TRANSACTIONS OF THE ILLINOIS STATE ACADEMY OF SCIENCE

SUPPLEMENT TO VOLUME 117

117TH ANNUAL MEETING
APRIL 5, 2025

WITH ILLINOIS JUNIOR ACADEMY OF SCIENCE REGIONAL WINNERS

IN PERSON ALL-DAY EVENT HOSTED BY

SOUTHERN ILLINOIS UNIVERSITY
EDWARDSVILLE

ILLINOIS STATE ACADEMY OF SCIENCE

FOUNDED 1907

AFFILIATED WITH THE ILLINOIS STATE MUSEUM
SPRINGFIELD, IL

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117TH ISAS ANNUAL MEETING

April 5, 2025
Southern Illinois University Edwardsville
Hosts: Dr. Tom Fowler and Dr. Amy Winn

MEETING SCHEDULE

SATURDAY, APRIL 5TH

MORNING EVENTS ARE IN SCIENCE EAST

- 8:00am – 11:45am Science East Atrium – Check-in, On-Site Registration if Needed, Break Area
- 9:00am – 11:45am Oral Presentations, Rms 0214, 0222, 2206, 2214

ISAS LUNCHEON AT CRYSTAL GARDENS BANQUET HALL (OFF-SITE)

- 12:00noon – 1:30pm 1230 University Drive (tickets required, carpooling recommended)

KEYNOTE ADDRESS IN SCIENCE EAST

- 2:00pm – 3:00pm 3126 Science East

AFTERNOON EVENTS ARE IN STUDENT FITNESS CENTER

- 3:00pm – 4:30pm Entry Area – Check-in, On-Site Registration if Needed, Break Area
- 3:15pm – 5:10pm Poster Sessions, Activity Center Gym Room 1420
- 5:10pm – 6:00pm Award Presentations, Activity Center Gym Room 1420

Future Meeting Sites
2026 – TBA

ABBREVIATIONS USED IN PROGRAM

Division Abbreviations

Anthro & Archeo	Anthropology & Archeology
Cell Biology	Cell, Molecular, & Developmental Biology
Chem & Biochem	Chemistry & Biochemistry
Physics, Math, & Astron	Physics, Mathematics, & Astronomy

Participant Abbreviations

UG	Undergraduate Student
Grad	Graduate Student
HS or JH	High School or Junior High
None	Regular/Faculty Member

Participating School and Organization Abbreviations

Adlai	Adlai Stevenson High School
Aptakisic	Aptakisic Junior High School
Bradley	Bradley University
Dunlap	Dunlap High School
EIU	Eastern Illinois University
Governor French	Governor French Academy
IC	Illinois College
IMSA	Illinois Math and Science Academy
ISU	Illinois State University
Lewis	Lewis University
Maryville	Maryville University
Millikin	Millikin University
Oak Park	Oak Park and River Forest High School
Oakton	Oakton College
Pharmacy	University of Health Sciences and Pharmacy
SIUE	Southern Illinois University Edwardsville
WIU	Western Illinois University

MESSAGE FROM THE VICE PRESIDENTS

Welcome to Southern Illinois University Edwardsville (SIUE) for the 117th Annual Meeting of the Illinois State Academy of Science! It has been nearly a decade since the last time we hosted the ISAS Annual Meeting, and we are pleased that you are joining us to take in a day of presentations about science endeavors that have occurred around the region. The ISAS Annual Meeting is meant for us to educate and celebrate each other, be reunited with scientific colleagues we know, and make new connections with others. Please be an active participant! We challenge you to meet new people and expand your science network during your time here. The tradition of this organization is to provide a welcoming experience to new members of the scientific community by including many presentations from students to go along with those from the professional ranks. Through this forum, students and more senior scientists can inspire and be inspired by each other. In addition to the abstracts that will be available online in a Supplement to the *Transactions of the Illinois State Academy of Science* soon after the meeting, we encourage those with completed studies to consider submitting a full manuscript for peer review to that same journal.

While you are on the SIUE campus, feel free to explore. In addition to the locations of meeting events, points of interest include the Morris University Center, the Gardens at SIUE, and scattered installations of outdoor sculptures by student artists. Guest Wi-Fi access can be gained through the unencrypted 'Welcome to SIUE' network or (if your home institution uses it) through the inter-institution 'Eduroam' network.

We gratefully acknowledge the contributions of many others to the success of this event. Our colleagues in the Department of Biological Sciences graciously agreed to host and be the SIUE sponsor of the meeting, and the administrators of other SIUE Departments and their associated Colleges supported faculty and student participation. The SIUE Information Technology Service staff provided preparation and technical assistance at the meeting, and Tracy Ziegler and the staff at the SIUE Student Fitness Center arranged for the poster venue. Emily Dawson coordinated participation of IJAS students, and the SIUE STEM Center provided poster printing assistance to the IJAS presenters. Jen Jost and Bradley University loaned and transported poster easels, and many student volunteers, seen and unseen by guests, assisted and contributed in a myriad of ways. We thank the ISAS executive officers and council members for their input and for taking on tasks as needed. As has been the case for many years, ISAS and its meetings are supported by two amazing and very dedicated people who really make it happen for the rest of us: Robyn Myers, Executive Secretary, and Tere North, Director of Communications and Program Planning. We truly cannot thank them enough for their contributions, and we hope you will join us in showing appreciation.

Welcome, and thanks for joining us!

VPs for the ISAS 2025 Annual Meeting,
Drs. Amy Winn and Tom Fowler

SOUTHERN ILLINOIS UNIVERSITY
EDWARDSVILLE

CAMPUS MAP


Fields
Circle Dr
Circle Dr
Circle Dr
First Community Arena
Tennis Courts
Sam M. Vadalabene Center
SIUE Student Fitness Center
Dehne Morris Trail
SIUE School of Nursing
Alumni Hall
Circle Dr
Southern Illinois University Edwardsville
Metcalf Student Experimental Theater
SIUE Speech-Language...
Peck Service Rd
Science East Building SIUE
Lovejoy Library
Peck Hall
Science Lab Building West
Lot E
Dunham Hall
Hairpin Dr
Rendleman Hall
University Dr
Lot C - (Metered)
SIUE School of Engineering
Southern Illinois University...
Art and Design
Circle Dr
Circle Dr
Circle Dr
University Dr

ISAS ORAL PRESENTATIONS OVERVIEW

SCIENCE EAST

	SE 0222	SE 2206	SE 0214	SE 2214
9:00 – 9:15	**Danielle Lee** Environmental Sci	**Yusiro Ismail** Cell Biology	**Chelsie Hadley** Physics, Math, & Astronomy	**Jena Sellers** Plant Biology
9:15 – 9:30	**Chris Theodorakis** Environmental Sci	**Chiemeka Emeribe** Cell Biology	**Angelica Strack** Physics, Math, & Astronomy	**Toby McTamney** Plant Biology
9:30 – 9:45	**Iyanuoluwa Fatunmbi** Environmental Sci	**Emily Edwards** Cell Biology	**Gabriel Sojka** Physics, Math, & Astronomy	**Kurt Schulz** Plant Biology
9:45 – 10:00	**Anna Berg** Environmental Sci	**Shreya Sharma** Cell Biology	**Amy Aung** Physics, Math, & Astronomy	**Zackary Woodall** Plant Biology
10:00 – 10:15	**Brianna Cook** Environmental Sci	BREAK	**Marcus King** Physics, Math, & Astronomy	BREAK
10:15 – 10:30	BREAK	**Jessica Sager** Chem & Biochem	BREAK	**Abhilash Polu** Health Sciences
10:30 – 10:45	**Harriet Barker** Environmental Sci	**Samuel Bickford** Chem & Biochem	**Amritha Praveen** Computer Sci	**Luke Yin** Health Sciences
10:45 – 11:00	**Emma Prott** Environmental Sci	**Gwendowlyn Knapp** STEM Education	**Jenna Mohammed** Computer Sci	**Jacob Black** Health Sciences
11:00 – 11:15	**Blake Rentz** Environmental Sci	**Hailey Gula** Zoology	**Ren Goodfriend** Engineering & Technology	**Lucia Thompson** Health Sciences
11:15 – 11:30	**Emily Beiler** Environmental Sci			**Abigail Falkoff** Health Sciences
11:30 – 11:45	**Lev Khoubaeva-Hummel** Environmental Sci			**Bradley Coulter** Health Sciences
11:45 – 12:00	Travel (Carpool) to Lunch @ Crystal Gardens Banquet Hall			

ISAS POSTER PRESENTATIONS OVERVIEW

STUDENT FITNESS CENTER, ACTIVITY CENTER GYM ROOM 1420

Group A [3:15pm – 4:10pm] – Odd Numbers				Group B [4:15pm – 5:10pm] – Even Numbers			
1	**Kirsten Fisher** Anthro & Archeo	55	**Amanda Tannehil** Health Sciences	2	**Bowen Li** Computer Science	56	**Laura Tayon** Zoology
3	**Devin Boggs** Anthro & Archeo	57	**Joseph Agyemang** Health Sciences	4	**Misbahuddin Mohammed** Computer Science	58	**Robert Mense** Health Sciences
5	**Elyse Ibata** Cell Biology	59		6	**Elly Beck & Kaylee Shaw** Cell Biology	60	**Sanam Talwar** Health Sciences
7	**Godfred Mensah** Cell Biology	61	**Tsilate Tadesse** Health Sciences	8	**Ali Daoud** Cell Biology	62	**Sahana Garapati** Health Sciences
9	**Melanie Buzzard** Cell Biology	63	**Amanda Ekstrand** Microbiology	10	**Kennedy Spears** Cell Biology	64	**Colin McLeod-Demers** Health Sciences
11	**Jesus Gudino** Cell Biology	65	**Matthew Skelley** Microbiology	12	**Riley Mooney** Cell Biology	66	**Princess Akyea-Obesebea** Microbiology
13	**Mariela Garces** Chem & Biochem	67	**Ashley Olson** Microbiology	14	**Ava Austin** Chemistry & Biochem	68	**Beamlak Hiltework** Microbiology
15	**Marissa Purfeerst** Chem & Biochem	69	**Olivia Viele** Microbiology	16	**Caleb Whitaker** Chemistry & Biochem	70	**Yusra Amena** Microbiology
17	**Ty Ojanovac** Chemistry & Biochem	71	**Mary Olorunkosebi** Microbiology	18	**Owen Beck** Chemistry & Biochem	72	**Zoey Lane** Microbiology
19	**Omnia Ahmed** Chemistry & Biochem	73	**Alyssa Culver** Microbiology	20	**Hannah Eden** Chemistry & Biochem	74	**Diana Guzman** Microbiology
21	**Isabel Navas Rodriguez** Chemistry & Biochem	75	**Danielle Ashton** Microbiology	22	**Remi Irwin** Chemistry & Biochem	76	**Emily Everett** Microbiology
23	**Jesús Gómez** Chemistry & Biochem	77	**Maciej Zalinski** Microbiology	24	**Abigail Lewis** Chemistry & Biochem	78	**Allisha Ishaque** Microbiology
25	**Conner Herkert** Chemistry & Biochem	79	**Philip Ambe Omiah** Physics, Math, & Astronomy	26	**Maddy Kotler** Chemistry & Biochem	80	**Hansini Gamage Don** Microbiology
27	**Samuel Hannig** Chemistry & Biochem	81	**Nathan Oliveira** Physics, Math, & Astronomy	28	**MD. Imon Hossain** Chemistry & Biochem	82	**Octavio Ortiz** Microbiology
29	**Md Mahmud Alam** Chemistry & Bio Chem	83	**Thu Thanh Minh Do** Physics, Math, & Astronomy	30	**Marlena Gabriel** Chemistry & Biochem	84	**Blake Abernathy** Physics, Math, & Astronomy
31	**Olalekan Ogunsola** Chemistry & Bio Chem	85	**Marissa Feldhake** Physics, Math, & Astronomy	32	**Ayowole Owolabi** Chemistry & Biochem	86	**Gregory Wilson** Physics, Math, & Astronomy
33	**Md. Motahar Kibriah** Engineering & Technology	87	**David Revelle** Plant Biology	34	**Prajakta Pohare** Engineering & Technology	88	**Sydnee Osgood** Physics, Math, & Astronomy
35	**Cory Booher** Engineering & Technology	89	**Jacob Sutton** Plant Biology	36	**Boone Formhals** Engineering & Technology	90	**Yaksh Patel** Plant Biology
37	**Rachel Kim** Engineering & Technology	91	**Leyla Zeynep Loga** Plant Biology	38	**Dennis Fofie Kwarkye** Environmental Science	92	**Jacob Blameuser** Plant Biology
39	**Christopher Mueller** Environmental Science	93	**Kylie Pearman** Plant Biology	40	**Prakash Joshi** Environmental Science	94	**Michaela Barter** Plant Biology
41	**Pragya Sharma** Environmental Science	95	**Riley Brown** Zoology	42	**Allissa Busch** Environmental Science	96	**Avril Enciso** Zoology
43	**Jenisha Adhikari** Environmental Science	97	**Abigail Beddingfield** Zoology	44	**Sophia Borjon** Environmental Science	98	**Kirsten Fisher** Zoology
45	**Grace Witsken** Environmental Science	99	**Isabell Walker** Zoology	46	**Brenden Auerbach** Environmental Science	100	**Dylan Krohe** Zoology
47	**Garrett Vanfossan** Environmental Science	101	**Abby Heberling** Zoology	48	**Sam McNamee** Environmental Science	102	**Aleyda McPherson** Zoology
49	**Richard Owusu Ansah** Environmental Science	103	**Michelle Le** Zoology	50	**Mohamed Saady** Environmental Science	104	**Hannah Bendler** Zoology
51	**Viola Stangle** Environmental Science	105	**Mariam Sani** Earth Science	52	**Mehedi Hasan** Environmental Science	106	**Zachary Renken** STEM Education
53	**Christopher O'Steen** Environmental Science	107	**Claire Iott** Earth Science	54	**Confidence Ikpe** Environmental Science		

ILLINOIS JUNIOR ACADEMY OF SCIENCE POSTER PRESENTATIONS OVERVIEW

STUDENT FITNESS CENTER, ACTIVITY CENTER GYM ROOM 1420

Group A [3:15pm – 4:10pm] – Odd Numbers				Group B [4:15pm – 5:10pm] – Even Numbers			
1001	**Yagnesh Lokesh** *(Agriculture)*	9th	Illinois STEM Society	1002	**Ishika Mathur** *(Agriculture)*	10th	Adlai E. Stevenson High School
1003	**Sohum Mehta** *(Behavioral Science)*	11th	Illinois Math & Science Academy	1004	**Diego Landeros** *(Biochemistry)*	11th	Lane Tech High School
1005	**Arnav Chaphalkar** *(Computer Science)*	9th	Adlai E. Stevenson High School	1006	**Theodore Tikhomirov** *(Design Project)*	11th	Independent
1007	**Oluwanifemi Ngozi Ekemode** *(Earth Science)*	9th	Air Force Academy High School	1008	**Anda Wattanakit** *(Electronics)*	10th	Richwoods High School
1009	**Navtej Bhatti** *(Electronics)*	11th	Glenwood High School	1010	**Aditya Dara** *(Electronics)*	8th	Dunlap Area Research Group
1011	**Samarth Donapati** *(Environmental Science)*	10th	Adlai E. Stevenson High School	1012	**Akshitha Sushil** *(Environmental Science)*	11th	Adlai E. Stevenson High School
1013	**Agrini Neekhra** *(Health Science)*	11th	Dunlap High School	1014	**Amrutha Dara** *(Health Science)*	11th	Dunlap High School
1015	**Cyrus Darki** *(Health Science)*	9th	Hinsdale Academy	1016	**Yamileth Gamez-Rocha** *(Health Science)*	12th	Carver Military Academy
1017	**Ishani Gupta** *(Health Science)*	10th	Adlai E. Stevenson High School	1018	**Sohum Kodilkar & Ansh Mehta** *(Health Science)*	9th	Dunlap Area Research Program
1019	**Ishant Sharma** *(Health Science)*	10th	Illinois STEM Society	1020	**Yuxin Shi** *(Health Science)*	10th	Walter Payton High School
1021	**Cynthia Chen** *(Mathematics)*	10th	Walter Payton College Prep	1022	**Bogdan Felix Jones** *(Mathematics)*	11th	Walter Payton College Prep
1023	**Darius Jones** *(Mathematics)*	9th	Whitney M. Young Magnet High School	1024	**Navya Shah** *(Molecular Biology)*	10th	Neuqua Valley High School

KEYNOTE ADDRESS – ZHI-QING (ZQ) LIN, PH.D – 2:00PM
SCIENCE EAST 3126

Selenium in the Environment and Human Health

Zhi-Qing (ZQ) Lin, Ph.D.
Professor and SIUE Distinguished Research Professor (2020), Department of Environmental Sciences & Department of Biological Sciences

Dr. Lin earned a Bachelor of Science (environmental biology) from Liaoning University, a Master of Science (pollution ecology) from the Chinese Academy of Sciences, and his Ph.D. (renewable resources) from McGill University (1996). He conducted post-doctoral research at UC Berkeley and joined the faculty of SIUE in 2002.

Dr. Lin has served as director of the SIUE Environmental Sciences program and as chair of the SIUE Department of Environmental Sciences, has held many offices and provided his expertise to scientific agencies and societies, and is the co-founder and current secretary of the *International Society for Selenium Research*. We are proud to recognize that Dr. Lin has a long association with ISAS and served as the division chair for Environmental Sciences from 2004-2006!

Dr. Z.Q. Lin with his students and colleagues have investigated trace element selenium along its path in the abiotic and biotic environment for more than 25 years. His prolific research informs both basic science knowledge and practical application. As you will hear, selenium can be in harmful excess or in deficiency, depending on geography and past environmental disturbances. How can these conditions be assessed, remediated, or modified to alleviate potential harm or even provide benefits to human nutrition and the environment? Dr. Lin's research perspective on selenium may be best encapsulated by the terms 'biogeochemistry,' 'phytoremediation,' and 'biofortification.' In the process of exploring selenium in our environment, Dr. Lin has authored or co-authored over one hundred peer-reviewed articles and book chapters and been part of research funding of nearly 1 million US dollars, including grants from US NSF, NIH, EPA, and DOE. You can learn more about Dr. Lin's research and laboratory at www.siue.edu/~zhlin/.

