22nd Annual

RESEARCH SYMPOSIUM

The Oklahoma Louis Stokes Alliance for Minority Participation

Saturday, September 24th, 2016

Oklahoma State University

Noble Research Center

Stillwater, Oklahoma

CONFERENCES

STEM Diversity & Public Understanding

2016 SACNAS

REGISTER ONLINE SPRING 2016- 2016SACNAS.ORG

OCTOBER 13TH-15TH
LONG BEACH CONVENTION CENTER
LONG BEACH, CA

Oklahoma Research Day
Northwestern Oklahoma State University, Alva, Oklahoma
March 3, 2017
www.oklahomaresearchday.com/

Oklahoma Research Day

http://www.cur.org/ncur_2017/

OK-LSAMP 22nd Annual Research Symposium

AGENDA

8:00 AM - 11:00 AM	Registration/ Check-In	Poster Set-up: **ALL POSTERS MUST BE IN PLACE BY 9 AM** Refreshments available	1st Floor Atrium
9:00 AM - 9:30 AM	Welcome Remarks and Introductions	Brenda L. Morales, OK-LSAMP Director Jason F. Kirksey, PhD, OK-LSAMP Principal Investigator VP for Institutional Diversity	Room 106
9:30 AM - 10:45 AM	Keynote Speaker	Robin W. Kimmerer, PhD Distinguished Teaching Professor and Director, Center for Native Peoples and the Environment State University of New York College of Environmental Science and Forestry	Room 106
10:45 AM - 11:15 AM	Workshop	Responsible Conduct of Research Information Session Toni Shaklee, PhD, Assistant Vice President for Research Oklahoma State University	Room 106
10:45 AM - 11:15 AM	Judges Meeting	Judges Orientation	Room 107
11:15 AM - 11:30 AM		BREAK	
11:30 AM - 12:30 PM	Poster Presentations	Each presenter must be by his/her poster	1st Floor Atrium
11:30 AM - 1:00 PM	Alliance Meeting	OK-LSAMP Administration, Campus Program Managers and Invited Guests	Room 130
12:30 PM - 1:00 PM		LUNCH PROVIDED	1st Floor Atrium
1:00 PM - 2:15 PM	Oral Presentations	*For Specific Times, See "Presentations at a Glance"*	
		Engineering and Technology	Room 108
		Chemistry and Biology	Room 207
		Biological Sciences	Room 246H
		Physics and Math	Room 348B
2:15 PM - 2:30 PM		BREAK/NETWORKING/GROUP PICTURES	1st Floor Atrium
2:30 PM - 3:15 PM	International Experiences Panel Q&A	OK-LSAMP International Research and Study Abroad Panel Moderator: Sara Mata, PhD	Room 106
3:15 PM - 3:45 PM	Awards Presentation	1st, 2nd, and 3rd Place Presentations Life Science Poster Presentations Non Life Science Poster Presentations Oral Presentations	Room 106
3:45 PM - 4:00 PM	Closing Remarks	Jason F. Kirksey, PhD, OK-LSAMP Principal Investigator	Room 106

PLEASE VISIT ATRIUM TABLES THROUGHOUT THE DAY.

*Note: Symposium volunteers are designated on their name badges. They will gladly assist if you need information or directions.

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INFORMATION TABLES

University of Wisconsin-Madison SciMed GRS

OU Aeroecology (Oklahoma Biological Survey)

University of Tulsa Graduate School

OSU Graduate College Ambassador Program

KEYNOTE SPEAKER

Dr. Robin Kimmerer is a mother, plant ecologist, writer and SUNY Distinguished Teaching Professor at the SUNY College of Environmental Science and Forestry in Syracuse, New York. She serves as the founding Director of the Center for Native Peoples and the Environment whose mission is to create programs which draw on the wisdom of both indigenous and scientific knowledge for our shared goals of sustainability. Her research interests include the role of traditional ecological knowledge in ecological restoration and the ecology of mosses. In collaboration with tribal partners, she and her students have an active research program in the ecology and restoration of plants of cultural significance to Native people. She is active in efforts to broaden access to environmental science education for Native students, and to create new models for integration of indigenous philosophy and scientific tools on behalf of land and culture. She is engaged in programs which introduce the benefits of traditional ecological knowledge to the scientific community, in a way that respects and protects indigenous knowledge.

Dr. Kimmerer has taught courses in botany, ecology, ethnobotany, indigenous environmental issues as well as a seminar in application of traditional ecological knowledge to conservation. She is the co-founder and past president of the Traditional Ecological Knowledge section of the Ecological Society of America. Dr. Kimmerer serves as a Senior Fellow for the Center for Nature and Humans. Of European and Anishinaabe ancestry, Robin is an enrolled member of the Citizen Potawatomi Nation.

As a writer and a scientist, her interests in restoration include not only restoration of ecological communities, but restoration of our relationships to land. Dr. Kimmerer is the author of numerous scientific papers on the ecology of mosses and restoration ecology and on the contributions of traditional ecological knowledge to our understanding of the natural world. She is also active in literary biology. Her essays appear in Whole Terrain, Adirondack Life, Orion and several anthologies. She is the author of “Gathering Moss” which incorporates both traditional indigenous knowledge and scientific perspectives and was awarded the prestigious John Burroughs Medal for Nature Writing in 2005. Her latest book “Braiding Sweetgrass: indigenous wisdom, scientific knowledge and the teachings of plants” was released in 2013 and was awarded the Sigurd Olson Nature Writing Award. She has served as writer in residence at the Andrews Experimental Forest, Blue Mountain Center, the Sitka Center and the Mesa Refuge.

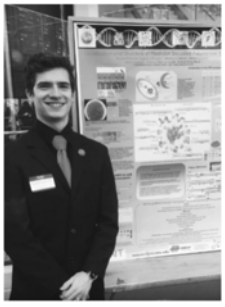
She holds a BS in Botany from SUNY ESF, an MS and PhD in Botany from the University of Wisconsin and is the author of numerous scientific papers on plant ecology, bryophyte ecology, traditional knowledge and restoration ecology. As a writer and a scientist, her interests in restoration include not only restoration of ecological communities, but restoration of our relationships to land. She lives on an old farm in upstate New York, tending gardens both cultivated and wild.

International Experiences Panel

Sara Mata, PhD, moderator
Dr. Mata currently serves as the National Science Foundation National Research Traineeship Program Coordinator at the University of Oklahoma in Norman, Oklahoma. In this role, Sara provides assistance with developing a graduate education model in promoting interdisciplinary research while supporting students in this process. Dr. Mata currently serves as the NASPA Latino/a Knowledge Community National Co-Chair and as the Foundation Ambassador for Region IV-W. Dr. Mata received her Bachelor's degree in Sociology with an emphasis in Juvenile Corrections and Treatment, a Master's degree in Community Counseling, a Master's degree in Sociology, and a Doctorate degree in Social Foundations from Oklahoma State University. Dr. Mata has had an extensive career at all levels of education as well as working with families and communities.

Ana Chicas Mosier

Ana is a second year graduate student in the Integrative Biology department at Oklahoma State University. My research focus is pollinator behavior and responses to chemical contamination of floral resources. As a student, I have travelled both internationally and domestically most of which was completely funded by scholarships or grants. As an undergraduate I participated in NSF REU programs in Turkey, Montana and Colorado. I also spent this past summer in Turkey and Greece studying subspecies of honey bees in their native environment as part of my dissertation work. Every student should seize the opportunity to travel during college to broader their horizons and understand other ways of life.



Andres Guerrero Criado
Andres has has studied in Venezuela, the United States, Spain and France. In May of 2016, he earned a degree in Microbiology, Cell and Molecular Biology and Genetics and a degree in Biochemistry with minors in Chemistry and Spanish from Oklahoma State University. During his undergraduate career he was involved in research in bioinformatics, phylogeny ***(research published in the J. Adv. Res.)***, microbial ecology and protein structure elucidation under Dr. Noha Youssef during Fall of 2013, Spring of 2014, and Fall of 2014. While studying abroad through an OKLSAMP Program in Grenoble France, Andres initiated a novel exchange program with american scientists to the lab of German researcher Dr. Thomas Pfannschmidt. He graduated Summa Cum Laude from Oklahoma State University, and is now applying to medical schools in his pursuit to become a physician scientist.

Amber Morgan
University of Oklahoma Scholar majoring in Chemical Engineering, was selected to participate in the Native American and Pacific Islander Research Experiences (NAPIRE) program in Costa Rica for the summer of 2016.

Nick Means,
Undergraduate major: Microbiology/Cell and Molecular Biology, Oklahoma State University
Current Institution: Graduate Student at University of Oklahoma Health Sciences Center
Undergraduate Research: Enzymatic versus electrocatalytic oxidation of NADH at carbon-nanotube electrodes modified with glucose dehydrogenases with applications to bucky-paper-based glucose enzymatic fuel cells.

Adrian A. Saenz
Adrian is a first year master's student pursuing Biosystems and Agricultural Engineering at Oklahoma State University. He completed his bachelor's degree in Civil Engineering last May and his graduate research involves studying the effects of varying vegetation on watershed erosion. Adrian recognizes that even though his life has been challenging, thanks to the motivation of advisors and friends, he was fortunate to study abroad in Italy and Greece. Adrian stated that "Both trips were unique and they form the foundation of my career goal to travel the world!"

LOUIS STOKES & LSAMP

In 1991, the National Science Foundation created six multi-institutional Alliance for Minority Participation (AMP) programs. In 1998, **Congressman Louis Stokes'** name was added to the program.
Unfortunately, Congressman Stokes passed away this year. The LSAMP community and the nation has lost a great man.

You can read all about Congressman Stokes' career at:
http://history.house.gov/People/Detail?id=22311

Dr. A. James Hicks was named LSAMP program director in 1997. He received a Ph.D. in biology from the University of Illinois at Urbana and additional training at Harvard University, the National Institutes of Health, and the Missouri Botanical Gardens. When Dr. Hicks took over LSAMP, there were 25 Alliances in the nation. Today, there are more than 40 active LSAMP alliances with over 800 colleges and universities involved in increasing the quality and quantity of students from underrepresented populations who receive degrees in science, technology, engineering, and mathematics.

A Brief History of OK-LSAMP

In 1992, the Oklahoma State Regents organized the Oklahoma Alliance for Minority Participation in Science, Engineering, and Mathematics (OKAMP SEM). Dr. Earl Mitchell, Oklahoma State University (OSU) Professor, was chosen to serve as Chair of the Alliance. In 1993, Dr. Mitchell, with the help of Dr. Ann Ackerman from South Oklahoma City Junior College, wrote and submitted an AMP proposal to the National Science Foundation (NSF). Included in the proposal was additional matching support for the program at the regional universities provided by the Oklahoma State Regents for Higher Education. In 1994, OSU, as the lead institution, along with seven partner institutions was awarded the grant. The OKAMP program was established to address the critical undersupply of minority students pursuing BS degrees in Science, Mathematics, Engineering, and Technology (SMET).

Today, 11 Oklahoma institutions of higher education make up the Oklahoma consortium. During the past 21 years, many changes have been made including the addition of Congressman Louis Stokes' name to the AMP programs nation-wide, and the change of SMET to Science, Technology, Engineering, and Mathematics (STEM). A graduate school initiative - the Bridge to the Doctorate (BD) program was implemented with Oklahoma providing graduate support for 7 cohorts of BD Fellows since the BD initiative began.

The Oklahoma Alliance began with a baseline of 214 under-represented minority (URM) students completing requirements for BS degrees in STEM disciplines. In 2013, 811 URM students completed BS degrees in STEM disciplines. This is a 279% increase! Since the 1995-96 academic year, OK-LSAMP institutions have awarded 10,386 BS degrees in STEM disciplines to URM students.

SPECIAL THANKS

OK-LSAMP would like to thank the ***Division of Institutional Diversity*** (ID) for continued support and connections created among the other ID programs and organizations. For the fifth year, OSU has received the Insight into Diversity Higher Education Excellence Award. Institutional Diversity also contributes to lunch at the symposium. ***El Tapatio, Mexican Restaurant*** in Stillwater, Oklahoma, has catered lunch for the symposium this year. We greatly appreciate the quality and value of their service.

OK-LSAMP would like to thank the **Citizen Potawatomi Nation** for providing the keynote speaker and assistance to get her here.

OK-LSAMP appreciates the use of rooms provided for the symposium by the ***Department of Biochemistry and Molecular Biology*** - Dr. John Gustafson, Department Head, and the ***Department of Entomology and Plant Pathology*** - Dr. Phil Mulder, Professor and Head.

OK-LSAMP would like to thank the ***Experimental Program to Stimulate Competitive Research (EPSCoR)*** for their continued support of our scholars to travel to national conferences such as the National Conference on Undergraduate Research (NCUR) for presentations.

OK-LSAMP would like to thank all the ***graduate schools*** and departments for supplying information on graduate programs and internship opportunities for our scholars.

Mentors MOST OF ALL, OK-LSAMP would like to give praise and special thanks to the faculty and industry ***Mentors***. This program would not be the success it is without the expert support and guidance mentors provide to the scholars as they explore and enhance their research and scientific skills. We cannot say "Thank you" enough.

OK-LSAMP would especially like to thank the ***National Science Foundation*** and the LSAMP Program Director, ***Dr. A. James Hicks, Ph.D.,*** for their continued support of both the undergraduate and graduate LSAMP programs.

OK-LSAMP is eternally grateful for the hard work and dedication of the ***OK-LSAMP Staff*** on each campus. Their mentoring and guidance keeps scholars on track academically and professionally so they are ready for the rigors of graduate school, academia and/or industry careers.

ADMINISTRATION

Oklahoma State University, Lead Institution

Jason F. Kirksey, Ph.D., Principal Investigator
405-744-9154, jason.kirksey@okstate.edu
Dr. Kirksey is the Vice President for Institutional Diversity at Oklahoma State University (OSU). In this role, he serves as the chief diversity officer for the entire OSU system. In addition, Dr. Kirksey serves as director of the African American Studies Center and Associate Professor in the Department of Political Science. His research interests include minority politics (especially African American and women), urban politics, the election system, and American government.

Sandra Whalen, Ph.D., Program Evaluator
405-325-2158, swhalen@ou.edu
Sandra received her M.Ed. In Adult and Higher Education from the University of Oklahoma and is Director of the Center for Institutional Data Exchange and Analysis (C -IDEA) at the University of Oklahoma. One of the main functions of the center is to coordinate the Consortium for Student Retention and Data Exchange (CSRDE). She has helped transition the CSRDE from solely a data exchange group to a national organization supporting higher education institutions interested in improving the success of their students. Sandra was instrumental in establishing the National Symposium on Student Retention in 2005, and creating the CSRDE monthly webinar series in 2007. Under her leadership, the CSRDE published "Building Bridges for Student Success: A Sourcebook for Colleges and Universities" in 2003.

Brenda L. Morales, M.S., Director
405-744-6710, brenda.morales@okstate.edu
Brenda received her B.S. degree from the University of Texas Pan-American, which led her to Oklahoma State University through a National Science Foundation - Research Experience for Undergraduates (NSF - REU). In Fall 2002 she made Oklahoma State University her choice to pursue a Master of Science degree in Psychology. She became Director of the OK-LSAMP program and the Bridge to the Doctorate program in 2016. The OK-LSAMP program is a consortium of 11 Oklahoma colleges and universities in which Brenda oversees the day-to-day and long-term activities associated with the NSF grant.

