to determine the efficacy of apigenin in inducing apoptosis on breast cancer cells. Apigenin is a flavonoid found in plants that has many therapeutic properties, including anti-inflammatory, antioxidant, and anti-viral significance. Results of our MTT assay showed a dose dependent induction of apoptosis. The Caspase-3 assay indicated that apigenin induces cell death by activating the Caspase pathway. Our flow cytometry results revealed that apigenin downregulated the expression of PD-L1 in MDA-MB 231 cells. Furthermore, HEK293T, a human embryonic kidney cell line, was used to test the potential detrimental effects of apigenin on normal cell lines. Through an MTT assay, it was determined that apigenin possesses minimal harm to HEK293T cells; thus, confirming apigenin's potential for in vivo applications.

Sean Johnson, Troy Baird, and Christopher Goodchild (University of Central Oklahoma)

EFFECTS OF TERRITORIAL BEHAVIOR ON HEMATOLOGICAL INDICES, LEUKOCYTE COUNTS, AND OXIDATIVE STRESS IN MALE COLLARED LIZARDS (*CROTAPHYTUS COLLARIS*)

Male Collared Lizard (*Crotaphytus collaris*) can be categorized as 'territorial' or 'non-territorial' according to display frequency of certain behaviors. Territorial males spend more time courting females and defending their territory against nonterritorial lizards, and previous studies have shown the annual fitness (number of mates, offspring sired) is greater for territorial males. However, it is unclear whether there is a physiological tradeoff associated with a territorial reproductive strategy. Therefore, the primary objective of this study was to examine whether territorial and nonterritorial males exhibit differences in immune function, oxidative stress, and hematological indices. Additionally, these hematological variables are not well characterized in Collared Lizards, thus a secondary objective was to examine sex-specific differences in these physiological variables. We conducted focal observations of male Collared Lizards from a long-term study population at Arcadia Lake (Edmond, OK, USA) and categorized individuals as territorial or nonterritorial according display behaviors during the breeding season (April-June). We collected blood from male Collared Lizards over three breeding seasons (2021-2023) and measured packed cell volume, hemoglobin, and mean corpuscular hemoglobin concentration. To determine white blood cell differentials, we prepared blood smears, manually counted white blood cells by light microscopy, and recorded the number of heterophils, lymphocytes, monocytes, eosinophils, and basophils. Additionally, we assessed oxidative stress by measuring the amount of reactive oxygen metabolites in plasma. Although territorial males tended to have lower PCV and hemoglobin, these trends were not significant. Additionally, territorial males appeared to have lower heterophil counts and higher lymphocyte counts compared to nonterritorial males. Males exhibited higher hematocrit and hemoglobin compared to females, but there was no difference in MCHC or white blood cell counts across sexes. Collectively, these data may indicate territorial males exhibit a different physiological phenotype compared to nonterritorial males, but further data collection is required to confirm these preliminary results.

Wyatt Johnson, Nathalie Moro, Daniel Kim, and Rajesh K. Nayak (Cameron University)

INVESTIGATION OF QUENCHING OF FLUORESCENCE STUDIES OF AF 647 DYES IN PRESENCE OF GRAPHENE OXIDE NANOCOLLOID (GONC)

The photophysical properties and quenching of fluorescence studies were investigated in presence of Graphene Oxide nano colloid (GOnc) using reverse micelle as a simple model system. Our observation shows that AF 647 fluorophore undergoes significant quenching in presence GOnc in aqueous as well as reverse micelle of varying sizes. Furthermore, our photophysical

studies further show that the dyes in reverse micelle environments behave very differently as compared to that of dyes in aqueous environment. Finally, the quenching studies in presence of GOnc nanoparticle can shed light on the use of GOnc in photovoltaics and other cellular applications.

Jennifer L. Kisamore (University of Oklahoma-Tulsa)

STROBOSCOPIC LIGHT AND THE ENHANCEMENT OF EMPLOYEE OUTCOMES: PRELIMINARY FINDINGS

Light therapy has been used to alter mood, most commonly in the treatment of seasonal affective disorder. Alternatively, entheogens have received increasing attention for use in the treatment of addictions and psychological disorders such as PTSD. A new type of treatment using stroboscopic light has shown promise in altering affect and mirroring the effects of entheogens by producing mild psychedelic experiences without the potential side effects or time commitment of entheogens. The goal of the current study is to examine whether stroboscopic light treatments affect employees' perceptions of stress and creativity. Five people who have completed 6 or more stroboscopic light sessions, with the most recent session occurring in the past six months, were interviewed about their experiences. All five participants were women. Participants worked in a variety of industries, though all worked closely with other people as part of their work. Participants reported the stroboscopic light sessions helped them recover more quickly from workplace stressors and enhanced their creativity in and overall ability to address client, customer, or subordinate's needs. Participants indicated the light sessions improved their ability to regulate their moods in stressful situations. While participants reported engaging in other practices (e.g., meditation) to reduce stress, they reported the light sessions deepened their meditative practices and experiences. Furthermore, participants reported the stroboscopic light sessions induced feelings of awe and enhanced their perceptions of connectedness to others and nature while also helping them recover from stressful workplace experiences. Results of this preliminary study suggest further research on the effects of stroboscopic light on employee affect are warranted. Prospective research as well as data from men and non-binary employees would help expand understanding of the role of stroboscopic light treatment on employee affect.

Jenna Knox, Katie McCullock, and Lindsey Long (Oklahoma Christian University)

COMPARISON OF CONSERVATION AND DIVERGENCE IN GENE RL COMPARED TO GENE GIG

The goal of this experiment is to understand how pathways evolve using the insulin/TOR pathway. *Drosophila* was used as the model organism to identify gene conservation among various species that have increasing divergence from *D. melanogaster*. The specific gene of interest for this project was rl. In a paper published by Alvarez Ponce, it is hypothesized that more connections results in slower evolution of a gene. To show this we compared divergence scores in species closely, intermediately, and loosely related to *D. melanogaster*. We hypothesized that rl will be less evolutionarily conserved when compared to gig.

Ethan Korn and Jason Shaw (University of Science and Arts of Oklahoma)

EFFECTS ON HERPETOFAUNA POPULATION BY TRAFFIC OF SURVEY LOCATION

Heavy human traffic can affect herpetofauna populations by taking up their space, causing noise pollution, etc. The richness and diversity of species may be affected by these events. As such, it is important to survey pertinent locations and determine any differences between them. Using the USAO habitat as a control, this experiment compared a low-traffic area to a more popular recreational location. Catch and release traps, as well as recorders, were set up to aid in the survey. The resultant population numbers were compared over two years against location, season, and weather.

David Kunkel and Mark Fishbein (Oklahoma State University-Stillwater)

CHARACTERIZING CLIMATIC AND EDAPHIC NICHES OF THE TEMPERATE NORTH AMERICAN CLADE OF ASCLEPIAS

Niche divergence has been considered an important driver of speciation and diversification that has consequences for species coexistence. By characterizing the niches of species across a whole group it becomes possible to assess niche differences among closely related species and gain insight into the role that niches play in lineage diversification, as well as how that leads to coexistence across a landscape. To evaluate the role of niche differentiation in lineage diversification, I studied the Temperate North American Clade of *Asclepias* (milkweeds). I hypothesized that 1) species diverged along both climatic and edaphic niche axes, primarily precipitation and soil texture, and 2) niche differentiation among species in the southwestern United States and Mexico is greater than in the Eastern Temperate Forest. I characterized niches by utilizing 19 bioclimatic variables, elevation, and 7 soil variables accounting for texture and chemical structure. I used principal component analysis (PCA) and ecological niche modeling to characterize niches and evaluate species differences. Niche overlap between species was measured using Warren's I. Results from PCA show that species of the Temperate North American Clade are differentiated primarily along a climatic niche axis. Soil characters, while still important for differentiation among species pairs, did not contribute to differentiation as much as climate. Counter to my original hypothesis the niche differentiation of the species found in western North America is not significantly higher than among species in the Eastern Temperate Forest. These results indicate that the majority of the ecological variation of this group is not contained in one part of this group's distribution, but rather is found across its range. This could suggest that the rapid diversification of this group, potentially associated with niche, may be consistent across their evolutionary history as well.

Jennifer Lane and Susmita Hazra (Cameron University)

ANALYZING LIGHT CURVE DATA OF AN EXOPLANET USING ROBOTIC TELESCOPE DATA

In this project, we are presenting our observation on exoplanets. This project is a part of NASA's citizen science initiative. Planets that orbit around other stars are called exoplanets. NASA's Kepler's Telescope is one of the space telescopes that have discovered over thousands of exoplanets. We are using robotic telescope data for observing and using EXOTIC to analyze sample dataset of the transiting exoplanet. Studying exoplanets is important as it helps us to understand other solar systems as well as our own solar system. This study will aid in the more accurate forecasting of upcoming transit events for follow-up with big ground-based or space-based observatories, help monitor the variation in brightness of stars, as well as identifying and confirming any new exoplanets that are orbiting in our solar system.

Stevie Langstraat, Rachel Uhlig, Kade Flores, Payden Farnsley, Lisa Boggs, and Sherry Westmoreland (Southwestern Oklahoma State University)

M.A.R.S. ON MARS: MICROBIAL ADDITIONS TO REGOLITH AND SCAT ON MARS

Efficient nutrient cycling is key to plant growth and waste management on Earth, and will certainly be critical for human habitation off of Earth. As part of the NASA-affiliated Plant the Moon Challenge competition, ten students at Southwestern Oklahoma State University examined interactions between soil microbes, Mars regolith, mammal fecal matter, and growth of food plants. Four species of plants (spinach, lettuce, peas, and basil) were grown in simulated Mars regolith that was enhanced with soil amendments, including sterilized rabbit feces. After germination, all pots were treated with microbes from one of four sources—rabbit fecal matter, worm castings, purchased beneficial bacteria, or purchased mycorrhizal fungi. In addition to documenting total plant yield, soil pH was monitored, along with seedling germination rates and chlorophyll content.

Leah Larkpor[1], Eddy Bagaruka[1], Lindsey Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

CONSERVATION OF IMPL2 IN *DROSOPHILA* SPECIES

The insulin/TOR pathway plays a key role in glucose regulation in organisms, including *Drosophila* melanogaster. Due to its contribution to the growth and development of the species, it involves multiple genes that coordinate the pathway. The main aim of this study was to investigate the conservation of the genes in this pathway relative to the position they occupy in the pathway, specifically focusing on the gene of ImpL2. The gene is upstream in the pathway compared to RpS6, Rolled (Rl), and Lnk. It was hypothesized that ImpL2 is more conserved than RpS6, Rolled (RI), and Lnk due to its ability to switch off the Insulin/TOR cascade. To test the hypothesis, the genes were annotated with bioinformatic software to identify the genomic neighborhood, divergence scores, and protein identity in different *Drosophila* species. The annotation results showed that ImpL2 was more diverged compared to the other downstream genes, which led us to conclude that the hypothesis was not supported.

Michelle Lastrina (East Central University)

EXPLORATIONS IN SIM: A GAME ON K6

In this introductory talk we explore the game of Sim, which is a two-player game played on the complete graph with six vertices. Players color the edges of the graph using two distinct colors with the goal of avoiding the creation of monochromatic triangles. During the given time, we demonstrate game play and discuss connections to Ramsey Theory which ensures a game can never end in a tie. We also note variations of the game, ways to play digitally, as well as open questions. This talk is appropriate for anyone with an interest in games or graph theory.

Brenden Latham[1], Vladimir Ufimtsev[1], and Ayan Dutta[2] ([1]East Central University; [2]University of North Florida)

MATCHING-BASED COALITION FORMATION FOR MULTI-ROBOT TASK ASSIGNMENT UNDER PARTIAL UNCERTAINTY

In this research, we examine the multi-agent coalition formation problem for instantaneous task allocation (IA) where a group of agents needs to be allocated to a set of tasks so that the tasks can be finished optimally. We will present new results in coalition formation for multi-agent systems in the presence of large partial uncertainty. We pair ideas from the Interval Hungarian Algorithm with a One-To-Many Bipartite Matching algorithm to achieve a scalable, parallel solution for allocation under partial cost uncertainty.

Serene Lim[1], Wan-Hsin Hsueh[2], Claire Hodges[3], and I-Hsiu Huang[1,4] ([1]Oklahoma State University-Center for Health Sciences; [2]National Cheng Kung University-Taiwan; [3]Southeastern Oklahoma State University; [4]Oklahoma State University College of Osteopathic Medicine-Tahlequah)

CHARACTERIZATION OF *FUSOBACTERIUM NUCLEATUM* STRAINS ISOLATED FROM ORAL SQUAMOUS CELL CARCINOMA PATIENTS

Fusobacterium nucleatum, a Gram-negative oral commensal in human, has recently been shown to contribute to the initiation and progression of colorectal cancer (CRC). The existence of *F. nucleatum* in CRC has led to poor prognosis, the abundance increased gradually from stage I to IV. CRC ranks as the fourth most prevalent cancer in men and women, and the fourth leading

cause of cancer-related deaths in the United States. According to National Cancer Institute, in 2020, there were approximately 1.3 million people with CRC in the United States. *F. nucleatum* contributes to the promotion of CRC through various virulence mechanisms, including its ability to invade host tissues and modulate the host immune response. Several adhesion molecules in *F. nucleatum* have been identified as virulence factors in CRC. For example, *F. nucleatum* can stimulate tumor growth in CRC by inducing oncogenic expression through the FadA adhesion virulence factor. Increased FadA expression in CRC correlates with the upregulation of oncogenic and inflammatory genes. Yet, *F. nucleatum* has a vast genome, with over 2,000 genes, which suggests that additional unidentified pathogenic factors may also be influencing tumor progression in CRC with *F. nucleatum* colonization. In light of these findings, the initial phase of our research focuses on evaluating the carcinogenic properties of clinical *F. nucleatum* isolates from Taiwanese Oral Squamous Cell Carcinoma (OSCC) and non-OSCC patients. We treated HCT116, a human colorectal carcinoma cell line, with these isolates and monitored their effects on promoting CRC cell migration and invasion. By observing HCT116 patterns, we aim to determine if *F. nucleatum* isolates from OSCC patients exhibit a greater carcinogenic potential than those from non-OSCC patients. According to our preliminary findings, clinical *F. nucleatum* isolates have variable abilities to stimulate HCT116 cell migration. Their effects on cell invasion will be studied to provide a better picture.