ORAL PRESENTATIONS SCHEDULE – 9:00AM-11:45AM
SCIENCE EAST

Time	Presenter	Title of Presentation
Cell, Molecular, & Developmental Biology – Rm SE 2206		
9:00am	Yusiro Ismail (WIU, Grad)	The Potency of Anti-Cancer Extracts of *Acmella* spp in Ovarian Cancer
9:15am	Chiemeka Emeribe (WIU, Grad)	When Plant Defense Goes Silent: Jasmonates does not accumulate in the *ppi*2 Mutant of *Arabidopsis*
9:30am	Emily Edwards (Millikin, UG)	Late-Stage Immune Responses to Self-Antigens in Tadpoles: Potential as a Lupus Model
9:45am	Shreya Sharma (EIU, Grad)	Cellular Reprogramming of Rat Fibroblasts Using CRISPR Technology
Chemistry & Biochemistry – Rm SE 2206		
10:15am	Jessica Sager (SIUE, UG)	Temperature Dependence of Kinetic Isotope Effects of the Apparent Hydride Transfer Reactions from NADH Analogues to Tetracyanoethylene in Solution
10:30am	Samuel Bickford (SIUE, UG)	Reaction Monitoring and Catalyst Exploration for Tandem Ugi-Smiles Reactions
Computer Science – Rm SE 0214		
10:30am	Amritha Praveen (Adlai, HS)	Early Risk Assessment of Autism Spectrum Disorder: A Novel Approach Using Microbial Biomarkers and Ensemble Classification Models
10:45am	Jenna Mohammed (ISU, UG)	The Role of Prompt Engineering in Enhancing Generative AI Performance
Engineering & Technology – Rm SE 0214		
11:00am	Ren Goodfriend(Oak Park, HS)	Evaluation of Muon Energies for Quantification of Single Event Upsets Within Aircraft Transistors With Specific Applications of United States Military Technology
Environmental Science – Rm SE 0222		
9:00am	Danielle Lee (SIUE)	Urban Biomonitoring – Comparing Local Biodiversity of Collinsville and Edwardsville
9:15am	Chris Theodorakis (SIUE)	Acute and Chronic Toxicity of Metal Oxide Nanoparticles in Fathead Minnows
9:30am	Iyanuoluwa Fatunmbi (SIUE, Grad)	Bridging Resolution Gap: A Machine Learning Approach to Estimating Land Surface Temperature Using Higher-Resolution Satellite Data
9:45am	Anna Berg (Bradley, UG)	Landscape of Fear in Mammals in Response to Anthropogenic Hunting Pressure
10:00am	Brianna Cook (Bradley, Grad)	Anthropogenic Invasion's Effect on Mammal Community Composition and Activity
10:30am	Harriet Barker (Bradley, Grad)	Impact of Urbanization on Macro-Moth Species Composition in Central Illinois
10:45am	Emma Prott (SIUE, UG)	The Sedimentological Impact of Immigration Infrastructure on River Dynamics: Rio Grande at Eagle Pass, Texas
11:00am	Blake Rentz (SIUE, Grad)	Comparative Life-History Parameters of DDT-Susceptible and -Resistant *Drosophila melanogaster* Strains
11:15am	Emily Beiler (SIUE, Grad)	Acute, Developmental, and Behavioral Toxicity of PFOS on Fruit Flies and Planarians
11:30am	Lev Khoubaeva-Hummel (Oak Park, HS)	Quantification of the Effects of Fluopyram on the Head Regeneration, Photophobic Behavior, Mobility, and Mortality Rates of *Girardia tigrina* with Implications for Ecotoxicological Safety
Health Sciences – Rm SE 2214		
10:15am	Abhilash Polu (IMSA, HS)	Qualitative Analysis of the Acceptability of Attention Training as a Potential Treatment for Individuals with Long-COVID Brain Fog
10:30am	Luke Yin (IMSA, HS)	Efficacy of Tomivosertib (MNK1/2 Inhibitor) in Mitigating RDEB Mice Pain
10:45am	Jacob Black (Oakton, UG)	Using a Randomized Natural Experiment to Estimate the Effects of the Evaluee's Gender, Physical Attractiveness, and Serial Position on the Evaluator's Memory and Accuracy
11:00am	Lucia Thompson (SIUE, Grad)	Methimazole-Induced Hypothyroidism Influences Growth, Circulating Ghrelin Levels, and Gut Microbiome Composition in Mice
11:15am	Abigail Falkoff (Oak Park, HS)	Ecdysone Used to Induce a Hyperandrogenism Phenotype in *Drosophila melanogaster* as a Basis for a Novel Invertebrate Polycystic Ovary Syndrome Model
11:30am	Bradley Coulter(SIUE, Grad)	Hormonal Havoc: Thyroid's Role in Bone and Gut Health
Physics, Mathematics, & Astronomy – Rm SE 0214		
9:00am	Chelsie Hadley (WIU, UG)	Automating Quantum Error Correction
9:15am	Angelica Strack (WIU, Grad)	Physical and Optical Properties of Neodymium (Nd^{3+}) Doped Bismuth Boro-Tellurite Glasses
9:30am	Gabriel Sojka (WIU, Grad)	Molecular Masers and Continuum Variability in the Orion Nebula

Time	Presenter	Title of Presentation
9:45am	Amy Aung (WIU, Grad)	Raman Spectroscopic Investigations of Structural Properties of Pr^{3+} Doped Bismuth Boro-Tellurite Glasses
10:00am	Marcus King (Governor French, HS)	Water World Exoplanet Atmospheric and Spectral Data Analysis via Thermodynamic Modeling and Unsupervised Machine Learning
		Plant Biology – Rm SE 2214
9:00am	Jenna Sellers (IC, UG)	Viability Assessment of Orchid Seeds and Their Mycorrhizal Fungi in Prolonged Cool Storage for Conservation
9:15am	Toby McTamney (IC, UG)	The Status of Florida's Ghost Orchid (*Dendrophylax lindenii*) as of 2024
9:30am	Kurt Schulz (SIUE)	Invasion by *Lespedeza cuneata* Reconfigures Plant and Ground-Dwelling Insect Communities
9:45am	Zachary Woodall (SIUE, UG)	Determining the Effect of Falling Chloroplasts on the Gravitropic Response in *Arabidopsis thaliana*
		STEM Education – Rm SE 2206
10:45am	Gwendolyn Knapp (IC)	Incorporating Primary Literature into the Classroom Using *This Week in Microbiology* (TWiM) Podcasts
		Zoology – Rm SE 2206
11:00am	Hailey Gula (Millikin, UG)	Significance of *Aspergillus* as a Pathogen to Birds of Prey in Central Illinois

POSTER PRESENTATIONS SCHEDULE –3:15PM-5:10PM
STUDENT FITNESS CENTER, ACTIVITY CENTER GYM ROOM 1420

Time	#	Presenter	Title of Presentation
			Anthropology & Archeology
3:15pm	**1**	Kirstien Fisher (Bradley, UG)	Gender Disparities in the Diagnostic Process of Chronic Illness among College-Aged Women in the US
3:15pm	**3**	Devin Boggs (IC, UG)	Does Mandible Development Influence Wisdom Tooth Impaction?
			Cell, Molecular, & Developmental Biology
3:15pm	**5**	Elyse Ibata (SIUE, UG)	RNA-Seq Analysis of White vs. Green Sectors in *Arabidopsis geranylgeranyl* Diphosphate Synthase 11 Mutants
4:15pm	**6**	Elly Beck (Bradley, UG)	Characterizing the Effect of Carboplatin on the Aggression of Bulk Ovarian Cancer Cells and Ovarian Cancer Stem Cells
3:15pm	**7**	Godfred Mensah (WIU, Grad)	The Effect of Toc132/120 Mutation on the Expression of JAZ Repressor Genes
4:15pm	**8**	Ali Daoud (IC, UG)	Challenging Cornea-Lens Regeneration in the Mature Frog Cornea
3:15pm	**9**	Melanie Buzzard (Bradley, UG)	Investigating Cardiotoxic Effects of Nab-Paclitaxel Compared to Regular Paclitaxel on Developing Zebrafish (*Danio rerio*)
4:15pm	**10**	Kennedy Spears (SIUE, UG)	The S*cizophyllum* Commune Mound Mutant in a wc-2 -Disrupted Background
3:15pm	**11**	Jesus Gudino (SIUE, UG)	Knockout of a Kynureninase-Coding Gene Does Not Lead to a Nicotinic Acid Requirement in *Schizophyllum* Commune
4:15pm	**12**	Riley Mooney (SIUE, UG)	Physiological and Behavioral Changes in *Drosophila melanogaste*r After Chronic Repeated Ethanol Exposure
			Chemistry & Biochemistry
3:15pm	**13**	Mariela Garces (WIU, UG)	Analysis of Oxamyl is Locally Purchased Produce
4:15pm	**14**	Ava Austin (SIUE, Grad)	Correlation of Kinetic Isotope Effects with Their Temperature Dependences of Hydride Transfer Reactions of NADH/NAD^+ Analogues in Solution
3:15pm	**15**	Marissa Purfeerst (Maryville, UG)	Using Dry ATR-FTIR Spectroscopy to Identify 1,4-Butanediol in Alcoholic Beverages
4:15pm	**16**	Caleb Whitaker (WIU, UG)	Nickel Telluride Synthesis
3:15pm	**17**	Ty Ojanovac(WIU, Grad)	Development of an Organometallic Chemistry Reaction for Use in a Senior Level Inorganic Laboratory
4:15pm	**18**	Owen Beck (WIU, UG)	Athabascaite Crystal Synthesis
3:15pm	**19**	Omnia Ahmed (SIUE, Grad)	Exploring Bacterial Replication and Survival Dynamics Under Different Oxidative Stress Conditions at the Single-Bacterium Level
4:15pm	**20**	Hannah Eden (WIU, UG)	The Flavonoid Content of the *Acmella* Plant
3:15pm	**21**	Isabel Navas Rodriguez (WIU, Grad)	Anticancer Activity of Nigerian Inorganic Complexes in Ovarian Cancer (SKOV3) Cells
4:15pm	**22**	Remi Irwin (WIU, Grad)	Exploration of FeS, $Fe_{.8}S_{1.2}$, and FeS_2 by Solid State Synthesis
3:15pm	**23**	Jesús Gómez (SIUE, UG)	Dual Photosensitizer Polymeric Platforms with Optimized Antimicrobial Properties
4:15pm	**24**	Abigail Lewis (SIUE)	Exploration of Caffeic Acid as a Component in Ugi Reactions
3:15pm	**25**	Conner Herkert (SIUE, UG)	Temperature Dependence of Modified Ugi-Smiles Reactions with CPA Catalysts
4:15pm	**26**	Maddy Kotler (WIU, Grad)	Quantification of Cannabichromenic Acid among Seventeen Cannabinoids in Key Lime Pie Hemp Flowers by Liquid Chromatography Ultraviolet Detection
3:15pm	**27**	Samuel Hannig (IC, UG)	Extraction and Characterization of Chitin from Cicada Shells
4:15pm	**28**	MD. Imon Hossain (WIU, Grad)	Quantification of Cannabidiol in Bath Balm Using Ultrahigh Performance Liquid Chromatography with Ultraviolet Detection
3:15pm	**29**	Md Mahmud Alam (WIU, Grad)	Quantification of Cannabichromene in Hemp-Infused Face Cream Using Ultrahigh-Performance Liquid Chromatography with Ultraviolet Detection
4:15pm	**30**	Marlena Gabriel (WIU, Grad)	Application of Diorganylditellurides in Hiyama Coupling Reactions

Time	#	Presenter	Title of Presentation
3:15pm	**31**	Olalekan Ogunsola (WIU, Grad)	Potency Testing of Synthetic THC Isomers-Based Products by Liquid Chromatograph Ultraviolet Detection: Quantification of Cannabidiol in a Delta8-THC Focused Blends – Soothe Oil
4:15pm	**32**	Ayowole Owolabi (WIU, Grad)	Potency Testing of Synthetic THC Isomers-Based Products by Liquid Chromatograph Ultraviolent Detection: Quantification of Delta 9-THC in a Delta 8-THC Fortified Hemp Oil Tincture
		Computer Science	
4:15pm	**2**	Bowen Li (Aptakisic, JH)	Machine Learning Models for Tennis Serves
4:15pm	**4**	Misbahuddin Mohammed (Bradley, Grad)	Analysis and Modeling of Respiratory Disease and the Influence of Socioeconomic Factors in Central Illinois
		Earth Science	
3:15pm	**105**	Mariam Sani (SIUE, Grad)	Science-Interested Undergraduates' Perceptions of the Geosciences as a Career
3:15pm	**107**	Claire Iott (SIUE, Grad)	Where Have Spring and Fall Gone? Changes in Temperate Transition Season Days
		Engineering & Technology	
3:15pm	**33**	Md. Motohar Kibriah (WIU, Grad)	Advancing Aviation Safety: The Possibility of an Emergency Evacuation Detachable Airplane Cabin
4:15pm	**34**	Prajakta Pohare (ISU, Grad)	Enhancing Inventory Control to Prevent Expired Goods Using Six Sigma
3:15pm	**35**	Cory Booher (WIU, Grad)	From Concept to Completion
4:15pm	**36**	Boone Formhals (WIU, Grad)	Mapping Engineering Excel Functions to VBA Across Versions: A Proof-of-Concept
3:15pm	**37**	Rachel Kim (Dunlap, HS)	How is AI Impacting Students' Learning?
		Environmental Science	
4:15pm	**38**	Dennis Fofie Kwarkye (SIUE, Grad)	Assessing the Impact of Increased Levonorgestrel Exposure on Surface Water Pathogen Detection
3:15pm	**39**	Christopher Mueller (SIUE, UG)	Selenium Accumulation and GSH-Px Activity in Different Cultivars of Garlic (*Allium sativum*)
4:15pm	**40**	Prakash Joshi (SIUE, Grad)	Molecular Interaction of Selenium and Mercury in Edible Tissues of Shellfish
3:15pm	**41**	Pragya Sharma (SIUE, Grad)	Greenhouse Gas Inventories for Small Cities: A Case Study of Webster Groves, Missouri
4:15pm	**42**	Allisa Busch (Bradley, UG)	How is Urbanization Affecting the Morphology of Macromoths in the Family Erebidae in Central Illinois?
3:15pm	**43**	Jenisha Adjikari (SIUE, Grad)	Impact of Agricultural Practices and Nutrient Runoff on Water Quality in the Indian Creek-Cahokia Creek Watershed
4:15pm	**44**	Sophia Borjon (Bradley, UG)	Effect of Urbanization on Katydid Vocalization Events
3:15pm	**45**	Grace Witsken (SIUE, UG)	Best Fit Model of Ant Abundance in Edwardsville, IL
4:15pm	**46**	Brenden Auerbach (SIUE, UG)	Exploring the Potential Application of Natural Organic Matter Capped Silver Nanoparticles in Antimicrobial Photodynamic Therapy
3:15pm	**47**	Garrett Vanfossan (SIUE, UG)	Analysis of Stress Responses in DDT-Susceptible and -Resistant Strains of *Drosophila melanogaster*
4:15pm	**48**	Sam McNamee (SIUE, UG)	County-Level Water Use Efficiency and Demand Projection in Illinois
3:15pm	**49**	Richard Owusu Ansah (SIUE, Grad)	Determination of Antibiotic-Resistant Genes in *Pseudomonas* and *Salmonella* Species
4:15pm	**50**	Mohamed Saady (SIUE, UG)	Analysis of Chill Coma Recovery and Geotactic Behavior in DDT-Susceptible and –Resistant Strains of *Drosophila melanogaster*
3:15pm	**51**	Viola Stangle (SIUE, UG)	Synthesis and Characterization of NOM-Induced Silver Nanoparticle for Potential Contaminant Degradation Studies
4:15pm	**52**	Mehedi Hasan (SIUE, Grad)	Monitoring Microplastics in United States River Waters: A Review of Distribution, Sources, and Environmental Consequences
3:15pm	**53**	Christopher O'Steen (SIUE, Grad)	Hot Spot and Directional Distribution Analysis of Alaskan Wildland Fires, 1980-2020
4:15pm	**54**	Confidence Ikpe (SIUE, Grad)	Fecal Indicator Bacteria Monitoring and Microbial Source Tracking in Horseshoe Lake