Darlene Croci, Grant Coordinator
405-744-7820, darlene.croci@okstate.edu
Darlene received her BS degree in Human Environmental Sciences from Oklahoma State University (OSU) in 1991. Upon graduation, she began working for OSU serving in various roles across campus. Darlene worked for 5 years for the Oklahoma Department of Career and Technology Education before returning to OSU in 2004. She recently finished a five year term serving on the OSU Staff Advisory Council (SAC) - 2010-2015. Darlene became Grant Coordinator for OK-LSAMP September 2015.

CAMPUS PROGRAM MANAGERS

Cameron University

Michael Husak, Ph.D., 580-581-2374, michaelh@cameron.edu
Dr. Husak received a BS and MS in biology from Angelo State University and a Ph.D. in biological sciences with an emphasis in ecology and evolution from Mississippi State University. He is currently an Associate Professor of Biology at Cameron University and the Curator of the Cameron University Museum of Zoology. Dr. Husak's research interests include vertebrate ecology and the evolution of life history strategies in birds.

East Central University

Carl Rutledge, Ph.D., 582-559-5392, crutledge@mac.com
Dr. Rutledge received a BS, MS, and Ph.D. in physics from the University of Arkansas. His research interests include physics and astronomy education as well as x-ray diffraction studies of tetrahedral molecules in the liquid state. He is the Adolph Linscheid Distinguished Teaching Professor and Chairman of the Physics Department.

Langston University

Sharon Lewis, Ph.D., 405-466-3316, salewis@langston.edu
Dr. Lewis has a BS in zoology from Howard University as well as an MS in chemistry and a Ph.D. in chemistry/biochemistry from the University of Oklahoma. Her research interests include bioinformatics of bipolar disorder and asphalt chemistry. Currently, Dr. Lewis serves as an Associate Professor of Chemistry.

Northeastern State University

Jody Buckholtz, Ph.D., 918-444-3839, buckholt@nsuok.edu
Dr. Buckholtz received a BS from the University of Central Arkansas and an MS and Ph.D. from the University of Arkansas. Her research interests include electrochemistry-oxygen reduction reaction catalysis, construction of reference electrodes for use in nonaqueous solutions, nitrate determination in rural well-water supplies, and ionic liquid uses as solvents for cellulose degradation. Currently, Dr. Buckholtz is an Associate Professor and is also the College Safety Officer, AISES Advisor and Supplemental Instruction Coordinator.

Northwestern Oklahoma State University

Tim Maharry, Ph.D., 580-327-8583, tjmaharry@nwosu.edu
Dr. Maharry has a BA with distinction in mathematics from Hastings College as well as an MS in applied mathematics and a Ph.D. in statistics from Oklahoma State University. His research interests include math education, statistical literacy, and numerical analysis. Currently, Dr. Maharry serves as Chair and an Associate Professor in the Department of Mathematics and Computer Sciences.

Southeastern Oklahoma State University

Brad Ludrick, Ph.D., 580-745-2668, bludrick@se.edu

Dr. Ludrick received his BS in biology and a M.Ed. in science education from Southeastern Oklahoma State University. At Texas A & M, he received an Ed.D. in science education. His research interests include studying the nematicidal effects of transformed Escherichia coli in small ruminants and improving the scientific inquiry skills of the secondary science teacher. Dr. Ludrick is an Associate Professor in the Department of Biological Sciences.

Southwestern Oklahoma State University

Tim Hubin, Ph.D., 580-774-3026, tim.hubin@swosu.edu

Dr. Hubin received a BS in chemistry and a BS in secondary science education from Kansas State University and worked as a postdoc at Caltech. Currently, he is working on the development and screening of transition metal complexes as drug molecules for several diseases including cancer, HIV, malaria, and fungal infections. He is also continuing a long-term project on "green" oxidation catalysts able to work in water and produce only water as byproduct. Dr. Hubin has received several awards for combined teaching and research accomplishments, including Oklahoam awards as a DaVinci Scholar and the Oklahoma Medal for Excellence, as well as the national award designation as a Henry-Dreyfus Teacher-Scholar.

University of Central Oklahoma

Greg Wilson, Ph.D., 405-974-3497, gwilson@uco.edu

Dr. Wilson has a BA in biology from Central College, an MS from Fort Hays State University, and a Ph.D. in zoology from Oklahoma State University. His research interests include using molecular techniques to investigate questions relating to genetics, phylogeography, molecular ecology, and systematics in an array of organisms, especially mammals. He is particularly interested in how heterogeneous landscapes impact contemporary genetic structure of extant populations. Currently, Dr. Wilson is the Assistant Vice President, Office of Research and Grants and a Full Professor in the Biology Department.

University of Oklahoma

Susan Walden, Ph.D., 405-325-7407, susan.walden@ou.edu

Dr. Walden received her BS in chemistry from Arkansas State University and a MS and Ph.D. in computational organic chemistry from the University of Oklahoma. She is currently the director of the Research Institute for STEM Education (RISE) in the College of Engineering at OU and the Director of the Office of Undergraduate Research in the Vice President for Research Office. Dr. Walden's research uses primarily qualitative methods to study how the complex milieu of factors such as faculty cultural competency, institutional policies, and academic cultures intersect with students' race, ethnicity, socio-economic background, and cultural capital to contribute to students' academic experiences and eventual success in STEM majors.

University of Tulsa

J. C. Diaz, Ph.D., 918-631-2228, diaz@utulsa.edu

Dr. Diaz has a BS in mathematics from Universidad de los Andes and a MA and Ph.D. from Rice University. His research interests include human computer interaction, informational technology, and robotics. One of Dr. Diaz's accomplishments is a yearly summer robotics workshop for high school students for which OK-LSAMP Scholars from the University of Tulsa have served as mentors.

BRIDGE to the DOCTORATE

There are many causes for celebration for the OK-LSAMP BD Fellows.

Tomica Blocker, OSU BD Fellow, completed her Zoology Ph.D. in May 2016. She will continue her education in the M.D. program at Kansas Medical School. Tomica also had an article published in the National Geographic magazine in September 2015. Her article, "When Single Male Rodents Settle Down, They're Changed Forever", can be found at: http://news.nationalgeographic.com/2015/09/150903-prairie-voles-sex-love-animals-science/

Cara Cowan Watts, OSU BD, completed her Biosystems Engineering and Environmental Sciences Ph.D. in December 2015.

Zach Dunn, OU BD Fellow, completed his Electrical Engineering Ph.D. in May 2016.

Shelby Fraser, OSU BD Fellow, completed M.S. Degree requirements in Natural Resources, Ecology, and Management in July 2016. She received third place for her oral presentation in biological sciences at the 2016 OSU Research Week, received The People's Choice Award at the Entomology And Plant Pathology Graduate Student Association (EPPGSA) Research Symposium at OSU. She was named by her department Outstanding Master's Student in Leadership and Service, and received the MICAH scholarship for research and work with the elderly. She has been accepted to Ph.D. program at the University of Washington to conduct research on wolves.

Jonathan Gonzales, BD Fellow, is the Principal Investigator to an NSF grant for Small Business Innovation Research (SBIR).

Jacob Henderson, OU BD Fellow, completed his Electrical Engineering Ph.D. in May 2016.

Bill Jones, OSU BD Fellow, completed his M.S. Degree in Plant and Soil Sciences and accepted a position with Anheuser Busch in Fargo, North Dakota.

Daron "DJ" Lamkin, BD Fellow, is the CEO *Class Matters*, a non-profit organization aimed at increasing STEM among high school students in the Oklahoma City area.

Milecia Matthews, OSU BD Fellow, completed her M.S. Degree in Mechanical and Aerospace Engineering. She has accepted a position at Miratech Corporation in Tulsa.

Nicole Bryant Parker, BD Fellow, presented at the 2015 Arabidopsis International Conference, England.

Danielle Perryman, OSU BD Fellow, attended the 2016 Emerging Researchers National Conference in STEM on February 25-27, 2016 in Washington, DC.

Cody Pinkerman, OSU BD Fellow, completed his Aerospace Engineering Ph.D. in May 2016.

Joe Ross, OSU BD Fellow and former ECU LSAMP scholar, completed his M.S. Degree in Physics and accepted employment in Madison, WI as a Nuclear Engineer/Radioactive Materials Inspector for the state. He and his wife are expecting their first child in early 2017.

Allison Sherier, OSU BD Fellow, completed her M.S. Degree in Forensic Sciences at OSU Center for Health Sciences and has been accepted to a Ph.D. program at the University of North Texas.

David Supeck, completed Ph.D. requirements in July 2016.

Liz Zehren, OSU BD Fellow in Physics, completed the Dosimetry Certification program at the University of Texas in San Antonio. She has accepted a position at St. Francis Hospital in Tulsa.

Tomica Blocker

Cara Cowen Watts

Zach Dunn

Shelby Fraser

Jonathan Gonzales

DJ Lamkin

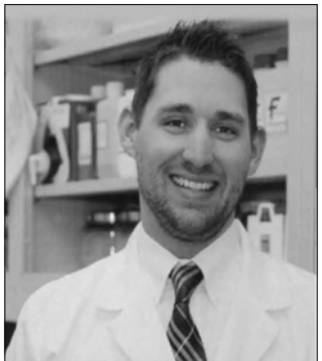
Milecia Matthews

Nicole Bryant Parker

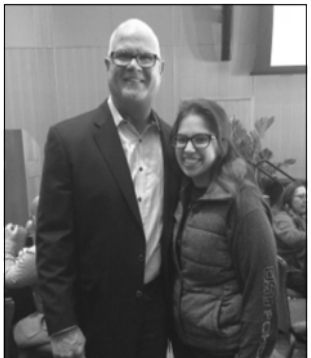
Danielle Perryman

Cody Pinkerman

Joe Ross



David Supeck



Liz with Jim Morris

Allie Sherier

ORAL PRESENTATIONS

Listed Alphabetically

First Name	Last Name	University	Discipline	Time	Room #
Alicia	Aguilar	OSU	Chemical Engineering/Biochemistry & Molecular Biology	1:00-1:15	348
Charles	Bales	TU	Electrical Engineering	1:00-1:15	108
Harwinder	Birdi	OSU	Management Information Systems	1:20-1:35	108
Cody	Brown	TU	Biological Science	1:40-1:55	246
Bradly	Burke	SWOSU	Microbiology	1:00-1:15	246
Mary	Catlett	OSU	Physics and Mathematics	2:00-2:15	348
Maranda	Clymer	ECU	Physics	1:40-1:55	348
Maya	Dunlap	TU	Mechanical Engineering	2:00-2:15	108
Victor	Ekehchiadi	OSU	Biochemistry	2:00-2:15	246
Michaela	Flonard	TU	Biology	1:40-1:55	207
LaQuan	Johnson	LU	Biology	2:00-2:15	207
Armond	Kelley	TU	Electrical and Computer Engineering	1:40-1:55	108
Kylee	O'Dell	ECU	Physics	1:20-1:35	348
Susan	Pham	OSU	Chemistry	1:00-1:15	207
William	Starr	OSU	Microbiology	1:20-1:35	246
Gabrielle	Williams	LU	Chemistry	1:20-1:35	207

ORAL PRESENTATIONS

Listed by Room Number

First Name	Last Name	University	Discipline	Time	Room #
Charles	Bales	TU	Electrical Engineering	1:00-1:15	108
Harwinder	Birdi	OSU	Management Information Systems	1:20-1:35	108
Armond	Kelley	TU	Electrical and Computer Engineering	1:40-1:55	108
Maya	Dunlap	TU	Mechanical Engineering	2:00-2:15	108
Susan	Pham	OSU	Chemistry	1:00-1:15	207
Gabrielle	Williams	LU	Chemistry	1:20-1:35	207
Michaela	Flonard	TU	Biology	1:40-1:55	207
LaQuan	Johnson	LU	Biology	2:00-2:15	207
Bradly	Burke	SWOSU	Microbiology	1:00-1:15	246
William	Starr	OSU	Microbiology	1:20-1:35	246
Cody	Brown	TU	Biological Science	1:40-1:55	246
Victor	Ekehchiadi	OSU	Biochemistry	2:00-2:15	246
Alicia	Aguilar	OSU	Chemical Engineering/Biochemistry & Molecular Biology	1:00-1:15	348
Kylee	O'Dell	ECU	Physics	1:20-1:35	348
Maranda	Clymer	ECU	Physics	1:40-1:55	348
Mary	Catlett	OSU	Physics and Mathematics	2:00-2:15	348

ORAL PRESENTATION ABSTRACTS

Room 108
1:00-1:15

CYBER-SECURITY MAPPING OF A RESEARCH NUCLEAR REACTOR

Author(s): Casey Strong, Will Nichols, Zac Hill, **Charles Bales**
University of Scholar: University of Tulsa
Location of Research: Washington State University and University of Tulsa
Funding: Department of Energy (DOE)
Mentor(s): Dr. Peter Hawrylak, Dr. Mauricio Papa, Dr. John Hale

This project focuses on the development of a communication network model for a nuclear research reactor (e.g., on a university campus). Nuclear research reactors are generally controlled by analog instrumentation and control systems with a point-to- point connection between the control or indicator gauge and the control mechanism (e.g., a valve) or sensor. Modern instrumentation and control systems are built using digital components and shared access networking mediums (e.g., Ethernet) and no longer have a direct connection between the control system and the instrumentation panel (i.e., the data may flow over a shared access network). The switch from analog to digital instrumentation and control systems must be evaluated from a cyber-security standpoint to determine how to secure these systems in a nuclear research reactor. This project will focus on the implementation of a system model using the networking simulator IMUNES and extraction of key operating parameters. This work is part of a DOE funded research project addressing this question. Currently an IMUNES model of the temperature control monitoring system and a skeleton of the SCRAM (emergency shutdown) control circuitry has been developed. This TURC project will extend the model by adding other control systems to the model (e.g., the Log Power Channel system). The current model uses Java programs to control the operation of each component. Part of the research will include learning Java, discrete event simulation basics, and Java network programming. The other aspect of this TURC project will be to identify the cyber and physical assets in the nuclear research reactor's instrumentation and control system and to document their interconnection. This will enable the security modeling tool known as attack graphs to be generated for the nuclear research reactor instrumentation and control system. The design of our partner's (Washington State University) nuclear research reactor will be used.

Room 108
1:20-1:35

UNDERGRADUATE RESEARCH ON DATA BREACH

Author(s): **Harwinder Birdi** and Bryan Hammer
University of Scholar: Oklahoma State University, Stillwater, OK, USA Location of Research: Oklahoma State University, Stillwater, OK, USA Funding: OK-LSAMP
Mentor(s): Bryan Hammer, Oklahoma State University

The purpose of this research is to measure the impact corporate data breaches have on social media. We research companies that experienced a data breach between 2005 to 2014. The importance of this research is to see how many people find news or hear about these data breaches through social media. In particular, we focus on communication through Twitter. To gather tweets about each company and the data breaches, a text mining software package was used in conjunction with a program written in the programming language C#. After gathering the tweets, process the text. This research is all about finding the impact of news on social networks.

Room 108
1:40-1:55

EMBEDDED SYSTEM DEVELOPMENT FOR THE HYDROSENSE WIRELESS FLOW METER

Author: **Armond Kelley**
University of Scholar: University of Tulsa, Tulsa, Oklahoma, USA
Location of Research: University of Tulsa, Tulsa, Oklahoma, USA
Funding: OK-LSAMP, NSF, TU Stem-Up
Mentor: Dr. Peter Hawrylak, University of Tulsa

Water is an important resource that is becoming scarce is several regions. I aim to develop a device that encourages water conservation. This device will be used to monitor the amount of water used in hotel showers, and show guests the amount of water they use. This research project was focused on developing the HydroSense device. An Arduino was used to send the amount of water to a server that hosted a database. I created a procedure for setting up the device. Much time was spent examining different means of communication between the embedded systems device and a server: a MySQL connector library, UDP, and TCP. Problems connecting to the server using the connector software and UDP were not present while using TCP communication, so TCP was chosen as the best method for the constraints of the project. I used it to establish a flow of data between the Arduino and a database. There is still more work to be done to finish development of the HydroSense Wireless Flow Meter.