Alejandro Lopez, Tram-An Ho, Shaariq Iqbal, and Janaki K. Iyer (Northeastern State University)

CHANGES IN BLADDER CANCER CELLS WHEN INFECTED WITH UROPATHOGENIC *ESCHERICHIA COLI*

According to the National Cancer Institute, in 2023, bladder cancer was the 5th most prominent type of cancer in the United States. Surgery, radiotherapy, and/or chemotherapy are common treatments used for bladder cancer but largely depend on the stage and type of bladder cancer. Unfortunately, many bladder cancers are becoming resistant to these therapies resulting in a substantial increase in treatment costs. Thus, alternative and more effective therapies to treat bladder cancers are required. There are different uropathogens that infect the bladder of humans. According to UCSF Health, *Escherichia coli* (*E. coli*) causes more than 70% of all UTI cases. We speculate that certain virulence factors produced by the bacterial cells may be promising therapeutics to treat bladder cancer. So, we screened different strains of uropathogenic *E. coli* (UPEC) to determine if any of them were able to efficiently kill bladder cancer cells. We hypothesized that we will identify at least one strain of UPEC that is able to kill bladder cancer cells. We obtained four strains of UPEC and characterized their antimicrobial resistance and growth properties. The bladder cancer cells (5637 cell line) were then infected with these different strains and observed for any changes in cell morphology. Bladder cancer cells infected with *E. coli* CFT073 become round-shaped within one hour of infection. Immunofluorescence studies showed that there was a dramatic reduction in microfilaments and changes in shape of nuclei, which suggest that the cells are undergoing cell death. Bladder cells infected with other UPEC strains, however, did not appear to exhibit any of these changes. Further experiments are being performed to determine the mechanism of cell death. These findings will allow us to determine whether the factor produced by *E. coli* CFT073 can be used as a therapeutic to treat bladder cancer.

Hannah Marie Lucy, Anastasia Dodge, and Rachel Budavich (Oral Roberts University)

QUANTIFYING THE DIFFERENCES IN *PHILODENDRON MELANOCHRYSUM* IN VITRO UNDER DIFFERENTIAL PH CONDITIONS

This research project aims to investigate the impact of extreme acidic pH ranges on *Philodendron melanochrysum* in multiplication media. Melanochryum is an epiphytic plant characterized by large, velvety leaves and remains relatively understudied in scientific research. The multiplication media is formulated with a concentration of 1mL/L 6-benzylaminopurine (a cytokinin) and .1mL/L 1-naphthaleneacetic acid (an auxin) and pH ranges from 4.2 to 2.5. The study focuses on the effects of various pH on contamination, shoot number, leaf health, and variegation in this Philodendrons. By analyzing the changes in these parameters under different pH conditions, the study aims to provide insights into the optimal pH range and the various impacts of extreme pH in plant tissue culture. We are conducting a study by monitoring and analyzing the morphological variations over an extended period, encompassing multiple weeks, across a range of pH levels. The aim is to determine whether there is any statistically significant difference occur.

Dennis Auld and Randall D Maples (East Central University)

USE OF OPEN EDUCATIONAL RESOURCES IN THE CHEMICAL PRINCIPLES CLASSROOM

In the Summer 2023 semester, open educational resource (OER) materials were integrated into the CHEM 1324 Chemical Principles course for allied health majors, resulting in substantial cost savings of approximately ^{1}200 per student. The implementation combined chapters from various OER sources, including Open Stax and adapted OER textbooks. Challenges included aligning content with nursing majors' needs and providing only digital chapter access due to different sources. In the laboratory, experiments were adjusted to compensate for the lack of specific equipment and chemicals. Although the absence of traditional PowerPoint resources affected instruction, students responded positively, citing reduced costs and improved focus. Surveyed students unanimously appreciated the OER materials. While the impact on learning outcomes and grades was neutral compared to previous semesters, no students dropped, failed, or withdrew from the course during the OER implementation, reflecting a positive trend. The project exemplified the effectiveness and cost-efficiency of OER materials in this chemistry course.

Joseph H. McCreary[1], Saeed Manouchehri[2], Yi-Wen Liu[3], Yu-Shan Lin[3], Josh Ramsey[2], and I-Hsiu Huang[1] ([1]Oklahoma State University-Center for Health Sciences; [2]Oklahoma State University-Stillwater; [3]National Cheng Kung University-Taiwan)

DESIGNING AN ORAL MUCOSAL VACCINE FOR ENHANCED PROTECTION AGAINST *CLOSTRIDIOIDES DIFFICILE*

Clostridioides difficile is a gram +, spore forming, toxin producing anaerobe that is found throughout the environment. *C. difficile* is the leading agent of hospital acquired infections. Symptoms of *C. difficile* infection (CDI) can range from diarrhea to pseudomembranous colitis and if left untreated can lead to death. *C. difficile* is currently only treated with the antibiotics Metronidazole, Vancomycin, and Fidaxomicin. These antibiotics are non-specific to *C. difficile* and have the side effect of killing the normal microbiota of the gut. This microbiota helps to keep the gut resistant to CDI, and its destruction can lead to relapses of disease. Ongoing work in our lab is looking at preventing CDI using a nanoparticle based oral vaccine. In a mouse model of CDI, we previously demonstrated that using the receptor-binding domain of *C. difficile* toxin B (TcdB) as the antigen was effective in producing robust antigen specific IgA and IgG antibodies. These robust antibody responses to the *C. difficile* toxin were enough to prevent disease, however, it was not able to reduce bacterial burden leaving the potential for asymptomatic spread and relapses of disease. To fight this problem, we are working on two solutions. The first being a nanoparticle polymer that specifically is designed to be M cell targeting and pH activated. Second, we are also evaluating the immunogenicity using fusion proteins combining rTcdB with *C. difficile* surface proteins in a mouse model. We hypothesize that a two-target approach may decrease the bacterial load and lead to complete protection against *C. difficile* infections. Preliminary results looking at four formulations of this polymer all including rTcdB indicate a trend in IgG responses. More tests are needed to further validate these trends.

Jayda Reed, Daniel McInnes, and Charles Crittell (East Central University)

ENERGETICS OF CHLORINE-SUBSTITUTED PHENYLDIAZENES

Calculations on chlorine-substituted phenyldiazenes were carried out at the DFT level with B3LYP functional using the 6-31+G(d,p) basis set. The influence of the electron withdrawing chlorine on the azo backbone were tabulated. In general, the chlorine substituent caused an increase in the nitrogen-nitrogen bond length (i.e., lower bond order). This can be explained as the chlorine extending the pi conjugation. The effects of the chlorine substituent on gap energy varied. The ortho- and para-substituted systems were most polar, probably due to the pi donating ability of the chlorine.

Ella McReynolds, Noha Youssef, and Mostafa Elshahed (Oklahoma State University-Stillwater)

AN EXPLORATION INTO HOW HABITAT TRANSITION IMPACTED THE EVOLUTIONARY TRAJECTORY AND GENOMIC REPERTOIRE OF THE PHYLUM ACIDOBACTERIOTA

The phylum Acidobacteriota is one of the most prevalent and ecologically successful lineages on earth. Its members are widespread but extremely successful in soil. The goal of this project is to determine, through a comparative genomics approach, the characteristics that render Acidobacteriota successful in their respective environments, with a specific emphasis on the differences between soil-dwelling and non-soil-dwelling Acidobacteriota. We are currently analyzing 811 publicly available genomes belonging to 9 families that we classified based on ecology and habitat preferences into majorly soil-dwelling (3), majorly non-soil dwelling (4), and families that are equally represented in both types of environments (2). General genomic features are currently being compared between families and ecological preference It is predicted that certain qualities advantageous to a soil environment, such as ability to engage in biological warfare (antibiotic resistance and production) and to increase adaptability to an ever-changing environment (pH, optimal growth temperature, presence of CRISPRs and viral genomes), will be enriched in soil-dwelling lineages. Predicted proteins from all genomes were clustered into protein families and preliminary ordination analysis based on the clusters grouped genomes based on their phylogenetic affiliation (50.4% of variance explained, p-value=0.001), but showed that habitat preference and the interaction between phylogeny and habitat also significantly (p-value=0.001) explained 1.99% and 3.23% of variances. Both phylogenomic and phylogenetic trees placed these families in distinct clades based on their preferred habitat. We are currently using the program Count to identify the list of clusters at each family node, as well as at each habitat node, to be gained or lost. These clusters will be further analyzed with the goal of pinpointing gained functions that allowed successful transition to soil habitats. We ultimately aim to construct the ancestral genome of the entire phylum, as well as the ancestral genomes of all soil- and non-soil dwelling lineages.

Danner Mcsperitt, Tristan Danielson, Julio Gonzalez, and Nolan Fox (University of Central Oklahoma)

CREIC DATA CENTER COOLING

Data centers are large producers of heat, and cooling these can be very expensive. It accounts for roughly 40% of the annual cost to operate an average center. More powerful cooling units are expensive, and other methods to improve cooling efficiency are needed in many cases. The cooling efficiency of the Crack Data Center will be increased using a baffle system. This method will reduce the load on the computer room air conditioning units in the data center as well as decrease the total cost of cooling the data center. Increasing this cooling efficiency will allow UCO to add more heat producing servers without committing to an expensive cooling unit. The effectiveness of our solution is determined by using 2-D and 3-D computational fluid dynamic analysis. The different flow maps show the increase in flow to the servers, which will decrease the usage of the CRAC units. Throughout the research and testing of the first half of the project the group was able to make significant findings to lead us on the second half. The baffle design being the most optimal and cost saving compared to cold aisle containment. The importance of

efficient server cooling increases hardware lifespan for both the servers and the CRAC units while also keeping the already high energy cost down. Model findings show that a baffle layout is the right solution to accomplish the goals of the CREIC data center.

Colin Mekler, Tate Lacey, and Rebecca Petty (University of Central Oklahoma)

INTEGRATED PHASE CHANGE THERMAL MANAGEMENT SYSTEM FOR ELECTRIC VEHICLES

In the past several years, electric vehicles have become more and more prominent on the road. However, vehicles powered by electric motors have yet to come close to the popularity or accessibility of their internal combustion engine counterparts. This is due to many factors, with one of the largest being the significantly smaller range that is offered in current EV's. The current thermal management system in electric vehicles is a primary detriment to the range efficiency of them. A thermal management system utilizing phase change material (PCM) is being proposed to replace the thermal management system that exists currently in nearly all electric vehicles. The heat exchanger fabricated and tested for this project consists of PCM surrounding a battery simulator with water flowing in a tube to recycle the PCM heat sink. An electrical system is designed to control pump power and completely automate the system. The battery temperature is evaluated over time while the liquid-solid fraction of the PCM is determined experimentally. In addition to experimental results, the heat exchanger is modeled in ANSYS and will be compared with experimental results once parameters match those of the experiment. A temperature drop of the battery simulator was observed using the fabricated thermal management system. The results of experimentation were favorable but further optimization of the flow rate, initial temperatures, and overall efficiency of the cooling system could be obtained to enhance the current thermal management system of electric vehicles.

Emma C. Mills and Noha Youssef (Oklahoma State University-Stillwater)

HARMFUL ALGAL BLOOMS (HAB) IN LAKE ECOSYSTEMS: PAST, PRESENT, AND FUTURE

Human activities and climate change are affecting freshwater lakes. Eutrophication and warming often lead to changes in the lake phytoplankton and microbial community composition. One such change is the occurrence of Cyanobacterial blooms. Some species of cyanobacteria can produce harmful toxins (and hence the term harmful algal blooms (HABs)) that affect both the water quality, as well as the resident microbial communities. While freshwater lakes worldwide have been experiencing regular HABs over the past century, we still do not have sufficient long-term data to increase our understanding of the mechanisms of how these blooms form, or the microbial community changes leading to the blooms. Lake sedimentary DNA can be helpful in revealing historical trends in eukaryotic algal and cyanobacterial communities. Sampling lake sedimentary cores followed by extraction of sedimentary eDNA allows the investigation of present and past lake microbial profiles. Historically, Horse Creek of Grand Lake Oklahoma has experienced frequent eutrophication leading to HABs. Here, we show the change in microbial community structure over time through studying a sediment core from Horse Creek. Microbial community composition was studied in the sectioned and dated core. Preliminary results suggest the recurrent occurrence of cyanobacterial blooms over historical times. We are currently using Cyanobacteria-specific as well as eukaryotic algae-specific primers to zoom in on the prokaryotic and eukaryotic algal community. Based on the results of this work, combined with long term water chemistry data we hope to train machine learning models that will help predict the future of blooms and inform lake management for better prediction and response to blooms.