Time	#	Presenter	Title of Presentation
			Health Science
3:15pm	**55**	Amanda Tannehil (SIUE, Grad)	Antimicrobial Properties of Agmatine and Epigallocatechin Gallate (EGCG): An In-Vitro Investigation
3:15pm	**57**	Joseph Agyemang (SIUE, Grad)	Illegal Mining: An Environmental Enemy and a Public Health Threat in Ghana
4:15pm	**58**	Robert Mense (SIUE, UG)	The Effect of Additives of Bacterial Growth
3:15pm	**59**	CANCELLED	
4:15pm	**60**	Sanam Talwar (SIUE, Grad)	Chronic Inflammation in the Dental Pulp of Marfan Syndrome Mouse Model Fbn1 C1041G+/-
3:15pm	**61**	Tsilate Tadesse (IC, UG)	Does Dual-Task Walking Affect Cognitive Performance in Individuals With and Without Concussion 'Negatively Or Positively'?
4:15pm	**62**	Sahana Garapati (IMSA, HS)	The Role of Genistein Modeling Estrogen in the Blood Brain Barrier as a Treatment for Alzheimer's Disease
4:15pm	**64**	Colin McLeod-Demers (IC, UG)	Impact of Physical Activity Intensity on Academic Achievement in Middle School Students in Illinois
			Microbiology
1:00pm	**63**	Amanda Ekstrand (SIUE), UG)	Sticking Together: Characterizing Locust Olfactory Responses to Bacterial Volatile Signals
2:30pm	**65**	Matthew Skelley (EIU, UG)	Impact of Media Composition on Culturing Acidophiles
3:15pm	**66**	Princess Akyea-Obesebea (IC, UG)	Surveying the Environment for Antimicrobial Resistance
3:15pm	**67**	Ashley Olson (IC, UG)	Playing in Dirt: The Search for New Antibiotics
4:15pm	**68**	Beamlak Hiltework (IC, UG)	Antimicrobial Screening of Orchid Mycorrhizal Fungi as a potential Source of New Antibiotics
3:15pm	**69**	Olivia Viele (EIU, UG)	Impact of Sulfate on Growth of an Acidophilic Archaeon
4:15pm	**70**	Yusra Amena (SIUE, UG)	Single-Cell Imaging Reveals Phage-Induced Bacterial Heterogeneity in Membrane Lysis
3:15pm	**71**	Mary Olorunkosebi (WIU, Grad)	Comparative Study of the Biodegradation Potential of Foreign and Indigenous Bacteria in Pharmaceutical Effluent
4:15pm	**72**	Zoey Lane (SIUE, UG)	Real-Time Imaging of Bacterial Predation Highlights Variability in Prey Survival Times
3:15pm	**73**	Alyssa Culver (SIUE, Grad)	Gut Warfare: Investigating Type VI Secretion System-Mediated Competition in Termite-Associated *Serratia*
4:15pm	**74**	Diana Guzman (Bradley, UG)	Investigating Regulatory Factors Influencing bcp Gene Expression in *Bacillus subtilis* Using Transposon Mutagenesis
3:15pm	**75**	Danielle Ashton (Bradley, UG)	Investigating Factors that Promote Expression of bcp in *Bacillus subtilis*
4:15pm	**76**	Emily Everett (Bradley, UG)	Impact of Mosquitocidal Fungal Entomopathogens on the Mosquito Microbiome
3:15pm	**77**	Maciej Zalinski (Lewis, UG)	Investigation of Antimicrobial Molecules in Osage Orange (*Maclura pomifera*) Extracts
4:15pm	**78**	Allisha Ishaque (WIU, Grad)	Degradation of the Toxic Chemical P-Nitrophenol by Environmental Water Samples
4:15pm	**80**	Hasini Gamage Don (EIU, Grad)	Oligotrophic Bacterial Carbon Compound Utilization Mechanisms
4:15pm	**82**	Octavio Ortiz (Lewis, UG)	Microbial Activity of Rhizosphere in Soils Amended with Biochar Produced from Different Species of Invasive Plants
			Physics, Mathematics, & Astronomy
3:15pm	**79**	Philip Ambe Omiah (WIU, Grad)	Spectroscopic Analysis of Rare Earth Ions (Pr^{3+} and Dy^{3+}) Co-Doped Bismuth Boro-Tellurite Glasses
3:15pm	**81**	Nathan Oliveira (SIUE, UG)	Studying the Formation of Persistent Holographic Grating in Tellurium Barium Glass
3:15pm	**83**	Thu Thanh Minh Do (SIUE, UG)	Tunable Polarization-Entangled Photon Pairs for Testing Bell's Inequalities and Demonstrating Quantum Nonlocality
4:15pm	**84**	Blake Abernathy (SIUE, UG)	Laser Induced Persistent Change in the Index of Refraction in Praseodymium-Doped Zinc-Tellurite Glass Using the X-Scan Technique

Time	#	Presenter	Title of Presentation
3:15pm	**85**	Marissa Feldhake (SIUE, UG)	Investigating the Thermo-Optical Coefficient of Telluride Glass with Different Concentrations of Praseodymium
4:15pm	**86**	Gregory Wilson (SIUE, UG)	Electro-Physical Properties of a Nematic Liquid Crystal Dispersed with Silver Nanoparticles
4:15pm	**88**	Sydnee Osgood (WIU, UG)	Variations in Refractive Index and Sm-Fluorescence in Barium Bismuth Borate Glasses
		Plant Biology	
3:15pm	**87**	David Revelle (SIUE, UG)	Assembly of an Inducible Gernaylgeranyl Diphosphate Synthase 11 (GGPPS11) Construct to Better Understand Variegation in the ggpps11-1 Mutant
3:15pm	**89**	Jacob Sutton (SIUE, UG)	Comparing Interior and Exterior Forest Amur Honeysuckle Growth Metrics
4:15pm	**90**	Yaksh Patel (SIUE, UG)	Using Machine Learning to Track and Quantify Circumnutation in *Arabidopsis thaliana* Inflorescence Stems
3:15pm	**91**	Leyla Zeynep Loga (SIUE, UG)	The Effect of Hypoxia on *Arabidopsis* Knockouts of Genes Showing Altered Expression During Spaceflight
4:15pm	**92**	Jacob Blameuser (SIUE, UG)	Analysis of Biomass in *Arabidopsis thaliana* Berberine Bridge Enzyme-Like Mutants
3:15pm	**93**	Kylie Pearman (SIUE, UG)	Comparison of Root and Surrounding Soil Microbiome of the Invasive Orchid *Epipactis helleborine* with the Threatened *Platanthera leucophaea*
4:15pm	**94**	Michaela Barter (SIUE, UG)	Microbiome Analysis of Roots and Soil Surrounding *Platanthera leucophaea*
		STEM Education	
4:15pm	**106**	Hunter Hansen (SIUE, Grad)	Geographic Thinking in Interdisciplinary Research: Examining Conceptualization, Experience, and Communication Among Watershed Scholars
		Zoology	
4:15pm	**56**	Laura Tayon (SIUE, UG)	The Effect of Incubation Temperature on Salamander Survival and Fitness
3:15pm	**95**	Riley Brown (SIUE, UG)	Lyme Disease in Field Mice in the Edwardsville Area
4:15pm	**96**	Avril Enciso (Bradley, UG)	Influence of CO_2 on Parasitic Infection of the American Bullfrog (*Rana catesbeiana*)
3:15pm	**97**	Abigail Beddingfield (IC, UG)	Examining the Response of Bats to the Playback of Conspecific and Heterospecific Distress Calls
4:15pm	**98**	Kirsten Fisher (Bradley, UG)	A Comparative Study of Lab vs. Field Based Aerial Exposure on Zebra Mussel Survival
3:15pm	**99**	Isabelle Walker (SIUE, Grad)	Behavioral Flexibility in Tool Use of *Aphaenogaster rudis*
4:15pm	**100**	Dylan Krohe (SIUE, Grad)	Adaptive Tool Use in Response to Resource Viscosity: A Study of *Aphaenogaster rudis*
3:15pm	**101**	Abby Heberling (Millikin, UG)	West Nile Virus in Birds of Prey: Minor Pest or Major Problem?
4:15pm	**102**	Aleyda McPherson (Millikin, UG)	Tradeoffs in Reproduction, Body Condition, and Immune Defense in Breeding and Non-Breeding Northern Cardinals (*Cardinalis cardinalis*)
3:15pm	**103**	Michelle Le (Pharmacy)	An Examination of the Trailing Ability of Neonate Snakes: Preliminary Findings
4:15pm	**104**	Hannah Bendler (SIUE, UG)	Canopy Cover Influences on Arthropod Abundance in Giant Cane Patches

ILLINOIS JUNIOR ACADEMY OF SCIENCE
POSTER PRESENTATIONS SCHEDULE –3:15PM-5:10PM
STUDENT FITNESS CENTER, ACTIVITY CENTER GYM ROOM 1420

Agriculture

3:15pm 1001 Yagnesh Lokesh (9th)
[Illinois STEM Society]
Seasonal Variations in Antibiotic Resistance: A Comparative Study of Soil Microbial Resistance in Summer and Winter

4:15pm 1002 Ishika Mathur (10th)
[Adlai E. Stevenson High School]
Machine Learning for Drought & Crop Yield Prediction In Geographic Regions

Behavioral Science

3:15pm 1003 Sohum Mehta (11th)
[Lane Tech High School]
Novel Interactions of Lexical Frequency and Visual Stimuli during Word Retrieval

Biochemistry

4:15pm 1004 Diego Landeros (11th)
[Illinois Math & Science Academy]
Nitroisoxazole GPX4 Inhibitor Conjugate

Computer Science

3:15pm 1005 Arnav Chaphalkar (9th)
[Adlai E. Stevenson High School]
Computer Vision-Powered Motion Analysis for Objective Fencing Refereeing

Design Project

4:15pm 1006 Theodore Tikhomirov (11th)
[Independent]
Improving EMS in Underserved Areas with Drones

Earth Science

3:15pm 1007 Oluwanifemi Ngozi Ekemode (9th)
[Air Force Academy High School]
Ozone Guard

Electronics

4:15pm 1008 Anda Wattanakit (10th)
[Richwoods High School]
Harvesting Rotational Energy from a Moving Wheel for a Self-Guided Mobility Aid (Glide)

3:15pm 1009 Navtej Bhatti (11th)
[Glenwood High School]
High-Frequency BLDC Feedforward Control and Optimization for Motion Control

4:15pm 1010 Aditya Dara (8th)
[Dunlap Area Research Group]
Analysis of Sensor Technologies for Enhanced Self-Driving Car Performance

Environmental Science

4:15pm 1011 Samarth Donapati (10th)
[Adlai E. Stevenson High School]
Leveraging Machine Learning Models to Forecast Atmospheric PM2.5 Concentrations

4:15pm	**1012**	**Akshitha Sushil** 11th) [Adlai E. Stevenson High School]	The Usage of Metal Organic Frameworks to Harvest Water, with factors of Passive Radiative Cooling & Relative Humidity

Health Science

3:15pm	**1013**	**Agrini Neekhra** (11th) [Dunlap High School]	A Unique Triage Approach to Management of Febrile Neutropenia in Pediatric Oncology Patients for Efficient Patient Stabilization and Antibiotic Administration
4:15pm	**1014**	**Amrutha Dara** (11th) [Dunlap High School]	Capsule Composion and Dissoluon: Analyzing the Efficiency of Various Capsule Types in Drug Delivery
3:15pm	**1015**	**Cyrus Darki** (9th) [Hinsdale Academy]	Exploring The Obesity Paradox: Impact of Obesity on Mortality and Inflammatory Markers in Acute Pulmonary Embolism
4:15pm	**1016**	**Yamileth Gamez-Rocha** (12th) [Carver Military Academy]	BioBone: Creating the Future of Bone Grafting
3:15pm	**1017**	**Ishani Gupta** (10th) [Adlai E. Stevenson High School]	The Effect of Herbal Supplements S-adenosyl methionine and St. John's Wort on Antibiotic Potency in *Escherichia coli*
4:15pm	**1018**	**Sohum Kodilkar & Ansh Mehta** (9th) [Dunlap Area Research Program]	What is Your Snoring Telling You?
3:15pm	**1019**	**Ishant Sharma** (10th) [Illinois STEM Society]	Computer Model to Detect Cases of Skin Cancer
4:15pm	**1020**	**Yuxin Shi** (10th) [Walter Payton High School]	HT1 and AKU Biological Meta-Analysis

Mathematics

3:15pm	**1021**	**Cynthia Chen** (10th) [Walter Payton College Prep]	Inversion to Gaskets
4:15pm	**1022**	**Bogdan Felix Jones** (11th) [Walter Payton College Prep]	Twisted Prime Pairs
3:15pm	**1023**	**Darius Jones** (9th) [Whitney M. Young Magnet High School]	Gaps Between Primes

Molecular Biology

4:15pm	**1024**	**Navya Shah** (10th) [Neuqua Valley High School	Somatic Mutations as Biomarkers for Autoimmune Disease Diagnosis & Prognosis

ISAS ORAL PRESENTATION ABSTRACTS

9:00am – 11:45am, Saturday, April 5, 2025, in Science East

*presenter, [school] with differences noted by superscript

CELL, MOLECULAR, & DEVELOPMENTAL BIOLOGY – RM SE2206

9:00am Grad **The Potency of Anti-Cancer Extracts of *Acmella* spp in Ovarian Cancer**

*Yusiro Ismail & Jennifer Schroeder [Western Illinois University]

Ovarian cancer is a gynecological cancer with a high mortality rate and is the fifth leading cause of the cancer death amongst women in the United States. Approximately 140,000 women die from ovarian cancer yearly. Treatment strategies like debulking surgery, platinum based chemotherapy, anti-angiogenic agents are used but these therapies especially chemotherapy fails due to late presentation, preventing remmission leading to chemotherapy resistance. Previous studies have shown that the anticancer effect of ethanol, methanol and ethanol extracts of *Acmella spp* significantly reduce SKOV 3 cells viability. The study aims to investigate the potency (Half maximal inhibitory concentration (IC_{50})) of the anti-cancer effects of different concentrations (0.02 mg, 0.1 mg, 0. 2mg, 1 mg, 2 mg, 10 mg and 20 mg) of *Acmella alba*, *Acmella oleracea, and Acmella calirrhiza* extracts on human ovarian cancer SKOV-3 cell line using 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay. The flowers, leaves, roots and stems of the plants were harvested, dried, crushed into fine powder and extracted using ethanol, methanol or water. Extracts were suspended in dimethyl sulfoxide (DMSO) to attain a concentration of 20 mg/mL. The anti-cancer effects were investigated using the MTT cell viability assay. The results will be analyzed using Graphpad Prism using the one-way ANOVA and Dunnett's post-analysis for multiple comparisons to the DMSO treatment. An IC_{50} curve will be used to determine the extract concentration required to reduce the cell viability compared to untreated cells. It is hypothesized that higher extract concentration will be more potent at reducing the viability of the SKOV-3 cells. The IC_{50} curve is expected to be sigmoidal, indicating a dose dependent response. Investigating the anti-cancer effect of *Acmella spp* extract on ovarian cancer cells can contribute to the existing treatment options which are inadequate as ovarian cancer has a 5-year survival rate of less than 50%.

9:15am Grad **When Plant Defense Goes Silent: Jasmonates does not accumulate in the *ppi*2 Mutant of *Arabidopsis***

*Chiemeka Emeribe, Meshack Afitlhile, & Godfred Mensah [Western Illinois University]

Plants like human defend themselves against herbivore attack, and their ability to do this is dependent on the accumulation of a lipid-derived hormone called Jasmonic acid (JA) in the cytoplasm. Perception of the biologically active JA-Ile in wounded plant tissue signals for the degradation of JAZ proteins by the 26S proteasome system, and for the activation of jasmonate responsive genes such as vegetative storage protein 2 or VSP2. The goal of this study was to compare the expression level of JAZ genes in mechanically wounded leaf tissues of the wildtype and *ppi*2 mutant of *Arabidopsis*. Gene expression studies revealed the down-regulation of JAZ1, JAZ2, JAZ5, JAZ7, and JAZ9 in the wounded *ppi*2 mutant when compared to the wounded wildtype. This suggests that the loss of the TOC159 receptor in the *ppi*2 mutant must have impaired the mutant's ability to synthesize and accumulate the jasmonates (OPDA, JA and JA-Ile). The JA responsive gene, VSP2, which accumulates only when jasmonates levels are high was upregulated in the wounded wildtype and not in the wounded *ppi*2 mutant. These preliminary data showed that leaf tissue wounding resulted in increased expression of VSP2 and JAZ genes only in the wildtype and not in the mutant. Other studies have reported that Map kinase 6 or MAPK6 is activated via MKK3 pathway during pathogen infection. Since the PDF pathway was not induced in our study, there was no significant expression of MAPK6 in the wounded tissues. Unpublished data in our laboratory have shown that genes in the JA pathway are down-regulated in the *ppi*2 mutant, we therefore hypothesize that the *ppi*2 mutant does not accumulate high levels of jasmonates. Understanding key genes involved in JA signaling in plant can lead to genetic engineering and breeding strategies that optimize enhanced wound response and growth, improving overall agricultural yield.

9:30am UG **Late-Stage Immune Responses to Self-Antigens in Tadpoles: Potential as a Lupus Model**

*Emily Edwards & Travis E Wilcoxen [Millikin University]

During late developmental stages, tadpoles actively suppress their immune systems to avoid rejecting adult organs and tissues formed during metamorphosis. This immunosuppression is characterized by a drastic reduction in levels of thymocytes and splenic lymphocytes. However, tadpoles have to maintain the self-tolerance of tadpole tissues while subjecting adult lymphocytes to a second wave of negative selection to develop adult self-tolerance. The period of both tadpole and adult self-tolerance during metamorphosis is called split tolerance. Studies have shown that adults may lose tolerance to certain larval antigens which could lead to a lupus-like autoimmune reaction. Lupus is an autoimmune disease in which autoantibodies attack healthy organs and tissues. We hypothesized that if injected with tail tissue from early in development at later developmental stages, Cuban treefrog tadpoles (*Osteopilus septentrionalis*) would develop a lupus-like autoimmune response to the antigenic tissue. Eighty *O. septentrionalis* tadpoles were divided into four groups: true control, saline injection, IL-2 injection, and antigen injection. The IL-2 group developed significantly less than the other groups. The IL-2 group had significantly more lymphocytes than all other groups. A direct Interferon γ (IFN γ) ELISA was also performed. We found that tadpoles injected with IL-2 significantly elevated their IFN γ levels beyond that of all other groups, though those injected with

self-antigen did elevate IFN γ significantly as well. These results show that immune activation is possible during *O. septentrionalis* metamorphosis; however, no significant autoimmune reaction was stimulated.

9:45am Grad **Cellular Reprogramming of Rat Fibroblasts Using CRISPR Technology**

*Shreya Sharma & Gary Bulla [Eastern Illinois University]

Cell identity is controlled by the activity of transcription factors that recognize and bind particular sequences in the genome and regulate gene expression. Mechanisms responsible for establishment and maintenance of tissue-specific gene expression have been well studied over several decades. These transcription factors that control pathways are important to decipher because they have the potential to define cell identity, enhance cellular reprogramming for regenerative medicine, and improve our understanding of abnormal transcription factors leading to disease. Fibroblast-specific genes have been studied in this laboratory using cell hybrids system and through whole genome analysis of fibroblast specific genes. Evidence suggests that some of these genes have the ability to act as master regulators that can activate fibroblast function. Previous studies have shown that abnormal expression or down-regulation of Snai2 gene expression is significantly associated with cancers, including lung and pancreatic cancers. Understanding of fibroblast specific transcriptional factors and genes will help to recognize the cellular and molecular mechanism pathways of development, regulation and maintenance of fibroblasts in mammalian systems. Using whole genome quantification and additional analyses using cell culture models, we hope to improve the understanding of fibroblasts gene expression in mammals, and to discover which genes are necessary in creating and maintaining fibroblast identity. Here we ask the question of whether loss of Snai2 gene expression can permanently deactivate the fibroblast phenotype to allow for reprogramming of cell fate.

In the project we are using the CRISPR technology to knockout Snai2 gene expression experiments in rat fibroblast cells. We will utilize a commercially available DNA plasmid to produce guide Snai2 RNA along with the Cas9 system. The Snai2-guide RNA/CRISPR system will identify the target sequence in the host genome and make a precise cut at desired location at bp 240 of the Snai2 coding sequence.