Room 108
2:00-2:15

CLOCK MECHANISM PROTOTYPE DESIGNING

Author: **Maya Dunlap**
University of Scholar: University of Tulsa
Location of Research: University of Tulsa, Tulsa, Oklahoma, USA
Mentor: Dr. Steven Tipton, PhD, University of Tulsa

For centuries, people have constructed clocks using gear trains powered by pendulums. Although the mechanics of these gear trains are well known, they must be designed and assembled with the utmost precision to function remotely accurately. Along with the internal mechanisms of the clock, the design of the pendulum and anchor escapement, the mechanisms which govern the rate energy from a weight is transferred to the gears, is crucial to accurate clock-making. The arc angle, the length of the rod, the weight of the bob, and the shape of the bob all affect the pendulum's period.

These factors can be adjusted as the clock is being built so that the period of the clock is close to two seconds, but the air resistance acting upon the bob causes the bob to become increasingly inaccurate over time. The effects of the drag forces on the bob result mainly from the shape of the bob. This research focused on how bobs of various shape but equal mass affected the accuracy of a pendulum based clock. The information on gear trains and aerodynamic properties of various shapes were collected and used to begin building a large clock model, where the bob for the pendulum can be replaced. For each bob shape examined in the design stage, the clock will be run for an extended period of time simultaneously with a digital timer. After this period, the time passed in accordance to the pendulum clock will be compared to the time passed by the timer and the time difference between them will be analyzed to confirm which bob shape allows for the most exact timekeeping.

Room 207
1:00-1:15

THE SYNTHESIS OF CARBOXYLIC-ACID DERIVED CARBON QUANTUM DOTS AND THEIR BACTERIAL TOXICITY

Author(s): **Susan N. Pham**, Bo Zhi, Christy L. Haynes*
University of Scholar: Oklahoma State University, Stillwater, OK
Location of Research: University of Minnesota–Twin Cities, Minneapolis, MN, USA
Funding: OK-LSAMP, NSF, Center for Sustainable Nanotechnology
Mentor(s): Bo Zhi, Dr. Christy Haynes, University of Minnesota – Twin Cities

Quantum dots are nanoscopic materials that have valuable, defined fluorescent characteristics that are tunable through size variations. However, these moieties are largely composed of heavy metal sources such as cadmium; these chemicals are intrinsically harmful to the environment. Because of that, researchers have used alternative sources to synthesize these quantum dots. Carbon quantum dots (CQDs) are a valuable alternative source to synthesize quantum dots. Because of their carbon backbone, they would ensue less mining damage (since we can derive it from plant-based materials, such as citric acid), and thought to be bio-compatible. They also show similar fluorescent qualities with high quantum yields. Because of that, they have seen use in chemical sensing of trace chemicals (including heavy metals), fluorescent probes, and photocatalysts. We are interested in understanding the toxicity of various carbon quantum dots at the level of microorganisms. We synthesized carbon quantum dots from different carboxylic-acid precursors such as citric acid and aconitic acid with varying crosslinkers such as ethylene diamine and amino acids. The UV-vis and fluorescence of these materials were analyzed and showed very defining, blue-emitting fluorescence. Preliminary toxicity tests showed that the aconitic acid derived carbon dots were non-toxic to *Shewenella oneidensis.* The morphology and sizes of the dots are currently under investigation.

Room 207
1:20-1:35

ASSESSING DEFECTS IN MITOSIS THROUGH COMPOUND INHIBITION OF MCAK BY IMMUNOFLUORESCENCE MICROSCOPY

Author: **Gabrielle G. Williams**
University of Scholar: Langston University, Langston, OK, USA
Location of Research: Indiana University, Bloomington, IN, USA
Mentors: Stefan J. Husted and Dr. Claire E. Walczak

A Mitotic Centromere Associated Kinesin (MCAK) is a vital protein that aides in proper chromosomal segregation during mitosis. A HeLa cell line was treated

Room 207
1:40-1:55

TRACKING SPONTANEOUS HAIR CELL REGENERATION IN WILD-TYPE MICE
Authors: **Michaela Flonard**
University of Scholar: The University of Tulsa
Location of Research: The Jackson Laboratory, Bar Harbor, ME, USA
Funding: National Science Foundation (NSF)
Mentor: Basile Tarchini, The Jackson Laboratory

Hair cells (HCs) of the inner ear are the basis for auditory and vestibular functioning, but are easily damaged. In adult mammals, hair cells do not regrow after damage, leading to hearing loss. Recent research demonstrates regeneration of hair cells in the auditory system can occur in postnatal mice for several days after birth. Genetic background may influence regeneration capacity, so studying regeneration in several strains could create to a better understanding of what genes and pathway underlying restoration. While HC regeneration has been identified in transgenic neonates, demonstrating regrowth in wild-type, non-transgenic mice required a new research protocol. I developed a protocol to distinguish between new, regenerated HCs and HC that survived injury in wildtype mice. This protocol can be extended to multiple inbred strains to allow for comparison. If there is variability across lines, then genome-wide profiling could reveal genes or pathways that affect the regeneration process.

Room 207
2:00-2:15

UNDERSTANDING MICRORNA STRAND SELECTION USING CRISPR/CAS9 GENOME EDITING IN *CAENORHABDITIS ELEGANS*.
Author(s): **LaQuan Johnson**
University of Scholar: Langston University, Langston, OK, USA
Location of Research: Kansas State University, Manhattan, KS, USA
Funding: The Summer Undergraduate Research Opportunity Program (SUROP) and K-INBRE
Mentor: Dr. Anna Zinovyeva, Kansas State University

We know that microRNA are important regulators of gene expression. Since they regulate the expression of many genes they play important roles of many diseases. This research has the potential of affecting many people because this can lead to cancer therapies that involve microRNAs. In the Zinovyeva lab we investigated the biogenesis of microRNAs, specifically how one strand is selected. In my project I used the CRISPR/Cas9 genome editing technique to switch sequences of two different microRNA strands within each other. Then we used PCR and electrophoresis to verify for the correct DNA recombinant. Although it was a successful summer there is still much more work to do.

Room 246
1:00-1:15

THE ROLE AND FUNCTION OF THE IMMUNOREGULATORY MOLECULE TIGIT DURING EXPERIMENTAL MALARIA
Author(s): **Bradly Burke**, Amy C. Graham, Noah S. Butler
University of Scholar: Southwestern Oklahoma State University
Location of Research: University of Oklahoma Health Sciences Center
Funding: OK-INBRE

Mentor(s): Dr. Noah S. Butler

Introduction: Clinical malaria, caused by the obligate intracellular protozoan parasite *Plasmodium*, remains a global health concern. T and B cells are crucial for immune-mediated resistance against *Plasmodium* infection; so understanding mechanisms that regulate these cells is essential. The T cell immunoreceptor with Ig and ITIM domains, also known as TIGIT, is an immuno-inhibitory molecule expressed on T and NK cells. Studies in cancer and autoimmune models demonstrated that TIGIT suppresses T cell activity and proliferation. Previously, this laboratory has shown that TIGIT is expressed on $CD4^+$ T cells during experimental malaria. However, whether TIGIT regulates CD4 T cell activity during malaria is not known. **We hypothesized that disrupting TIGIT during malaria will improve immune responses and parasite control. Methods:** We generated mixed bone chimeric mice that lack TIGIT on T cells, blocked TIGIT in wild-type mice with anti-TIGIT antibodies, and performed adaptive transfer of TIGIT knockout T cells to test our hypothesis. Antibody ELISA assays, parasitemia, T cell activation, and flow cytometry assays were used to compare the various test groups to the control groups. **Results:** One of the two genetic approaches supports that TIGIT restricts CD4 T cell function and parasite control during experimental malaria. Investigation into whether CD4 T cell expression of TIGIT regulates antibody secretion following adoptive transfer of WT versus $TIGIT^{-/-}$ CD4 T cells is warranted. **Conclusion:** Adoptive transfer studies suggest that TIGIT may play an important role in regulating parasite clearance during experiential malaria. Efficiency of BM engraftment was only 50% and the *in vivo* efficacy of blocking antibodies could not be verified in these initial pilot studies. Thus, repeat experiments are in progress.

Room 246
1:20-1:35

ANTIBIOTIC RESISTANCE OF *PSEUDOMONAS AERUGINOSA* RECOVERED FROM VARIOUS CYSTIC FIBROSIS PATIENT AGE GROUPS

Author(s): **William Starr**, Rawan Eleshy, Dr. Erika Lutter
University of Scholar: Oklahoma State University, Stillwater, Oklahoma, USA
Location of Research: Oklahoma State University, Stillwater, Oklahoma, USA
Funding: the National Institute for Health (NIH) and Niblack Scholar Foundation
Mentor(s): Dr. Erika Lutter and Rawan Eleshy

Cystic Fibrous (CF) patients produce dehydrated thick mucus in their lungs and lack the ability to clear this mucus due to mutations in the cystic fibrosis transmembrane conductance regulator gene (CFTR gene). The mucus provides an optimal environment for bacterial infections. It is reported that *P. aeruginosa* infects up to 50% of children and 80% of adults with CF. Once the infection has been acquired, eradication of *P. aeruginosa* from the CF lung is rare. *P. aeruginosa* is naturally resistant to many antibiotics and acquires antibiotic resistance during the infection process. This study aims to determine resistance profiles of *P. aeruginosa* clinical isolates from patients of various ages. Kirby-Bauer tests were performed on 54 isolates using six different antibiotics which represent three different antibiotic classes. To determine if resistance was due to genetic factors genomic DNA was extracted from the CF isolates and PCR was performed to verify the presence of eight antibiotic resistance genes. The results showed that all of the isolates had resistance to at least one of the six antibiotics; however, not all of isolates showed the presence antibiotic resistance genes by PCR. The study also found that isolates from younger patients were less resistant when compared to the older patients' isolates. By understanding antibiotic resistance of *P. aeruginosa* from CF patients regards to the mechanisms in which this resistance is acquired ,

treatment options for CF patients can be more specialized and targeted based on age, infection type, and susceptibility or resistance to certain antibiotics.

Room 246
1:40-1:55

DETECTION OF VIRUSES IN WHEAT CROPS OF OKLAHOMA

Author: **Cody Brown**
University of Scholar: The University of Tulsa, Tulsa, OK, USA
Location of Research: The University of Tulsa, Tulsa, OK, USA
Funding OK-LSAMP (NSF) and TURC
Mentor: Dr. Akhtar Ali, The University of Tulsa

Wheat is one of the most important grain crops worldwide. In Oklahoma, wheat is grown on approximately six million acres and is the leading cash crop. Wheat contributes more than 616 million dollar to the state's economy. Wheat is infected by a number of viral diseases. Plant viruses are economically important pathogens and cause significant losses in many agricultural crops worldwide. The purpose of this project is to detect viruses in wheat crops of Oklahoma using DIBA and Virus-like Particle purification. The goals of this project are to determine what virus occurs most commonly in wheat crops in Oklahoma and to determine if there is statistically significant comorbidity of these viruses. Funding for this project was provided by OK-LSAMP (NSF) and TURC.

Room 246
2:00-2:15

DEVELOPMENT OF AN IN-VITRO FRET INHIBITORY ASSAY FOR THE COILED-COIL INTERACTION BETWEEN MBD2CC AND P66ACR1.

Author: **VICTOR EKEHCHIADI**
University of Scholar: Oklahoma State University
Location of Research: University of North Carolina, Chapel Hill, North Carolina, United states.
Funding: Ok-LSAMP, Biophysical Society, National Institute of Health, National science Foundation.
Mentor(s): David C. Williams, Jr. MD, PhD.

The Nucleosome Remodeling and Deacetylase (NuRD) complex plays a critical role in the methylation dependent gene silencing, and a small coiled-coil interaction is critical for it's function. The coiled-coil interaction between the p66α and MBD2 proteins is responsible for the recruitment of a chromatin modeling protein (CHD4), which is responsible for the formation and function of the NuRD complex. Developing selective inhibitors would help us understand this role and possibly lead to a novel therapeutic for sickle cell. We have shown that a small peptide inhibitor can block the recruitment of CHD4, by inhibiting the p66α-MBD2 interaction. This inhibition prevents the silencing of ϒ-globin and activation of β-globin, there by preventing β-type globin disorder such as sickle cell anemia. Hence we would like to establish a FRET based assay for *in vitro* screening and characterization of potential inhibitors. This assay is based on appropriately pairing of the fluorophores to optimize the energy transfer, for whom we used eGFP and TAMRA.

Room 348
1:00-1:15

JMJD3 Binding Sites Interact with Promoter Regions in Naïve CD4$^+$ T Cell Activation

Author(s): **Alicia Aguilar**[1], Xiangzhi Meng[2], Nicole Riley[2], Siddhartha Sharma[2], Daniel R. Salomon[2]
[1]University of Scholar: Oklahoma State University, Stillwater, OK, USA, 92122
[2]Location of Research: The Scripps Research Institute, La Jolla, CA, USA, 92122
Funding: The National Science Foundation (NSF), The Scripps Research Institute (TSRI), Oklahoma Louis Stokes Alliance for Minority Participation (OK-LSAMP), and Niblack Research Scholars
Mentor(s): Dr. Dan Salomon, The Scripps Research Institute

CD4$^+$ T-cells are an important component for adaptive immunity and most of the immune functions of these CD4$^+$ T-cells require its activation, in which a whole gene expression network downstream T-Cell Receptor (TCR) and co-receptor stimulation is highly-precisely regulated. It has been shown that epigenetic changes are highly involved in transcriptional regulation after T-cell activation. One of the epigenetic modifiers that have been identified is JMJD3, a histone demethylase that removes the trimethyl group from histone H3 lysine 27 (H3K27me3) and serves as an activator for gene expression in general. Our previous work demonstrates that JMJD3 promotes cell proliferation in activated T-cells by regulating the RNA expression of MYC and CDK6. Also, by ChIP-seq, JMJD3 binding sites are identified at distal or intronic regions around MYC or CDK6, some of which overlap with transcription regulatory element markers, such as H3K27ac, H3K4me1or Dnase hypersensitivity sites. However, the exact mechanisms of how JMJD3 regulates the expression of these genes by binding at non-promoter regions remain unknown. It is hypothesized that JMJD3 binds at putative enhancer sites for the genes of MYC and CDK6 and loops back to the respective promoter sites to regulate transcription. Using the method of chromosome conformation capture (3C), the interactions between the binding sites were studied. The results indicate that JMJD3 binding sites interact together to allow the demethylation of H3K27me3 at distal putative enhancer regions of MYC and CDK6 that loop back to respective promoter regions. These results indicate a potential mechanism of how histone demethylase JMJD3 regulates target genes. However, further study is needed to determine how JMJD3 is recruited to these sites and forms chromosome loops.

Room 348
1:20-1:35

ADAPTIVE BIOLOGICAL MICROSCOPE

Authors: **Kylee O'Dell,** William Shain, Thomas Bifano
University of Scholar: East Central University
Location of Research: Boston University, Boston, MA USA
Funding: National Science Foundation (NSF)
Mentor: William Shain, Boston University

Our eyes are a window into our body. By viewing cells and blood vessels located on the retina, doctors can diagnose diseases such as diabetes and glaucoma early on.1 Due to aberrations of the eye, light becomes distorted, making it difficult to image the back of the eye.2 Retinal imaging technology using deformable mirrors currently exists, although these mirrors are not cost effective. Liquid lenses could provide an alternative to deformable mirrors as they are much more affordable. Using a liquid lens to correct for low order aberrations could significantly cut the cost of these systems, making it a more practical investment and leading to early diagnoses of more

patients. We tested the ability of a liquid lens to correct the defocus aberration in an optical system and found that a liquid lens is effective in correcting the defocus produced by lenses with as short as a 200 mm focal length. We hope that this information could lead to improvements in retinal imaging technology.