Alyssa Minsky and Rachel Budavich (Oral Roberts University)

A PRELIMINARY INVESTIGATION ON *PHILODENDRON ERUBESCENS*: ASSESSMENT OF PLANTLETS PLACED IN ELEVATED CYTOKININ 6-BENZYLAMINOPUTINE CONCENTRATIONS TO DETERMINE SHOOT MULTIPLICATION, CALLUS, AND VARIEGATION PROMOTION

This research project investigates the effects of elevated cytokinin concentrations, specifically the cytokinin 6-Benzylaminoputine (BA), on *Philodendron erubescens*. The study aims to determine the optimal higher concentration of cytokinin that promotes shoot multiplication, callus formation, and leaf variegation in *P. erubescens*. Plantlets of *P. erubescens* were cultured in Murashige and Skoog (MS) media with varying concentrations of 6-Benzylaminoputine. Weekly data collection included assessment of contamination, callus development, variegation, and shoot number for each plant in the different 6-Benzylaminoputine concentrations. Plantlets cultured in higher 6-Benzylaminoputine concentrations exhibited significant increases in pink variegation without any signs of distress. Based on these unexpected variegation findings, the subsequent experiment phase involved beginning with plantlets with little to no variegation, and using even higher 6-Benzylaminoputine concentrations, specifically analyzing if the occurrence of white and pink variegation occurs on leaves.

Xander R. Molina and Richard W. Dolman (University of Central Oklahoma)

COMPARISON OF SAMPLING METHODS FOR DIVERSITY ASSESSMENTS OF SMALL-MAMMALS IN GYPSUM PRAIRIE OF WESTERN OKLAHOMA

Habitat loss and fragmentation are major threats to global biodiversity, negatively affecting all major taxonomic groups. Small mammal diversity and community composition represent powerful tools for understanding these threats. Because they occur in high abundance, are ubiquitous, and are active year-round, they serve as a power tool for examining aspects of the landscape. Small mammals also provide important ecological services including dispersal of native plant seeds, spores, and aeration of soil

through burrowing. Together these contribute to increased rates of nutrient transfer throughout the landscape. Surveys of diversity and evenness commonly use one of two spatial designs, transects and grids. To compare these two methods our project is working in collaboration with an ongoing small mammal diversity study being performed by a colleague at the Selman Living laboratory in western Oklahoma. Our project has been comparing diversity and evenness estimates using linear transects with those estimates generated by the current study using grids. Five transects, each containing 50 Sherman live traps, will be used to survey small mammals throughout the approximately 135 ha of Selman laboratory property. Transects will be sampled for 3 consecutive nights using current established live trapping guidelines used by the American Society of Mammalogists. Species diversity and evenness will be compared with data collected from our collaborators grid based spatial design. Data collection for 2 seasons has been performed as of writing this abstract, spring and summer. To date, transect success is averaged at 12%, while grid success is 6%.

Leann Monaghan and Abby Moore (University of Oklahoma)

THE EVOLUTION AND TAXONOMY OF THE DRYADOIDEAE

The Dryadoideae is a subfamily within Rosaceae whose genera primarily live in the western part of North America. It contains mountain mahogany (*Cercocarpus*), mountain misery (*Chamaebatia*), cliff-rose (*Purshia*), and *Dryas*, and some of these plants house nitrogen-fixing bacteria. It is still unknown how exactly the genera in this subfamily are related due to differences in other groups' analyses. We aim to resolve these relationships using 353 highly conserved regions across the entire genome using the Angiosperm 353 target enrichment sequencing. Morphological variation within *Cercocarpus* is of particular interest due to the presence of many high-quality leaf fossils. Morphological data extracted from fossil records will help infer relationships within the genus and help time-calibrate the phylogenies generated from target enrichment data, providing a clearer picture into how Dryadoideae have evolved.

Jose Montalva[1], Leah S. Dudley[1] , Marie Stone[2], and Brenda D. Smith[3] ([1]East Central University; [2]University of Central Oklahoma; [3]University of Oklahoma)

IS THE FROSTED ELFIN REALLY FROSTED? EVALUATING THE CONSERVATION STATUS OF *CALLOPHRYS IRUS* (LEPIDOPTERA: LYCAENIDAE) IN OKLAHOMA

The Frosted Elfin, *Callophrys irus*, is a butterfly in the family Lycaenidae (gossamer-wing butterflies) and is a species of conservation concern in North America due to recent sharp population decline. Its geographic ranges includes the eastern half of the United States, but it has been considered rare or at best locally uncommon where found. it is a small butterfly with a wingspan of 25 to 32 mm. Larval host plants are various species in the pea family (Fabaceae), including wild indigo, *Baptisia* sp., and wild lupine, *Lupinus* sp. Major threats to this species are loss of habitat due to urban development or agriculture. Historical data suggested that there were but two populations in Oklahoma, separated by > 230 km. We conducted intensive searches for the butterfly's adult and larval stages as well as the host plant Baptisia spherocarpa in the southern and eastern parts of our state. We greatly increased the number of known locations for the *Callophrys irus* in Oklahoma.

Faith A. Wohlever[1], Amber E. Morgan[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

IMPL2 CONSERVATION IN THE INSULIN/TOR (IT) PATHWAY

The insulin/TOR (IT) pathway is an insulin pathway that helps with organism growth and survival. There are many genes involved to help with this mechanism and this study looked at two specifically, ImpL2 and rl. Looking at both of these gene's structures and neighborhoods, the two genes were compared in different species to see the divergence of each one compared to one certain species of a fly called *D. melanogaster*. The more diverged the genes were from this species, the higher the score. Since ImpL2 has fewer connections in the (IT) pathway it was hypothesized that it would have more divergence, meaning it would be less conserved and have a higher divergence score. However, when the divergence scores based off of the gene structures and neighborhoods were compared, it showed that the gene that had more connections in this IT pathway, rl, had more conservation than ImpL2 and a higher divergence score.

Nathalie Moro, Daniel Kim, and Rajesh K. Nayak (Cameron University)

INVESTIGATION OF PHOTOPHYSICS AND HYDRODYNAMIC PROPERTIES OF CY 5 DYES IN REVERSE MICELLE WITH THE PRESENCE OF GRAPHENE OXIDE

The photophysical dynamics and hydrodynamics properties of fluorescent CY5 dyes were investigated in presence of Graphene Oxide (GO) in confined environment using steady-state and time resolved fUV-Vis and Fluorescence spectroscopic techniques. Our observation shows that the photophysical behavior changes significantly as compared to CY5 dyes in aqueous environment. The dye probably undergoes significant dimerization inside reverse micelles of smaller sizes and the GO quenched the fluorescence. Furthermore, our findings show that GO modulate the photophysics of the probe molecules as compared to CY 5 in reverse micelles in absence of GO.

Ayesha Nair, Ashlee N. Hawkins, and Karen L. Wozniak (Oklahoma State University-Stillwater)

THE ROLE OF DIFFERENTIALLY-REGULATED GENES IN THE OUTCOME OF MURINE PHAGOCYTE-CRYPTOCOCCAL INTERACTION

Cryptococcus neoformans is a causative agent of cryptococcosis and can survive intracellularly, leading to cryptococcal meningitis. The pathogen interacts with pulmonary macrophages and dendritic cells (DCs) in the lungs. We previously showed that Ly6c- monocyte-like macrophages from female mice significantly inhibited fungal growth, while CD11b+ DCs from male mice significantly enhanced fungal growth. RNA sequencing revealed that MHC-I gene H2-K1, Calreticulin gene Calr, and Cyp1b1 genes were differentially regulated. We hypothesize that these differentially-regulated genes determine the outcome of C. neoformans intracellular interaction with pulmonary macrophage and DC subsets. We examined antifungal activity of Cyp1b1 KO bone marrow-derived DCs (BMDCs) against C. neoformans strain H99. We silenced H2-K1 in J774 cells and BMDCs and evaluated phagocytosis and fungal burden in H2-K1 silenced J774 cells. We also measured gene expression of Calr in H2-K1 silenced J774 cells and BMDCs. Metabolic changes in H99-treated macrophages were assessed using JC-1 and SCENITH assay. Our findings indicate that Cyp1b1 KO BMDCs allowed significantly greater cryptococcal growth compared to WT BMDCs. Additionally, H2-K1 silenced J774 macrophages have significantly higher rates of phagocytosis but significantly less antifungal activity. Our research also revealed a correlation between the expression of H2-K1 and Calr genes. Furthermore, we observed changes in mitochondrial activity in macrophages after uptake of H99. SCENITH studies indicate that H99-treated J774 cells oxidize glucose to generate ATP, which is then utilized for protein translation. We now aim to silence genes and perform SCENITH in primary cells and evaluate metabolic changes using the Met-Flow assay.

Malachi Newton, Uzziah Urquiza, Colter Esparza, Darren Powers, and Pragya Sharma (Southwestern Oklahoma State University)

UNDERSTANDING THE METABOLIC ADAPTATION TO NUTRIENT STRESS IN PANCREATIC CANCER

Pancreatic ductal adenocarcinoma will become the second leading cause of cancer-related death by 2030. Resistance to chemotherapies represents a critical challenge; therefore, it's imperative to understand the biology of PDA and identify putative therapeutic targets. Pancreatic cancer has a densely fibrotic tumor microenvironment, which leads to deregulated nutrient availability within the tumor, causing cancer cells to develop metabolic adaptations to allow for proliferation. The present study aims to identify specific nutrients that sustain pancreatic cancer cell growth under metabolic stress. Cell culture and treatment: Mia-Paca2 cells were cultured at 37 ºC in a 5% CO2 humidified atmosphere in complete DMEM containing 10% FBS and 1% penicillin/streptomycin. Different treatments included Human Plasma Like Media, 5 mM glucose, and 10 mM galactose. Real-Time PCR: RNA was isolated with RNA-Stat-60 and reverse transcribed using Superscript III. The resulting cDNA was diluted and used for real-time PCR. Cell Titer-Glo assay was used to determine the cell viability. Western Blotting: The change in the expression of genes at protein levels was examined using immunoblotting. Mia-Paca2 cells are known to exhibit Glycolytic phenotype. The metabolic resilience of Mia-Paca2 cells was challenged by substituting glucose with galactose as a carbon source, a condition that inhibits Glycolysis. Our data indicate a decrease in cell viability and a mild suppression of cell growth under glycolytic inhibition. Nevertheless, more than 60% of cells survived, suggesting that cells might adjust to energy-related challenges through metabolic reprogramming. Using RT-PCR and western blot analysis, we are studying metabolic gene expression associated with Glycolysis, OXPHOS, and glutaminolysis. Mia-Paca2 cells are sensitive to glycolysis inhibition but can exhibit metabolic reprogramming. Identification of metabolic genes that are differentially regulated during metabolic crisis can help us to effectively target pancreatic cancer cells.

Ashley Nguyen[1], Kayla Nguyen[1], Bao Cao[1], Madison Dennis[1], Morgan Wells[1], John Nail[1], Melville Vaughan[2], and Christina Hendrickson[1] ([1]Oklahoma City University; [2]University of Central Oklahoma)

THE HEALING POWER OF DANDELIONS: EXPLORING ANTI-CANCER AND ANTI-BACTERIAL PROPERTIES OF DANDELION SEED EXTRACT

Dandelion seeds' alcohol extract (DSE) has been shown to exhibit anti-inflammatory and anti-cancer effects. However, evidence on its combinative anti-cancer and anti-microbial effects remains insufficient. The aim of this study is to further investigate the anti-microbial and anti-cancer effects of DSE. Utilizing column chromatography, DSE was separated into several different fractions. To check the anti-cancer effects, both normal human dermal fibroblasts (HDF) and cancerous HeLa cells were treated with varying concentrations of the DSE and DSE fractions. Additionally, using broth micro-dilution method, four bacterial species were tested including: *Escherichia coli*, *Staphylococcus aureus*, *Acinetobacter baumannii*, and *Pseudomonas fluorescens*. All bacteria were treated with the same DSE and selected DSE fractions. DSE and some of DSE fractions exhibited anti-cancer and anti-microbial effects. Although the individual fractions did show varying levels of anti-cancer and anti-microbial effects, DSE had the most potent anti-cancer and anti-microbial effects compared to its fractions, possibly indicating the synergy of bioactive molecules within DSE. Triplicates of three biological samples of HDFs and HeLa cells treated with varying doses of DSE resulted in a statistically significant decrease in HeLa cell viability ($p<0.001$) compared to unaffected or less affected HDF cells. DSE and some of the DSE fractions were able to exhibit both anti-cancer and anti-microbial effects against the treated HeLa cells and bacteria respectively. However, the regulatory mechanism and active constituents within the DSE and its fractions remains unknown and requires further investigation.

Emily Nguyen, Zoe Wall, Mariela Encarnacion, and Lara Souza (University of Oklahoma)

HOW DOES ALTERED PRECIPITATION INFLUENCE PLANT DOMINANCE AND DIVERSITY IN A PRAIRIE ECOSYSTEM?

Plant dominance patterns can vary across space and time with climatic change such as drought events altering local abundance of plant species with consequences to community diversity. Prairies are dominated by C4 graminoid species with C3 grasses and forbs representing subdominant and transient species. Understanding how experimental drought will influence plant dominance and diversity patterns is critical in water-limited systems with implications to altering function such as net primary productivity. We examined the response of plant species' relative abundance to experimental precipitation manipulation and community level diversity in a mixed-grass prairie. We used a randomized block split-plot design with seven precipitation treatments (five precipitation exclusion levels, precipitation addition, and control) replicated three times for total of 21, 2 x 2 m plots. Each plot was divided into two halves; half remained unchanged, the other was clipped on a regular basis stimulating hay harvest. We identified all plant species in each experimental plot, clipped and unclipped, and estimated their relative abundance by quantifying foliar cover. We asked: (1) Does altered precipitation and clipping influence plant dominance overtime?; (2) Does altered precipitation and clipping influence plant diversity overtime? We found that altered precipitation and clipping impacted both plant dominance and plant diversity patterns overtime. Specifically, both plant dominance and diversity were reduced with both drought and water addition and increased under control and mild drought treatments; clipping promoted plant diversity. Further, variation in background precipitation influenced plant dominance and plant diversity patterns with some years having higher and other years lower plant dominance and plant diversity. Finally, we found a strong negative relationship between plant dominance and plant diversity across precipitation treatments and years. Taken together our results show that altered precipitation, both in terms of drought and water addition, will alter plant community dynamics by lowering dominance while promoting plant diversity.