CHEMISTRY & BIOCHEMISTRY – RM SE2206

10:15am UG **Temperature Dependence of Kinetic Isotope Effects of the Apparent Hydride Transfer Reactions from NADH Analogues to Tetracyanoethylene in Solution**

*Jessica Sager, Bibesh Pohkrel, & Yun Lu [Southern Illinois University Edwardsville]

Recent investigations of enzyme catalysis have shown a temperature (T)-independence of kinetic isotope effects (KIEs) ($\Delta E_a = E_{aD} - E_{aH} \sim 0$) for wild-type enzyme-catalyzed H-transfer reactions, but T-dependence of KIEs ($\Delta E_a > 0$) in enzyme mutants. Various theories have been proposed to explain these observations. The vibration assisted-activated hydrogen tunneling (VA-AHT) model is one of them, but its applicability to H-transfer reactions remains debatable. Within this model, the $\Delta E_a \sim 0$ is explained in terms of narrowly distributed donor-acceptor distances (DADs) compressed by the strong constructive enzyme motions, and the $\Delta E_a > 0$ is due to the weakened enzyme motions, leading to broader DAD distributions. To further investigate the role of protein motions in enzyme catalysis, our group examines the DAD-ΔE_a relationship using NADH/NAD^+ model hydride-transfer reactions in solution. We hypothesize that a more rigid tunneling-ready-state of densely populated DADs yields a smaller ΔE_a. While our previous work has focused primarily on concerted hydride-transfer reactions, this study explores a different class of hydride-transfer mechanisms: the sequential electron-proton-electron mechanism. Using 10-methylacridine (MAH) as the hydride donor and tetracyanoethylene (TCNE) as the acceptor, the sequential step mechanism is investigated in solvents of varying polarity. Compared to one-step hydride transfer reactions, these systems exhibit higher ΔE_a values. This is because the hydride transfer occurs within a tightly bound charge-transfer complex, whereas the proton transfer proceeds in a weakly associated radical-ion pair due to being relatively well solvated and separated. Results are in accordance with the VA-AHT model.

10:30am UG **Quantitatively Determining Amoxicillin Content in Antibiotic Capsules from Limited Resource Countries Using HPLC**

*Samuel Bickford & Sarah B. Luesse [Southern Illinois University Edwardsville]

The Ugi-Smiles (US) reaction is a one-pot multicomponent coupling that combines a phenol, an amine, an aldehyde, and an isocyanide in methanol to produce an aminoamide product. The Oxy-Michael Ugi-Smiles (OM-US) reaction is a tandem Ugi-Smiles reaction that includes addition of methanol solvent to the Ugi-Smiles product to provide a five-component coupling. Modified aldehyde and imine components having β-methoxy substitution were synthesized and subjected to modified Ugi-Smiles reactions, which produced expected OM-US products. The influence of BINOL-derived chiral phosphoric acid catalysts on the US and the OM-US reaction have been examined through analysis of products via chiral HPLC.

COMPUTER SCIENCE – RM SE0214

10:30am HS **Early Risk Assessment of Autism Spectrum Disorder: A Novel Approach Using Microbial Biomarkers and Ensemble Classification Models**

*Amritha Praveen [Adlai Stevenson High School]

Autism Spectrum Disorder (ASD) ranks among the most prevalent neurodevelopmental conditions worldwide, affecting over 1% of the global population. The prevalence is increasing and despite its significant public health impact, ASD diagnosis remains challenging due to the absence of objective biological markers. Current diagnostic processes rely on subjective behavioral assessments that are prone to clinician bias, interpretation variability, and difficulty distinguishing ASD from other developmental conditions. This often leads to misdiagnosis or delayed intervention during critical developmental windows. This study investigates gut-brain connections in ASD, testing the hypothesis that children with autism exhibit different gut microbiome compositions than neurotypical controls

The 16S rRNA sequencing data from stool samples of ASD and neurotypical control subjects from four cohorts was extracted from the National Center for Biotechnology Information (NCBI) database. A comprehensive analysis was performed on this data to identify differentially abundant bacterial taxa. The workflow included: data preprocessing and quality control, taxonomic classification of OTUs, and statistical analysis using differential abundance testing and Mann Whitney U test to identify differences between ASD and control groups. Using the identified biomarkers, an ensemble machine-learning classification model was built and trained to objectively assess the risk of ASD.

The hypothesis was supported as the findings revealed significant differences between the ASD and control groups including an increased abundance of *Prevotella* and *Lachnoclostridium* species, and a decreased abundance of beneficial bacteria like *Ruminococcaceae* and *Bacteroides*, with p-values < 0.0005 indicating statistical significance. Furthermore, the machine learning model trained with these biomarkers had a prediction accuracy of 0.90 +/-0.05 and ROC of 0.95 +/-0.02. This research can pave way for early diagnosis and targeted interventions for ASD.

10:45am UG **The Role of Prompt Engineering in Enhancing Generative AI Performance**

*Jenna Mohammed [Illinois State University]

Generative AI has significantly changed how we approach content creation, problem-solving, and human-computer interaction by utilizing large-scale language models. However, the accuracy and effectiveness of these models largely depend on how well prompts are structured, a concept known as prompt engineering. This technique involves carefully crafting clear, structured, and purposeful prompts to direct AI toward producing relevant and high-quality responses. Strategies like contextual priming, few-shot learning, and iterative refinement help improve AI-generated outputs, making them more precise and useful in various applications.

In this presentation, the presenter explains the concept of prompt engineering in detail and provides a practical example to illustrate its impact. By demonstrating how different prompt structures influence AI-generated responses, the example highlights the importance of effective prompt design in optimizing AI performance.

ENGINEERING & TECHNOLOGY – RM SE 0214

11:00am HS **Evaluation of Muon Energies for Quantification of Single Event Upsets Within Aircraft Transistors With Specific Applications of United States Military Technology**

*Ren Goodfriend [Oak Park and River Forest High School]

Current research reports the capability of muons, characterized by their high energy, to cause single-event upsets (SEUs) (spontaneous errors in computerized memory devices) within microtechnology. Current methods of determining muon SEU potential are expensive, time-consuming, and require immense computing power. In this experiment, the impacts of muon SEUs were quantified by collecting 6000 incidences of positive control alpha radiation and muon energy using a MiniPIX3 detector. Data were used to create a novel Python program to calculate the linear energy transfer (LET) of muons in any location quickly, with specific applications for military settings. Statistically significant data indicated that muons have a greater range of energy and LET when compared to Ac-225 alpha particles Kolmogorov-Smirnov $p = (8.90 \times 10\text{-}22)$ between the muon and Ac-225 energy. Next steps of research will include research on enhanced accuracy of the proposed method, and use of the method for single event upset rate mapping.

ENVIRONMENTAL SCIENCE – RM SE 0222

9:00am **Urban Biomonitoring – Comparing Local Biodiversity of Collinsville and Edwardsville**

*[1]Danielle Lee, [2]Yvonne Hart, & [2]Gregory Johnson [[1]Southern Illinois University Edwardsville, [2]Collinsville High School TRiO Upward Bound]

Urban Biomonitoring is a collaborative science outreach activity that identifies and catalogs local wildlife and environmental features. It involves Southern Illinois University Edwardsville TRiO/ Upward Bound Scholars Academy of Collinsville High School (CHS Upward Bound) and Department of Biological Sciences Faculty Dr. Danielle N Lee and college research students (DN Lee Lab). CHS Upward Bound serves 60 9th-12th grade students providing academic services and college readiness support programs for first generation, low-income students. The DN Lee Lab examines the ecology of nuisance rodents over local environmental gradients with local stakeholders. Working alongside college students and scientists, Upward Bound students were trained in environmental sciences techniques to identify plant and animal organisms, as well as soil and water evaluation to describe local wildlife habitats of Collinsville High School and SIUE campuses. Spring 2024 activities CHS Upward Bound students made 54 wildlife observations from SEEK app and game camera footage on their high school campus. Summer 2024, students participated in a summer academy on SIUE campus made nearly 300 wildlife observations from SEEK app, game camera footage, aquatic macroinvertebrate sampling, and wildlife signs and sightings observations. Across both engagement periods, students identified over 125 species of organisms -- including vegetation, vertebrate and invertebrate animals, plus collected 20 soil samples to complete lab chemistry analysis of pH, Moisture, Nitrogen, Phosphorus, Potassium content of local soils. At the end of the outreach activities most students responded positively about doing authentic science and participating in the ongoing science outreach opportunities with local science studentsand researchers.

9:15am **Acute and Chronic Toxicity of Metal Oxide Nanoparticles in Fathead Minnows**

*Chris Theodorakis [Southern Illinois University Edwardsville]

The objective of this research was to determine the toxicity of nZnO, $nTiO_2$, nFe_2O_3, nCu and nCuO to larval *Pimephales promelas* after 96-h and 28-d exposures. Endpoints included survival, growth, spinal curvature, and oxidative stress (total glutathione, GSH [reduced glutathione], GSSG/GSH ratio [GSSG = oxidized glutathione], and TBARS [Thiobarbaturic Acid Reactive Substances; a measure of lipid peroxidation]). The lethal concentration 50s (LC50s) for nFe_2O_3 (28 mg/L) and nCuO, (0.66 mg/L) were greater than those for Fe^{+3} (0.039) and Cu^{+2} ions (0.005), but the LC50 for nCu (0.009 mg/L) was similar to Cu^{+2}. There was no evidence of acute toxicity of dissolved ions in the nanoparticle suspensions, nor for nZnO or $nTiO_2$. In chronic exposures, both mortality and growth rate were increased at the lowest concentration of nFe_2O_3 (350 µg/L), while mortality and axial spinal curvature was the most sensitive indicator of chronic nCuO toxicity (the Lowest Observed Effect Concentration [LOEC]= 32.5 µg/L for both). The levels of TBARs and glutathione-related parameters suggested that oxidative stress increased in nFe_2O_3-exposed fish,but were decreased by nCuO exposure. Because of logistic constraints, chronic tests for nCu were not carried out. The LC10 and LC50 for nCu and LOEC concentrations of nCuO fall within the range of predicted concentrations for high-level exposure scenarios, so these effects may occur at environmentally-relevant concentrations. These nanoparticles were more toxic in fathead minnows than in other species from previous studies, and differential toxicity of pure nanoparticles vs. commercial formulations is discussed as a possible reason for difference between the present and previous works.

9:30am Grad **Bridging Resolution Gap: A Machine Learning Approach to Estimating Land Surface Temperature Using Higher-Resolution Satellite Data**

*Iyanuoluwa Fatunmbi & Shannon McCarragher [Southern Illinois University Edwardsville]

Land Surface Temperature (LST) plays a crucial role in understanding urban heat dynamics, yet its estimation is often limited by the spatial resolution of thermal satellite imagery. While Landsat satellites provide widely used 30-meter thermal data, their resolution restricts the precision required for localized urban studies, such as those assessing the cooling effects of green roofs. This research explores alternative methods to estimate LST so that higher-resolution satellite data and readily available air temperature measurements can be combined to achieve a more refined understanding of the heterogeneous urban landscapes.

This study extracts LST from Landsat images and establishes statistical and machine-learning models to identify key relationships between Landsat spectral bands, air temperature, and LST. It further investigates the potential of integrating bands from higher-resolution satellites to enhance LST estimations where direct thermal measurements are unavailable. The research seeks to bridge the gap between high-resolution data and thermal properties in urban environments by leveraging diverse datasets and predictive modeling.

9:45am UG **Landscape of Fear in Mammals in Response to Anthropogenic Hunting Pressure**

*Anna Berg, Brianna Cook, & Anant Deshwal [Bradley University]

Traditionally, hunting has several benefits, such as helping fund conservation activities and controlling game species populations. However, the effects of hunting on the temporal and spatial distribution of mammals has not been well studied, particularly in the case of small-game mammals. The goals of this study are to determine which species change their activity patterns across gradients of hunting intensity and to determine the effects of hunting on species composition. This study estimates the effect of hunting and habitat fragmentation on in and out-of-season species using remotely triggered camera

traps. Camera traps were deployed in both hunting and non-hunting zones in Central Illinois to collect data for different hunting seasons and outside of all hunting seasons. Our results indicate that *Odocoileus virginianus*, *Procyon lotor*, *Sciurus niger*, *Sylvilagus floridanus*, *Didelphis virginiana*, and *Vulpes vulpes* show significant changes in temporal activity patterns or habitat selection in response to the hunting season. These findings suggest that the pressure associated with hunting is causing predator-avoidant behavior in these mammal species. As habitat degradation and encounters with hunters continue to increase, it is important to understand that the behavior patterns of mammals change in response to these anthropogenic pressures.

10:00am Grad **Anthropogenic Invasion's Effect on Mammal Community Composition and Activity**

*Brianna Cook [Bradley University]

Urbanization, more specifically Land Use/Land Cover changes and increased human activity, have impacted mammal diversity and activity patterns in Central Illinois. Larger species such as White-Tailed Deer have received much higher attention for conservation purposes compared to the relatively few studies on medium and smaller mammals. This study aimed to answer the question of how the degrees of urbanization affect the mammal community composition and activity. This study used camera traps to observe mammal activity in both urban and natural areas. Using the linear models, this study has mapped the interactions between different types of landscape and community diversity. Mammals in this study were significantly affected by the amount of forested area compared to developed space in both time of encounter and duration spent in front of the camera. Smaller mammals and scavengers were found to benefit from the access to resources provided by urban green space.

10:30am Grad **Impact of Urbanization on Macro-Moth Species Composition in Central Illinois**

*Harriet Barker & Anant Deshwal [Bradley University]

In recent years, there has been a concerning decline in invertebrate populations worldwide, coined an “Ecological Armageddon” with studies suggesting an alarming 82% decrease in populations. Insects, as crucial components of many ecosystems play vital roles in nutrient cycling, pollination, and food web support. Various arthropod populations, including that of moths and butterflies, have shown significant declines, impacting ecosystems globally. Central Illinois, once dominated by tallgrass prairies and deciduous forests, has experienced extensive agricultural and urban expansion, leading to habitat loss and degradation resulting in a reduced invertebrate population.

This study aims to assess the impact of urbanization on macro moth diversity using urban vs. natural areas determined by National Land Cover Database (NLCD) data extraction. Universal blacklight moth traps were placed in selected sites throughout Peoria and Tazewell counties with each Macro moth being identified to species level. R Statistical Software was then used to replicate insect community metrics to quantify species composition, richness, and diversity, comparing urban and natural sites calculating alpha diversity, beta diversity, and creating species rarefaction curves. This analysis encompasses data from 32 sites over two years collected in the summer months of 2023 and 2024. Over 15,000+ macro moths and 453 different species have been recorded.

10:45am UG **The Sedimentological Impact of Immigration Infrastructure on River Dynamics: Rio Grande at Eagle Pass, Texas**

*Emma Prott [Southern Illinois University Edwardsville]

The U.S. Mexico border has undergone a series of changes as a result ofinternational relationships and efforts to deter undocumented immigration. In July 2023, Texas Govenor Greg Abbott initiated the installation of the 1,000 ft stretch of buoys in the Rio Grande River. As of January 2025, the same stretch of buoys has increased by over 2,000 ftin length to create a larger barrier to illegal border crossings. The presence of the buoys in the Rio Grande River act as both a danger to human safety and as a catalyst to change river dynamics. Serious injuryor death can occur while interacting with the razor-sharp saw blades in between the buoys and can also pose as a drowning risk. In addition, the placement of the buoys has already caused channel flow disruptions, which impact how the water travels in and around the stretch of buoys. Higher water velocities can be found on the Mexican side of the buoys, while in the buoys and on the U.S. side, the water velocities are lower. Through the low water velocities, changes to the river channel can causesediment deposition, varying depths, increased vegetation growth, and island formation within the buoys. Island formation poses a risk to maintaining international treaties with Mexico and poses an even bigger threat to river health and its adaptations.

11:00am Grad **Comparative Life-History Parameters of DDT-Susceptible and -Resistant *Drosophila melanogaster* Strains**

*Blake Rentz & Kyong Sup Yoon [Southern Illinois University Edwardsville]

An analysis of *Drosophila melanogaster* life-history parameters was conducted on the DDT-susceptible (CS and 91-C) and -resistant (91-R) strains to further characterize fitness disadvantages in 91-R. Sub-populations were prepared to minimize genetic variance and designatedas progeny of mating pair (PMP). LD50 and LT50 to DDT indicated 91-RPMP females were 1.83 and 1.44 times more insensitive to DDT than CSPMP and 91-CPMP, respectively. Male 91-RPMP were 4.38 and 1.84 times more resistant than CSPMP and 91-CPMP. 91-RPMP females (10 day old) had significantly heavier wet body weight (1.11 or 1.12-foldheavier) than CSPMP or 91-CPMP, respectively. 20-day old 91-RPMPfemales were 1.24-fold heavier than CSPMP. 30-day old 91-RPMPfemales were determined to be weighing 1.34 and 1.17-fold more than CSPMP and 91-CPMP. For males, 20-day old 91-RPMP weighed 1.23-fold more than CSPMP. Significant differences in dry body weight showed 10-

day old female 91-RPMP weighed 1.09-fold more than CSPMP, and 30-day old 91-RPMP weighed 1.22 and 1.10-fold more than CSPMP and 91-CPMP. For Males, 20-day old 91-RPMP weighed 1.12-foldmore than CSPMP, and 30-day old 91-RPMP weighed 1.07-fold more than CSPMP. 30-day old 91-CPMP were determined to be 1.04-foldheavier than 91-RPMP. Food ingestion rate measurements illustrated 10-day old 91-RPMP females consume 1.5-fold more food than CSPMP. Fly lifespan measurements indicated 91-RPMP females' median lifespan was 1.32 and 1.17-fold longer than CSPMP and 91-CPMP, respectively. 91-RPMP males' median lifespan was 1.46-fold longer than CSPMP or 91-CPMP . Investigation of starvation resistance indicated 91-RPMP is significantly more sensitive to starvation.