Room 348
1:40-1:55

HERMITE POLYNOMIALS IN *n*-DIMENSIONS

Author(s): **Maranda Clymer**
University of Scholar: East Central University, Ada, OK, USA
Location of Research: East Central University, Ada, OK, USA
Funding: the National Science Foundation grant (#DMS1148695) through the Center for Undergraduate Research in Mathematics (CURM), Brigham Young University, and sponsors
Mentor(s): Dr. Nicholas Jacob, East Central University

We investigate the *n*-dimensional Hermite polynomials. Beginning with the general multivariate normal, we will build the most general Hermite Polynomials. This process starts by taking partial derivatives. Once we have taken partial derivatives, we are able to define the Hermite polynomials. Then, we are able to calculate for different values of *n*. If we take *n* partial derivatives, we then get one entry for an n-tensor. We examine multiple properties of the polynomials, such as their orthogonality and symmetry. Finally, we restrict the Hermite polynomials to one-dimension. With the assumption of mean zero and standard deviation one, we recover the traditional Hermite Polynomials.

Room 348
2:00-2:15

FINDING QUANTUM YIELD OF MELANIN-LIKE MOLECULES

Author(s): **Mary L. Catlett**, Shuo Dai, Cosmo Binegar, and Dr. Mario F. Borunda
University of Scholar: Oklahoma State University, Stillwater, OK, USA
Location of Research: Oklahoma State University, Stillwater, OK, USA
Funding: OK-LSAMP
Mentor: Dr. Mario F. Borunda, Oklahoma State University

Biomemic melanin molecules could make ideal organic photovoltaic devices due to their inexpensive manufacturing process and semi-conductive properties. Finding ideal melanin-like molecules with Power Conversion Efficiencies (PCEs) to compete with silicon is too large a problem to approach only with experimental data. However, a computational tool to filter potential photovoltaic candidates for melanin-like molecules does not exist. This study will derive a quantum yield (QY) specific to the melanin class of molecules. We will also investigate the accuracy of this calculated QY in predicting melanin experimental PCEs in comparison to the generalized Scharber Model. To conduct this study, first a two stages of geometry optimizations are conducted on 32 candidate molecules derived from experimental literature. In the initial stage, optimized molecular coordinates from molecular dynamics are generated with Avogadro. Next, these coordinates are processed using geometry optimization calculations with Least Density Approximation (LDA) Density Functional Theory (DFT). Second, the optical absorption spectrum was calculated for each molecule using Time Dependent (TD) DFT. All DFT calculations for this study were conducted using the Octopus software suite with high performance computing hardware. The overlap between the calculated absorption spectrum for each molecule and solar spectrum will be used to calculate an approximate quantum yield for melanin. When compared to the Scharber Model, results are predicted to show that our calculated QY can predict experimental melanin PCE's more accurately. The calculated melanin QY from this study will contribute to efforts to find organic photovoltaic molecules.

POSTER PRESENTATIONS AT A GLANCE

Non-Life Sciences

First Name	Last Name	University	Discipline	Poster #
Akanimoh	Adeleye	OU	Computer Engineering	33
Alicia	Aguilar	OSU	Chemical Engineering/Biochemistry and Molecular Biology	28
Mary	Catlett	OSU	Physics and Mathematics	32
Aaron	Dolan	OSU - Tulsa	Mechanical Engineering	38
Halina	Garraway	LU	Mathematics	27
Kichelle	Henderson	LU	Mathematics	35
Mary	Ozor	UCO	Computer Science	37
Cameron	Patterson	OSU	Architecture	36
Jordan	Sosa	TU	Engineering Physics	25
Tekenari	Tienabeso	OU	Organic Chemistry	34
Chase	Tillar	ECU	Physics	29
Alfredo	Velasco II	TU	Computer Science	26
Nikolas	Wagner	UCO	Engineering Physics-Mechanical Engineering	30
Danielle	Wright	LU	Chemistry	31
Travis	Young	NSU	Chemistry	39

Life Sciences

First Name	Last Name	University	Discipline	Poster #
Alfa	Abame	SWOSU	Biology	21
Julian	Allen	CU	Organismal Biology	4
Mira	Bakine	LU	Biology	2
Suzi	Barboza-Pacheco	OSU	Biochemistry and Molecular Biology	8
Bradly	Burke	SWOSU	Microbiology	3
Sharonda	Carson	UCO	Biology	23
Melissa	Chanderban	OU	Microbiology	24
Mang	Chang	OSU	Microbiology	10
Victor	Ekehchiadi	OSU	Biochemistry	5
Jordan	Fleming	OSU	Microbiology	14
Tabitha	Gunnars	OSU	Zoology	17
Lensy	Hardy	LU	Biology	6
Daniel	Hayden	OU	Plant Biology	11
Daniel	Henthorn	OSU	Biochemistry and Molecular Biology	12
Allison	Joines	SEOSU	Biology	9
Matt	Maxwell	SEOSU	Cancer Biology	22
Khianta	Moore	LU	Biology	19
Anika	Nahar	OU	Biology	20
Dalton	Pannell	NWOSU	Biochemistry	1
Joana	Pantoja	UCO	Biology	13
Rendi	Rogers	OSU	Microbiology and Molecular Genetics	16
Nicholas	Simon, Jr.	LU	Biology	15
William	Starr	OSU	Microbiology	7
Jesse	Velasco	SWOSU	Biology	18

POSTER PRESENTATION ABSTRACTS

P01

INTRODUCTORY BIOORGANIC STUDY OF FIREFLY LUCIFERASE – AN ENZYME TO DRIVE BIOLUMINESCENCE

Author(s): **Dalton Pannell**, Brady Fields and Yeboah Gyening
University of Scholar: Northwestern Oklahoma State University
Location of research: Northwestern Oklahoma State University, Alva, OK 73717
Funding: OK-LSAMP and OK INBRE
Mentor: Dr. Cornelia Mihai, Northwestern Oklahoma State University

The objective of the proposed research project is to initiate a comprehensive bioorganic study of Firefly luciferase which will consist of: extraction of luciferase from dry firefly lanterns, purification and analysis of luciferase. This introductory study will be used to develop new laboratory experiments which will be incorporated in the Biochemistry laboratory course currently taught in the Department of Natural Sciences at NWOSU.

P02

STRESS HORMONE, NOREPINEPHRINE, A SUPPRESSING FACTOR IN THE GROWTH OF STREPTOCOCCUS PNEUMONIAE

Author: **Mira Bakine**
University: Langston University, Langston, OK USA
Location of Research: University of North Texas Health Science Center, Fort Worth, TX USA
Funding: National Heart Lung and Blood Institute (NHLBI) of the National Institute of Health (NIH) through UNT Summer Multicultural Advanced Research Training (SMART).
Mentor (s): Colette Ngo NDjom (MS), Harlan P. Jones (PhD)

Streptococcus pneumoniae (S. pneumoniae) contributes to the highest morbidity and mortality rates worldwide. In the United States, approximately 4.9 billion dollars in healthcare cost is attributed to pneumococcal disease. *S. pneumoniae* typically resides as a non-pathogenic commensal microbe in the upper respiratory tract. However, translocation of *S. pneumoniae* into the lung and other systemic tissues causes serious infections and even death. Mechanisms promoting the transition of *S. pneumoniae* from its non-pathogenic to pathogenic state remain unresolved. Emerging research suggest that endocrine stress produced by the release of neuropeptides may have direct influences on microbial species and therefore impact their pathogenicity. Norepinephrine (NE) is a major endocrine stress factor found elevated in patients with severe pneumococcal disease. Recent studies have demonstrated that NE stimulates *S. pneumoniae* growth, biofilm formation and virulence gene expression. In contrast, others have

reported NE binding of iron (Fe) inhibits lung epithelial cell adhesion by *S. pneumoniae*. The purpose of the current study was to define the effect of NE as a stimulator or suppressor of *S. pneumonia's* response controlling for Fe. We hypothesize that FE is a determinant of NE's effect on *S. pneumoniae* growth. *S. pneumoniae* strain (#6301) was grown in minimal (M9) and enriched Brain Heart Infusion (BHI) media in the absence or presence of NE and/or Fe(II) Sulfate. Bacterial growth was determined by monitoring absorbance readings taken over 30 minute time intervals using spectrophotometer techniques. Overall, NE suppressed the growth of *S. pneunomiae*. Supplementation with Fe did not enhance the growth of *S. pneunomiae* compared to NE only culture conditions in both minimal M9 and enriched BHI media. Our findings suggest that NE suppresses the growth *S. pneumoniae* independent of Fe. Future studies will delineate how suppression of growth by NE impacts other factors known to mediate its pathogenicity.

P03

THE ROLE AND FUNCTION OF THE IMMUNOREGULATORY MOLECULE TIGIT DURING EXPERIMENTAL MALARIA

Author(s): **Bradly Burke**, Amy C. Graham, Noah S. Butler
University of Scholar: Southwestern Oklahoma State University
Location of Research: University of Oklahoma Health Sciences Center
Funding: OK-INBRE
Mentor(s): Dr. Noah S. Butler

Introduction: Clinical malaria, caused by the obligate intracellular protozoan parasite *Plasmodium*, remains a global health concern. T and B cells are crucial for immune-mediated resistance against *Plasmodium* infection; so understanding mechanisms that regulate these cells is essential. The T cell immunoreceptor with Ig and ITIM domains, also known as TIGIT, is an immuno-inhibitory molecule expressed on T and NK cells. Studies in cancer and autoimmune models demonstrated that TIGIT suppresses T cell activity and proliferation. Previously, this laboratory has shown that TIGIT is expressed on $CD4^+$ T cells during experimental malaria. However, whether TIGIT regulates CD4 T cell activity during malaria is not known. **We hypothesized that disrupting TIGIT during malaria will improve immune responses and parasite control. Methods:** We generated mixed bone chimeric mice that lack TIGIT on T cells, blocked TIGIT in wild-type mice with anti-TIGIT antibodies, and performed adaptive transfer of TIGIT knockout T cells to test our hypothesis. Antibody ELISA assays, parasitemia, T cell activation, and flow cytometry assays were used to compare the various test groups to the control groups. **Results:** One of the two genetic approaches supports that TIGIT restricts CD4 T cell function and parasite control during experimental malaria. Investigation into whether CD4 T cell expression of TIGIT regulates antibody secretion following adoptive transfer of WT versus $TIGIT^{-/-}$ CD4 T cells is warranted. **Conclusion:** Adoptive transfer studies suggest that TIGIT may play an important role in regulating parasite clearance during experiential malaria. Efficiency of BM engraftment was only 50% and the *in vivo* efficacy of blocking antibodies could not be verified in these initial pilot studies. Thus, repeat experiments are in progress.

P04

COMPARING NESTING BIOLOGY OF THE CONGENERIC SCISSOR -TAILED FLYCATCHER AND WESTERN KINGBIRD

Author: **Julian Allen**
University of Scholar: Cameron Universuty
Location of Research: Elmer Thomas Park, Lawton, Oklahoma, United States
Mentor: Michael Husak

The congeneric Scissor-tailed Flycatcher (*Tyrannus forficatus*) and Western Kingbird (*T. verticalis*) have overlapping breeding distributions in the south-central plains states of the U.S. While they tend to occupy different habitats for nesting in natural settings, they commonly breed sympatrically in urban environments where they may compete for nesting sites. To date, no study has compared breeding success or nest site characteristics for these two species in urban habitats where both species occur. During 2013, 2015, and 2016 we located and recorded confirmed individual nests of the two species daily at Elmer Thomas Park in Lawton, Oklahoma, a manicured park dominated by mature elm, cottonwood, and soapberry trees, using a GPS system. In 2015, microhabitat site data was collected, and in 2016 the status of each nest with regard to presence of eggs and chicks was recorded in an Excel spreadsheet every two to three days. All active, inactive, and productive nests were recorded in an Excel spreadsheet to be used for data compilation. All variables were compared between species and among years using ANOVAs in program SPSS. We will discuss similarity and differences between nesting success and nest site selection between the two species.

P05

PROGRESS TOWARDS THE STUDY OF METAL CHELATING PROPERTIES OF EUMELANIN-INSPIRED SMALL MOLECULES

Author: **VICTOR EKEHCHIADI**
University of Scholar: Oklahoma State University
Location of Research: Oklahoma State University, Stillwater, Oklahoma, United states.
Funding: Ok-LSAMP, Lew Wentz Foundation, National Institute of Health, National science Foundation.
Mentor(s): Dr. Toby Nelson, PhD.

Eumelanin is a type of melanin, which is a pigment that is produced by cells known as melanocytes in the skin of most animals, including humans. This pigment comes in different shades, depending on the genetic make-up of the individual. Melanin comes in two basic forms, and can range from yellowish-red to dark-brown. Eumelanin is the most common form of melanin, and is brownish in color. The purpose of my project was to synthesize Eumelanin inspired small molecules from vanillin, then proceed to binding different metal to the eumelanin inspired core molecule, and observe any structural and property changes that occurred. The purpose for using eumelanin inspired molecules was because of its known light absorbing and electrical properties. We proposed that upon binding of metals, the absorptive property would change due to a change in the structure, and give the molecule new properties. This could be used as a method of sensing metals. The number one objective for my project started with vanillin, using a series of stepwise reactions to synthesize the eumelanin inspired core molecule, which would be used as a method of sensing different metals. The eumelanin inspired core molecule has been synthesized; the next objective is to test the different structural and property changes that will occur by substitutions of different metal groups. The reason for expecting changes in the molecules structure and properties is because of it has well -known light absorbing properties and electrical properties.

P06

EVALUATING SWITCHGRASS GERMPLASM EARLY BIOMASS TRAITS

Authors**: Lensy Hardy,** Vijaya Gopal Kakani Ph.D
University of Scholar: Langston University, Langston, OK USA
Location of Research: Oklahoma State University, Stillwater, OK USA
Funding: National Science Foundation (NSF)
Mentor: Vijaya Gopal Kakani Ph.D

A potential path for increasing soil carbon stocks is the development of crop cultivars that input a greater quantity of carbon in the soil through their roots or grow a deeper root system. Identifying the root traits to be used in a breeding program to rapidly increase switchgrass biomass production is a major problem. There is little information in the literature on the genotypic variability available for root and shoot traits in the switchgrass collection. A total of 175 switchgrass lines were obtained from the USDA-ARS GRIN collection. The 175 germplasm lines were grown in 10" containers for 5 weeks. Significant differences were observed for measured root traits in the switchgrass germplasm. Positive correlation was observed between root volume and root diameter, while a negative correlation was recorded between root volume and root length. The genetic variability identified in this research for root traits can be exploited to deploy rapidly for continuous genetic turnover and active land management in marginal lands. The genotypes with high root growth traits can be used to increase soil carbon sequestration and deliver economic net carbon sink with significant economic potential.