Jordan Odell-Brown, Bailey Howe, and Alisha Howard (East Central University)

INVESTIGATION OF BOVINE LEUKEMIA VIRUS (BLV) PREVALENCE IN OKLAHOMA HERDS

Bovine Leukemia virus (BLV) is an oncogenic retrovirus infecting a significant number of cattle globally. Beef is an essential component of the food supply. The effect of BLV on human health through the food supply and the loss of production in the host animal is a significant public health concern. Despite the potential public health impact, the prevalence of BLV infection in many herds is unknown. Potential BLV cross-reactivity is supported by findings of BLV reactive antibodies in human tissue, BLV DNA in human blood, and the presence of BLV DNA in human breast tissue with increases in breast cancer tissue compared to controls across several studies.2,5,6 The purpose of this research is to determine the prevalence of BLV residual particles in dairy and beef products. This can be done by assaying the presence of BLV RNA, DNA, or protein in raw milk samples. Milk samples are ideal as BLV is transmitted vertically through milk from mother to progeny, has been demonstrated experimentally to be a viable source of genomic DNA from cells in milk, and is minimally invasive causing the smallest amount of distress to the animal. Another avenue of research is understanding any potential infectivity of BLV viral particles or cross-reactivity of BLV proteins in human systems as well as any relationship between human t-cell leukemia virus (HTLV) and BLV. This project analyzed storage longevity of samples taken at different time postpartum and compared the success of different reverse transcriptase or direct-PCR protocols to identify infected cattle. Varying levels of success were demonstrated across samples. Results will allow for optimization of high-throughput analysis across larger sample sizes.

Ayodeji Olanite (University of Oklahoma)

POWER DISSIPATION OF ADIABATIC LOGIC CIRCUIT FOR FINFET AND MOSFET TRANSISTORS

Technology has turned things around in the microelectronics world and Integrated Circuit (IC) has been the driving force behind all these innovations. A lot of improvements have been made since the inception of the IC with the goal of improving performance of an IC. However, as the number of transistors on a chip increase with the goal of improving performance, it comes with a major drawback of more power dissipation. To address these challenges, this study investigates the energy efficiencies between two different types of adiabatic logic families, implemented with Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET) and Fin Field Effect Transistor (FinFET) 32 nm technology node. LTSPICE (SPICE based analog electronic circuit simulator computer software) is used as the simulation tool to evaluate the power dissipation between both the Energy Charge Recovery Logic (ECRL) and the Positive Feedback Adiabatic Logic (PFAL). The results obtained revealed clearly that the Energy Charge Recovery Logic (ECRL) Inverter and NAND gates dissipate more power than the PFAL Inverter and NAND gate using MOSFET transistor. On the other hand, the power dissipated for the ECRL NOR gate is less than the PFAL NOR gate. Furthermore, the experimental results demonstrate that for all gates configurations (Inverter, NOR and NAND), ECRL dissipate less power than the PFAL using the FinFET transistor.

Kaleb McIntyre[1], Brady Wright[1], and Carl Ompad[1], Nesreen Alsbou[1], and Imad Ali[2] ([1]University of Central Oklahoma; [2]University of Oklahoma Health Science Center)

DEVELOPING AND ENHANCING A SMART MECHANICAL SYSTEM WITH IOT CAPABILITIES FOR IMAGING AND MOTION DETECTION

Microwave imaging is an emerging technique with great potential for non-ionizing diagnosis and low cost with the aim of distinguishing malignant tissues from healthy ones. This is not to be used as a substitute to traditional methods, rather a device used primarily for early detection. Antennas are used to transmit and receive microwave frequency to produce images. To achieve high-resolution images, a system is required to keep the antennas position fixed. This project will show a proof of concept of a mechanical system for microwave imaging. The mechanical system developed will be able to hold up to 32 antennas, can allow for the antennas to be place at various diameters, and is portable. One of the main constraints of this project washaving no metal near the antenna because it will impact the image results. The 3D printed design allows the antennas to stay fixed and while having the capability to move. It also allows for exact measurements of the placement of the antennas. The results of the project showed a proof of concept of a mechanical system for microwave imaging. The system is portable and can accommodate up to 32 antennas, which are able to be moved back and forth as needed. This project aims to allow easier access to the non-ionizing and cheap technology of microwave imaging for things like Traumatic Brain Injury (TBI), breast cancer and stroke.

Lydia Ostmo (Northeastern State University)

INVESTIGATING PROTEIN INTERACTIONS AT THE REPLICATION FORK IN DNA POLYMERASE EPSILON FILS MUTANTS

Error-free DNA replication is essential to human health, with mutations in the DNA replication machinery being linked to many human diseases. One of our DNA replication proteins of interest, Polymerase Epsilon (POLE) is highly conserved from yeast to humans, and is responsible for leading strand DNA synthesis. POLE has four subunits, POLE1, POLE2, POLE3, and POLE4. Specific mutations in the catalytic subunit of Polymerase Epsilon, POLE1, cause the rare disease Facial dysmorphism, Immunodeficiency, Livedo and Short stature (FILS) Syndrome. The FILS mutation causes a major truncation in the POLE1 protein. We sought to investigate how wild-type (WT) and several mutant versions of POLE1, (including the truncated FILS version) interact with other replication factors. To check protein expression of plasmid borne POLE1 and POLE1 mutants in HEK293T cells, we performed fluorescence microscopy and western blot studies. Protein-protein interactions were studied by co-immunoprecipitation. Those Co-IP experiments confirmed that POLE1 and Minichromosome Maintenance protein 10 (MCM10) interact in mammalian cells. Our data suggests that POLE1 and MCM10 interaction is conserved from yeast to humans. In addition, our preliminary data demonstrates that the FILS protein still interacts with MCM10 despite its truncation. In addition, we have observed that interaction is preserved between both the POLE1 WT and FILS mutant with other replication factors like MCM2, POLE3, and POLE4. Subcellular localization studies of POLE1 and POLE1-FILS were performed using fluorescence and confocal microscopy, and the results will be discussed at the meeting.

Yulianis Pagan, Hallum Ewbank, and Christopher Goodchild (University of Central Oklahoma)

CO-EXPOSURE TO TWO POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) ALTERS GROSS ORGAN MASS AND METABOLIC RATE OF CHICK EMBRYOS

Polycyclic aromatic hydrocarbons (PAHs) are naturally occurring toxic chemicals found in crude oil and are known to transfer from the external eggshell surface to egg contents. Previously, we conducted an egg-injection study with White Leghorn chicken (Gallus gallus) eggs and identified two PAHs, chrysene (Chr) and phenanthrene (Phe), that increased embryonic heart mass and decreased embryonic heart rate. In this study, we investigated whether co-exposure to Chr and Phe resulted in additive or synergistic effects on chick embryo development. On embryonic day (ED) 3, chicken embryos were exposed to Chr (800 ng / g of egg mass), Phe (800 ng / g egg mass), and Chr and Phe in combination (∑ PAH 1600 ng /g ng egg mass) via egg-injection. We then collected embryonic organ mass, heart rate, metabolic rate, and cardiac and hepatic mRNA expression of detoxification enzymes on ED 18. We observed a decrease in ED 18 heart rate across all treatments. We also saw an increase in ED 18 liver mass in eggs exposed to Chr and Phe simultaneously, and shifts in metabolic rate and mRNA expression of cardiac detoxification enzymes. Collectively, these data suggest in ovo exposure to PAHs may lead to congenital heart defects, which may have long-term implications for hatching success and hatchling survival.

Lane Paul and Leah S. Dudley (East Central University)

ANTIMICROBIAL PROPERTIES OF NATIVE OKLAHOMA PLANTS

Historically, plants have been used as antimicrobials in medicinal practices across many different cultures. Antimicrobial resistance poses a significant global health challenge, making the exploration of alternative therapeutic strategies necessary. This study aims to investigate the antimicrobial properties of plant species native to Oklahoma with the objective of identifying potential natural sources of antimicrobial compounds. Whole, wild grown plant samples were collected from two preserves in southern Oklahoma. Tinctures were prepared from various plant organs, including stems, leaves, roots, flowers, and buds. Agar disc diffusion assays were used to test the plant extracts' ability to inhibit growth of bacteria. Among the tested tinctures, a notable increase in inhibition against the bacteria was observed compared to the negative control of alcohol alone. Variations in

inhibition against bacteria were observed among the tested extracts. Our findings suggest that there are potential antimicrobial compounds within the extracts of native Oklahoma plants that inhibit the growth of bacteria; although, some species may deserve closer inspection than others. These results highlight the value of investigating locally produced, plant-derived sources for the development of antimicrobial products to address the growing challenge of antimicrobial resistance and the rising costs of medicine. Furthermore, the study of locally sourced, reliable alternatives may have a remarkable societal health impact for our local population and future generations.

Grace Payne (University of Central Oklahoma)

EMERGENCE OF ECOFEMINISM AMID ENVIRONMENTAL DEGRADATION: HOW HAS SETTLER-COLONIALISM IMPACTED SCIENCE EDUCATION?

Ecofeminism has historical foundations and applications that reflect the coinciding development of both ecological practices and feminism. Early ecofeminist ethics maintained eight conditions to improve the conceptual and operational framework. The eight standards highlighted by Karren Warren promote the dissolution of the logic of domination, or the idea that humans are justified in their superior role above nature and women. The first condition requires that ecofeminism cannot perpetuate systems of oppression, and must reject the logic of domination. The second condition includes viewpoints across history so no one group or movement has control over the narrative. The third adds diversity to the second point as another important factor in informing the narrative of ecofeminist ethics. The condition of inclusiveness serves to combat biases in development of the ethical framework. The sixth condition focuses on objectivity as meaningless, and shifts towards a "better bias," or one that emphasizes marginalized perspectives. Values of love, friendship, and care emerge in the seventh condition as a necessary foundation for negotiations with nature and others. The final condition rejects abstract individualism, or the suspension of humans above their relationship to other beings and context motivated by self interest. These conditions have ethical implications but the degree at which they impact traditional scientific knowledge transfer has been undermined. Conservationism, rooted in patriarchal notions of nature preservation only after degradation, experiences residual racism, naturism, sexism and classism. In my presentation, I seek to expose how aforementioned isms influence the "objective," lens of scientific knowledge and the damage it has done to those in the field and the content of the field.

Joshua Pilote (Oral Roberts University)

OPTIMIZING PARAMETERS FOR THE SUCCESSFUL BIOLISTIC TRANSFECTION OF HEMP

Different parameters were tested for the most successful biolistic transfection of hemp, *Cannibus sativa*, based on the expression of blue fluorescent protein of transfected cells. Biolistic transfection involves using a high-pressure helium blast to get DNA bound to a heavy metal carrier past a cell's wall to deliver the DNA construct to the cell's interior. Each plant has its own optimum transfection protocol, and as of yet, no tests have been completed to determine what these ideal parameters are for hemp. The main variables adjusted and optimized were pressure, the density of microcarriers per shot, and the DNA to microcarrier ratio. This data can be applied to any transfections of *C. sativa*, especially ones aimed at decreasing accidental THC production due to environmental stressors, which can cost CBD hemp farmers entire crops.

Josue Ponce, Mohamed Bingabr, Jordan Wiley, and Jason Houpt (University of Central Oklahoma)

SPEECH STRATEGY FOR COCHLEAR IMPLANT WITH NOISE REDUCTION

Over one million people across the globe rely upon cochlear implants. While the technology is widespread, the comprehensibility of the devices is limited. The implanted electrode bundles are limited to sixteen electrodes due to the tiny size of the cochlea; any more and they electrically interfere with one another. A 16 electrode limit means that the full range of human hearing – 20Hz to 20,000kHz – must be simplified to sixteen tones. The proposed solution for the problem is implementing a zero crossing quantization strategy, which more accurately reproduces natural sound. Previous versions of this strategy were susceptible to noise, which must be reduced. The solution will be accompanied by a working cochlear box model, based on a modified version of the Lumped Parameter model, to observe behavior for two tone inputs. It is also shown that cochlear modeling is highly dependent on the input modal pressure. The implications of the results show that MATLAB modeling is inadequate for the given inputs. The pressure distribution of the model is highly dependent on stapes velocity and local acceleration, so SIMULINK modeling is resource intensive. Fortunately, the results of our study show that it is possible to boost intelligibility while preserving a more natural sound even without the MATLAB modeling by pre-processing the input audio before quantization.