11:15am Grad **Acute, Developmental, and Behavioral Toxicity of PFOS on Fruit Flies and Planarians**

*Emily Beiler, Autumn Belt, Kyong Sup Yoon [Southern Illinois University Edwardsville]

Perfluorooctance sulfonic acid (PFOS) is a persistent organic pollutant, found in nearly all trophic levels with negative health impacts on a wide range of organisms including humans. This study aimed to evaluate the acute developmental behavioral toxicity of PFOS using mortality, locomotor activity, and regeneration assays. Adult male flies exposed to PFOS (2, 20, 100, 200 μM) exhibited concentration and time dependent mortality responses (Chi-squared test, $p < 0.05$). The 12 and 24-hr LC_{50}values for flies were 88.1 μM (95% CI, 62.6-126.4) and 16.7 μM (95% CI, 7.6-25), respectively. The LT_{50} for 20 μM PFOS was determined to be 22.9 hr (19.2-26.8) for the flies. A PFOS concentration of 20 μM was determined to be suitable for monitoring altered PFOS toxicity in the presence of target-specific ion channel modifiers. Ion channel modulators acting on the gamma-aminobutyric acid receptors (ivermectin, lindane, and carbamazepine) were used in combination with 20 μM PFOS. Sub-lethal ivermectin (0.1 ppm) cotreatments significantly decreased the fly mortality by 4.4-fold at the 48 hr post-treatment marks (t-test, $p<0.05$). To monitor locomotor activity flies were exposed to sublethal concentrations of PFOS during the larval stages. Flies displayed significantly decreased daytime activity at 0.2 nM (1.42-fold reduction) and increased at 200 nM (1.26-fold) (ANOVA, $p<0.05$). This suggests that PFOS may interfere with the flies' circadian rhythm. Planarian 5-7 mm in length, exposed to PFOS (54.65, 60.1, 66.1, 72.75, 80 μM) exhibited concentration and time dependent mortality responses (Chi-squared test, $p < 0.05$). The 72 and 96-hr LC50 values for planarian were 74.7 μM (95% CI, 70.4-83.3) and 66.5 μM (95% CI, 63.1-70.2), respectively. The LT50 for 80 μM PFOS was determined to be 58.6 hr (95% CI, 48-66.6) for the planarian. Planarian regeneration assays are currently being conducted, exposing planarian to sublethal concentrations of PFOS and measuring blastema growth.

11:30am HS **Quantification of the Effects of Fluopyram on the Head Regeneration, Photophobic Behavior, Mobility, and Mortality Rates of *Girardia tigrina* with Implications for Ecotoxicological Safety**

*[1]Lev Khoubaeva-Hummel, [1]Allison Hennings, [2]Julia Bauer, [3]Neil Deochand, [4]Karen Echeverri, [5]Travis Faske, [6]Danielle Ireland [[1]Oak Park and River Forest High School, [2]University of Illinois Chicago, [3]University of Cincinnati, [4]University of Chicago, [5]University of Arkansas, [6]Swarthmore College]

The use of pesticides is increasing to accommodate global population growth. Due to the well-documented harmful effects of older pesticides, new-generation pesticides were developed to target specific organisms and are proposed as safer alternatives. However, the effects of new-generation pesticides on non-target organisms are not well documented. There is a gap in current literature regarding the effects of fluopyram, the active ingredient in the widely used new-generation pesticide Velum® Prime, on a specific non-target, freshwater organism called *Dugesia tigrina*. This experiment quantified the effects of varying concentrations of fluopyram (independent variable) on four dependent variables: 1.) mortality rates, 2.) regenerative abilities, 3.) photophobic behavior, and 4.) mobility. The results of this experiment have the potential to reveal more specificity with respect to fluopyram and its ecotoxicological manifestations in freshwater ecosystems. A Welch's ANOVA test indicated a significant difference in normalized blastema area between treatment groups ($p = .0002$).

HEALTH SCIENCES – RM SE 2214

10:15am HS **Qualitative Analysis of the Acceptability of Attention Training as a Potential Treatment for Individuals with Long-COVID Brain Fog**

*[1]Abhilash Polu & [2]Shira Cohen-Zimerman [[1]Illinois Math and Science Academy, [2]Shirley Ryan Ability Lab]

Long-COVID is a condition where individuals continue to experience symptoms after recovering from the acute phase of COVID-19. A common symptom of long COVID is brain fog, a term which refers to cognitive impairments, including problems with attention and memory. This project aims to address this gap and examine the acceptability of a potential attention intervention among people living with long COVID brain fog. In this study, we analyzed interviews conducted with individuals who have Long-COVID, and who were invited to participate in an intervention targeting brain fog symptoms. This research aims to improve the understanding of the subjective experiences and the needs of stakeholders in the Long-COVID community. This research project also has the goal of understanding what are the needs and expectations of the target population. De-identified transcriptions of the interviews serve as the primary data source. These interviews are systematically analyzed using qualitative data analysis (i.e., initial and axial coding), which allows for identifying and organizing key themes and patterns. All in all, these results establish high acceptability for the proposed treatment among individuals affected by Long-COVID.

10:30am HS **Efficacy of Tomivosertib (MNK1/2 Inhibitor) in Mitigating RDEB Mice Pain**

*Luke Yin [Illinois Math and Science Academy]

Recessive dystrophic epidermolysis bullosa (RDEB) is a skin disorder caused by pathogenic variants in the COL7A1 gene, resulting in the loss of collagen VII proteins, which anchor the epidermis to the dermis. Without these fibrils, the skin is fragile and blisters easily, leading to severe pain, chronic wounds, and infection risk. However, effective, non-opioid pain treatments remain limited, highlighting the need for alternative therapies.

MNK1/2 kinases are part of a known pain pathway that regulates pain-related protein translation. This study investigates MNK 1/2 signaling in RDEB pain and the effect of tomivosertib, an MNK1/2 inhibitor, on pain-related behaviors and gene expression in an RDEB mouse model with hypomorphic Col7a1 mutation. RDEB mice were treated with tomivosertib or DMSO control for two to four weeks. Pain behaviors (paw nibbling, grooming, grimacing) were assessed using behavioral assays, and gene expression (*Bdnf*, *Eif4e*) was quantified via RT-qPCR, which measures mRNA levels, along with immunostaining to assess MNK pathway activation.

The results indicate that tomivosertib reduces pain-related gene expression and alleviates pain behaviors in RDEB mice without significantly affecting itch. MNK inhibition decreased *Bdnf* expression in dorsal root ganglia, supporting MNK1/2 inhibition as a potential intervention for RDEB pain.

10:45am UG **Using a Randomized Natural Experiment to Estimate the Effects of the Evaluee's Gender, Physical Attractiveness, and Serial Position on the Evaluator's Memory and Accuracy**

*Jacob Black [Oakton College]

I study factors that influence memory and ability to evaluate and remember how well others performed at an objectively-measurable task. This is hard to study because we rarely can observe objective measures of performance, and also observe true private evaluation. I use a unique setting that allows to do so, a natural experiment, TV show The Weakest Link. Strangers take turns, answering randomly-assigned trivia questions. Each incorrect answer harms all players, thus, all participants have incentives to remove weak players. After each round, participants vote out worst player, voting simultaneously and without deliberations. Players cannot take notes; the must rely on memory and gut feeling to identify the worst player. This creates: (1) objective measure of performance (# correct answers); (2) on randomly assigned tasks (questions); (3) objective measure of performance evaluation by others (voting record). My hand-collected dataset includes 302 players, hundreds of voting events, hundreds of rounds, thousands of questions. For each player, I use AI to generate a cardinal, consistent measure of attractiveness. I collect data on player's objective performance, voting record, and demographics.

I run two statistical models: (1) panel with player fixed effects to identify effect of changes in performance or player's serial position on chances of removal, and (2) cross-sectional, to identify effects of time-invariant player characteristics like sex or attractiveness. Findings: controlling for performance: (1) men and women perform similarly and on average have the same rate of being voted out, but averages camouflage large cross-sectional differences: attractive women are less likely to be voted out than men, and unattractive women, more likely; (2) performance-evaluation sensitivity declines with rise in attractiveness, and is almost nonexistent for most beautiful players; (3) player who is last to speak before the vote is much more likely to be voted out (being last to speak is random).

11:00am Grad **Methimazole-Induced Hypothyroidism Influences Growth, Circulating Ghrelin Levels, and Gut Microbiome Composition in Mice**

*[1]Lucia Thompson & [2]Cinnamon VanPutte[[1]Southern Illinois University Edwardsville, [2]Southern Illinois University School of Dental Medicine]

Thyroid disorders are the second most common endocrine disorder after diabetes mellitus, with primary hypothyroidism being the most common. Primary hypothyroidism results from an insufficient production of thyroid hormones, usually caused by autoimmunity or iodine deficiency. The community composition of commensal gut microbes influences both priming of the immune system and sufficient absorption of micronutrients. Dysbiosis of the gut microbiome is associated with several systemic conditions, including hypothyroidism. 16S rDNA sequencing was performed to characterize the changes in gut microbial composition of mice following treatment with methimazole, an inhibitor of thyroid hormone biosynthesis.

Ghrelin is a hormone secreted by the stomach to stimulate growth hormone secretion and to promote appetite. Evidence suggests that gut microbial composition and thyroid dysfunction can influence secretion of gut-derived hormones, including ghrelin. Following treatment with methimazole, both circulating ghrelin levels and mRNA levels of the *Ghrl* gene in stomach tissue were measured. The aim of this study was to elucidate a potential mechanism of communication that relies on appropriate nutrient intake and regulation of metabolic and development.

11:15am HS **Ecdysone Used to Induce a Hyperandrogenism Phenotype in *Drosophila melanogaster* as a Basis for a Novel Invertebrate Polycystic Ovary Syndrome Model**

*Abigail Falkoff [Oak Park and River Forest High School]

Polycystic ovary syndrome (PCOS) is the largest contributor to infertility in women. PCOS contributes to serious health problems due to the overproduction of androgen in females, leading to miscarriages and infertility, as well as an increased susceptibility to type 2 diabetes mellitus. The etiology of PCOS is unknown. However, to control the variety of symptoms,

several approaches exist; these include using oral contraceptives, making changes in diet and exercise, as well as using the drug metformin. Although researchers currently use vertebrate models induced with PCOS-like phenotypes, the development of a reliable vertebrate model requires research over multiple generations, which is expensive and time-consuming. This experiment developed a novel invertebrate model for PCOS, using *Drosophila melanogaster* (*D. melanogaster*), induced with PCOS-like phenotypes utilizing various amounts of ecdysone in their diets. *D. melanogaster* were tested over three generations to determine the impact of ecdysone diets on fertility with respect to egg laying. The results demonstrated a statistically significant reduction in egg production (one-way ANOVA $p < 0.0001$) when ecdysone levels in the fly media were increased by, respectively, 10µl and 40µl. The results of this experiment provide support for the effectiveness of ecdysone as a method of inducing PCOS-like fertility changes in *D. melanogaster*, demonstrating the potential for a novel invertebrate model for studying PCOS. An invertebrate model that uses *D. melanogaster* and ecdysone would allow for a cost-effective and efficient way to study the syndrome.

11:30am Grad **Hormonal Havoc: Thyroid's Role in Bone and Gut Health**

*Bradley Coulter [Southern Illinois University Edwardsville e]

This study investigates the impact of thyroid hormone dysfunction on systemic inflammation, gut microbiome composition, and periodontal health. Thyroid hormones are critical for regulating metabolism, inflammation, and bone health, and their dysregulation can lead to conditions like hyperthyroidism or hypothyroidism, both of which are associated with elevated inflammatory markers such as Interleukin-6 (IL-6). This inflammation exacerbates periodontal disease by promoting tissue degradation and alveolar bone loss. Additionally, thyroid dysfunction may contribute to gut dysbiosis, further amplifying systemic inflammation and impacting oral health. To explore these relationships, this research administers T3 and T4 to female mice to simulate chronic thyroid hormone imbalances. The study aims to clarify how thyroid hormone dysfunction influences periodontal disease progression, systemic inflammation, and gut microbiome disturbances, providing insights into the interconnectedness of these factors in maintaining overall health.

PHYSICS, MATHEMATICS, & ASTRONOMY – RM SE 0214

9:00am UG **Automating Quantum Error Corrections**

*Chelsie Hadley & Kishor Kapale [Western Illinois University]

While a new quantum revolution is upon us, much work is needed to scale up quantum computers to a level which will be useful to society at large. However, schemes to encode quantum information, in order to maintain fidelity, vary as widely as the hardware being developed to process it. Each encoding scheme requires a unique circuit to detect and correct for errors, which is often calculated manually. Therefore, in order to increase the scaling rate of quantum computers, we will need a way to reliably automate this process. Our research accomplishes this first by taking a given encoding scheme, and its corresponding detection scheme, as input. We looked at the most common class of errors, called Pauli errors (X,Z,Y), and created a process to analyze how the circuit changes when introduced to these errors. We used these results to generate corresponding dictionaries for both X and Z errors. These dictionaries are a set of bit strings corresponding to where the error occurred in the circuit. We then used these bit strings to derive a corresponding error correction circuit. The key point here being that given a certain detection scheme as input, the code we created automatically outputs and applies the necessary corrections. Our work is an important step in more efficiently obtaining reliable quantum information and increasing the rate at which quantum computers can be developed.

9:15am Grad **Physical and Optical Properties of Neodymium (Nd^{3+}) Doped Bismuth Boro-Tellurite Glasses**

*Angelica Strack, P.K. Babu, & Saisudha B. Mallur [Western Illinois University]

Rare Earth (RE) doped bismuth boro-tellurite glasses are expected to exhibit compositional dependence in their physical and optical properties due to changes induced by variations in the electronic structure of the base glass with increasing Nd^{3+} content. A series of bismuth boro-tellurite glasses with composition 30Bi2O3:[69-x-y]B_2O_3:yTeO_2:xNd_2O_3 (x=0.5,1.0,1.5 mol %: y=10,20 mol %) were prepared using the melt-quench technique followed by 3 hours of annealing near the glass transition temperature. Using the Brewster's Angle experiment, Archimedes Principle, and UV-VIS Spectroscopy, the refractive index, density, and optical absorption spectra of each sample was measured and analyzed to determine the impact of increasing Nd^{3+} on the physical and optical properties of these glasses. Preliminary analysis has shown very little impact to the refractive index of host glass samples and an increase in the density of host glass samples with increasing Nd_2O_3 content. The hypersensitive transition peak position and oscillator strength vary significantly with composition.

9:30am Grad **Molecular Masers and Continuum Variability in the Orion Nebula**

*Gabriel Sojka & Esteban Araya [Western Illinois University]

The Orion Nebula is the closest high mass star forming region to Earth and it is believed to be a close approximation to the nebula where our Sun formed. We can investigate the physical conditions of young stellar objects in the Orion Nebula via spectral line and continuum observations. This study is a part of the VLA Orion A Large Survey (VOLS) project, which is an international survey of the Orion nebula led by P.I.s G. Busquet and J. Girart using the Very Large Array Telescope (VLA) in

New Mexico. VOLS is conducting radio continuum (to detect ionized gas) as well as spectral line observations, including the 6.67 GHz methanol (CH_3OH) and 6.035 GHz hydroxyl (OH) lines. We are in the process of analyzing the data to check for short term variability (time scales of less than 1h to 3 months) based on over 20 observations conducted in 2022. Our preliminary results show notable variability of some of the maser components, as well as variability of a continuum source located near the location of the CH_3OH maser. We discuss the possibility that variability of the CH_3OH maser may be related to a magnetic reconnection event responsible for the continuum variability.

9:45am Grad **Raman Spectroscopic Investigations of Structural Properties of Pr^{3+} Doped Bismuth Boro-Tellurite Glasses**

*Amy Aung, P.K. Babu, Saisudha Mallur [Western Illinois University]

TPr^{3+} doped bismuth borate glasses have some superior physical properties such as high thermal stability, low melting point, and good optical properties which are favorable for applications in a variety of optical devices. We used Raman spectroscopy to study the structural properties of 3 groups of bismuth glasses doped with Pr^{3+} ions: binary bismuth borate, bismuth boro-tellurite, and bismuth boro-tellurite containing CdSe nanoparticles. Glass samples with varying bismuth oxide content are prepared using the melt-quench technique. CdSe nanoparticles are grown in one of the bismuth boro-tellurite glasses by varying the annealing time. Raman spectra of glasses are obtained using a Nano Photon Raman spectrometer to analyze the structural properties. The Raman bands in the region 100 cm^{-1} to 1600 cm^{-1} have been identified and assigned to their respective vibrational groups. The band at 138 - 387cm^{-1}, 412 - 748cm^{-1} and 784 -1511cm^{-1} are identified as vibrational modes of bismuth oxide, tellurium oxide and borate groups, respectively. Position and width of the Raman peaks clearly reflect changes in glass composition when the bismuth oxide content is varied.

10:00am HS **Water World Exoplanet Atmospheric and Spectral Data Analysis via Thermodynamic Modeling and Unsupervised Machine Learning**

*[1]Marcus King & [2]Laura Schaefer [[1]Governor French Academy, [2]Stanford University]

Recent discoveries like GJ 9827 d's water-rich atmosphere have brought to light an understudied class of exoplanets—water worlds. The discovery of water in this exoplanet atmosphere simultaneously showed current telescope capabilities while demonstrating a need to understand this planet class better with many similar discoveries soon likely. The current understanding of water world exoplanet detection is limited by models—through modeling exoplanetary processes, astronomers develop expectations and can optimize their searches accordingly. Water worlds are currently only known by their key atmospheric signature, water vapor, and due to this many planetary scientists have suggested that these worlds would be exceedingly hard to identify based on atmospheric spectroscopy. This study confronts this problem by developing 1.5 million data point resolution thermodynamic models of water world atmospheres relative to pressure and temperature (via equilibrium chemistry), using these to create an open-source database of over 5,000 synthetic spectra. A K-Means clustering algorithm is trained to identify different water world subtypes in the spectral dataset, and several new atmospheric tracers are identified from three main clusters such as carbon dioxide, sulfur dioxide, hydrogen fluoride and molecular hydrogen. This study also, in tandem, develops an analytical pipeline for modeling exoplanet atmospheres given initial conditions at a higher resolution than any previous study. This study marks a notable advancement in the modeling of these water world atmospheres.