P07

ANTIBIOTIC RESISTANCE OF *PSEUDOMONAS AERUGINOSA* RECOVERED FROM VARIOUS CYSTIC FIBROSIS PATIENT AGE GROUPS

Author(s): **William Starr**, Rawan Eleshy, Dr. Erika Lutter
University of Scholar: Oklahoma State University, Stillwater, Oklahoma, USA
Location of Research: Oklahoma State University, Stillwater, Oklahoma, USA
Funding: the National Institute for Health (NIH) and Niblack Scholar Foundation
Mentor(s): Dr. Erika Lutter and Rawan Eleshy

Cystic Fibrous (CF) patients produce dehydrated thick mucus in their lungs and lack the ability to clear this mucus due to mutations in the cystic fibrosis transmembrane conductance regulator gene (CFTR gene). The mucus provides an optimal environment for bacterial infections. It is reported that *P. aeruginosa* infects up to 50% of children and 80% of adults with CF. Once the infection has been acquired, eradication of *P. aeruginosa* from the CF lung is rare. *P. aeruginosa* is naturally resistant to many antibiotics and acquires antibiotic resistance during the infection process. This study aims to determine resistance profiles of *P. aeruginosa* clinical isolates from patients of various ages. Kirby-Bauer tests were performed on 54 isolates using six different antibiotics which represent three different antibiotic classes. To determine if resistance was due to genetic factors genomic DNA was extracted from the CF isolates and PCR was performed to verify the presence of eight antibiotic resistance genes. The results showed that all of the isolates had resistance to at least one of the six antibiotics; however, not all of isolates showed the presence antibiotic resistance genes by PCR. The study also found that isolates from younger patients were less resistant when compared to the older patients' isolates. By understanding antibiotic resistance of *P. aeruginosa* from CF patients regards to the mechanisms in which this resistance is acquired , treatment options for CF patients can be more specialized and targeted based on age, infection type, and susceptibility or resistance to certain antibiotics.

P08

COMPARING DATABASE MANAGEMENT SYSTEMS IN ORDER TO STORE CASSAVA VARIANT CALL FORMATTED DATA

Author(s): **Suzi Barboza-Pacheco,** Nick Morales, Lukas Mueller
University of Scholar: Oklahoma State University, Stillwater, OK, USA
Location of Research: Boyce Thompson Institute, Ithaca, NY, USA
Funding: Boyce Thompson Institute and the National Science Foundation (NSF)
Mentor(s): Nick Morales, Boyce Thompson Institute. Lukas Mueller, Boyce Thompson Institute.

As faster and cheaper DNA-sequencing technologies develop, so do the challenges of handling the

immense amount of genetic data produced. The challenges for database systems include developing efficient methods to organize data and optimizing performance for storing and retrieving data. The benefits of using a database system to store genetic data include multi-user access, online data distribution, and performance scaling. The overall goal of this project was to compare methodologies for storing and querying the latest set of cassava SNP genotypic data in an efficient manner. We compared PostgreSQL, a relational database management system (DBMS) and MongoDB, a non-relational DBMS, by measuring how quickly each database ran a query. We designed three queries that performed different functions including counting the number of mutations in each accession, counting the number of deletions in each accession, and selecting accessions with specific mutations. We also measured the time it took to run each query on different data storing formats used in PostgreSQL including text, JSON, JSONB, and bytea data formats. Development of the loading scripts and query scripts was an iterative process, where the performance was profiled and tuned using various tools, and further development can continue to improve the system used in this project. Data from next-generation sequencing methods are being produced at a rapid rate from many experiments across the world. Therefore, it is necessary to research different methods to store data and to compare databases especially in the case of genetic data.

P09

BROOD SIZES OF *C. ELEGANS* ARE REDUCED WHEN *E. COLI* EXPRESSING CRY5B ARE USED AS FOOD SOURCE

Author(s): **Allison Joines** and Brad Ludrick
University of Scholar: Southeastern Oklahoma State University
Location of Research: Southeastern Oklahoma State University, Durant, Oklahoma, USA
Funding: OK-LSAMP, OK-INBRE
Mentor(s): Dr. Brad Ludrick, Southeastern Oklahoma State University

In this study we used transformed *Escherichia coli* to produce the pore-forming toxin, Cry5B. Cry5B is a native crystal protein of certain *Bacillus thuringiensis* strains and has been found to be toxic to multiple nematode species, including *C. elegans*. Investigating potential nematicidal effects of such crystal proteins is needed for the development of anthelmintic methods in livestock to combat the increasing resistance to available, approved classes of drugs. *C. elegans* (N2) and transformed *E. coli* (Cry5B+) were cultured according to standard techniques. The approximate concentration of Cry5B within the induced culture was determined to be 42.76 µg/mL by SDS-PAGE with BSA as standard, and densitometry calculations using ImageJ software. Transformed *E. coli* (Cry5B-) without the pore-forming toxin insert was used as the negative control. Using a single-well assay measuring 3-day partial brood size, synchronized L4 individuals (hermaphrodites) were placed in wells containing mixtures of *E. coli* as food source (i.e., prepared ratios of Cry5B+ to Cry5B-). The food-source mixtures were prepared so that each well contained the same amount of total *E. coli*. The following Cry5B+ conditions were investigated: 100.00%, 31.62%, 10.00%, 3.16%, 1.00%, 0.31%, and 0.00%. Five separate individuals were tested for each food-source condition per trial. Individuals were grown for 3 days at RT and brood sizes were counted. Three independent trials of the assay were performed with a total of 105 individuals evaluated. Based upon our results, a very small percentage of *E. coli* that produce the Cry5B toxin (0.41%) were required to reduce the 3-day brood size by 50% relative to the negative control. Further, the brood sizes for all food-source conditions containing *E. coli* that produce the Cry5B toxin were significantly lower ($P < 0.001$) than individuals grown in the absence of *E. coli* that produce the Cry5B toxin.

P10 DEVELOPMENT OF TOOLS FOR *VARIOVORAX* TO UNDERSTAND PLANT-MICROBE INTERACTIONS

Authors: **Mang Chang**, Amber Bible, and Jennifer Morrell-Falvey
University of Scholar: Oklahoma State University, Stillwater, OK, USA
Location of research: Oak Ridge National Laboratory, Oak Ridge, TN, USA
Funding: ORAU-HERE, ORISE, DOE, OK-LSAMP
Mentor: Dr. Jennifer Morrell-Falvey, Oak Ridge National Laboratory

The plant-microbe interface in the soil is a site where complex interactions between plants and microorganisms take place, influencing plant physiology and the soil microbiome. Subsequently, this affects interactions between plants and microbes causing beneficial or pathogenic interactions in the root microbiome. Here, plants communicate through biochemical signals, recruiting bacteria to colonize in the rhizosphere (area around the roots), rhizoplane (surface of the root), and endosphere (inside the root). Then, bacteria compete to colonize or attach to the roots, and promote plant growth. Endophytes are bacteria that colonize the endosphere and are known to have plant growth promoting properties through specific interactions. We aim to develop tools for the gram-negative, genetically tractable bacteria, *Variovorax*, as a model system to understand endophytes. Bacteria in the genus *Variovorax* are catabolically diverse, promote plant growth, and are thought to control pathogenesis. From the Plant-Microbe Interfaces (PMI) strain collection, we have collected 15 strains of *Variovorax* sp. strains isolated from the *Populus* tree endosphere or rhizosphere. This collection includes a complete genome for *Variovorax* sp. CF313 is sequenced, and the remaining strains are in the process of being sequenced. It is pertinent to understand the roles of endophytes in the poplar tree rhizosphere and endosphere. Our goals are to (1) create a transposon mutant library of *Variovorax* sp. CF313 to create random mutants that will allow us to look for unique phenotypes in endophytes, (2) construct fluorescent *Variovorax* strains in order to determine localization in plant root colonization studies, and (3) characterize the *Variovorax* strains' ability to swarm, swim and colonize wheat root. Currently, we are in the process of creating a mutant library of *Variovorax sp.* CF313, have determined that *Variovorax* is generally a slow grower, created 2 fluorescent strains, and determined swarming and swimming ability of the 15 strains.

P11 THE EFFECTS OF FIRE ON ECTOMYCORRHIZAL FUNGI COMMUNITIES OF *PINUS PONDEROSA* IN THE SANTA CATALINA MOUNTAINS

Author(s): **Daniel Hayden**, Liz Bowman, Shuzo Oita
University of Scholar: University of Oklahoma, Norman, OK, USA
Location of Research: University of Arizona, Tucson, AZ, USA
Funding: National Science Foundation (NSF) and Center for Integrated Access Networks (CIAN)
Mentor(s): Dr. Betsy Arnold, Liz Bowman, and Shuzo Oita, University of Arizona School of Plant Sciences

Ectomycorrhizal fungi (EMF) are important components of forest ecosystems providing forest trees with wider access to soil nutrients and water and helping host trees adjust to a number of biotic and abiotic stressors. Wildfires have been shown to have an effect on the abundance and community composition of symbiotic fungal communities in the past. As climate change is expected to increase the intensity and frequency of wildfires across the U.S, it is important to understand how EMF communities are transformed by fire and how long they take to recover. This study aims to answer what effect past large fires in the Santa Catalina Mountains has had on the EMF community. Soil and root samples were taken from two sites that experienced high intensity burns in 2002 and 2003 and compared to previous data collected from

unburned sites with a similar climate and plant community. Soil data showed significant differences in levels of nitrate, sulfate, phosphate and boron between burned and unburned sites. Analyses showed that there was no significant difference in abundance or diversity between burned and unburned sites, however unburned sites did show a higher trend in abundance than burned sites. EMF community structure and taxonomy significantly differed between both sites, revealing that fire had a significant effect on community composition. It is important to understand these trends as it gives better understanding of EMF communities, which play a pivotal role in forest ecosystems, and their changes as a function of environmental change.

P12

Authors: **Daniel Henthorn**, Brianna VanTreeck, and Dr. Roy Parker
University of Scholar: Oklahoma State University, Stillwater, OK, USA
Location of Research: University of Colorado at Boulder
Funding: Howard Hughes Medical Institute—EXROP
Mentors: Dr. Roy Parker, University of Colorado at Boulder

Some neurodegenerative diseases including Amyotrophic lateral sclerosis (ALS) and Frontotemporal Lobar Dementia (FTLD) have been linked to the formation and persistence of stress granules. Stress granules are cytoplasmic assemblies composed of multiple RNAs and proteins and are thought to be important in translation regulation. Although stress granules are important in both the realms of medicine and basic biology, little is known about the formation or function of these granules, and how they are correlated to disease. One protein functioning in stress granule assembly/disassembly is the ATP-dependent DEAD-box helicase, DDX3, which is also required in Hepatitis C Virus and HIV infection. Interestingly, expression of a mutated form of the yeast ortholog, Ded1, containing a small deletion near the ATPase domain results in large constitutive granules. Currently the composition and function of these granules is unknown. The composition of these granules is to be studied using a new technique that allows semi-purification of stress granules and subsequent analysis with mass spectroscopy. This is important because it gives insight into the basic biological function of stress granules, as well as having medical significance. Furthermore, by understanding how the composition of stress granules changes in different conditions, one can have further insight into the handful of disorders associated with them.

P13

CAFFEINE INHIBITS DUPUYTREN'S FIBROBLAST FORM AND FUNCTION IN VITRO

Author(s): **Joana C. Pantoja**, Matthew Bryson, Niyaf Alkadhem Ph. D., and Melville B. Vaughan, Ph. D.
University of Scholar: University of Central Oklahoma, Edmond, OK
Location of Research: University of Central Oklahoma, Edmond, OK
Funding: University of Central Oklahoma Office of Research and Grants, Louis Stokes Oklahoma Alliance for Minority Participation (LS-OKAMP), and Fulbright Visiting Scholars Program
Mentor(s): Melville B. Vaughan, Ph. D., Department of Biology, University of Central Oklahoma, Edmond, OK and Center for Interdisciplinary Biomedical Education and Research, UCO

Myofibroblasts are contractile, secretory cells of wound healing, fibroses, and contractures. Recently caffeine was shown to reduce fibrotic conditions in rodents. Our goal was to determine caffeine's effect on Dupuytren's contracture cells in vitro. We cultured fibroblasts in four different experimental models for 5 days. Replicate cultures were treated with 5mM caffeine using a coverslip assay. Immunostaining results showed that caffeine reduced proliferation and alpha-smooth muscle actin. Stress fibers were present in both treated and untreated groups, suggesting the cells would be contractile. Fibroblasts plated in stress-relaxed collagen lattices failed to generate any tension (3 cell types, n=4 each). We then cultured collagen lattices for 3 days to allow tension generation, followed by caffeine treatment. Caffeine failed to inhibit

contraction under these conditions (n=4). Fibroblasts remodel and compress collagen using migration-like tractional forces. We predicted that caffeine would inhibit cell migration. Using two different migration assays we determined that 5mM caffeine inhibited migration. Therefore caffeine likely affects cellular pathways related to migration rather than contraction or tension generation. This suggests that treating already-existing fibrotic conditions with caffeine will be more challenging than preventing future occurrences.

P14 YEAST-TWO HYBRID ANALYSIS OF *CHLAMYDIA TRACHOMATIS* TYPE III SECRETED EFFECTOR PROTEINS

Authors: **Jordan Fleming**, Amanda Behar, and Erika Lutter
University of Scholar: Oklahoma State University, Stillwater, OK, USA
University of Research: Oklahoma State University, Stillwater, OK, USA
Funding: National Institute of Health (NIH), Lew Wentz Foundation
Mentor: Dr. Erika Lutter, Oklahoma State University

Chlamydia trachomatis is a very well-known sexually transmitted infection that affects millions of people on an annual basis. As an obligate intracellular pathogen it requires the host cell for survival and usurps host cell resources. After *Chlamydia* gains entry into the host cell it begins to secrete proteins, called effector proteins, through a type III secretion system that interacts with yet undetermined host cell proteins. Some of these proteins will insert themselves into the inclusion membrane, while others will be secreted into the host cell milieu. To date, little is known about what these secreted effectors do and what host proteins they interact with during an infection. To help determine the role of these secreted effectors, the corresponding Chlamydial genes were cloned into Yeast-two-hybrid bait vectors, transformed into yeast and screened against a HeLa cDNA library for interacting partners. Positive clones that interact with the bait proteins have been identified. Current efforts focus on sequencing the interacting prey to identify potential host proteins that are interacting with these Chlamydial effector proteins.

P15 PROTONATION OF PHENOL AND ITS SOLVATION WITH H_2O

Author(s): **Nicholas Simon Jr.**
University of Scholar: Langston University, Langston, OK, USA
Location of Research: NASA Ames Research Center, Moffett Field, California, USA
Funding: Bay Area Environmental Research Institute, NASA Oklahoma EPSCoR, NASA Astrobiology Institue
Mentor(s): Partha B. Bera, Ph.D. and Timothy J. Lee, Ph.D., NASA Ames Research Center

Quantum chemistry calculations were performed on the organic molecule phenol and its derivatives to understand its protonation and solvation. Phenol is a compound with a hydroxyl group linked directly to a benzene ring. Knowledge of protonation of this aromatic molecule is crucial, as it is observed in biological molecules such as protein and DNA. This research was conducted to investigate the effects that solvation has on protonated phenol cations. This would be paramount in revealing how organic molecules grow and become functional in an H_2O environment. The calculations were performed using B3LYP density functional and MP2 methods along with CC-PVDZ, CC-PVTZ, and CC-PVQZ basis sets. The structure of each molecule, along with its energy, frequency and IR intensities were examined and quantified using quantum chemistry calculations. Two isomers were discovered, one more stable than the other. One isomer

added the proton in the para position. The other isomer added the proton on the oxygen. The energies of these isomers were converted from Hartree to Kcal/mol and the energy differences were computed and compared. The proton prefers to attach with the para carbon instead of the OH on phenol. But upon solvation with the water molecule the structure in which proton is attached with the OH is favored.