Carrie J. Pratt[1], Casey H. Meili[1], Adrienne L. Jones[1], Darian K. Jackson[1], Emma E. England[1], Yan Wang[2], Steve Hartson[1], Janet Rogers[1], Mostafa S. Elshahed[1], and Noha H. Youssef[1] ([1]Oklahoma State University-Stillwater; [2]University of Toronto-Scarborough)

EXPLORING ANAEROBIC GUT FUNGI IN TORTOISES: NOVEL GENERA AND INSIGHTS INTO EVOLUTIONARY HISTORY

Anaerobic gut fungi (AGF, phylum Neocallimastigomycota) have been well-documented in mammalian hosts, however, little is known about their presence in non-mammals. We sought to investigate the occurrence of AGF in tortoises (family Testudinidae) through analysis of community structure, phylogenetic diversity, and evolutionary history. We identified three novel deep-

branching AGF genera that accounted for over 90% of sequences in 9 out of 11 fecal samples from nine tortoise species. We were able to isolate two of the three novel dominant genera and through a phylogenomic analysis were able to confirm their deep-branching position. Molecular clock timing including the two novel genera suggests that the phylum Neocallimastigomycota evolved in the early Cretaceous period (104-112 Mya) rather than the late Cretaceous period (67 Mya), as previously thought. These novel genera exhibited a limited capacity for plant polysaccharide metabolism and lacked genes for several carbohydrate active enzyme (CAZyme) families mediating degradation. This limited degradation capacity and reduced CAZyme repertoire is likely driven by the scarcity of horizontal gene transfer (HGT) compared to the considerable HGT occurrence in mammalian AGF taxa. This is also reflected in an altered cellulosome production capacity in the novel genera. Our findings provide insights into community structure and phylogenetic diversity of AGF in tortoises and explore the evolutionary history and dynamics of genes and traits in Neocallimastigomycota.

Bhuvanesh Kumar Raju, Thomas Momanyi, and Joshua Muia (Oklahoma State University-Center for Health Sciences)

IDENTIFICATION OF THE METALLOPROTEASE ADAMTS7 INTERACTION PARTNERS USING YEAST TWO-HYBRID SYSTEM

Genome-wide association studies (GWAS) have established ADAMTS7 as a locus for coronary artery disease (CAD) in humans. CAD is one of the most prevalent diseases in the developed countries and affects approximately 20 million adults in the United States. ADAMTS7 is a member of the ADAMTS family (A Disintegrin and Metalloproteinase with Thrombospondin motifs, Member 7). Although there is a strong link between ADAMTS7 and CAD based on clinical data, how ADAMTS7 exacerbates atherosclerosis is not well understood. Furthermore, the validation data for the proposed biological substrates of ADAMTS7 remain conflicting. This study aimed at screening and identifying ADAMTS7 partners targeting functionally distinct ADAMTS7 domains using Yeast Two-Hybrid system. For example, ADAMTS7 domains Thrombospondin-1 (T), Cysteine-rich (C), and Spacer (S) domains (TCS) are thought to direct substrate specificity and cleavage, and likely to interact with proteins that are proteolyzed specifically by the enzyme. The TCS region of the ADAMTS7 was cloned into the plasmid pGBKT7 (bait plasmid) which encodes the GAL4 DNA-Binding Domain region and was transformed into the yeast 2 Gold strain mated with the Y187 strain that had transformed with the plasmid pGADT7 (prey plasmid). The prey plasmid (cDNA library) encodes for the GAL4 DNA-Activation Domain fused with the human heart cDNA isolated from heart tissue of CAD patients. After the mating procedure, the cells were subjected to various screening processes using the Dropout media that contained X-alpha gal and Aureobasidin to select interacting partners. The positive prey plasmid was isolated using the dropout media and the plasmid was extracted using the yeast plasmid extraction kit followed by DNA sequencing. The interactions were validated as genuine or false using the co-transformation procedure. We identified proteins of tetraspanins and heat-shock families that interacted with the TCS region of ADAMTS7. Validation studies are underway.

Natalia Ramirez and William Ranahan (Oral Roberts University)

CYTOTOXICITY OF *HERICIUM ERINACEUS* MUSHROOM SECRETIONS AGAINST U-87 MG GLIOBLASTOMAS

With a five-year survival rate of 6.8%, glioblastoma has poor survival outcomes for patients. Current treatments of glioblastoma include surgical removal of the tumor followed by intensive radiation therapy and chemotherapy. The development of a natural remedy with reduced side effects would significantly benefit cancer patients. *Hericium erinaceus*, better known as Lion's Mane, has been traditionally used to enhance immune system function, treat gastric ulcers, and aid the body in controlling cancer cell growth. Additionally, studies on *H. erinaceus* have suggested that it increases cognitive ability and improves brain function. This study focuses on the cytotoxic effects of *H. erinaceus* secretions against U-87 MG glioblastoma cells in vitro. Full spectrum secretions from the mycelia, as well as three combinations of fractions, were used in a cytotoxicity assay. Results from the assay suggest that secretions from *H. erinaceus* may be efficacious in causing U-87 MG cells to undergo apoptosis as compared to non-tumorigenic MCF10A epithelial cells.

Kaylyn Rawls and Leah S. Dudley (East Central University)

BEYOND BOUNDARIES: HYBRIDIZATION IN *BAPTISIA AUSTRALIS* AND *B. SPHAEROCARPA*

This research endeavor aims to shed light on the genetic intricacies of *Baptisia* hybridization, using parental species *B. australis* and *B. sphaerocarpa*. DNA extraction from each plant species used the DNeasy Plant Mini Kit. Polymerase Chain Reaction (PCR) amplified specific genomic segments using the primer pairs ITS1F and ITS4R. The resultant amplified DNA fragments were subsequently subjected to electrophoresis on a gel, applying an electric field of 100 volts for an approximate duration of 30 minutes. The resulting DNA bands were then excised for further analysis. The excised DNA fragments were sent to the Eurofins Sequencing Center for sequencing. The sequences were subjected to comprehensive analysis using the ClustalOmega alignment tool. *Baptisia australis* and the hypothesized hybrid exhibit a remarkable degree of genetic sequence similarity. In contrast, DNA obtained from *B. sphaerocarpa* displayed a significantly unreadable sequence and was excluded from the comparative analysis. Upon a more detailed examination of the data for the proposed hybrid, a heterozygotic locus was detected within the genetic sequence. Subsequent investigative efforts will entail the reacquisition of DNA samples from all studied specimens, followed by the execution of a fresh DNA extraction protocol, incorporating newly designed primers.

Thomas Richards and Susmita Hazra (Cameron University)

IMAGE PROCESSING OF ROBOTIC TELESCOPE DATA FROM MICROOBSERVATORY

In this project, we are presenting image processing on Microobservatory data. Microobservatory is a network of robotic reflective telescopes that could be controlled remotely. We focused our research mainly on observing our solar system images as targets. We are using image processing tools like JS9-4L to optimize brightness and contrast, colorize image, and blending images. This is a great opportunity to be a part of Observing with NASA project and learning about our universe.

Lauren Rosenfelt, Tipton Gentry, Keng-Lou James Hung, and Lara Souza (University of Oklahoma)

ECOSYSTEM MULTIFUNCTIONALITY: BENEFITS OF FORB PLANT DIVERSITY TO LOCAL POLLINATORS AND SOIL PROPERTIES FROM WATER RETENTION TO CARBON SEQUESTRATION

Turfgrass landscapes have expanded rapidly in the United States and are a dominant land cover in urban ecosystems, predicted to expand as urban areas increase. If turfgrass is a dominating land cover, then this reduction in plant species diversity (quality) and biomass (quantity) could result in negative impacts on multiple ecosystem functions (ecosystem multifunctionality), both above- and belowground. To address ecosystem multifunctionality, our study compares multiple ecosystem response variables across three habitat types (1) bermudagrass turfs, (2) pollinator gardens, and (3) remnant prairies, by combining measured variables into ecosystem multifunctionality scores representative of each habitat type. This study inquires if there is a distinguishable difference between functions of these urban habitats and if aboveground variables can be used as predictors for belowground biotic and abiotic properties. Our approach addresses soil properties tested against possible plant drivers in topsoil that are analyzed through measures of plant community composition, biomass, blooming cover, leaf C:N content, functional richness, and diversity. Soil samples are tested through means of microbial biomass, gravimetric water content, and soil C and N sequestration to examine these how soil properties pertain to ecosystem multifunctionality. Pollinator taxonomic richness and diversity are quantified as additional aboveground functional processes affecting plant and soil properties.

Christof Rosler, Derick DuFriend, Evonn Annor, Rita Njoroge, William P. Ranahan II, Matthew H. Goelzer, Stephen Wheat, and Julianna A. Goelzer (Oral Roberts University)

OBJECTIVE COMPARATIVE GENOME SEQUENCE ALIGNMENT OF THE HOMININI SPECIES USING A HIGH-PERFORMANCE COMPUTING ALGORITHM TO REVEAL PHYLOGENETIC INSIGHTS

The branching of the Hominidae family has long engrossed the minds of zoologists as the taxa includes *Homo sapiens*. Phylogenetic trees have been constructed using morphology, proteins, and genes yet often the genetic segments used neglect regulatory, non-coding genes. With a greater understanding of the importance of these genes due to advances in biochemical research, we reanalyzed the historical percent similarities, 96-98.4%, between the sister genus taxa *Pan* and *Homo* via direct base pair comparison across their whole genome. We used ORU's GeneCompare program on Titan, the high-performance computing system to examine whole genomes. The program can take two FASTA files and find exact matches of a minimum length between the two files, the experimental granularity. Each chromosome was individually tested in this manner, a base and against a target, until the whole genome was compared. The matches are recorded as genomic coordinates and can provide insightful data such as the total percent similarity between each specie's chromosomes. We found more enriched percent similarity relationships between *Pan paniscus*, *Pan troglodytes*, and *Homo sapiens* as specific chromosomes expressed a lower and upper range of 59.66-93.1%, and a total mean of 81.8% (excluding Y-chromosome). Using bioinformatics as a tool to expand the scope of zoology new insight into the phylogenetic relationships between the Hominini species was found.

Alejandro Sanchez III[1], Hadley M. Horn[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

CONSERVATION OF RPS6 AND IMPL2 IN *DROSOPHILA* SPECIES

The complex Insulin/TOR signaling pathway is involved in growth, stress response, blood glucose regulation, and aging. Observing the impact of damages and certain inhibitions within this pathway can help progress current research on treatments for diseases such as cancer and diabetes. *Drosophila* is an extremely useful model for examining divergence in genes, researchers can manipulate and study the expression of specific genes in *Drosophila* and use it to model human diseases. In this study, the conservation of RpS6 accross multiple *Drosophila* species were examined. Because RpS6 is at the positioned at the bottom of the insulin/TOR pathway and has the most interactions, we hypothesized that It would be more evolutionary constrained than ImpL2 and any other gene in the insulin/TOR pathway.

Katherine Scott-Lang and Leah S. Dudley (East Central University)

THREE SISTERS GROWN WITH A FOURTH SISTER, ATTRACTIVE OR REPELLENT

The three sisters are an example of polyculture. Indigenous people of the Americas planted the three-sisters which is corn, beans, and squash or pumpkins together often in mounds. In this study, we examined the effects of adding a fourth sister to the traditional Three Sister planting. We chose 4 varieties of plants thought to be attractive to potential visitors and 4 varieties of plants thought to be repellent to potential visitors as the Fourth Sister. In a common outdoor garden, 90 mounds were created. Each mound contained the Three Sisters and were randomly assigned: attractive plant, repellent plant or negative control (no

plant).The plants in the mounds were observed two times a week for three months. All visitors that landed on any of the plants within a mound was noted. Observations continued until all plants within a mound senesced. The number of visitors were totaled across the observations and divided by the total time spent observing. Our results show that the mounds with an attractant fourth sister had lower visitation rates compared to the repellent treatment and the control. This is counter to predictions, but may be due to visitor identity.

Sarah Short (Oklahoma State University-Stillwater)

THE DISTRIBUTION OF INVASIVE HONEYSUCKLE IN EASTERN OKLAHOMA

The introduction and spread of invasive plant species has been an increasingly concerning environmental issue in recent decades due to the harmful impacts their presence has on the ecosystems they've been introduced to. Due to many factors, non-native species may have survival or reproductive advantages over native plant species in their introduced habitats, which can lead to direct and indirect negative impacts on these ecosystems and their biodiversity. These effects are often logistically difficult and expensive to manage, and they often lead to larger long-term issues down the line. *Lonicera maackii* and *L. japonica* are invasive honeysuckle species that have formed naturalized populations in Oklahoma, where they outcompete, inhibit, and reduce the growth of native species, thus posing a threat to local biodiversity. Both species reproduce quickly, grow aggressively, lack competitors and herbivores, and survive in a wider range of environmental conditions for longer periods than most native plant species. Using data collected from field surveys and herbarium records, my study aims to provide new information to the existing knowledge of the distribution of both honeysuckle species throughout eastern Oklahoma. Parks and public recreation areas of all 47 counties of eastern Oklahoma were surveyed. Between herbarium data and observation records from the field surveys, this research observed *L. maackii* in fewer counties than expected and *L. japonica* in nearly all counties surveyed. Data analysis shows a strong correlation between the presence of *L. maackii* and the population size of a town.

Caleb Smith (University of Science and Arts of Oklahoma)

DETERMINING LACTIC ACID THRESHOLDS BETWEEN DIFFERENT ATHLETIC TYPES WITH THE CORRELATION BETWEEN BODY FAT, HEART RATE, AND BLOOD OXYGEN LEVELS

Lactic acid is the buildup of hydrogen ions in muscles that occurs from anaerobic exercise. It has the ability to limit muscle movement, leaving a person feeling weak and sore. Rapid lactic acid build up limits an athlete's ability to perform at their highest level, therefore understanding this buildup can help shape training methods. Training styles that train the body to slow down lactic acid buildup can help assist athletes in performing at an optimum level. Comparing different style athletes' performance, during the same exercises, can help determine which style of training leads to the best rate of lactate build up.