PLANT BIOLOGY – RM SE 2214

9:00am UG **Viability Assessment of Orchid Seeds and Their Mycorrhizal Fungi in Prolonged Cool Storage for Conservation**

*Jenna Sellers, Toby McTamney, Ashly Ceden, & Lawrence W. Zettler [Illinois College]

Orchids need specific types of fungi to facilitate seed germination and seedling development in nature. To effectively conserve these remarkable plants in the wake of ongoing habitat destruction worldwide, seed and fungus banks have been established across the globe to serve a vital purpose for future restoration efforts. Since 1996, Illinois College has maintained a sizable orchid seed and fungus storage facility housed in our Parker Science building containing hundreds of orchid seed and fungus samples. Some of the seeds in our collection are from orchid populations that no longer exist (*e.g., Platanthera integrilabia* in South Carolina), and our fungus collection includes new species sought by researchers from around the world (*e.g.*, Smithsonian Environmental Research Center). The purpose of our study is to record (catalogue) all of the seed and fungus samples in cool storage and to assess the viability of these samples. We are especially interested in determining if orchid mycorrhizal fungi in the genus *Ceratobasidium* in our collection have poor survival rates in storage compared to members in the genius *Tulasnella*. This talk will provide a summary of our findings and how our results have a conservation application in North America and abroad. Our ultimate goal is to provide other researchers with the knowledge of what we have, and to safeguard our samples in large international facilities to benefit future conservation efforts.

9:15am UG **The Status of Florida's Ghost Orchid (*Dendrophylax lindenii*) as of 2024**

*[1]Toby McTamney, [2]Adam R. Herdman, [3]Mark W. Danaher, & [1]Lawrence W. Zettler [[1]Illinois College, [2]University of Florida, [3]Florida Panther National Wildlife Refuge]

Regarded as the most familiar and sought-after of all orchids in the Western Hemisphere, the Ghost Orchid, *Dendrophylax lindenii*, serves as an ecological flagship species for its unique wetland habitats in south Florida where many other orchids reside. About one-quarter of all Ghost Orchids in the state are found in the Florida Panther National Wildlife Refuge. As of last year (2024), the numbers in the Panther Refuge and throughout Florida have dropped, raising conservation concerns. This talk will present an overview of ongoing efforts to survey populations of this enigmatic species within the Panther Refuge during the past decade. Data on demographics (seedlings, juveniles, mature plants) and fecundity (flowering, fruit set) will also be presented.

9:30am **Invasion by *Lespedeza cuneata* Reconfigures Plant and Ground-Dwelling Insect Communities**

*Kurt Schulz, Matthew Goessling, & Jason Williams [Southern Illinois University Edwardsville]

The invasive forb sericea lespedeza (*Lespedeza cuneata* (Dum. Cours.) G. Don) visibly replaces desirable plants with a different community type. Lespedeza canopies are very dense, shading the substrate and limiting air movement. Moreover, lespedeza weakly fixes N, which might benefit remaining plants and their insect herbivores. In contradiction, it accumulates high concentrations of tannin, which limits its food value to herbivores. These characteristics likely affect insects and other grassland fauna.

Surprisingly, published *quantitative* data evaluating the effects of lespedeza on plants and insects are scarce. We compared the plant and insect communities of plots dominated by lespedeza and plots dominated by successional meadow species. Based on anecdotal and our own observations, we hypothesized that conversion to lespedeza caused sharp changes in plant and insect community composition and diversity.

Eight semi-permanent 15m x 10m plots were placed in control or infested vegetation. Ground-dwelling insects were captured in early September 2020 using pitfall traps (5 per plot) containing ethylene glycol. Vegetation was sampled in the plots using a point intercept technique.

Ordination of the insect and plant communities revealed differences in the invaded and control plots. These were statistically different based on permutation tests. Insects in the control plots showed significantly lower Shannon (H') combined diversity and evenness (H'/H'max), but not species *richness.* Conversely plants in the control plots showed significantly higher richness and combined diversity, but not evenness. There was a strong, significant correlation between vegetation community composition and insect community composition (Mantel test). This correlation was not affected directly by the presence/absence of lespedeza, rather the presence of the subgenera *Pseudoophonus* in invaded plots and variation in the abundance of *Abacidus* across invaded and control plots. Clearly vegetation changes caused by lespedeza ramify into the insect community as well.

9:45am UG **Determining the Effect of Falling Chloroplasts on the Gravitropic Response in *Arabidopsis thaliana***

*Zachary Woodall & Darron Luesse [Southern Illinois University Edwardsville]

Gravity is one of the most important environmental signals for determining how a plant orients its organs. During development, directed growth in response to a change in gravity is known as gravitropism. The cellular mechanisms behind how plants sense gravity and respond are not completely understood, but it is clear that falling components within the cell function as statoliths. Sedimenting starch-filled amyloplasts play this role, as demonstrated by the reduced gravitropism in *Arabidopsis thaliana* with a mutation in the *PHOSPHOGLUCOMUTASE* gene (*pgm*), which limits starch production. However, it is unknown what other organelles can function as statoliths, and if the signaling is caused by their weight on the plasma membrane, or if specific molecular interactions with membrane-associated receptors are required. The goal of this project is to investigate the gravitropism response in mutants that display sedimenting chloroplasts. While chloroplasts are normally suspended in, and positioned by, a network of actin, mutants in *CHLOROPLAST UNUSUAL POSITIONING 1* (*chup1*) prevent that association and lead to chloroplast sedimentation to the abaxial membrane of the cell. We hypothesize that these falling chloroplasts can replace the amyloplasts and restore full gravity sensing in *pgm* mutants. To test this, *pgm chup1* double mutants have been isolated using RFLP markers for *pgm1-1* and *chup1-1*. Gravitropism will be tracked via timelapse image capture for 24h after 90 degree gravistimulation. Seedling roots and hypocotyls are identified using a Convolutional Neural Network (CNN) model and their curvature characterized by a modified version of the PlantCV python package. Restoration of gravitropism would suggest that the identity of the statolith is not as important as its physical presence.

STEM EDUCATION – RM SE 2206

10:45am UG **Incorporating Primary Literature into the Classroom Using *This Week in Microbiology* (TWiM) Podcasts**

*[1]Gwendolyn Knapp, [2]Nancy M. Boury, [3]Rebecca Seipelt-Thiemann, [4]Amaya M. Garcia Costas [[1]Illinois College, [2]Iowa State University, [3]Middle Tennessee State University, [4]Colorado State University-Pueblo]

The ability to critically think about science is important and engaging students in learning to read and write about science is challenging. Students often leave STEM because they feel unconnected and uninspired by traditional teaching methods. Moreover, identifying effective, reliable and innovative teaching resources can be difficult for instructors. This science literacy project provides two opportunities for curricular change. Student/faculty teams collaboratively annotate episodes from *This Week in Microbiology* (TWiM), map podcast concepts to the American Society of Microbiology (ASM) curricular guidelines and develop figure reading exercises based on the primary literature discussed in the podcast. These annotations, which provide peer-reviewed authorship for students, are being incorporated into an Open Educational Resource (OER) and include accessible and inclusive activities for instructor implementation in the classroom.

ZOOLOGY – RM SE 2206

10:00am UG **Significance of *Aspergillus* as a Pathogen to Birds of Prey in Central Illinois**

*[1]Hailey Gula, [2]Jacques Nuzzo, [2]Beth Chan, [2]Jane Seitz, & [1]Travis E Wilcoxen [[1]Millikin University, [2]Illinois Raptor Center]

Aspergillosis is a fungal infection caused by the inhalation of fungal spores. These fungal spores are commonly found in warm, moist composting organic matter. Aspergillosis cases have been reported in mammals and birds, however, avian species are known to be especially susceptible to Aspergillosis, due to the constant exposure of the spores within their ecosystem. Aspergillosis affects the respiratory system and is shown clinically by increased respiration rates, weight loss, diarrhea, and fatigue, and in severe neurological cases, raptors may display coordination issues and neck twisting. The purpose of this study is to compare the prevalence of *Aspergillus fumigatus*-specific antibodies in wild-captured raptors to those brought to the Illinois Raptor Center for rehabilitation, and to see if there is a disproportionate number of raptors admitted for rehabilitation that were infected, which may suggest that Aspergillosis infection is a significant cause of illness or injury. We hypothesize that wild-caught raptors will have evidence of prior Aspergillosis less frequently than the raptors admitted to the Illinois Raptor Center for rehabilitation. We will use an indirect ELISA for IgY specific to Aspergillus, with Aspergillus gliotoxin as the antigen target to determine infection history for each bird. This study will shed light on the prevalence of this disease in wild raptor populations and help understand its role in causing illness in birds of prey.

ISAS POSTER PRESENTATION ABSTRACTS

3:15pm – 5:15pm, Saturday, April 5, 2025, in Student Fitness Center, Activity Center Gym Room 1420
*presenter, [school] with differences noted by superscript

ANTHROPOLOGY & ARCHEOLOGY

3:15pm **1** UG **Gender Disparities in the Diagnostic Process of Chronic Illness among College-Aged Women in the US**

*Kirsten Fisher & Jacqueline Hogan [Bradley University]

In the US, young women with chronic illnesses can often face longer delays in diagnosis and experience gender-based medical discrimination. While literature has documented these disparities, there is limited research into how women personally experience their diagnosis journeys. Therefore, this study aims to provide qualitative insights into the emotional and physical impacts of diagnosis delays for college-aged women with chronic or complex illnesses. Eligibility criteria for participation include being between the ages of 18-25, having chronic or complex illness, and having a feminine gender identity or presentation or being assigned female at birth. Using semi-structured interviews, this study has gathered in-depth narratives from 15 to 25 participants who identify with a feminine gender or were assigned female at birth. Mental illnesses were not included. Participants were recruited through flyers, referrals from professors, and snowball sampling, with the latter method clearly explained to account for sampling bias and limited generalizability. The interviews were conducted in a private, neutral space at Bradley University, recorded securely on an offline device, and transcribed for analysis. Data was coded using a standard inductive coding methodology to identify recurring themes around gender-based discrimination and subsequent emotional, physical, and psychological impacts. To account for and explore intersectional factors such as gender identity, ethnicity, and other personal identifiers, participants were also instructed to complete a demographic survey before the beginning of the interview. This research aims to illuminate the specific barriers young women encounter in their journey to diagnosis and provide insights that can inform clinical practices, ultimately improving patient outcomes by ensuring more equitable and timely diagnosis for women in the future.

3:15pm **3** UG **Does Mandible Development Influence Wisdom Tooth Impaction?**

*Devin Boggs & [Illinois College]

This study examines whether mandible development influences the impaction of mandibular wisdom teeth, with a focus on the mandible length to height ratio and gonial angles (GA). Utilizing digital X-ray images from the University of Toronto Burlington Growth Study, measurements were taken from 65 subjects (36 males, 29 females) over two age groups: 7.0-9.3 years (age 1) and 15.9-21.0 years (age 2). The results found no significant difference in the GA between males and females at age 1, but a significant difference was shown at age 2. Males showed changes in GA between the two age groups, while females did not. Between the age groups, both sexes exhibited significant differences in mandible length to height ratios. However, no significant differences were found in mandible length to height ratios or GA when individuals with impacted and non-impacted mandibular wisdom teeth were compared. The study also observed cranial length to mandible length ratios, which were found to be significant different between ages 1 and 2 for both sexes. These findings suggest that while sexual dimorphism in mandible development becomes more distinct after puberty, it does not significantly influence the likelihood of mandibular wisdom tooth impaction. The results oppose previous assumptions that larger gonial angle reduces the probability of wisdom tooth impaction, highlighting the complexity of factors involved in dental development.

CELL, MOLECULAR, & DEVELOPMENTAL BIOLOGY

3:15pm **5** UG **RNA-Seq Analysis of White vs. Green Sectors in *Arabidopsis geranylgeranyl* Diphosphate Synthase 11 Mutants**

*Elyse Ibata & Darron R. Luesse [Southern Illinois University Edwardsville]

Isoprenoid biosynthesis within the plastidal Methylerythritol Phosphate pathway is critical for the production of many plant compounds including hormones, defense-related products, and photosynthetic pigments. The plastid localized GERANYLGERANYL DIPHOSPHATE SYNTHASE 11 (GGPPS11) catalyzes the production of Geranylgeranyl Diphosphate (GGPP), a key precursor for chlorophyll biosynthesis. A temperature sensitive point mutation, ggpps11-1, produces variegated leaves with green tissue near the periphery and albino or pale yellow tissue near the center. The source of this pattern remains unclear, as does the determining factor if specific cells are fated to become white or green. To better understand this process, RNA-seq transcriptomic analysis was performed separately comparing wild-type tissue to ggpps11-1 green and ggpps11-1 albino tissue. While a basic analysis of misregulated genes was provided with the sequencing, this work seeks to reanalyze these data with a specific focus on individual transcripts. To do this, we will perform differential gene expression analysis using the R programming language within the RStudio environment. This will involve mapping the RNA sequenced reads to the Arabidopsis reference genome We will use DESeq2 to identify which

genes and transcripts have statistically significant changes in expression between the wild-type, green, and albino tissues. By analyzing transcripts in multiple tissue types, we hope to understand on a molecular level how the plant is coping with reduced GGPP and potential clues to the cause of variegation.

4:15pm **6** UG **Characterizing the Effect of Carboplatin on the Aggression of Bulk Ovarian Cancer Cells and Ovarian Cancer Stem Cells**

*Elly Beck, *Kaylee Shaw, & Craig Cady [Bradley University]

The research presented by Elly Beck and Kaylee Shaw is designed to characterize the effects of carboplatin, a chemotherapy, on the aggression of ovarian cancer cells. The data gathered from this project will provide insight into how two types of ovarian cancer cells - bulk ovarian cancer cells and ovarian cancer stem cells (OvCSCs) - respond to chemotherapy. Understanding these cellular level responses to chemotherapy is essential to creating treatments for ovarian cancer patients that reduce the chance of relapse and improve long-term survival rates. A dosage titration was performed to determine the resistance of the cells to carboplatin as well as a growth rate assay to show the effect of carboplatin exposure on the proliferation of both cell types. The titration and growth rate assay were both run using an AlamarBlue Cell Viability assay. The cells' aggression levels were quantified with a Transwell migration assay, a circular wound assay, and gene expression will be measured through qRT-PCR. Before chemotherapy, the OvCSCs show a faster proliferation rate and aggression level, as well as a greater resistance to the carboplatin exposure compared to the bulk ovarian cancer cells. Results from the in vitro experiments show that chemotherapy exposure does not have a significant effect on the aggression of bulk ovarian cancer cells and induces a dormant state in the OvCSCs; analysis of the qRT-PCR results is currently ongoing. By understanding how chemotherapy exposure changes the aggression rates of both ovarian cancer bulk cells and stem cells, the scientific community can better understand therapeutic treatments for patients with aggressive ovarian cancer.

3:15pm **7** Grad **The Effect of Toc132/120 Mutation on the Expression of JAZ Repressor Genes**

*Godfred Mensah, Meshack Afitlhile, & Chiemeka Emeribe [Western Illinois University]

Plants have a complex signaling network to respond to stress in the environment like herbivore attacks. Jasmonic acid (JA), a lipid-derived hormone, is an essential plant hormone that regulates plants' defense responses against herbivores. JA biosynthesis begins in the chloroplasts and ends in the peroxisomes. The Translocon on the outer chloroplast membrane (TOC) complex, facilitates the import of nuclear-encoded proteins into the chloroplast. This study aims to investigate the effects of Toc132/120 mutations on the expression of JA-repressor genes in mechanically wounded tissue of both wild type and Toc132/Toc120 mutant of *Arabidopsis*. Gene expression studies revealed an upregulation of JAZ1, JAZ5, JAZ7, and JAZ9 in the wounded wild type. This suggests that the wild type accumulates Jasmonates when wounded. JAZ1, JAZ5, JAZ7, JAZ9 were upregulated in the wounded and unwounded Toc132/Toc120 mutant, which suggests that the mutation is seen as stress which mimics wounding. MPK6 was downregulated in wounded wild type and mutant. This is reasonable because MPK6 is usually expressed when wounding results from a pathogen attack. We, therefore, hypothesize that both the mutant and the wildtype accumulate increased levels of Jasmonates since our unpublished data in our laboratory have shown that the Toc132/120 mutant has a normal gene expression in the JA pathway. This suggests that the Toc132/120 receptors might not be critical in the import of nucleus-encoded enzymes that initiate the JA pathway in the chloroplast.

4:15pm **8** UG **Challenging Cornea-Lens Regeneration in the Mature Frog Cornea**

*Ali Daoud & Paul Hamilton [Illinois College]

Xenopus laevis tadpoles have the ability to regenerate lenses through signals sent from the neural retina to the cornea epithelium, but this ability is lost post-metamorphosis. However, mature frog corneas still possess the ability to express some lens proteins when challenged to regenerate ex vivo. A leading hypothesis is that the physical presence of the stroma interferes with the ability to regenerate a lens in the mature frog eye, and enzymatic disruption of the stroma could help restore this ability. Previous work in our group suggested that collagenase and amylase can disrupt the stroma while preserving the corneal epithelium. This current study builds on that work by refining the enzymatic protocol. Frog eyes were surgically excised and corneas were treated with an enzyme solution of 15 mg/ml amylase and 1 mg/ml collagenase. Cornea histology was microscopically analyzed for stromal and corneal thickness. Additionally, mature corneas that had been enzymatically treated were challenged to regenerate through culture with tadpole neural retina. In the regeneration experiment, tadpole eyes underwent lentectomy, complete resection of corneal epithelium, and the remaining eyecup received either a piece of enzymatically treated mature cornea or a piece of untreated mature cornea. After 12 days of ex vivo culture, eye tissues were processed for histology, immunostained for lens protein, and analyzed with fluorescence microscopy. Results showed that enzymatic treatment of adult corneas significantly reduced stromal thickness compared with controls. Fluorescence analysis of regeneration experiments revealed some positive staining for lens protein expression in the experimental group and none in the control cornea group. However, morphology was not consistent with a fully regenerated lens and this work continues.