P16 EXAMINING CALCIUM BINDING IN THE EF-HAND PROTEIN, EFHP, REGULATING CALCIUM-DEPENDENT VIRULENCE IN *PSEUDOMONAS AERUGINOSA*

Authors: **Rendi Rogers**, Biraj Kayastha, and Dr. Marianna A. Patrauchan
University of Scholar: Oklahoma State University
Location of Research: Oklahoma State University, Stillwater, OK, USA
Funding: OK-LSAMP, The Lew Wentz Foundation
Mentor: Dr. Marianna A. Patrauchan

Pseudomonas aeruginosa is a human pathogen that, along with causing other various types of infections, is the leading cause of death in patients with cystic fibrosis. Research in our lab has shown that calcium (Ca^{2+}) induces virulence in *P. aeruginosa.* Aiming to identify the main components of Ca^{2+} signaling and regulatory networks in *P. aeruginosa,* our lab predicted several putative Ca^{2+}-binding proteins and characterized their role in *P. aeruginosa* virulence. One of them is EfhP protein, whose sequence contains two canonical EF-hand domains. The EF -hand motif has been studied in eukaryotes and is shown to bind Ca^{2+}. We hypothesize that EfhP binds Ca^{2+} and plays role in *P. aeruginosa* Ca^{2+}-induced virulence. The gene encoding for EfhP (PA4107) has been successfully cloned, expressed in *E. coli*, and the protein was purified. The identity and the predicted size of the protein have been confirmed by mass spectrometry. The quantitative analysis of Ca^{2+} by Inductively Coupled Plasma-Optical Emission Spectroscopy detected 3 calcium ions to be bound to the molecule of the protein. Current studies aim to assess the Ca^{2+} binding capabilities and specificity of EfhP. Using isothermal titration calorimetry, a Ca^{2+}-binding constant will be calculated and the Ca^{2+} binding affinity will be compared to that of Mg^{2+}. Further, the amino acid residues involved in the Ca^{2+} binding process will be identified by studying mutants with point mutations based on predictions from previous studies. Future studies will aim to detect whether EfhP undergoes conformational changes when binding Ca^{2+}, and identify any protein partners EfhP may have to transduce Ca^{2+} signals.

P17 GEOREFERENCING AMERICAN MANATEES (*TRICHECHUS MANATUS*) IN THE OSU COLLECTION OF VERTEBRATES

Author(s): **Tabitha Gunnars**
University of Scholar: Oklahoma State University, Stillwater, OK, USA
Location of Research: OSU Collection of Vertebrates & Department of Integrative Biology, Stillwater, OK, USA
Funding: OK-LSAMP
Mentor(s): Karen McBee, Oklahoma State University

I investigated the twenty skeletal remains of salvaged manatees, *Trichechus manatus,* which are located in the OSU Collection of Vertebrates (COV). In the COV's catalogue, I was only given the description of the manatee's location. I used that information in Google Earth to pinpoint the

exact coordinates of where each manatee was found. Information on sex and measurements were also recorded in the COV's catalog. I used this information to assign age categories (calf, sub-adult, adult) to the specimens. Once I completed assigning coordinates to salvage locations, I chose a certain color for the sex and age of the manatee so I can use it to compare similarities among location, age, and sex for salvaged manatees. I will continue my research by using VertNet and Global Biodiversity Information Facility (GBIF) to compare the data we have for manatees housed in the OSU COV to data available through these systems to determine if there are similar habitat characteristics for locations in which dead manatees were found. The IUCN Red List lists this marine mammal as vulnerable. My project is important in that it can help provide information that may be useful in slowing the current decrease in populations of the American manatees so that this species will not become endangered. I expect that younger manatees (calves and sub-adults) will be in areas where there is more human development, and that the males will also be nearer people.

P18

CHARACTERIZING THE EFFECTS OF *SPHK1* KNOCKOUT IN MOUSE NEURAL RETINA

Authors(s): **Jesse Velasco**, JL Wilkerson, MA Stiles, and NA Mandal
University of Scholar: Southwestern Oklahoma State University
Location of Research: Dean McGee Eye Institute, Oklahoma City, OK. USA
Funding: Research reported in this publication was supported by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number 8P20GM103447.
Mentor(s): Dr. Nawajes Mandal, University of Oklahoma Health Science Center (OUHSC)

Sphingosine-1-phosphate (S1P) generated by the sphingosine kinases (SPHK1 and SPHK2) is a bioactive sphingolipid that operates as an intracellular and extracellular mediator. Previous studies have associated the dysregulation of sphingolipids with ocular diseases. This study focuses on identifying the physiological and morphological effects caused by the absence of SPHK1 in mouse retina. We hypothesize that knocking out the *Sphk1* gene will reduce the amount of retinal S1P, which can then cause structural abnormalities and dysfunction of the neural retina. Albino *Sphk1* knockout and wild-type mice were raised in ambient room light for 6 months. Rod and cone function were evaluated by electroretinography. Retinal structure and degeneration were assessed by histology, and transmission electron microscopy. Retinal samples were subjected to immunohistochemistry and confocal microscopy for adheren junctions' proteins. *Sphk1* knockout mice raised in ambient light had a functional reduction of rod response at early age, and rod and cone response by 6 months. TEM of these animals showed reduced outer limiting membrane (OLM) and misplaced cone outer-segments; animals aged to 15 months showed a complete loss of the OLM and disrupted photoreceptors. Immunofluorescence showed a loss N-cadherins at the OLM, and confirmed the reposition of cone cells into the inner segments. Retinal astrocytes started to spread through the retinal ganglia cell layer indicating retinal stress. These findings provide new insight into the importance of *Sphk1* and S1P in the neural retina playing a crucial role in the morphology, arrangement, maintenance, and cell adhesions in the retina.

P19 IDENTIFYING HUMAN PEPTIDES THAT BIND TO CALCINEURIN

Author: **Khianta Moore**
University: Langston University
Location of Research: Stanford University, Stanford, CA, USA
Funding: LUNAR-BC
Mentor: Jagoree Roy, Stanford University; PI: Martha S. Cyert, Stanford University

Donor organ rejection remains an obstacle to successful and otherwise life-saving transplantation procedures. The role of T-Cells is to fight antigens of the body, and these cells are the cause of rejection of transplanted organs. Although the use of immunosuppressant drugs has solved the problem of rejection, greater problems have risen. Calcineurin (CN) is a calcium dependent ser/thr phosphatase that plays an essential role in T-Cell activation, and is the target of many immunosuppressant drugs. CN is present in a wide range of cell types and organs in the body, resulting in adverse effects when targeted by these drugs. While we understand the role CN plays in T-Cell activation, it remains unknown how CN may be functioning in the context of other cell types and what proteins it's dephosphorylating. We seek to describe CN substrates by identifying proteins that contain peptide motifs, LxVP and PxIxIT, which are required for substrate binding to CN. I tested peptide sequences from four human proteins that were predicted to bind to CN. The results showed that the peptides that contained the sequence, LQVPAVNLH and LDVPEIVIS, had the greatest amount of binding. These peptide sequences are within human proteins known as RAPGEF and MAP3K7, which play roles in cell adhesion and innate immunity. In the future, CN will be tested in a series of ways to find out if CN regulates these proteins, and if immunosuppressant drugs affect this regulation to cause side effects in organ transplant patients.

P20 ONSET OF CIRCADIAN MODULATION OF THE ELECTRIC ORGAN DISCHARGE IN *BRACHYPOPOMUS GAUDERIO*

Author: **Anika Nahar**
University of Scholar: University of Oklahoma, Norman, OK, USA
Location of Research: University of Oklahoma, Norman, OK, USA
Funding: the National Science Foundation (NSF)
Mentors: Drs. Katie Willis and Michael Markham, University of Oklahoma

Weakly electric fishes emit electric signals for communication and electrolocation. We identified the initiation of circadian modulation of the Electric Organ Discharge (EOD) in juvenile ***Brachyhypopomus*** *gauderio*. The EOD changes in form from onset to maturation of the organ and is regulated by circadian rhythms. We measured frequency and amplitude of the EOD in juveniles until adult EODs were observed.

P21 HEALING THE HEARTLAND: EFFECTS OF DEFORESTATION AND RISE OF POPULAITON ON THE MEDICINAL PLANTS USED BY THE SOUTH GONDAR CHURCH COMMUNITIES

Author(s): **Alfa Abame,** Dr. Travis Reynolds,
University of Scholar: Southwestern Oklahoma State University
Location of Research: South Gondar, Ethiopia
Funding: OK-LSAMP, NSF
Mentor(s): Dr. Travis Reynolds, Colby College

Ethiopia has a long-standing tradition of using locally grown medicinal plants to treat the ailments of its people. Since communities are often a far distance from clinics, knowledge of these medicinal plants is a valuable asset to the people. This study is aimed at collecting data on how medicinal plants are used in the communities of South Gondar, and how the effects of deforestation and population increase have impacted the availability and use of these resources. Using household surveys and interviews, utilization of plants and knowledge of the medicinal plants by the local people is documented on the Open Data Kit software. A table outlining plant name, parts used and mode of preparation for treatment is complied to serve as a reference catalog.

P22 IDENTIFYING POTENTIALLY ONCOGENIC DOWNSTREAM TARGETS OF THE HIPPO-YAP SIGNALING PATHWAY IN LIVER CANCER

Author(s): **Matt Maxwell**
University of Scholar: Southeastern Oklahoma State University
Location of Research: Harvard Stem Cell Institute, Boston, MA
Funding: The National Science Foundation (NSF)
Mentor(s): Dr. Wei-Chien Yuan, Harvard Stem Cell Institute

When dysregulated the Hippo-YAP signaling pathway has been observed to be hyperactive in many human cancers, including liver cancer. YAP is a transcriptional coactivator and the major effector of the Hippo pathway. When the Hippo pathway is dysregulated, YAP can become active, inducing gene expression promoting cell proliferation, hepatomegaly, and tumorigenesis. Since YAP is a transcriptional coactivator, its downstream targets are thought to contribute to the oncogenic behavior of the pathway. CRISPR-CAS9 was used to knockout a gene coding for an effector enzyme indicated to be downstream of YAP in a liver cancer cell line. The knockout of the downstream effector enzyme was performed via both transfection and lentiviral infection. Transfected and lentiviral infected cells were lysed, PCR amplified, and sequenced to confirm whether the target gene of the knockout underwent genomic editing such as insertions or deletions. Western blotting and qPCR will be used to measure gene expression of the effector enzyme after sequencing. To determine whether this downstream effector enzyme contributes to the hyperactive cell proliferation observed when YAP is active, cell proliferation assays will be used to compare the effector enzyme knockout samples to a control. Differences in cell proliferation assays between knockout samples and a control will give an indication as to whether or not our effector enzyme contributes to the oncogenic behavior of the pathway. Funding was provided from NSF REU Grant DBI-1263215

P23 GENETIC VARIATION WITHIN STRIPED SKUNKS IN THE NORTHERN AND SOUTHERN REGIONS OF THE UNITED STATES

Author(s): **Sharonda Carson**, Kelly A. Smith, Winnifred E. A. Pipkin, and Michelle L. Haynie;
Location of Research: Department of Biology, University of Central Oklahoma

Striped skunks (Mephitis mephitis) are found throughout the United States, southern Canada, and northern Mexico. Skunks are vectors for rabies, of which there are three known rabies variants specific to skunks: one in the south central US, one in the north central US, and another in California. We hypothesized that infected Mephitis mephitis in the north and south regions

represent more than one distinct genetic variant of skunks. Tissue samples were collected from both the northern and southern areas and DNA sequences from the mitochondrial DNA D-loop are being analyzed. Northern areas include WY, MO, IA, ND, and NE; southern areas include AZ, TX, KS, OK, and CA. Preliminary data does not appear to show a distinct demarcation between northern and southern skunks, although additional data is still being generated.

P24 FUNCTIONAL ANALYSIS OF A TWO-COMPONENT SYSTEM IN A METHANOGEN

Authors: **Melissa Chanderban** and Elizabeth A. Karr
University of Scholar: University of Oklahoma
Location of Research: University of Oklahoma, Norman, OK, USA
Funding: NIH Centers of Biomedical Research Excellence (COBRE) and OK-LSAMP
Mentor: Elizabeth A. Karr, University of Oklahoma

Production of biological methane, which accounts for approximately three-quarters of atmospheric methane (CH_4), is due primarily to the methanogenic archaea (methanogens). While CH_4 is a contributor to climate change, and its reduction in the atmosphere could prove beneficial, it can also be economically and ecologically advantageous as a cleaner energy source. Therefore, the manipulation of methanogenesis is an important tool for developing methods of controlling CH_4 production. A crucial first step is elucidating the gene regulatory network that governs methanogenesis. Previous studies have proposed one of these networks within *Methanococcus maripaludis*, an organism that converts carbon dioxide (CO_2), another potent greenhouse gas, to CH_4. *M. maripaludis* is also a model organism for investigations into methanogens with its relatively quick growth rate, fully sequenced genome, genetic tractability, and potential for the metabolic production of other valuable compounds (e.g. geraniol) in addition to CH_4 as a biogas. The focus of the presented research is on the regulation of formate dehydrogenase genes (*fdh*) in *M. maripaludis*. These genes are required for the use of relatively inert formate instead of gaseous, combustible H_2:CO_2 as the substrate for methanogenesis. Shortly upstream of one set of *fdh* genes is a two-component regulatory system (MMP1303-1304). Results have demonstrated that an MMP1304 deletion strain showed a marked inability to grow on formate in comparison to the wild-type, yet this impairment is not demonstrated when grown on H_2:CO_2. Thus at least part of this two-component system is vital for the growth of *M. maripaludis* on formate.

P25 DESIGNING AND CONSTRUCTING A MULTI-FUNCTIONAL POLARIZED MICROSCOPE

Author: **Jordan D. Sosa**
University of Scholar: University of Tulsa
Funding of Research: the National Science Foundation and the Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506
Mentors: Cen Cheng and Ming Yang

There is a recent interest in crystalline materials with ferroic properties because they may allow for more efficient data storage or solar energy harvesting. However, many of these materials are birefringent and have properties only viewable on the nanoscale, so a very specified microscope is needed to see through the birefringent effect, and apply Kerr microscopy to see magnetic or electric polarization, as well as see with high resolution and magnification. Kohler illumination was used to achieve resolution down to hundreds of nanometers. To see into even birefringent materials, meaning light moves differently depending on the light orientation, polarized microscopy became a part of the microscope, using polarizers and waveplates. The Kerr microscopy will be achieved through viewing the material in varied temperatures, pressure, magnetic fields, applied currents, or applying a photovoltaic effect. Pump-probe microscopy will also be used to measure reflective properties of these materials. In the future, this microscope will help find a possible way to manipulate the electric or magnetic polarizations (the ferroic

properties) or possibly domain walls that form from crystalline properties. These materials are interesting because they are metals, but polarize under certain conditions which this microscope will explore.

P26 CLASSIFYING ANCIENT WEST MEXICAN FIGURINES USING MACHINE LEARNING

Author: **Alfredo Velasco**
University of Scholar: University of Tulsa, Tulsa, OK, USA
Location of Research: University of Tulsa, Tulsa, OK, USA
Funding: University of Tulsa and STEM-UP
Mentor: Dr. JC Diaz, University of Tulsa

The project aims to both classify by posture and gesture anthropomorphic ceramic figures that were created in western Mexico from ca. 300BCE – 500CE and seek to identify patterns between the shaft tomb figures. The first step of the project attempts to collect the posture of ancient West Mexican figurines by scanning them with a 3D camera. These postures and gestures can be given a data representation suitable for a machine learning algorithm. The machine learning can then classify such data into the figurines' cultures. This will allow us to learn more about the body language the ancients used to communicate. Technologies that automatically detect and track the joints of humans in motion are known. However, these technologies fail to detect still figures. A 3D representations of representative figurines has been obtained scanning with a 3D depth camera. 3D manipulation software has allowed the extraction of the joints in the 3D representations. This made it possible to extrapolate relationships between the joints and thus convert the scans into data that is suitable for the machine learning algorithm.