Heather Sparks[1], Jackson Taubel[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

EVOLUTIONARY CONSERVATION OF GIG AND SLMB IN *DROSOPHILA*

The insulin pathway functions to uptake glucose molecules into fat or muscle cells. This pathway is vital for several biological processes, such as cell metabolism, growth, proliferation, and differentiation. In this study, the insulin pathway was studied in *Drosophila*. Gig and slmb are two genes in the insulin pathway. The genetic interactions of these genes were analyzed, leading to a hypothesis. It was predicted that gig and slmb have similar evolutionary conservations in the insulin pathway of *Drosophila*. Using bioinformatic data, genes of *D. melanogaster* were compared to genes of other species. Genetic comparisons were performed using gene annotation data, nucleotide and protein sequences, as well as percent identities and similarities. This information was combined in order to calculate divergence scores. Results from data analysis showed that gig is less conserved and diverged faster than slmb.

Imana Stetson, Troy A. Baird, and Christopher G. Goodchild (University of Central Oklahoma)

HEMATOLOGICAL INDICES AND LEUKOCYTE DIFFERENTIALS IN HATCHLING COLLARED LIZARDS (*CROTAPHYTUS COLLARIS*)

Perinatal physiological shifts occur during a critical window of development and can have long-lasting consequences for an animal's life history. We examined a suite of hematological indices in free-living hatchling collared lizards (*Crotaphytus collaris*). In this species, hatchlings emerge in late summer (August-September) and rapid growth is critical for hatchlings to be able to survive winter brumation. As such, investment in physiological traits (e.g., oxygen delivery to tissues) that directly facilitate energy assimilation may promote rapid growth and overwinter survivorship. Conversely, the immense pressure for growth during the hatchling stage creates a potential tradeoff between mass gain and other non-essential physiological processes (e.g., investment in immune function). To characterize physiological development in hatchling collared lizards, we collected blood samples during three field seasons (2021-2023) and measured hematological variables (packed cell volume [PCV], hemoglobin, mean corpuscular hemoglobin concentration [MCHC]) and leukocyte differentials. We compared hatchling hematological indices to adult collared lizards. Additionally, we examined sex-specific and size-specific (snout-vent length [SVL]) variation in hematological indices among hatchlings. We found hatchlings exhibited lower PCV, hemoglobin, and MCHC compared to adult lizards. However, unlike adult collared lizards that exhibit sex-specific differences in PCV and hemoglobin,

hematological indices did not vary by sex in hatchlings. Both hemoglobin and MCHC increased with SVL, whereas the relationship between SVL and PCV was not significant.

Reia Storch (East Central University)

BIOINFORMATIC TARGETING TO DETERMINE THE MOLECULAR ETIOLOGY OF CANINE ANASARCA

Fetal anasarca is a homeostatic imbalance of the subcutaneous fluids of the body, resulting in the bodily swelling of a fetus. When present in canines, this condition results in offspring born as “water puppies.” Water puppies are characterized by generalized edema and are often stillborn or die soon after birth. The exact cause of fetal anasarca has not been identified, and it is likely the etiology is multifactorial. Recent studies have shown that brachycephalic dog breeds, such as bulldogs, are increasingly expressing various harmful genetic mutations. This is likely due to a lack of genetic diversity in the breed, which is the result of many generations of inbreeding. One of the most common congenital malformations found in brachycephalic breeds is canine anasarca. Noting the increase in mutations among the brachycephalic breeds, it can be hypothesized that there is a genetic link to canine anasarca found in the bulldog genome. To determine the presence of a genetic mutation with possible linkage to canine anasarca, genes of interest must be identified. This thesis aims to target these genes of interest and determine whether there is a linkage to the condition. This was done using bioinformatic tools to perform genome analysis. Several genes of interest were identified due to their connection to other conditions common in brachycephalic breeds, as well as the brachycephaly trait itself.

Christina Wallace[1], Hope Swor[1], Napine Tumuhoze[1], Lindsey J. Long[1], and Laura K. Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

FLY BY EVOLUTION

This study places a focus on the genes in the insulin pathway for *Drosophila*. The insulin pathway helps to regulate blood glucose levels, metabolism, and aging. The genes involved in this pathway can evolve at different rates due to conservation being influenced by gene interactions and location in the biological pathway. This study focuses on Lnk and its divergence across several species in comparison to *D. melanogaster* as well as the gene Rps6. Online tools and blasts were used to analyze the nucleotides and protein alignments in both *D. melanogaster* and the target species to help annotate the gene and determine the divergence score of the different species that were analyzed. Once annotation was complete, comparison between the divergence scores of Lnk and Rps6 was performed. It was hypothesized that Lnk would have a higher divergence score in all of the species compared due to its location in the insulin pathway and its fewer amount of connections in the insulin pathway. This hypothesis was proven to be true, as overall Lnk had a higher divergence score.

Marisa Blake Szubryt and Abby Moore (University of Oklahoma)

TOWARDS A PHYLOGENETICALLY-INFORMED TREATMENT OF *HETEROTHECA* CASS. (ASTERACEAE: ASTEREAE)

Heterotheca represents a diverse but taxonomically conflicted genus of herbs and subshrubs throughout North America. While multiple comprehensive treatments exist, these did not include molecular phylogenetic data that would better inform the relationships among and validity of miscellaneous species and varieties within the genus. This study aims to ameliorate those deficiencies by incorporating next-generation sequencing data to discern the group’s evolution and deciding which taxa warrant recognition as distinct species.

Tia Tafla and Janaki K Iyer (Northeastern State University)

EVALUATING CYTOKINE RESPONSES IN BLADDER CELLS INFECTED WITH UROPATHOGENIC *ESCHERICHIA COLI* AND *KLEBSIELLA PNEUMONIAE*

Urinary tract infections (UTIs) are prevalent infections that are caused by different types of bacteria including *Escherichia coli* (*E. coli*) and *Klebsiella pneumoniae* (*K. pneumoniae*). When the bladder cells become infected, they respond by producing pro-inflammatory cytokines and chemokines. To gain a deeper understanding of the host's response to different uropathogens, we conducted an Enzyme-Linked ImmunoSpot (ELISpot) assay. This approach allowed us to assess the expression of multiple pro-inflammatory cytokines in a sample. We hypothesized that infections with various uropathogens would lead to varying levels of pro-inflammatory cytokine expression due to differences among uropathogens. To test this hypothesis, we infected human 5637 bladder cells with uropathogenic *E. coli* and *K. pneumoniae* strains for 24 hours and evaluated cytokine protein expression. The ELISpot results revealed that uropathogenic *E. coli* caused the secretion of IL-1ra, IL-6, IL-1□, and IL-1□ compared to uninfected cells. However, the response of IL-6 and IL-1□ was reduced in bladder cells infected with *K. pneumoniae* strains, thereby supporting our hypothesis. To differentiate between cytokine production and secretion, we decided to perform intracellular cytokine staining followed by flow cytometry. Brefeldin A (BFA) is commonly used in these experiments to prevent cytokine secretion. We conducted an MTT cell viability assay to evaluate any cytotoxic effects of BFA. Our results showed no statistically significant differences among the various BFA concentrations tested. Ongoing experiments will help us establish optimal conditions for detecting cytokine production by flow cytometry. These findings will enhance our insights into how uropathogens modulate innate immune responses in bladder cells during the infection process, contributing to the development of more effective UTI treatments.

Heather Sparks[1], Jackson Taubel[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

GIG AND SLMB HAVE MISLEADING GENETIC INTERACTIONS

The overall goal of this project was to gain information about how pathways evolve using *Drosophila* as a model organism. Studying the insulin/TOR (IT) pathway gives information to see how it works and to investigate if the same evolution principles apply to pathways in other organisms. Alvarez-Ponce shows that connectivity has a relationship with how fast pathways evolve1 . Gig and slmb were compared to observe the effects it has on conservation of the IT pathway in *Drosophila*. Gene interactions were observed via Flybase. Gig and slmb were examined in the GEP Genome Browser. Target species were annotated using the Genome Browser to obtain divergence scores that were calculated using specific regulations.

Benjamin Tayo (University of Central Oklahoma)

DETECTION OF DNA NUCLEOBASES USING SINGLE-LAYER TI3C2 MXENE AND GRAPHENE: COMPUTATIONAL STUDIES

The interaction of DNA nucleobases with atomically thin two-dimensional (2D) materials has garnered significant interest in the field of materials science because of its importance in single-molecule detection and DNA sequencing. Indeed, a great number of theoretical and experimental studies have been performed to investigate the viability of various 2D materials for DNA sequencing such as graphene, hexagonal boron nitride (hBN), molybdenum disulfide (MoS2), tungsten disulfide (WS2), phosphorene, silicene, and borophene, with varying levels of success and challenges. Recently, 2D MXenes have emerged as promising alternative materials for DNA nucleobase detection. In this talk, we will present the results of computational studies that can be used for modeling the interaction of DNA nucleobases [adenine (A), guanine (G), thymine (T), and cytosine (C)] with single-layer Ti3C2 MXene. All results were benchmarked against graphene. We will discuss the opportunities and challenges of using two-dimensional Ti3C2 MXene for DNA nucleobase detection.

Makayla N Tillett[1] and Umesh S Deshmukh[2] ([1]Oklahoma City University; [2]Oklahoma Medical Research Foundation)

THE CLONING AND EXPRESSION OF SJOGREN'S DISEASE-ASSOCIATED AUTOANTIGENS IN A BACULOVIRUS EXPRESSION SYSTEM

Autoantibodies reactive with Ro60, Ro52, and La/SSB are found in the sera of Sjogren's Disease (SjD) patients. However, the precise role of these autoantibodies in SjD pathogenesis is unclear. The long-term goal of this project is to generate autoantibody responses in mice against the native protein conformation of Ro60, Ro52, and La and investigate their role in SjD. We aim to clone and express mouse, -Ro60, -Ro52, and –La in the baculovirus expression system to achieve this objective. For this purpose, as a first step, we successfully generated by PCR, full-length mRo60, mRo52, and La DNA. The PCR products were gel purified and cloned into the pFast/Bac-HBM vector by the TOPO cloning method. The cloned DNA was sequenced and was used to generate Bacmids. The Bacmids were then used to generate recombinant baculovirus to express these proteins in insect cells. The successful completion of this project will provide investigators with a substantial amount of recombinant proteins in native conformation, which will be used for immunizing mouse strains and investigating SjD development.

Brenda Tinoco-Bravo, Mylissa A. Stover, Crystal A. Shults, Sydney Marouk, Ratnakar Deole and Jacob R. Manjarrez (Oklahoma State University-Center for Health Sciences)

PROBIOTIC EFFECTS OF *LACTOCOCCUS LACTIS* AND *LEUCONOSTOC MESENTEROIDES* ON MORPHOLOGY, FECUNDITY, AND LONGEVITY IN *CAENORHABDITIS ELEGANS*

Probiotic supplementation has been widely studied showing that it can sustain significant therapeutic benefits to overall health, which depends on the overall composition of the microbiome. In this study, we investigated the supplementation of potential probiotic lactic acid bacteria *Lactococcus lactis* and *Leuconostoc mesenteroides* in the gut of *Caenorhabditis elegans* and observed their effects in survival, size and morphology, and fecundity. Survival assays were used to analyze median and total lifespan, where analysis was performed until death. Fecundity assays were performed with the number of progenies counted daily. Body morphometrics were analyzed where length, width, area, and speed were recorded. Intestinal permeability was also evaluated using a dye-leakage assay (Smurf). Survival analysis using CeMbio, a *C. elegans* natural microbiome, demonstrated a decrease in survival when supplemented with *L. lactis* and *L. mesenteroides*. When *L. lactis* and *L. mesenteroides* was used as a sole food source or were supplemented to the standard *E. coli*, OP50, diet it showed an increase in survival. In terms of morphometrics, OP50-fed *C. elegans* supplemented with *L. mesenteroides* were smaller and slower when compared to *L. lactis*-supplemented OP50, which were larger and faster. Fecundity showed that OP50 supplementation with *L. mesenteroides* or *L. lactis* produced higher amounts of progeny than the *L. mesenteroides* or *L. lactis* monocultures. Intestinal permeability was shown to be higher in both *L. lactis* and *L. mesenteroides*, which also show to have an increase in longevity when compared to OP50. These results highlight the potential and beneficial applications for these lactic acid bacteria as a therapeutic probiotic. Our study indicates that both *L. lactis* and *L. mesenteroides* when supplemented with OP50 has a positive influence on the overall health and longevity of *C. elegans*.

Troy A. Baird[1], Teresa D. Baird[1], and Richard Shine[2] ([1]University of Central Oklahoma; [2]Macquarie University-Australia)

BIG, CROWDED, URBAN LIZARDS: BEHAVIORAL CONSEQUENCES IN AUSTRALIA'S LARGEST DRAGON

Individual home range area increases with body size in most lizards. We were surprised, therefore, to find large numbers of Australia's largest agamid lizard, the Eastern Water Dragon (*Intellagama lesueurii*), thriving in a relatively small (1.2 ha) urban riparian site. To study space-use of adult Water Dragons relative to other large lizard species, we mapped the locations of males and females daily and recorded the social behavior of territorial males throughout the austral spring reproductive season in 2009 and 2016. Both female home ranges and male territories (standardized for lizard size) were smaller than most of the other large lizard species examined. Nearly 40% of Water Dragon females migrated away from their small home ranges for one day to dig nests and lay eggs. Male territory area increased with lizard body and head size. However, smaller territories in areas with more females, food, and refuges indicated that crowding allows males to access critical resources without defending large areas. As the season progressed, males decreased the relative number of undirected advertisement displays, but increased those given to females, perhaps to enhance future mating opportunities in these long-lived, philopatric lizards. Our results demonstrate that Water Dragons display a high level of behavioral plasticity allowing them to thrive in urban habitats frequented by humans.