3:15pm 9 UG **Investigating Cardiotoxic Effects of Nab-Paclitaxel Compared to Regular Paclitaxel on Developing Zebrafish (*Danio rerio*)**

*Melanie Buzzard & Oliver Anderson [Bradley University]

Paclitaxel and nanoparticle albumin bound (nab)-paclitaxel are standard chemotherapy pharmaceuticals used to treat breast cancer, which is the most frequently diagnosed cancer in pregnant individuals. Both drugs inhibit cell division at the G2/M checkpoint by stabilizing microtubules, although nab-paclitaxel was designed as a better targeted and solvent-free alternative to improve drug distribution specificity and reduce solvent-induced toxicities. While it is known that paclitaxel can cross the human placental barrier, its effects on early fetal development are understudied and unclear. Therefore, treatment recommendations for pregnant cancer patients remain conservative despite the diagnosis of cancer in approximately 1 in every 1000 pregnant women. A prevalent and well-studied side effect of chemotherapy in adults is cardiotoxicity, but it is unknown whether there are similar cardiotoxic effects during development. Our project aims to investigate and compare the signs of developmental defects and cardiotoxicity in response to paclitaxel and nab-paclitaxel in early zebrafish development, during stages that coincide with the first trimester of human pregnancy. Understanding these impacts of paclitaxel and nab-paclitaxel on a developing heart can lead to better-informed treatment options for pregnant cancer patients.

4:15pm 10 UG **The S*cizophyllum commune* Mound Mutant in a wc-2 -Disrupted Background**

*Kennedy Spears & Thomas Fowler [Southern Illinois University Edwardsville]

Successful fruiting body development in *Schizophyllum commune* depends on input cues and favorable conditions. One of the cues is blue light perception by the white collar complex (WCC) of WC-1 and WC-2 proteins and a chromophore. Fruiting body formation is not initiated when either protein partner in the WCC is genetically eliminated. Mound (mnd) is a recessive morphological mutant that produces hemispherical clumps of aerial hyphae called mounds that are more likely to develop on mycelia of heteroallelic dikaryons (mnd+, mnd) than on mutant monokaryons. Expression patterns of hydrophobins, air spaces with structural similarity, andvery early developmental hyphal growth habits all suggested that mounds could be from thedysfunctional development of fruiting bodies. Other evidence from the mutant monokaryon points out that mound formation is not a simple defective alternative of the fruiting body formationpathway because both structures can simultaneously arise from a single mnd mutant mycelium.Development in conditions of continuous white light and total darkness were reported to supportthe hypothesis of mounds resulting from dysfunctional fruiting body development after early light-independent steps were completed. We constructed a homokaryotic mnd mutant strainwith a disrupted wc-2 allele to look further into the role of light and the WCC in mound formation. A gene for bleomycin resistance was inserted into the protein coding region of the wild-type wc-2gene in vitro. This newly disrupted allele replaced the wild-type wc-2 by homologous recombination within a mnd strain. The allele replacement was confirmed by PCR. Outcrosses ofthe mnd, wc-2-disrupted strain were made to select mating-compatible wc-2-disrupted strains that can be used to confirm the light-insensitivity of the wc-2 disrupted allele and the effect of WC-2/WCC loss on mound formation as compared to fruiting body formation.

3:15pm 11 UG **Knockout of a Kynureninase-Coding Gene Does Not Lead to a Nicotinic Acid Requirement in *Schizophyllum commune***

*Jesus Gudino & Thomas Fowler [Southern Illinois University Edwardsville]

The kynurenine pathway is a metabolic pathway in which tryptophan is converted into different metabolites including kynurenic acid, quinolinic acid, picolinic acid, nicotinic acid, and NAD^+. NAD^+ is essential for cellular respiration and ATP production emphasizing the pathway's importance. The kynurenine pathway additionally plays a significant role in human brain health in which the metabolites have been linked to protection against neurological diseases like Alzheimer's and schizophrenia. In our study, we are working with *Schizophyllum commune*, a basidiomycete fungus that has two predicted expressed kynureninase genes, provisionally named *kyn1* and *kyn2,* located within 50 kb on genome assembly Scaffold 1 (Schco v.3.0, strain H4-8). Their location roughly correlates to a genetic map locus for an existing nicotinamide auxotrophic mutation (*nic1*), but it is not known if *nic1* and *kyn1* or *kyn2* are allelic. The goal of this project is to determine whether one or both kynurenine genes are functionally involved in tryptophan catabolism and their relationship to the previously identified *S. commune* auxotroph. We aim to use these knock-out alleles as molecular chromosomal markers for future mapping on Scaffold 1 and as selectable nutritional markers in *S. commune* should they lead to nicotinic acid auxotrophy. To investigate these genes, we individually knocked out *kyn1* and *kyn2* replacing them with a zeocin-resistance marker. For this process, we ligated DNA of ~1200 bp flanking each side of the *kyn* coding regions into a bleomycin-resistant plasmid to facilitate homologous recombination. Through PCR we have confirmed a *kyn1* knockout mutant that has properly replaced the *kyn1* gene with a zeocin-resistance marker. In addition, we identified from a plate assay that the *kyn1* mutant had not recapitulated the previous *nic1* auxotrophy. Further analysis of the *kyn2* mutant must be performed to properly identify a confirmed mutant and its relationship to the *nic1* auxotroph.

4:15pm **12** UG **Physiological and Behavioral Changes in *Drosophila melanogaste*r After Chronic Repeated Ethanol Exposure**

*Riley Mooney & Emily Petruccelli [Southern Illinois University Edwardsville]

Around 400 million people - 7% of the world's population - currently live with an alcohol use disorder (AUD.) Modeling AUD in animals like *Drosophila melanogaster*, fruit flies, is integral for understanding ethanol's impact on the brain and behavior. Most studies to date have exposed flies to acute ethanol exposures – a single sedating dose or short less than 30-minute intoxicating dose, but few studies examine effects of chronic, repeated exposure. Here, we exposed flies daily to three 10-minute bouts of 50% ethanol vapor spaced by hour rests, for one week. Following this exposure, flies underwent several different tests to measure physiological and behavior responses. Tests included olfactory preference, basal respiration, sedation tolerance, longevity, and starvation survival. We found that when compared to mock-treated controls, chronic pre-exposure had no significant impact on olfactory preference for ethanol or basal respiration. However, chronic pre-exposure did significantly increase ethanol-induced sedation resistance, which is an expected level of tolerance observed even after acute, 1-day pre-exposure. Lastly, no effect on longevity was observed for the pre-exposed group, but chronic pre-exposure significantly decreased starvation resistance. These findings suggest that chronic ethanol intoxication does not drastically alter fly physiology and behavior.

CHEMISTRY & BIOCHEMISTRY

3:15pm **13** UG **Analysis of Oxamyl is Locally Purchased Produce**

*Mariela Garces [Western Illinois University]

Oxamyl, is a carbamate pesticide, is commonly applied to crops such as potatoes, tomatoes, and peppers. However, it is highly toxic to humans, wildlife, and aquatic organisms and is classified as a highly hazardous pesticide. Accurate detection of oxamyl in environmental and food samples requires sensitive and selective analytical techniques. Gas chromatography coupled with a flame ionization detector (GC-FID) is a widely used method for oxamyl quantification, as it enables separation and detection of components through sample vaporization and ionization in a hydrogen-air flame. This study aims to analyze local bell pepper samples to determine the presence of oxamyl residues. This will contributing to a better understanding of pesticide contamination in produce in the region

4:15pm **14** Grad **Correlation of Kinetic Isotope Effects with Their Temperature Dependences of Hydride Transfer Reactions of NADH/NAD^+ Analogues in Solution**

*Ava Austin, Jessica Sager, Bibesh Pokhrel, Grishma Singh, Lauren Phan, & Yun Lu [Southern Illinois University Edwardsville]

The study of hydrogen (H) kinetic isotope effects (KIEs) and their temperature dependences can provide valuable insights into the nature of H-transfer, particularly H-tunneling mechanisms. It also aids in evaluating existing H-tunneling theories or developing new ones. While several H-tunneling models have been proposed, none has gained universal acceptance. Among these, the vibration-assisted activated H-tunneling (VA-AHT) model is the only one that suggests a relationship between KIE magnitudes and their temperature dependences — specifically, the larger the KIE, the more temperature-dependent it is. In this study, we report a correlation between KIEs and the isotopic activation energy differences ($\Delta E_a = E_{aD} - E_{aH}$), which reflect the degree of temperature dependence of the KIEs, for 40 hydride transfer reactions of NADH/NAD^+models in acetonitrile. A linear relationship appears to exist between ln(KIEs) and ΔE_a, consistent with the VA-AHT model. This finding may contribute to refining current models or developing future H-tunneling models.

3:15pm **15** UG **Using Dry ATR-FTIR Spectroscopy to Identify 1,4-Butanediol in Alcoholic Beverages**

*[1]Marissa Purfeerst, [2]Ethan Nugen, [2]Thomas Spudich, [2]Christina Hayes [[1]Maryville University, [2]Southern Illinois University Edwardsville]

Attenuated Total Reflectance FTIR (ATR-FTIR) can be used to identify and determine the presence of IR-active molecules. When working with a liquid mixture, a sample can be allowed to dry on a transparent crystal, which allows for IR radiation to traverse the sample, so only the non-volatile material will be analyzed in a method called Dry ATR-FTIR. The chemical 1,4-butanediol – a derivative of GHB – is becoming more prevalent in drug-facilitated crimes, making it a key interest in forensic crime laboratories. There is currently no standardized method to identify the presence of 1,4-butanediol in alcoholic beverages. Due to the IR-active nature and high viscosity of this chemical, Dry ATR-FTIR can be used to identify 1,4-butanediol from the rest of the alcohol mixture. Samples were made by mixing 1,4-butanediol with alcohol and mixers. The concentrations of 1,4-butanediol in these samples were determined in accordance with the common street dosages of GHB, from most to least safe. The spectra produced by these samples were analyzed by utilizing SpectraGryph software to identify the presence of peaks unique to 1,4-butanediol. By using this software with the data from the Dry ATR-FTIR method, the presence of 1,4-butanediol was able to be determined in several alcoholic beverages.

4:15pm **16** UG **Nickel Telluride Synthesis**

*Caleb Whitaker [Western Illinois University]

The goal of the project is to synthesize nickel telluride via solid state methods. Nickel telluride has provided to be an efficient water splitting catalyst. The reaction is conducted in quartz glass tubing. The tubes are prepared by cutting four-foot tubes into six-inch sections using a glass cutter and oxygen-methane torch. Two drops of acetone are then placed into the tube and presented to a direct flame to produce a carbon coat on the inside of the tube to ensure no reactions occur with the glass. These tubes are then loaded in a 3:2 ratio of nickel to telluride and sealed under vacuum. The sealed tube is then placed into a temperature-controlled furnace at 600°C for one week. After baking the sample for one week, it is then brought down to room temperature and examined under an optical microscope. Hand selected crystals are placed onto a scanning electron microscope stub for further analysis.

3:15pm **17** Grad **Development of an Organometallic Chemistry Reaction for Use in a Senior Level Inorganic Laboratory**

*Ty Ojonovac [Western Illinois University]

The goal of this work was to develop an organometallic chemistry reaction which yielded an organometallic product in high yield, high purity, can be analyzed by several physical methods (FTIR, ^{1}H NMR, and $^{31}P\{^{1}H\}$ NMR), and be completed in one three-hour laboratory period. The synthesis of trans-$Fe(CO)_2(PR_3)$ is well studied and an ideal candidate for this laboratory exercise. Organoiron complexes are versatile reagents in inorganic and organic chemistry. The starting materials for the reaction are cost effective and can be stored indefinitely under proper storage conditions. This poster will present modifications to the published procedure which reduce the reaction time and make the experiment more accessible for those without air sensitive capabilities

4:15pm **18** UG **Athabascaite Crystal Synthesis**

*Owen Beck & Brian Bellott [Western Illinois University]

Athabascaite (Cu_5Se_4) is a copper selenide mineral that was recently discovered as a natural material, but has not been thoroughly invested as a synthetic material. This project focuses on the synthesis of athabascaite (Cu_5Se_4), a copper selenide crystal. To synthesize this compound, 5 moles of copper (Cu) and 4 moles of selenium (Se) are carefully mixed in a 5:4 ratio and placed in small glass tubes coated with carbon to prevent unwanted reactions. The tubes are sealed carefully under vacuum and heated using various heating programs over the course of one week. After the heating program is done, the tubes are cracked open, and any potential crystal samples are examined using a dissection/compound microscope. Crystal samples are hand selected and transferred onto stubs for further analysis using scanning electron microscopy (SEM). If the samples are pure, they will be further characterized via single crystal X-ray spectroscopy. This will allow for an understanding of how the atoms are bound together in the solid-state.

3:15pm **19** Grad **Exploring Bacterial Replication and Survival Dynamics Under Different Oxidative Stress Conditions at the Single-Bacterium Level**

*Omnia Ahmed, Madyson LaBotte, Maria Poston, & Andrés M. Durantini [Southern Illinois University Edwardsville]

Pathogen survival under various treatments is often influenced by their ability to withstand oxidative stress. This type of stress occurs when the balance between reactive oxygen species (ROS) and antioxidant defenses is disrupted, resulting to cellular damage. ROS are highly reactive molecules that can jeopardize lipids, proteins, and nucleic acids, ultimately compromising cell function and integrity. While ROS are typically produced as byproducts of cellular metabolism, they can also be deliberately generated to target and eliminate pathogens. In particular, photosensitizers (PS), molecules that absorb light and generate ROS, can be utilized to selectively induce oxidative damage in microbial cells, offering a promising strategy for antimicrobial treatments. In this study, we use fluorescence microscopy combined with cell viability markers to assess bacterial phenotypic survival dynamics under varying oxidative stress conditions. Also, a dependency between bacterial replication and PS dosimetry was found. These findings provide valuable insights into how bacteria phenotypes and metabolic state influence their response to oxidative stress, which could lead to more effective strategies for enhancing the efficacy of antimicrobial treatments.

4:15pm **20** UG **The Flavonoid Content of the *Acmella* Plant**

*Hannah Eden, Sydnee Osgood, Mette Soendergaard [Western Illinois University]

Many medications that are used today have ingredients pulled from plants or synthetic derivatives of a product from a plant. This includes a large portion of chemotherapeutic drugs. Cancer is one of the leading causes of death and continues to be a growing issue. *Acmella* has been used as a medicinal herb and has had the extracts researched on. Previous research in the lab has shown cytotoxic effects of *Acmella* extracts on ovarian and pancreatic cancer cells, yet the flavonoid content is unknown. Flavonoids are strong antioxidants that can bind to reactive oxygen species thus preventing further tumor development.

This led to the interest in testing the flavonoid content of the different *Acmella* extracts. We are testing many different types of extracts from the *Acmella* plants. There are three different species of *Acmella* that we are looking at: *Acmella alba*, *Acmella oleracea*, and *Acmella calirrhiza*. We formed an extract in methanol from the root, stem, leaves, and flower of each species. The Aluminum Chloride assay is a colorimetric assay used to determine the flavonoid content in drugs. A standard curve was created using quercetin, a known flavonoid pigment with antioxidant qualities, in a range of concentrations (100, 50, 25, 10, 5, 2, 1, and 0 µg/mL). The equation from the standard curve was then used to determine the flavonoid concentration of the different *Acmella* extracts.

This study has resulted in showing that the leaf extracts contained the most flavonoids, next to the the stem of the *Acmella calirrhiza* then the stem of the *Acmella alba.* This correlated with the previous anticancer research performed. These results further prove that these *Acmella* extracts are a great candidate for further research toward cancer treatment drugs.

3:15pm **21** Grad **Anticancer Activity of Nigerian Inorganic Complexes in Ovarian Cancer (SKOV3) Cells**

*Isabel Navas Rodriguez, Mette Soendergaard, & Temitope Olalekan [Western Illinois University; University of Ibadan, Nigeria]

Ovarian cancer is the eighth most frequent cancer type among women and the eighth most frequent cause of death from cancer in the world. Around 324,000 women are diagnosed, and 207,000 women die with the disease every year. Even though chemotherapy can alleviate the disease, there is no current cure emphasizing the need for developing new forms of treatment. Many current chemotherapeutic medications used today contain inorganic compounds. It is therefore important to look into the anti-cancer properties. These extracts were provided by the project collaborator, Dr. Temitope Olalekan from the University of Ibadan, Nigeria.

Human ovarian cancer cells (SKOV-3) were grown overnight on 96-well plates in McCoy 5A modified medium at 37°C and 5% CO2, necessary for human cells. The extracts were then added to the SKOV-3 cells and incubated for 24 hours. The (3-[4,5-dimethylthiazole-2-yl]-2,5-diphenyltetrazolium bromide) (MTT) assay has been widely used to assess cell viability and metabolic activity in cells. Absorbance was compared to the DMSO and paclitaxel (PAX) controls to determine if the extracts have anti-cancer activity. A one-way ANOVA statistical test using GraphPad Prism software was used to compare the data and to calculate statistical significance. In summary, this project aims to test and identify new extracts that contain compounds that have anti-cancer activity. Such compounds may be developed into drugs to treat ovarian cancer. Three compounds have exhibited cytotoxic activity in ovarian cancer cells. However, further testing is required to ensure consistent activity.

4:15pm **22** Grad **Exploration of FeS, $Fe_{.8}S_{1.2}$, and FeS_2 by Solid State Synthesis**

*Remi Irwin & Brian Bellot [Western Illinois University]

The ratios of FeS, $Fe_{.8}S_{1.2}$, and FeS_2 are explored to determine if any materials can be synthesized via solid state methods. The process involves mixing iron and sulfur in the ratios provided in a reaction vessel. The vessel is sealed under vacuum and then heated in a computer-controlled furnace for several days at high temperature. After the time is up the vessel is broken and the contents examined. The contents of the reaction vessel will be the focus of this presentation. The overarching goal would be to prepare samples that are suitable for use in an educational lab setting. This involves two goals; first the crystals need to be large enough to be easily handled and second the yield needs to be sufficient for analysis by FTIR and SEM-EDS.

3:15pm **23** UG **Dual Photosensitizer Polymeric Platforms with Optimized Antimicrobial Properties**

*Jesús Gómez, Noah Phillips, & Andés M. Durantini [Southern Illinois University Edwardsville]

Light-activated materials that combine biopolymers like polylactic acid (PLA) with photosensitizers (PS) offer a promising strategy for developing antimicrobial surfaces through the generation of reactive oxygen species (ROS). Additionally, self-sterilizing polymers can be achieved by 3D printing PLA blends with biocidal additives using fused deposition modeling. However, to our knowledge, there have been no reports on 3D-printed platforms utilizing filaments made from PLA combined with multiple dyes. We propose that using a combination of dyes enhances ROS generation by capturing a broader range of photons compared to using a single fluorophore. In this study, we successfully fabricated composites by extruding PLA with a mixture of Zn phthalocyanine and Rose Bengal into filaments. These materials were used to print various objects with notable photodynamic properties. Upon irradiation, the generation of cytotoxic singlet oxygen was evaluated using an indirect chemical trap method. Colony-forming unit assays over time demonstrated a significant decrease in microbial viability following 30 minutes of light exposure. These findings open the door to the cost-effective and straightforward development of sustainable 3D-printed materials for efficient light-mediated microbial elimination.