P27 THE EFFECTS OF A NON-LOCAL VISCOSITY ON THE EVOLUTION OF PROTOSTELLAR DISKS

Author(s): **Halina Garraway**
University of Scholar: Langston University, Langston, OK USA
Location of Research: NASA Ames Research Center, Moffett Field, CA, USA
Funding: OK-LSAMP, NASA-Oklahoma Space Grant Consortium (NASA-OSGC), NASA Astrobiology Institute (NAI), Education Associates Program (EAP), NASA-Oklahoma Experimental Program to Stimulate Competitive Research (EPSCoR)
Name of Mentor(s) and their university, organization, or company: Dr. Uma Gorti, SETI/NASA Ames Research Center; Dr. Gregory Laughlin, UC Santa Cruz, NASA Ames Research Center

Protostellar disks are the forerunners of planetary systems. Yet, despite decades of progress, how the mass and angular momentum are transported in these disks remains mysterious. The difficulties stem from our inability to obtain high resolution images of disks. Our goal is thus to improve understanding through the computational study of the build-up of the central star and the subsequent disk evolution. We will investigate how the action of viscosity drives the global evolution of protostellar disks. Preliminary analysis and the resultant framework of differential equations for the disk evolution are based upon pre-existing theories of viscous evolution disks. Depending upon how much mass is contained within the disk, we expect that the disk will be unable to maintain axisymmetry and constant viscosity. Instead, the disk will produce spiral arms, whose effect will be to globally reorganize the disk structure. In previous work, constant viscosity, denoted as α, is commonly used, but spiral waves generated by gravitational instability may produce an effective α that is constant with neither radius nor time. Our goal will be to understand how a radially varying alpha viscosity prescription affects the global evolution of the disk.

P28

JMJD3 BINDING SITES INTERACT WITH PROMOTER REGIONS IN NAÏVE CD4$^+$ T CELL ACTIVATION

Author(s): **Alicia Aguilar**[1], Xiangzhi Meng[2], Nicole Riley[2], Siddhartha Sharma[2], Daniel R. Salomon[2]
[1]University of Scholar: Oklahoma State University, Stillwater, OK, USA, 92122
[2]Location of Research: The Scripps Research Institute, La Jolla, CA, USA, 92122
Funding: The National Science Foundation (NSF), The Scripps Research Institute (TSRI), Oklahoma Louis Stokes Alliance for Minority Participation (OK-LSAMP), and Niblack Research Scholars
Mentor(s): Dr. Dan Salomon, The Scripps Research Institute

CD4$^+$ T-cells are an important component for adaptive immunity and most of the immune functions of these CD4$^+$ T-cells require its activation, in which a whole gene expression network downstream T-Cell Receptor (TCR) and co-receptor stimulation is highly-precisely regulated. It has been shown that epigenetic changes are highly involved in transcriptional regulation after T-cell activation. One of the epigenetic modifiers that have been identified is JMJD3, a histone demethylase that removes the trimethyl group from histone H3 lysine 27 (H3K27me3) and serves as an activator for gene expression in general. Our previous work demonstrates that JMJD3 promotes cell proliferation in activated T-cells by regulating the RNA expression of MYC and CDK6. Also, by ChIP-seq, JMJD3 binding sites are identified at distal or intronic regions around MYC or CDK6, some of which overlap with transcription regulatory element markers, such as H3K27ac, H3K4me1or Dnase hypersensitivity sites. However, the exact mechanisms of how JMJD3 regulates the expression of these genes by binding at non-promoter regions remain unknown. It is hypothesized that JMJD3 binds at putative enhancer sites for the genes of MYC and CDK6 and loops back to the respective promoter sites to regulate transcription. Using the method of chromosome conformation capture (3C), the interactions between the binding sites were studied. The results indicate that JMJD3 binding sites interact together to allow the demethylation of H3K27me3 at distal putative enhancer regions of MYC and CDK6 that loop back to respective promoter regions. These results indicate a potential mechanism of how histone demethylase JMJD3 regulates target genes. However, further study is needed to determine how JMJD3 is recruited to these sites and forms chromosome loops.

P29

INVESTIGATING TEMPERATURE DEPENDENCE OF THE OPTICAL ATTENUATION COEFFICIENT

Author(s): **Chase Tillar**
University of Scholar: East Central University, Ada, Oklahoma, USA
Location of Research: East Central University, Ada, Oklahoma, USA
Funding: NASNTI, OK-LSAMP
Mentor(s): Dr. Karen Williams, East Central University

The optical attenuation coefficient can be characterized as a measurement of how easily a medium can be penetrated by a beam of light, therefore every unique material has its own unique optical attenuation coefficient. This uniqueness property makes the optical attenuation coefficient an applicable quantity to many industries. For example, during laser surgery an attenuation coefficient must be specified for the specific medium (fat cell, muscle tissue, etc.) the laser intends to travel

through to insure the laser reaches the correct depth with the correct intensity. Lasers of 635 and 532 nm wavelengths with predetermined intensities are fired one at a time through a bath filled with some medium - mediums chosen for this experiment were DI water, saltwater, and sunflower oil. A detector is placed on the opposite end of the bath to measure the intensity of laser after passing through the medium. With initial and final intensities established it is then possible to mathematically calculate the optical attenuation coefficient via the light attenuation equation. These measurements are made for a range of temperatures (20 °C - 55 °C). Resulting optical attenuation coefficient calculations are then entered in Graphical Analysis software where they are plotted against temperature to examine if a relationship exists between the two. From the graphs, a conclusion can be drawn that as temperature of a given medium increases, the value of the optical attenuation coefficient for that medium also increases. Previous research has focused on the relationship between temperature and the ultrasound attenuation coefficient. Data generated from this project will also be compared to that of the work with ultrasound in an attempt to establish a relationship between the optical and ultrasound attenuation coefficient.

P30 THE DESIGN AND FABRICATION OF A TESTING SYSTEM FOR DETERMINING THE COEFFICIENT OF KINETIC FRICTIONS

Author(s): **Nikolas Wagner**
University of Scholar: University of Central Oklahoma, Edmond, OK, USA
Location of Research: University of Central Oklahoma, Edmond, OK, USA
Funding: OK-LSAMP Scholarship, UCO Student RCSA Grant
Mentor(s): Dr. Gang Xu, University of Central Oklahoma

The goal of this project was to design and fabricate a testing system for determining the coefficient of kinetic friction between different surfaces. The system, composed mainly of a force sensing resistor in conjunction with a linear actuator, measures frictional forces between metal plates with different coatings and sand papers of varying grits. The system allows the simulation of frictional interactions between a metal drill tip and rocks with varying properties, a common problem in gas and oil industry. Specifically, we quantified the effects of different Teflon™ coating on reducing kinetic friction between metals and sand papers. The results from this project will guide us on selecting a coating to use in the industry.

P31 SUGARS AND SUGAR DERIVATIVES IN RESIDUES PRODUCED FROM UV IRRADIATION OF ASTROPHYSICAL ICE ANALOGS

Author(s): **Danielle Wright**, Dr. Michel Nuevo
University of Scholar: Langston University
Location of Research: NASA Ames Research Center, Moffett Field, CA, USA
Funding: National Aeronautics and Space Administration through the NASA Exobiology Program and the NASA Astrobiology Institute, LSAMP, NASA Oklahoma EPScoR
Mentor: Dr. Michel Nuevo, NASA Ames Research Center, Moffett Field, CA; BAER Institute, Petaluma, CA

Sugars and sugar derivatives are important for terrestrial life, as they are involved in a lot of biological processes. The detection of dihydroxyacetone, the smallest sugar, as well as several sugar acids and sugar alcohols in the Murchison and Murray meteorites together with amino acids, carboxylic acids, nucleobases, and amphiphiles suggests that compounds of biological importance can be formed under astrophysical, non-biological conditions. Previous experiments in which simple H2O:CH3OH ice mixtures were UV irradiated at 10 K and then warmed up to room temperature showed that sugars and sugar derivatives can form. However, the distribution is different from what is observed in meteorites, in which there are more sugar

acids than in the laboratory samples. During this internship, we performed experiments in which H2O:CO2 and H2O:CH3OH:CO2 ice mixtures were UV irradiated under the same conditions in order to answer the question, “Do more sugar acids form when starting with ice mixtures containing CO2 as a carbon source?”

P32

FINDING QUANTUM YIELD OF MELANIN-LIKE MOLECULES

Author(s): **Mary L. Catlett**, Shuo Dai, Cosmo Binegar, and Dr. Mario F. Borunda
University of Scholar: Oklahoma State University, Stillwater, OK, USA
Location of Research: Oklahoma State University, Stillwater, OK, USA
Funding: OK-LSAMP
Mentor: Dr. Mario F. Borunda, Oklahoma State University

Biomemic melanin molecules could make ideal organic photovoltaic devices due to their inexpensive manufacturing process and semi-conductive properties. Finding ideal melanin-like molecules with Power Conversion Efficiencies (PCEs) to compete with silicon is too large a problem to approach only with experimental data. However, a computational tool to filter potential photovoltaic candidates for melanin-like molecules does not exist. This study will derive a quantum yield (QY) specific to the melanin class of molecules. We will also investigate the accuracy of this calculated QY in predicting melanin experimental PCEs in comparison to the generalized Scharber Model. To conduct this study, first a two stages of geometry optimizations are conducted on 32 candidate molecules derived from experimental literature. In the initial stage, optimized molecular coordinates from molecular dynamics are generated with Avogadro. Next, these coordinates are processed using geometry optimization calculations with Least Density Approximation (LDA) Density Functional Theory (DFT). Second, the optical absorption spectrum was calculated for each molecule using Time Dependent (TD) DFT. All DFT calculations for this study were conducted using the Octopus software suite with high performance computing hardware. The overlap between the calculated absorption spectrum for each molecule and solar spectrum will be used to calculate an approximate quantum yield for melanin. When compared to the Scharber Model, results are predicted to show that our calculated QY can predict experimental melanin PCE’s more accurately. The calculated melanin QY from this study will contribute to efforts to find organic photovoltaic molecules.

P33

SIZE OF TRAFFIC SIGNS FROM GPS-TAGGED IMAGES USING A SMARTPHONE-BASED SYSTEM

Authors(): **Akanimoh Adeleye,** Jahdiel Alvarez and Christoph Mertz
University of Scholar: University of Oklahoma
Location of Research: Carnegie Mellon University, Pittsburgh, Pennsylvania,Allegheny
Funding: Program funding - NSF, Robotic Institute Summer Scholars(RISS); Scholar sponsors - LSAMP, McNair
Mentor: Dr. Christoph Mertz

The Federal Department of Transportation regulates traffic sign sizes as a way to ensure the general public's safety. Such regulations require manual inspection, a tedious and costly process. In this paper, we present a solution to estimate the size of traffic signs using a smartphone-based system. Our process takes advantage of the Pinhole Camera Model's mathematical relationship between a 3D world point and a corresponding 2D image plane. We formulated the two-camera pinhole model by including a second pinhole camera to the basic model. This new model provides additional mathematical information which allows us to relate one 3D world point to two corresponding 2D image planes. The dual-image model relies on the assumption that an accurate distance measurement between the two cameras is already known. To obtain the distance between the two cameras we implemented two methods, Visual Odometry(VO) and Sensor Fusion, both of which produced precise measurements.

P34

SYNTHETIC ACCESS TO PSEUROTIN CORE VIA A DIAZO-OH INSERTION/CONIA-ENE CASCADE

Author(s): **Tekenari Tienabeso** and Indrajeet Sharma*
University of Scholar: University of Oklahoma, Norman, OK, USA
Location of Research: University of Oklahoma, Norman, OK, USA
Funding: The Oklahoma Louis Stokes Alliance for Minority Participation (OK-LSAMP), ACS Division of Organic Chemistry Summer Undergraduate Research Fellowship
Mentor: Dr. Indrajeet Sharma, University of Oklahoma

Pseurotins are natural products that have diverse biological activities ranging from antibiotic to anticancer. The core of Pseurotin A is a good starting point to then produce its other variants and is also similar to the natural products of Azaspirene and Berkeleyamide D. The goal of this research project is to access the pseurotin core via a Diazo-OH insertion along with performing a Conia-Ene Cascade. Successfully completing this project would involve achieving a 4 step synthesis of a biologically relevant core in Pseurotin A, applying a well-known reaction in the Conia-Ene to an electronically unique motif in the γ-lactam, and performing a challenging feat in synthetic chemistry of synthesizing a spirocycle. Optimization will be tested with different metal catalysts. The research conducted in this project may provide another piece of evidence that synthesizing the core of pseurotin can be accomplished in fewer steps and can lead to more research that can reduce the number of steps necessary to make the different analogues of pseurotin. Further discoveries into the field of synthetic chemistry with diverse metal catalysts may be possible as a result of this research project. Evaluation of the biological significances of the products in this project will be studied at the Stephenson Research and Technology Center of Norman, Oklahoma as well as through collaborations with other labs.

P35

TIME EVOLUTION OF PROTOPLANETARY DISKS

Author(s): **Kichelle Henderson**
University of Scholar: Langston University, Langston, OK, USA
Location of Research: NASA Ames Research Center, Moffett Field, CA, USA
Funding: NASA Oklahoma EPSCoR, NASA Astrobiology Institue, OK-LSAMP
Mentor(s): Uma Gorti, NASA Ames Research Center

The aim of this project is to test theories of disk evolution and planetesimal formation by comparing theoretical model results with observational data. Disks form during collapse of dark clouds during star formation. A disk helps the formation of the central star and leftover material forms planets, but we do not know if every disk forms planets. Here, we study how disk material evolves with time. Disks consist of gas and dust which accrete onto the star at some rate. Gas also gets dispersed, while dust may form planets. These processes take a few million years, and we compare observations of stars at different ages with the time evolution of the accretion rate and disk mass as computed by models.

P36 PROPOSAL FOR MASS PRODUCED WOOD CONSTRUCTION TECHNIQUE

Professor Nathan Richardson, **Cameron Patterson**
Oklahoma State University
Stillwater, OK, USA

OK-LSAMP, NSF, Oklahoma State University Riata School for Entrepreneurship, Oklahoma State University Technology Business Development Program, Oklahoma State University School of Architecture
Professor Nathan Richardson, Oklahoma State University School of Architecture

Standard construction methods are inefficient and wasteful, and are often inaccessible or unaffordable to many on the planet. Technological innovation provides opportunities for cheaper, faster, more adaptable and accessible solutions. This research investigates and proposes better options through modulation, prefabrication, inventive materials, ease of construction, and sustainability. The system is tested and compared against standard methods through material usage, insulation potentially, time of construction, and similar means. Aluminum sheeting, plywood, steel angle, and masonry units are four proposed materials previously explored and tested. Plywood demonstrates the most potential and is currently under further development. Environmental testing, feasibility studies, and market research will immediately follow design optimization.