Joseph Alcuitas, Rachel Uhlig, Jarrett Smith, Ryan Agyemang, and Rickey Cothran (Southwestern Oklahoma State University)

THE EFFECT OF FEMALE MATE CHOICE ON OFFSPRING SEX RATIOS IN A FRESHWATER AMPHIPOD SPECIES

Theory predicts even sex ratios because parents always benefit from producing the rarer sex. However, deviations in nature may occur to maximize reproductive success. On an individual brood basis, females may allocate resources to the offspring sex that returns the most fitness. We hypothesized that choosy females bias sex ratio of broods in favor of sons. Amphipods (*Hyalella* sp.) were used as it's possible to identify chosen mates because they physically pair for a short period before copulation. We collected mating pairs and a background sample of amphipods from a freshwater spring. Half of the females were separated and re-paired with their original mate—i.e. they chose their mate. The other half of the females were separated and assigned a new male randomly from the background sample. Each pair was placed in a jar inside of an environmental chamber. We checked the pairs three times weekly and recorded offspring sex ratios. As predicted, choosy females produced a higher proportion of sons in their broods than females mated at random. This strategy allows females to maximum fitness by investing in sons only when high quality mates are present in a mating system characterized by strong sexual selection on males.

Brennan VanDyke, Austin Aduddell, Matthew Roberts, and Christopher G. Goodchild (University of Central Oklahoma)

DEVELOPING IN OVO AND EX OVO METHODS FOR EXAMINING CARDIOTOXICITY OF ALTERNATIVE FLAME RETARDANTS

Because of the phase out use of polybrominated diphenyl ether (PBDE) flame retardants due to toxicity concerns in the early 2000s, alternative flame retardants have become prevalent in various consumer products. However, while alternative flame retardants are likely safer than PBDEs, their toxicities have not been fully characterized. Specifically, alternative flame retardants are known to cross the placental barrier, leading to concerns that prenatal exposure may cause congenital defects. This study investigates The long-term goal of this project is to investigate potential effects of three high-priority alternative flame retardants - triphenyl phosphate (TPP), bis-(2-ethylhexyl)tetrabromophthalate (TBPH), and tris (2-chloroethyl) phosphate (TCEP) - on cardiovascular development during the embryonic development. To do so, we developed methods to characterize (1) extraembryonic vascular branching, (2) cardiac flow dynamics, and (3) the expression of shear-dependent genes that orchestrate cardiac morphogenesis. Extraembryonic branching will be measured by culturing chick embryos ex ovo in a shell-less incubation vessel. To measure cardiac flow dynamics in chicken embryos, a custom optical coherence tomography (OCT) system will be used to image 3-D volumetric flow. Finally, we create primers and optimized qPCR methods to measure expression of shear-dependent genes (KLF, NOS-3, ET-1). Because chick embryos are a model for human cardiac morphogenesis, this method development will allow us to assess human health risks associated with prenatal exposure to alternative flame retardants.

Jess Warr, Richard Dolman, and Christopher Goodchild (University of Central Oklahoma)

ECOLOGICAL DISTURBANCE IN THE ANTHROPOCENE: LEGACY EFFECTS OF ORPHANED WELLS ON VEGETATIVE COMMUNITIES AND METABOLIC PHENOTYPE OF FREE-LIVING RODENTS

Persistent organic pollutants have been studied intently for the last thirty years, and many are known to be mutagenic, some carcinogenic. Among the most commonly studied environmental organic contaminants are polycyclic aromatic hydrocarbons (PAHs), 16 of which are listed by the United States Environment Protection Agency (US EPA) as priority contaminants of concern. Many PAHs are found in crude oil and can remain in the environment long after crude oil spills have occurred. While catastrophic large marine oil spills often receive considerable media attention, smaller-scale inland spills occur much more frequently, resulting in legacy PAH contamination. Oklahoma currently has 15,965 documented orphaned oil rigs that were operated under less regulatory oversight. Oklahoma Energy Resources Board (OERB) is working diligently to plug orphaned wells however, the toxic legacy effects on surrounding ecosystems are not well understood. Using 2 separate field sites in Cushing, Oklahoma, we collected soil samples to compare surface PAH concentrations. We targeted areas surrounding unplugged oil wells and will compare soil PAH concentrations to EPA soil screening levels (SSLs) and a reference location having no known recent crude oil production activity. To assess site-specific disturbance, we will conduct vegetative surveys to

generate Floristic Quality Assessments (FQAs) for each site. In accordance with substantial data showing PAH exposure causes hematological damage, altered immune function, and shifts in organismal metabolic rates, we hypothesize legacy PAH contamination will lead to physiological differences in free-living *Peromyscus* populations inhabiting the individual sites. We will measure white blood cell differentials, packed cell volume, hemoglobin concentration, and organismal resting metabolic rate. Collectively, this data will allow us to evaluate legacy effects of unplugged oil wells on multiple ecosystem components.

Micah Watson, Jeffery Moore, Fernando Salazar, Kevin Knop, and Benjamin O. Tayo (University of Central Oklahoma)

ELECTROMECHANICAL TRANSLOCATION OF DNA THROUGH NANOPORE MEMBRANES

Our research endeavor is centered on the replication and expansion of the simulations expounded upon in the cited research paper "DNA Detection with Single-Layer Ti3C2 MXene Nanopore". Our overarching aim revolves around the development of a versatile simulation platform, strategically devised for the systematic exploration of diverse factors influencing the translocation of DNA through nanopores. We are conducting these simulations using VMD and LAMMPS software. Taking inspiration from the methodologies articulated in the reference, our objective is to construct simulation environments that encompass a spectrum of DNA strands, a range of nanopore dimensions, an array of materials akin to MXene, and carefully controlled induced current profiles. This concerted effort is geared towards enriching the comprehension of intricate interactions between DNA nucleobases and nanopores, thereby illuminating the dynamics governing DNA translocation and its implications in the realm of sensing technologies. Our research initiatives are poised to equip scientists and scholars with the means to explore a multitude of scenarios and optimize experimental configurations for DNA detection and analysis. This, in turn, promises to catalyze advancements in the domain of nanoscale biophysics.

Micah Watson, Mubaraak Akinbola, Abduquadri Bolakale, Morshed Khandaker, and Abdellah Ait Moussa (University of Central Oklahoma)

HYDRAULIC BASE SHOCK TUBE CHANBERS FOR BRAIN PHATOM MODEL

This research project centers on comprehensively investigating and mitigating blast-induced traumatic brain injuries resulting from explosive events. The focal point involves enhancing and innovating a shock tube setup to accurately replicate blast waves, enabling the study of their effects on phantom brain models. Understanding and simulating these blast waves are fundamental for advancing research and potentially devising preventive measures or treatments for traumatic brain injuries resulting from explosive incidents. The purpose of our project was to improve upon previous shock tube designs and their limitations. Notably, prior shock tube designs could not be operated in the vertical position, and they could not reach the desired maximum pressure of 85psi. The proposed solution entails devising a portable shock tube setup capable of generating mild, moderate, and extreme shock waves. The design integrates a hydraulic base shock tube chamber to attain the targeted pressure of 85 psi before diaphragm rupture. Moreover, the project aims to fabricate a human brain phantom model for more precise simulation and rigorous testing. This research contains our shock tube design, brain phantom model, and safety cage so we can safely conduct our experiment. Our future endeavors encompass the fabrication of a metal shock tube and safety chamber, coupled with rigorous tests on the phantom brain model to gather crucial data. The overarching objective is to contribute to an enriched understanding of blast-induced traumatic brain injuries and advance potential strategies for prevention and treatment.

Alex Webb, Melville Vaughan, Austin Aduddell, Matthew Roberts, and Christopher G. Goodchild (University of Central Oklahoma)

EXPOSURE TO 'ALTERNATIVE' FLAME RETARDANTS ALTERS RAT AORTIC SMOOTH MUSCLE CELL FUNCTION IN VITRO AND DECREASES HEART RATE IN OVO

Flame retardants are routinely incorporated into common household items, including furniture, car seats, and crib mattresses, to enhance fire safety. In 2004, concerns regarding the toxicity of traditional flame retardants, such as polybrominated diphenyl ethers (PBDEs), led to their replacement with 'alternative' flame retardants. However, the potential toxicity of these alternatives remains largely unknown. A particular concern is the risk of maternal transfer to the developing embryo, as these flame retardants have been detected in breast milk and placental fluid of pregnant women. In utero exposure to alternative flame retardants may lead to congenital defects, especially if exposure occurs during early embryonic development, which involves sensitive processes. This study focused on the potential effects of two alternative flame retardants, Triphenyl phosphate (TPP) and Tris 2-chloroethyl phosphate (TCEP), on arterial wall development. We employed in vitro tests, including wound scrape migration assays and microscopy, to assess cell migration and proliferation. To better understand adverse outcomes on cardiac function, we conducted in ovo experiments with chicken embryos to examine the effects of TPP and TCEP on embryonic heart rate and organ mass. Our findings suggest that TPP and TCEP may inhibit aortic smooth muscle cell function, which could potentially impact proper heart development and function. These results underscore the importance of further investigation into the safety of alternative flame retardants in household products.

Andrew Wells (East Central University)

TOPOLOGICAL DATA ANALYSIS ON NBA TEAMS

We apply a kepler mapping to NBA teams from the past 20 years to look for significant clusters and patterns. The basics of the topological data analysis process will also be discussed.

Luke West and Eric Howard (East Central University)

AN EXPLORATORY STUDY ON THE EFFECTIVENESS OF COMMON CLEANING PRODUCTS IN REDUCING ATP LEVELS

Adenosine Triphosphate (ATP) is an energy carrying molecule found in the cells of all living creatures. Testing the ATP level can be used as a way to quickly and easily tell how many microbes are found on a surface. To test which cleaning products were the most effective at reducing ATP levels three different cleaning products were tested, those being barkeepers friend, Lysol spray and Clorox wipes. A Charm sciences Novalum II-X ATP illuminometer was acquired and used for the purpose of measuring ATP levels. During measuring an initial score was taken from a chosen desk before being sprayed with the chosen cleaning agent and allowed to dwell for the time listed on the bottle before being wiped with paper towels for either 45 or 15 wipes over 10 seconds. This was repeated for several rounds until the tested scores reached zero or stabilized. Ultimately only barkeepers friend was able to achieve a score of 0 Relative Light Units (RLU's) with Lysol spray reaching the low hundreds and Clorox wipes reaching just under 2000 RLU's before being interrupted by a lack of supplies. While experiment showed the ability of several cleaning products to remove ATP from surfaces it suffered from a flaw in methodology and lack of supplies necessary to fully test each cleaning agent more testing will be required.

Nathan G Wiley (University of Central Oklahoma)

MICROWAVE MEDICAL IMAGING SYSTEM

This presentation showcases a cutting-edge project which encompasses two interconnected systems: the Antenna Sweep Program and the Microwave Imaging System. The project leverages a Vector Network Analyzer (VNA) and a custom antenna setup for electromagnetic measurements. The Antenna Sweep Program, implemented in C#, facilitates precise sweeps and data collection with the MiQVNA API. It seamlessly integrates with an Arduino board for antenna control, streamlining the experimental process. Complementing this, the Microwave Imaging System, implemented in C, processes IQ data from the VNA system and employs the Delay-and-Sum algorithm for generating high-resolution microwave images. The system provides a robust framework for extracting valuable insights from complex electromagnetic data. This presentation will delve into the technical details of both systems, covering installation procedures, usage instructions, and practical applications. Attendees will gain a comprehensive understanding of the project's significance in advancing electromagnetic measurement techniques, with potential applications in diverse fields such as microwave tomography and medical imaging. The innovative combination of the Antenna Sweep Program and Microwave Imaging System marks a notable milestone in the domain of electromagnetic measurements, showcasing the potential for impactful contributions to the scientific community.

Jennifer Wilson and Christopher Goodchild (University of Central Oklahoma)

EFFECTS OF BIS(2-ETHYLHEXYL)-2,3,4,5-TETRABROMOPHTHALATE (TBPH) FLAME RETARDANT ON HEART RATE, METABOLIC RATE, AND ORGAN DEVELOPMENT OF WHITE LEGHORN CHICKEN EMBRYOS

Flame retardants are a diverse group of chemicals applied to manufactured materials to prevent or slow the spread of fires. However, flame retardants are not chemically bonded to the products they are applied to and can leach into the environment. The persistence of flame retardants in the environment led to toxicity concerns for free-living animals, including birds. Adult birds are exposed to flame retardants that have bioaccumulated in their prey, and trophic transfer of flame retardants lead to flame retardants being detected in hepatic tissue of adult birds. Flame retardants can be passed on to eggs by maternal deposition and cause embryotoxicity. Given their persistence and toxicity, traditional flame retardants were banned in 2004 and replaced by 'alternative' flame retardants. However, alternative flame retardants have also been found in environmental samples, but the effects of many these chemicals have not been fully tested for potential adverse developmental outcomes. Bis(2-ethylhexyl)-2,3,4,5-tetrabromophthalate (TBPH) is an alternative brominated flame retardant found in rubber, appliances, and polyurethane foam. In this study, we examined the effects of in ovo exposure to TBPH at two concentrations (50 ng/g egg mass and 150ng/g egg mass) on white leghorn chicken embryos. Chicken eggs are an established model for embryonic toxicity. We drilled small holes into the eggshell and injected TBPH was into the albumin. Heart rate was measured on embryonic days 14 and 18. On day 18 we measured metabolic rate, crown-rump length, and body and organ (heart, liver, brain) masses. Preliminary analysis indicates exposure to TBPH reduces crown-rump length, body mass, and liver mass. Exposure to TBPH did not reduce heart mass or heart rate. Collectively, these results suggest in ovo exposure to TBPH suppresses embryonic growth but does not directly impair cardiac function.

Rebecca Wilson, Noopur Dasgupta, and Erika Lutter (Oklahoma State University-Stillwater)

UNDERSTANDING ANTIBIOTIC RESISTANCE IN CYSTIC FIBROSIS PATIENTS

Cystic fibrosis (CF) is a lethal genetic disease, characterized by polymicrobial lung infections that are near impossible to treat due to the high level of antibiotic resistance of the pathogens. Though the multi-drug resistance of pathogens has been previously documented, the mechanisms for antibiotic resistance acquisition are still unknown. A prior screen of CF sputa identified the most resistant and multidrug-resistant bacterial candidates. This project aims to identify the MICs against antibiotics currently used in CF treatment for several bacterial isolates with subsequent genome sequencing to determine the genetic basis for their resistance mechanisms. Each bacterium was tested in an MIC broth dilution assay with various concentrations of each antibiotic to determine the minimum amount needed to inhibit the growth of each isolate. Genomic DNA has also been isolated and was

sequenced with the genomes assembled by an external company. The assembled genomes were searched for genes that confer antibiotic resistance mechanisms to the antibiotics screened for. Looking at the genetic content, it may be possible to determine if the genes conferring resistance were transferred to the isolates from other bacteria. Information obtained from sequencing the genomes of the CF isolates will hopefully aid in understanding how to treat CF infections more effectively and improve the prognosis for CF patients.

Giovanni Winters[1], Oscar Galindo[1], Ethan Wright[1], Sadguru Panchal[1], Nesreen Alsbou[1], and Imad Ali[2] ([1]University of Central Oklahoma; [2]University of Oklahoma Health Science Center)

DEVELOPING THREE-DIMENSIONAL DETECTOR FOR PROTON, ELECTRON, AND PHOTON DOSIMETRY IN RADIATION THERAPY

In the Stephenson Center Radiation clinic in Oklahoma City, the only dosimeters in use are two-dimensional. This causes a limitation in radiation calibration. These two-dimensional dosimeters only capture the impact locations on a flat plane of the specified particle rather thanthe path and intensity of the impact. We are developing a three-dimensional detector to account for these limitations. We are looking to capture a three-dimensional dose distribution of the beam generated by the radiation machine. To do this, we are using an array of plastic scintillators to emit light created by the energy of the beam. We will capture this light emission via cameras mounted in every cartesian direction. The images captured by these cameras will then be analyzed with software to attach values to the light generated. We are planning to find an accurate representation of the dose distributed by the machine. This report details our findings through the testing of our prototype and how the output relates to it's expected value. This device should increase the accuracy, safety, and efficacy of each individual treatment.

Lorelei Winton, Myriam Achour, Jacob Burch-Konda, and Marianna Patrauchan (Oklahoma State University-Stillwater)

THE ROLE OF CALCIUM SENSOR EFHP IN REGULATING PYOVERDINE PRODUCTION IN A HUMAN PATHOGEN, *PSEUDOMONAS AERUGINOSA*

Pseudomonas aeruginosa (Pa) is a human pathogen causing life-threatening infections in immunocompromised and wounded people worldwide. Pa's infections are particularly deadly when they occur in the lungs of patients suffering from cystic fibrosis (CF). These infections become chronic and are very difficult to treat due to Pa's resistance to multiple antibiotics. To successfully colonize a host and develop infection, Pa produces an arsenal of virulence factors. One such factor is pyoverdine, a high affinity siderophore that provides Pa with iron, essential for the survival and scarce in the human lung environment. Our group showed that pyoverdine production is regulated by elevated calcium (Ca2+), and this regulation requires an earlier identified Ca2+ sensor, EF-hand protein (EfhP). This study seeks to characterize EfhP regulation of Pa's response to Ca2+, particularly pertaining to iron uptake pathways. We have established that efhP deletion significantly hinders Ca2+-dependent induction of Pa pyoverdine production in the lab strain PAO1. By using PCR and efhP-specific primers, we confirmed the presence of efhP in five CF clinical isolates. We observed that these clinical isolates express efhP at the levels at least two fold greater than that in PAO1. The isolates also showed increased pyoverdine production at 5 mM Ca2+. These data suggest that EfhP plays a similar role of mediating Ca2+ regulation of pyoverdine production in CF isolates. Current research aims to characterize the role of EfhP functional domains in regulating pyoverdine production by testing a series of strains expressing mutated EfhP. New knowledge gained will support further studies to ultimately develop novel efficient medications to improve quality of life of CF patients who struggle with chronic *P. aeruginosa* infections.

Faith A. Wohlever[1], Amber E. Morgan[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

IMPL2 CONSERVATION IN THE INSULIN/TOR (IT) PATHWAY

The insulin/TOR (IT) pathway is an insulin pathway that helps with organism growth and survival. There are many genes involved to help with this mechanism and this study looked at two specifically, ImpL2 and rl. Looking at both of these genes' structures and neighborhoods, the two genes were compared in different species to see the divergence of each one compared to a certain fly species called *D. melanogaster*. The more diverged the genes were from this species, the higher the score. Since ImpL2 has fewer connections in the (IT) pathway it was hypothesized that it would have more divergence, meaning it would be less conserved and have a higher divergence score. However, when the divergence scores based on the gene structures and neighborhoods were compared, it showed that the gene with more connections in this IT pathway, rl, had more conservation than ImpL2 and a higher divergence score.

Zachary Woods and Daniel Gomes da Rocha (Southern Nazarene University)

TERRESTRIAL MAMMALS OF THE OKC METRO AREA

Urbanization is growing world-wide, and particularly in North America. As urbanization grows, so does our dependence on remaining urban green areas (e.g., parks, reserves, green belts) to preserve biodiversity and ecosystem services. The objective of this study is to understand how effective these green areas are in preserving species diversity. Additionally, we aim to identify environmental and anthropogenic variables that are influential to species diversity. We focused on the medium and large terrestrial mammal community in the highly urbanized Oklahoma City Metro area. Here we report preliminary data on 12 camera trap sites (active for [3]75 days during Summer 2022), in combination with site covariates (NDVI, road intensity, elevation, and

number of domestic records) collected at and around the camera locations. We used Poisson Generalized Linear models (GLM) to test the effect of site covariates on mammal species richness. We also plotted species cumulative curves to assess the survey completeness. In total we detected 11 wild and 3 domestic medium and large terrestrial mammal species. We detected the majority of mammals species expected to occur in this region (with the exception of larger predators). Sites varied greatly in species richness (4-10) and composition. All site variables had a statistically non-significant effect (p-values>0.05) on species richness. This result is not unexpected considering the small sample size, but revealed some promising covariates to be tested as new data is added to the database (data from the Summer 2023 survey is being processed). Our species inventory serves as a baseline for future wildlife monitoring programs in the OKC metro area.

Elijah Woodward, Jimena Ramirez, and Alisha Howard (East Central University)

PURIFICATION OF THE HULWCAS13A ENZYME — GROUNDWORK FOR MUTAGENESIS

Although nucleic acid detection using CRISPR-Cas systems has been established in the basic research lab setting, this did not translate in the recent pandemic for point-of-care (POC) diagnostic wide-spread use. Part of this problem is the comfort of scientists with the system but also with the sensitivity levels of the enzyme. The goal of this project is to improve the detection sensitivity of the huLwCas13a enzyme. To lay the groundwork for this project, my lab is working on the expression and purification of the enzyme. Once the methods for obtaining a pure functional enzyme have been developed, we may commence with mutagenesis and testing. While the expression of the enzyme follows along with the literature, our method of purification deviates from the source material. Moreover, with the eventual improvement of the enzyme, a route for quick, and economical POC testing becomes available for widespread use.

Luke M. D. Woodward, Lucy V. Ramirez, Alejandro A. Arriaga, and Eric W. Howard (East Central University)

AN INNOVATIVE SYSTEM FOR STREAMLINING VECTOR ANALYSIS

Currently there is no system for mass analysis of vector-competent mosquitoes in Oklahoma or elsewhere. Most analyses consist of individual qualitative identification of vectors. A system for quantitatively identifying potential vectors simultaneously would be beneficial for risk analysis. One potential avenue is through PCR: the goal being to design a single set of primers which anneals to all competent vector species but amplifies different lengths along their DNA. The amplification of different lengths would allow for species identification in a sample using gel electrophoresis, thereby eliminating the need for DNA sequencing and sequence analysis for species identification. To fulfill this goal, the primer set would need to bind to a region of DNA which is conserved enough for the primer set to anneal in all species, but variable enough to allow for amplification of different lengths of DNA among the different species. Ribosomal DNA has shown some promise in this regard as the exon regions are highly conserved interspecifically (mutations are more likely to result in cell death) but the intron regions are able to vary significantly (intron regions are spliced out and are not represented transcriptionally). Being able to simplify the approach to competent vector analysis is vital to create an efficient public awareness structure.

Kaybre Wright[1], Lauren Yarnell[1], Lindsey J. Long[1], and Laura Reed[2] ([1]Oklahoma Christian University; [2]Genomics Education Program-University of Alabama)

LNK IS LESS CONSERVED THAN SLMB IN THE INSULIN SIGNALING PATHWAY

This research examined the divergence of two genes, Lnk and slmb, between six species of *Drosophila*. Lnk is involved in the insulin signaling pathway as an adaptor for the insulin receptor and stabilizes the interaction between the receptor and the substrate. Slmb negatively regulates insulin-like receptor signaling pathway and suppresses insulin-like receptor (lnR) activation and the activity of intracellular effectors. In the insulin signaling pathway, Lnk has less connections than slmb, so slmb would be expected to evolve slower because it is more connected.

Yingxin Zhang, Marianna A. Patrauchan, and Erika I. Lutter (Oklahoma State University-Stillwater)

CHARACTERIZATION OF HOST RESPONSES OF CUFI5 AND A549 CELLS FOLLOWING *PSEUDOMONAS AERUGINOSA* INVASION

Pseudomonas aeruginosa is an opportunistic pathogen that commonly causes chronic lung infections in cystic fibrosis (CF) patients. *P. aeruginosa* can invade and replicate within airway epithelial cells, which requires the activation of the PI3K/Akt pathway. To investigate *P. aeruginosa* host interactions during bacterial invasion and adaptation to intracellular niche, we examined the protein profiles of whole cell lysates from uninfected, 30 mins- and 90 mins- PAO1 infected CuFi-5 cells and A549 cells. We recognized the protein bands between 20-25 kDa enriched only in infected CuFi-5 cells and further excised the spot of interest for LC-MS/MS proteomic analysis. Overall, we identified 468 proteins from *P. aeruginosa* and CuFi-5 cells, out of which 47 proteins were upregulated and 23 proteins were downregulated at 90 mins post-infection. KEGG analysis revealed the changes in protein abundance associated with endocytosis, especially Rab-11A upon PAO1 infection. Western blotting validation demonstrated that *P. aeruginosa* stimulated enhanced expression of Rab-11A upon infection, which gradually decreased to the level of the uninfected group in a time-dependent manner. Interestingly, compared to wildtype PAO1, T3SS mutant (Δ pscN) and LecA-deletion mutant (Δ lecA) of PAO1 exhibited defect in stimulating the expression of Rab-11A and its interacting protein Rab11FIP2, which probably suggested the important role of intracellular *P. aeruginosa* in the interactions with Rab-11A. Our

next goal is to investigate the role of host Rab small GTPases in *P. aeruginosa* invasion as well as the process of escape from bacterial vacuole. This study will provide further information about the molecular details of *P. aeruginosa*'s intracellular lifestyle.

Jessica Burke[1], Craig Zimmermann[1], Cheyanne Olson[1], Dustin Browning[2], and James Gaspard[2] ([1]Rogers State University; [2]Grand River Dam Authority)

REMOVAL OF NUTRIENTS FROM ORGANICALLY CONTAMINATED WATER USING BIOCHAR

Increased human activity is causing nutrients to run off into lakes and ponds that can harm our waters because they can produce toxic algae blooms, low dissolved oxygen, and impair freshwater and estuarine ecosystems. To combat this issue, scientists are working on practical solutions to remove excess amounts of nitrate and phosphate. One promising solution to this issue is the use of biochar, a charcoal-like substance made from organic biomass. Biochar is typically used as a fertilizer, but scientists have found it is an environmentally cost-effective way to remove unwanted nutrients from water. Biochar can be used to remove these nutrients because it is rich in surface functional groups allowing for nutrient uptake. In this study nitrogen and phosphorus concentrations were created to mimic eutrophic concentrations found in a lake. Each concentration was tested using an unmodified biochar and modified biochar made with a 5% concentration of magnesium sulfate. Results showed that modifying biochar had 95% confidence to remove more nitrogen than unmodified, however there is no certainty that unmodified vs modified has any impact in the removal of phosphorus. These findings indicate that there is potential for biochar to remove excess nutrients from lakes and streams in Oklahoma. These findings are important to determine whether modifying biochar can improve its capability to remove nutrients from contaminated water.

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Established in 1909

"The purpose of the Academy shall be to stimulate scientific research; to promote fraternal relationship among those engaged in scientific work in Oklahoma; to diffuse among the citizens of the State a knowledge of the various disciplines of science; and to investigate and publicize the human, natural and educational resources of the State."
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