P37 PERFORMANCE COMPARISON OF COMMON CLASSIFIER ALGORITHMS USING THE MNIST DATABASE

Author(s): **Mary Ozor**
University of Scholar: University of Central Oklahoma, Edmond, OK, USA
Location of Research: University of Central Oklahoma, Edmond, OK, USA

Funding: The National Science Foundation (NSF) and The Oklahoma Louis Stokes Alliance for Minority Participation (OK-LSAMP)
Mentor(s): Dr. Gang Qian, University of Central Oklahoma

Classification algorithms for data mining are also called supervised learning algorithms. Such algorithms find hidden patterns in attributes of existing (training) data items with regard to their class labels and construct a classification model accordingly. The model can then be used for classification by assigning a class label to each new data item. In this presentation, we report our studies of several common classification algorithms and a comparison of their performance in accuracy for hand-written digit recognition. The MNIST database was used in our experiments, which contains a training set of 60,000 digits, and a test set of 10,000 digits. Most of our experiments were conducted using Weka 3, an open source software with a collection of implemented data mining algorithms. The algorithms that we studied in this project were nearest neighbor, decision tree, random forests, Naïve Bayes and the bagging approach.

P38 ADSORBED NATURAL GAS COMPOSITE TANKS

Author(s): **Aaron Dolan**, Zach Miller , Efren Leuvano , Ranji Vaidyanathan
University of Scholar: Oklahoma State University, Tulsa, OK, USA
Location of Research: Oklahoma State University, Tulsa, OK, USA
Funding: the National Science Foundation (NSF) and OCAST
Mentor(s): Dr. Ranji Vaidyanathan, Oklahoma State University

As the field of natural gas expands, researchers are focused on the most cost effective and efficient way to make natural gas available for use in cars, trucks, and passenger vehicles. Compressed natural gas (CNG) tanks are currently the prevailing technology in the natural gas vehicle industry, but implementation of CNG tanks can be expensive and inconvenient . This presentation will focus on the use of adsorbed natural gas (ANG) tanks, an alternative to CNG in the vehicle industry.

P39 SPECTROSCOPIC STUDY OF ION-ION INTERACTIONS IN BINARY SOLUTIONS OF IONIC LIQUIDS AND INORGANIC SALTS

Authors: **Travis Young**, Christopher M. Burba*
University of scholar: Northeastern State University, Tahlequah, Ok
Location of Research: Department of Natural Sciences, Northeastern State University, 601 N. Grand Ave. Tahlequah, OK
Funding: Department of Natural Sciences, Northeastern State University
Mentor: Jody Buckholtz, Northeastern State University

Vibrational spectroscopy was used to investigate ion-ion interactions in solutions of ionic liquids (1-butyl-3-methylimidazolium trifluoromethanesulfonate or 1,1-butylmethylimpyrrolidinium trifluoromethansulfonate) mixed with LiOTf, NaOTf, KOTf, $Mg(OTf)_2$, and $Y(OTf)_3$ inorganic salts. All compounds dissolved in the ionic liquid at elevated temperatures except for $Mg(OTf)_2$, which was insoluble in both ionic liquids at all compositions and temperatures investigated. Infrared and Raman spectra of the solutions were collected as a function of temperature and composition (10:1 and 5:1 IL to salt mole ratios), and ionic association of the OTf^- anions for these solutions was assessed by monitoring select vibrational modes of the OTf^- anion. In particular, S-O stretching motions (near 1030 cm^{-1}) and F-C-F bending motions (at ~760 cm^{-1}) are sensitive to the local structure about the OTf^- anions. Our spectroscopic data indicates that solutions containing cations with high charge densities (e.g., Li^+ and Y^{3+}) resulted in strong cation-anion interactions.

REGISTERED ATTENDEES

Abame, Alfa	Southwestern OSU	Biology
Adams, Henry	Oklahoma State University	Plant Biology/Ecology
Adeleye, Akanimoh	University of Oklahoma	Computer Engineering
Aguayo, Eduardo	Cameron University	Chemistry
Aguilar, Alicia	Oklahoma State University	Chem Engr/Biochem & Molecular Biology
Allen, Julian	Cameron University	Organismal Biology
Alumairi, Faleh	Oklahoma State University	Fire Protection and Safety
Apala, Elizabeth	East Central University	Physics
Apblett, Allen	Oklahoma State University	Chemistry
Armenta-Zamora, Rafael	Northeastern State University	Pre-professional Health
Askew, Hope	Oklahoma State University	Nutrition
Asongwe, Eric	University of Oklahoma	Petroleum Engineering
Baah, Samantha	University of Oklahoma	Pre-Medicine
Baham, Corey	Oklahoma State University	Management Science & Info Systems
Bakine, Mira	Langston University	Biology
Bales, Charles	The University of Tulsa	Electrical Engineering
Barbosa, Matheus	Oklahoma State University	Electrical Engineering
Barboza-Pacheco, Suzi	Oklahoma State University	Biochemistry and Molecular Biology
Bejarano, Alexandra	The University of Tulsa	Computer Science
Birdi, Harwinder	Oklahoma State University	Management Information Systems
Black, Kristina	Univ of Wisconsin-Madison	Wildlife Ecology
Brown, Cody	The University of Tulsa	Biological Science
Buchanan, Austin	Oklahoma State University	Industrial Engineering & Management
Burgess, Michael	Pawnee Nation College	President
Burke, Bradly	Southwestern OSU	Microbiology
Butson, Eric	Oklahoma State University	Chemistry
Calvert, Taylor	University of Oklahoma	Chemical Bio-Sciences Pre-Pharmacy
Canales, Jailene	University of Central Oklahoma	Developmental Biology
Carson, Rhonda	University of Central Oklahoma	Biology
Catlett, Mary	Oklahoma State University	Physics and Mathematics
Catlin, Jessica	Oklahoma State University	Chemical Engineering
Chanderban, Melissa	University of Oklahoma	Microbiology
Chang, Mang	Oklahoma State University	Microbiology
Chicas-Mosier, Ana	Oklahoma State University	Biology

Clymer, Maranda	East Central University	Medical Physics Student
Coleman, John	Langston University	Chemistry
Colwell, Miles		
Cook, Gregory	OSU- Center for Health Sciences	Neurobiology
Cooper, Bree	University of Oklahoma	Chemical Engineering
Core, Sheri	OSU - Center for Health Sciences	Biomedical Sciences
Croci, Darlene	Oklahoma State University	OK-LSAMP
Cruz, Sarah	Northeastern State University	Biology
Day, Brookelyn	East Central University	Nursing
Ding, Li	Oklahoma State University	Graduate College Ambassador Program
Dolan, Aaron	Oklahoma State University-Tulsa	Mechanical Engineering
Douglas, Amber	OSU - Center for Health Sciences	Biology
Dunlap, Maya	The University of Tulsa	Mechanical Engineering
Ekehchiadi, Victor	Oklahoma State University	Biochemistry
Elenwo, Covenant	University of Oklahoma	Biology
Faneros, Michael	University of Oklahoma	Undergrad Research/Research Psychology
Fields, Brady	Northwestern OSU	
Fields, Julian	Oklahoma State University	Mechanical Engineering
Fleming, Jordan	Oklahoma State University	Microbiology
Flonard, Michaela	The University of Tulsa	Biology
Garcia, Shelby	University of Central Oklahoma	Biology
Garraway, Halina	Langston University	Mathematics
German, Amber	Langston University	Biology
Golliver, June	Oklahoma State University	Office of Multicultural Affairs
Golphin, Jalen	Oklahoma State University	Aerospace Engineering
Grider, Rachel	Southeastern OSU	Biology
Guerrero Criado, Andres	Oklahoma State University	Microbiology
Gunnars, Tabitha	Oklahoma State University	Zoology
Haley, Joseph	Oklahoma State University	Physics
Hardy, Lensy	Langston University	Biology
Hayden, Daniel	University of Oklahoma	Plant Biology
Hefner, Montana	Northeastern State University	Chemistry
Henderson, Kichelle	Langston University	Mathematics
Henthorn, Daniel	Oklahoma State University	Biochemistry and Molecular Biology
Hubin, Tim	Southwestern OSU	Chemistry
Husak, Michael	Cameron University	Biology
Jaco, William	Oklahoma State University	Mathematics
Jody, Buckholtz	Northeastern State University	Chemistry
Johnson, LaQuan	Langston University	Biology
Johnson, Latrina	Langston University	
Joines, Allison	Southeastern OSU	Biology
Joines, Peyton	Southeastern OSU	Biology

Kelley, Armond	The University of Tulsa	Electrical & Comp Engineering
Kimmerer, Robin	State University of New York	Environ Science & Forestry
Kirksey, Jason	Oklahoma State University	VP Institutional Diversity
Lewis, Sharon	Langston University	Chemistry
Lightning, Lizzie	Northeastern State University	Chemistry
Lopez, Evelin	The University of Tulsa	Mechanical Engineering
Ludrick, Brad	Southeastern OSU	Biology
Luera Jr., Robert	Cameron University	Agriculture Animal Science
Lutter, Erika	Oklahoma State University	Microbiology
Maharry, Tim	Northwestern OSU	Math & Computer Science
Mata, Sara	University of Oklahoma	Education
Maxwell, Matthew	Southeastern OSU	Cancer Biology
Mazumder, Suman	Oklahoma State University	Chemistry
Means, Nick	University of Oklahoma	
Mock, Andrew	Stantec/Univ of Illinois at Urbana-Champaign	Structural Engineering
Montoya, Diana	Langston University	Psychology
Moore, Jay	Oklahoma State University	Microbiology
Moore, Khianta	Langston University	Biology
Morales, Brenda L.	Oklahoma State University	OK-LSAMP
Morgan, Amber	University of Oklahoma	Chemical Engineering
Mosier, Rachel	Oklahoma State University	Construction Mgmt/Civil Engr
Munuraju, Kiran	Oklahoma State University	Graduate College Ambassador Program
Nahar, Anika	University of Oklahoma	Biology
O'Dell, Kylee	East Central University	Physics
Only A Chief, Autumn	Oklahoma State University	Nutritional Sciences
Ozor, Mary	University of Central Oklahoma	Computer Science
Palmer, Leland	Oklahoma State University	Physics
Pannell, Dalton	Northwestern OSU	Biochemistry
Pantoja, Joana	University of Central Oklahoma	Biology
Patterson, Cameron	Oklahoma State University	Architecture
Patterson, Clay	Oklahoma State University	Computer and Electrical Engineering
Peal, Lila	Langston University	Chemistry
Perez, Patrick	Cameron University	Computer Science
Pham, Susan	Oklahoma State University	Chemistry
Piedra, Juan	Oklahoma State University	Engineering
Pollard, Kellyn	Langston University	Biology
Porter, Kay	Oklahoma State University	OK-LSAMP Retired
Redmond, Jaron	Oklahoma State University	Mechanical Engineering

Redner, Richard	The University of Tulsa	
Rewasiewicz, Coral	Oklahoma State University	Howard Hughes Medical Institute
Reyes Campillo, Diana	Cameron University	Agronomy
Rogers, Rendi	Oklahoma State University	Microbiology and Molecular Genetics
Rutledge, Carl	East Central University	Physics
Rycroft, Ashton	East Central University	Physics
Saravia, Katherine	Oklahoma State University	Zoology
Schachle, Amy	The University of Tulsa	Math
Seagraves, Nikki	University of Central Oklahoma	Biology
Sellers, Ian	University of Oklahoma	Physics
Shaklee, Toni	Oklahoma State University	Vice-President For Research
Sharp, Patrick	Southeastern OSU	Chemistry/Biology
Sierra, Luis	Langston University	Computer Science
Simon Jr., Nicholas	Langston University	Biology
Smith, Sydni	Oklahoma State University	Microbiology
Sosa, Jordan	The University of Tulsa	Engineering Physics
Spencer, Todd	Oklahoma State University	Graduate College Ambassador Program
Starr, William	Oklahoma State University	Microbiology
Stevenson, Monica	University of Oklahoma	Chemistry
Swanson, Ayrianna	Oklahoma State University	Microbiology
Tahsini, Laleh	Oklahoma State University	Chemistry
Tienabeso, Tekenari	University of Oklahoma	Organic Chemistry
Tillar, Chase	East Central University	Physics
Vaidyanathan, Ranji	Oklahoma State University	Materials Science and Engineering
Vasquez, Yolanda	Oklahoma State University	Chemistry
Vaughan, Mel	University of Central Oklahoma	Biology
Velasco, Jesse	Southwestern OSU	Biology
Velasco II, Alfredo	The University of Tulsa	Computer Science
Vivar, Angela	Oklahoma State University	Office of Multicultural Affairs
Wagner, Nikolas	University of Central Oklahoma	Engineering Physics-Mechanical Engineering
Walden, Susan	University of Oklahoma	Multi-disciplinary Research
Whalen, Sandra	University of Oklahoma	Center for Institutional Data Exchange & Analysis
Whitaker, Katelyn	Oklahoma State University	Animal Sciences
White, Catherine	Oklahoma State University	Biology
Williams, Gabrielle	Langston University	Chemistry
Wills, Kendra	Oklahoma State University	Graduate College Ambassador Program
Wright, Danielle	Langston University	Chemisty
Xu, Gang	University of Central Oklahoma	Biomedical and Mechanical Engineering
Yanez, Felix	University of Central Oklahoma	Biology
Young, Travis	Northeastern State University	Chemistry
Youngblood, CheyAnne	Northeastern State University	Biology

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Thank you for all the great memories!




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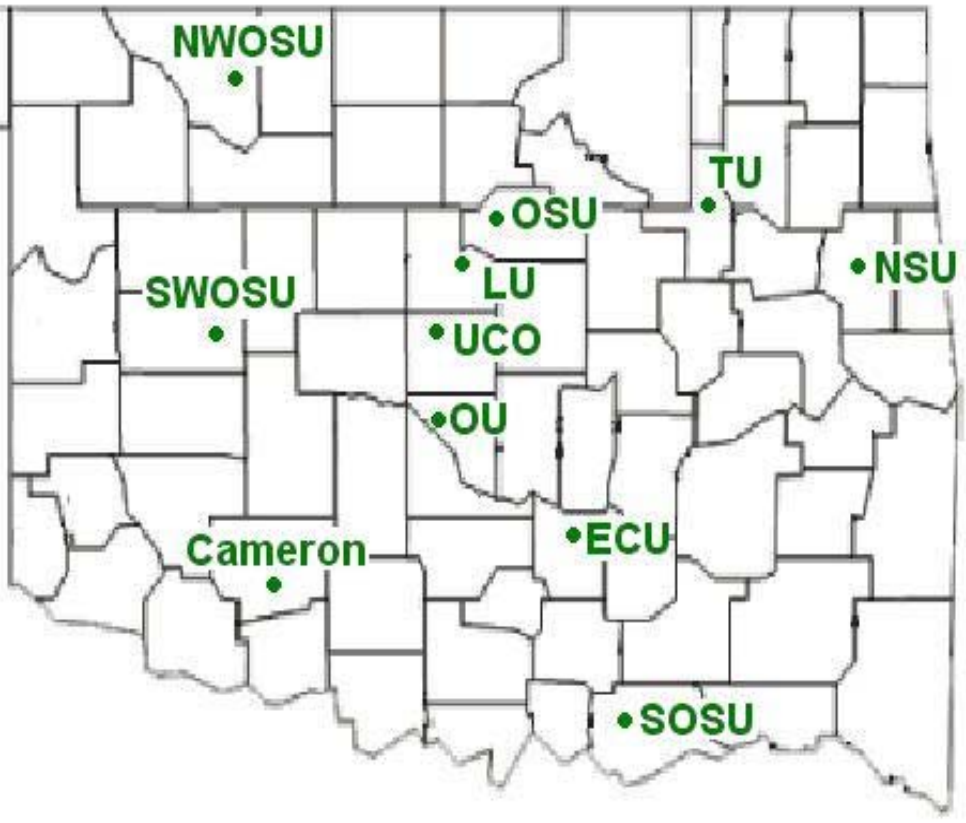
for all your
years
of service!



Thank you for attending the OK-LSAMP symposium. Please make sure to join us again next year!