4:15pm **24** **Exploration of Caffeic Acid as a Component in Ugi Reactions**

*Abigail Lewis & Sarah Luesse [Southern Illinois University Edwardsville]

The Ugi reaction is a one-pot, four-component reaction that involves the combination of an aldehyde, an amine, an isocyanide, and a carboxylic acid to produce α-aminoacyl carboxamide derivatives. Caffeic acid has been a successful building block in the pharmaceutical industry due to its anti-cancer and anti-viral properties. Our experiment aims to

effectively synthesize a pure Ugi product and prepare a chemical library of compounds that can utilize acetonitrile or methanol as solvents. Further studies will explore variations of the isocyanide and amine components and possible compatible secondary reactions to expand and enrich the chemical library.

3:15pm 25 UG **Temperature Dependence of Modified Ugi-Smiles Reactions with CPA Catalysts**

*Conner Herkert & Sarah Luesse [Southern Illinois University Edwardsville]

The Ugi-Smiles reaction is a multicomponent reaction (MCR) that generates highly functionalized amides by combining phenol, amine, aldehyde, and isocyanide components. When paired with a Diels-Alder reaction, the resulting Ugi-Smiles Diels-Alder process produces six new bonds and four new stereocenters, generating two separable, highly functionalized epoxyisoindoline diastereomers. The use of a bromo-substituted 2-nitrophenol has given good reaction yields of 60-96%. Current efforts are directed towards exploration of the use of chiral phosphoric acid (CPA) catalysts in Ugi-Smiles and tandem process, and analysis of isolated products by chiral HPLC.

4:15pm 26 Grad **Quantification of Cannabichromenic Acid among Seventeen Cannabinoids in Key Lime Pie Hemp Flowers by Liquid Chromatography Ultraviolet Detection**

*Maddy Kotler, Liguo Song, & Kara Tidwell [Western Illinois University]

A liquid chromatography ultraviolet detection (LC-UV) method was developed for the quantification of cannabichromenic acid (CBCA) in key lime pie hemp flowers among Seventeen cannabinoids. The quantification was achieved using external standard calibration between 0.02 and 25 mg/mL. The limits of quantitation (LOQ) were determined to be 0.04% CBCA in hemp flowers. To recover CBCA, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 50 mg/mL and analyzed by LC-UV. The measurement precision in triplicate was 1.8%. The method is not interfered by other cannabinoids present in hemp flowers

3:15pm 27 UG **Extraction and Characterization of Chitin from Cicada Shells**

*Samuel Hannig & Paola Gonzalez [Illinois College]

This study investigates the extraction and characterization of chitin from the exuviae (molted shells) of periodical cicadas (*Magicicada spp.*) that emerged in Jacksonville, Illinois, in 2024. Chitin, a biopolymer with significant roles in biomedical, agricultural, and industrial applications, was extracted by cleaning, drying at 50 °C, demineralizing with 1N HCl, deproteinizing with 1N NaOH and Na2CO3, and decolorizing with sodium hypochlorite. The isolated chitin was characterized using FTIR, UV-Vis spectroscopy, GC-MS, and 1H NMR. FTIR analysis confirmed chitin through characteristic C=O stretching bands at 1739 cm^{-1} and 1652 cm^{-1} (amide C=O), and overlapping O-H and N-H stretching bands at 3463 cm^{-1} and 3302 cm^{-1}. UV-Vis spectroscopy showed maximum absorbances at 244 and 249 nm, indicative of the $\pi \rightarrow \pi^*$ transition in chitin. The 1H NMR spectrum revealed peaks consistent with chitin's theoretical structure, including signals around δ 1.4-3.9 ppm for glucosamine protons. GC-MS analysis identified compounds, such as acetamide and chitosan derivatives, further confirming the chitin structure. This study demonstrates that cicada exuviae, often left to decompose, represent a substantial and renewable source of chitin. Utilizing these shells for chitin extraction provides valuable educational resources for biopolymer extraction and characterization, and promotes sustainable use of biological waste.

4:15pm 28 Grad **Quantification of Cannabidiol in Bath Balm Using Ultrahigh Performance Liquid Chromatography with Ultraviolet Detection**

*MD. Imon Hossain, Md Mahmud Alam, Kerval Quinlan, & Liguo Song [Western Illinois University]

An ultrahigh performance liquid chromatography ultraviolet detection (UHPLC-UV) method was developed for the quantification of cannabidiol (CBD) in bath balm. The quantification was achieved using external standard calibration between 0.02 and 25 μg/mL. The limits of quantitation (LOQ) were determined to be 0.008% CBD in bath balm. To recover CBD, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 250 μg/mL and analyzed by UHPLC-UV. The measured CBD content in the bath balm was 0.0218%, with a relative standard deviation (RSD) of 12.8% across triplicate measurements. The method is not interfered by other cannabinoids present in bath balm.

3:15pm 29 Grad **Quantification of Cannabichromene in Hemp-Infused Face Cream Using Ultrahigh-Performance Liquid Chromatography with Ultraviolet Detection**

*Md Mahmud Alam & Liguo Song [Western Illinois University]

An ultrahigh-performance liquid chromatography ultraviolet detection (UHPLC-UV) method was developed for the quantification of cannabichromene (CBC) in face cream. The quantification was achieved using external standard calibration between 0.02 and 25 mg/mL. The limits of quantitation (LOQ) were determined to be 0.008% CBD in face cream. To recover CBD, a sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication,

centrifugation, and filtration, the extract was serially diluted to 250 mg/mL and analyzed by UHPLC-UV. The measured CBC content in the face cream was 0.0141%, with a relative standard deviation (RSD) of 2.4% across triplicate measurements. The method is not interfered with by other cannabinoids present in face cream.

4:15pm 30 Grad **Application of Diorganylditellurides in Hiyama Coupling Reactions**

*Marlena Gabriel, Shaozhong Zhang, & Jin Jin [Western Illinois University]

In organic chemistry, a coupling reaction is a class of organic reactions that involve the joining of two chemical species together usually catalyzed by a metal catalyst. Coupling reactions can be classified into two types: homo-coupling and hetero-coupling reactions. In homo-coupling, two identical partners are joined together while in hetero-coupling (also called cross-coupling), two different partners are joined together. Richard Heck, Ei-ichi Negish and Akira Suzuki were awarded the 2010 Nobel Prize in Chemistry for developing palladium catalyzed cross-coupling reactions. Many cross-coupling reactions have been developed such as Suzuki, Stille, Negishi, Sonagashira, Heck, Hiyama, Buchwald-Hartwig coupling, etc. Coupling reactions provide important ways for the formation of carbon-carbon or carbon-heteroatom bonds, which are widely applied in the pharmaceutical industry, polymer, and natural product synthesis.

The silicon-based cross-coupling has attracted much attention in recent years due to the natural abundance of silicon, its stability, and non-toxicity. Organotellurides have many applications, including in optoelectronics, photovoltaics, and energy storage. In this research project, we have developed a cross-coupling reaction between diorganylditellurides and organosilanes. This Hiyama-type cross-coupling reaction provides a general method for the construction of carbon-tellurium bonds and the synthesis of unsymmetrical tellurides. The reaction is carried out at 100 ^{o}C in DMSO catalyzed by copper catalyst in the presence of tetrabutylammonium fluoride (TBAF). The unsymmetrical telluride products were obtained within a short time in very high yields. The reaction mechanism will be investigated.

3:15pm 31 Grad **Potency Testing of Synthetic THC Isomers-Based Products by Liquid Chromatograph Ultraviolet Detection: Quantification of Cannabidiol in a Delta8-THC Focused Blends – Soothe Oil**

*Olalekan Ogunsola, Kate Dosch, Jeev Hora, & Liguo Song [Western Illinois University]

A liquid chromatography ultraviolet detection (LC-UV) method was developed for quantification of Cannabidiol (CBD) among twelve cannabinoids in a D^8-THC focused blends – soothe oil tincture. The quantification was achieved using external standard calibration between 0.04 and 50 mg/mL. To recover CBD, the sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 500 mg/mL and analyzed by LC-UV. The limits of quantitation (LOQ) were determined to be 0.08% CBD in the sample. The CBD content in the sample was measured to be 0.53% with relative standard deviation (RSD) of 1.61% in triplicate. The method was not interfered by other cannabinoids present in the sample.

4:15pm 32 Grad **Potency Testing of Synthetic THC Isomers-Based Products by Liquid Chromatograph Ultraviolent Detection: Quantification of Delta 9-THC in a Delta 8-THC Fortified Hemp Oil Tincture**

*Ayowole Owolabi & Lene Mitchell [Western Illinois University]

A liquid chromatography ultraviolet detection (LC-UV) method was developed for quantification of D^9-tetrahydrocannabinol (D^9-THC) among twelve cannabinoids in a D^8-THC focused blends – soothe oil tincture. The quantification was achieved using external standard calibration between 0.04 and 50 mg/mL. To recover D^9-THC, the sample was combined with methanol to prepare a 25 mg/mL mixture. After ultrasonication, centrifugation and filtration, the extract was serially diluted to 500 mg/mL and analyzed by LC-UV. The limits of quantitation (LOQ) were determined to be 0.08% D^9-THC in the sample. The D^9-THC content in the sample was measured to be 5.8% with relative standard deviation (RSD) of 13.4% in triplicate The method was not interfered by other cannabinoids present in the sample.

COMPUTER SCIENCE

4:15pm 2 JH **Machine Learning Models for Tennis Serves**

*Li Bowen [Aptakisic Junior High School]

The objective of this research is to evaluate various machine learning models to assess the quality of a tennis serve, and implement the most effective model. The model will allow users to use a smartphone to capture real-time movements during tennis play and receive immediate feedback, thereby improving the overall quality of their serves. It provides an affordable and effective solution for tennis players with financial constraints and in economically underdeveloped regions who may not have access to expensive coaching and training resources.

The research project consists of three key components: The first is an AI tool to analyze tennis serving videos and detect objects. This tool processes videos and collects motion data including body positions, racket trajectories, and ball placements. The second component trains machine learning models to predict if a tennis serve is successful or not. Support Vector Machine, Neural Networks and Gradient Boosting Machines are developed. The best model is then integrated into

the last component: a user-friendly mobile application. Through the app, the users can record videos of their serves. The model evaluates the quality of the serve. The app also incorporates generative AI to offer personalized feedback.

The performances of the models are assessed using accuracy scores derived from confusion matrices. The Gradient Boosting Machines produced the highest accuracy score of 79.3%, compared to 64.3% for Neural Network, and 62.3% for Support Vector Machine. The model performance can be enhanced by increasing the data size, and fine-tuning hyperparameters with more computation power.

4:15pm **4** Grad **Analysis and Modeling of Respiratory Disease and the Influence of Socioeconomic Factors in Central Illinois**

*Misbahuddin Mohammed, Likhitha Cherukuri, Babu Baniya, Sherif Abdelfattah, Balasree Sreedharan Pillai, Roopa Foulger, Praneeth K. Chebrolu, & John Marino [Bradley University]

The COVID-19 pandemic has underscored the need for robust epidemiological modeling to understand disease dynamics and inform public health responses. For instance, socioeconomic factors are strongly associated with the impact of COVID-19 on different communities, and such analyses can offer insights into their influence. In this study, we analyze COVID-19 trends in Illinois by developing an SEIRS compartmental model in R using the 'pomp' package. The model simulates disease progression and estimates key epidemiological parameters through a recently developed algorithm (iterated filtering) for maximum likelihood estimation. Additionally, we perform exploratory data analysis in Python to preprocess and visualize the dataset and assess disparities related to socioeconomic status. The model is calibrated using epidemiological data from OSF healthcare and the Illinois Department of Public Health to enhance the accuracy of infection trend forecasts. This integrated approach provides valuable insights into disease transmission patterns and supports data-driven decision-making for public health interventions.

EARTH SCIENCE

3:15pm **105** Grad **Science-Interested Undergraduates' Perceptions of the Geosciences as a Career**

*Mariam Sani & Sharon Locke [Southern Illinois University Edwardsville]

A group of 22 undergraduates, most identifying as underrepresented in science, participated in a multi-year extracurricular program that incorporated research, internships, and field activities and aimed to increase awareness and interest in geoscience careers. Concurrently, a longitudinal mixed-methods research study examined how participant perceptions changed after being incorporated into the world of geosciences. Sixteen participants completed two surveys and interviews, one upon entry into the program and the last at least a year after the program, and five completed an additional survey and interview within three years after graduation. Surveys and interviews measured participants' self-efficacy, identity, and scientific values in the context of the geosciences, as well as participants' perceptions of the geosciences. We analyzed data using statistical tools and thematic coding. Results from the analysis showed that participation in extracurricular programs has the potential to positively influence geoscience perceptions and increase geoscience identity. This research revealed that while scientific values and self-efficacy were not statistically significant, the extent of students' involvement in program activities did not necessarily play a role in solidifying identity, fostering scientific values, or improving self-efficacy. We demonstrate that extended field trips, geoscience faculty mentoring, and community internships helped participants to have a better understanding of geosciences and recognize their ability to excel in the geosciences.

3:15pm **107** Grad **Where Have Spring and Fall Gone? Changes in Temperate Transition Season Days**

*Claire Iott & Alan Black [Southern Illinois University Edwardsville]

Anecdotal evidence suggests that temperate transition season days are less numerous in recent years, with abrupt shifts directly from winter to summer or summer to winter becoming more common. In this work we examine this phenomenon for St. Louis, MO using two measures of human thermal comfort: apparent temperature (AT) and thermohygrometric index (THI). Several thresholds for AT and THI are used to examine the occurrence of "comfortable" hours that would be expected during the transition seasons. Results indicate there are recurring themes in which months are experiencing the greatest changes, regardless of metric or time of day. Depending on the measure, there is evidence that the number of "comfortable" hours are decreasing on an annual basis. In addition, the seasonality and diurnal patterns of these "comfortable" hours are changing which may further the perception of fewer "comfortable" days. Future work will expand this work to additional locations and using other thermal comfort indices.

ENGINEERING & TECHNOLOGY

3:15pm **33** Grad **Advancing Aviation Safety: The Possibility of an Emergency Evacuation Detachable Airplane Cabin**

*Md. Motohar Kibriah [Western Illinois University]

Air transportation remains one of the most secure means of traveling, but when accidents do occur, they often result in a high number of casualties. One innovative approach to improving aviation safety is the concept of a detachable airplane

cabin. This design allows the passenger compartment to separate from the main fuselage during emergencies, using parachutes and air-cushioned landing systems to ensure a safe descent to land or water. This study seeks to explore the technical feasibility, engineering challenges, and practical considerations of integrating such a system into commercial aviation. Using computer-aided design (CAD), stress analysis, and aerodynamic simulations, this research aims to examine key factors affecting the cabin's structural integrity, deployment mechanisms, weight constraints, and ability to withstand impact during landing. Previous studies suggest that lightweight composite materials like carbon fiber and Kevlar could enhance safety while maintaining fuel efficiency. However, challenges such as separation dynamics and aerodynamic stability during descent require further investigation. Statistical data shows that 71% of fatal air accidents occur at cruising altitude, where traditional evacuation methods are ineffective. While technologies like ejection seats and ballistic parachutes have been successfully implemented in smaller aircraft, adapting them for large commercial airliners presents significant regulatory, economic, and structural challenges. Despite these hurdles, advancements in materials science, automated deployment systems, and impact absorption technologies indicate that a detachable cabin could become a viable life-saving innovation in the future. This study aims to provide an in-depth analysis of the potential benefits, design limitations, and prospects of this concept, contributing to ongoing efforts to enhance aviation safety.

4:15pm **34** Grad **Enhancing Inventory Control to Prevent Expired Goods Using Six Sigma**

*Prajakta Pohare, Harish Darne, Sachin Chaudhary, Sindhu Kandula, Faith Mutinda, & Jaby Mohammed [Illinois State University]

Reducing product expiration is important for food management for social and economic reasons. Consumers who use expired products run the risk of suffering health problems in addition to financial losses. This research paper suggests a methodical strategy for improving pantry operations and lowering the frequency of expired goods by utilizing Six Sigma methodologies. Organizations can attain increased efficiency and effectiveness in pantry management by pinpointing important areas for improvement, putting strong strategies into place, and closely monitoring and controlling procedures. This paper offers practical insights for optimizing pantry processes to reduce or eliminate product expiry through a case study analysis and the application of Six Sigma tools like DMAIC (Define, Measure, Analyze, Improve, Control).

3:15pm **35** Grad **From Concept to Completion**

*Cori Booher [Western Illinois University]

The purpose of this poster project is to visually describe the complex planning techniques and operations required to run a plasma cut metal sign company. The poster project will explain the class background, the customer requirements, the techniques used to plan operations and sales, and the daily operation of the plasma cutter. The poster will also explain how we create signs, and further our operational model of "from concept to completion." Lastly, the poster will detail the daily requirements of each operator, and what is expected to complete the orders on time. This poster project will accurately describe how we produce metal signs, and teach students to lead manufacturing in the production of these metal signs.

4:15pm **36** Grad **Mapping Engineering Excel Functions to VBA Across Versions: A Proof-of-Concept**

*Boone Formhals [Western Illinois University]

This project developed a comprehensive GitHub database that maps engineering Excel functions with corresponding VBA implementations. The work was motivated by the need for backward compatibility and enhanced automation in engineering applications running on diverse Excel environments. The primary objective was to create a proof-of-concept for a process that takes modern Excel functions and systematically implements them in previous versions of Excel using VBA, thereby providing more easily implemented compatibility across Excel 2003 to Excel 365. To accomplish this, function occurrence through the different versions of Excel were documented into a table along with the version of VBA that generation of Excel used. Custom VBA implementations of each function were created in every version of Excel that lacked that function natively. The success of this project shows the feasibility of efficiently creating VBA equivalents of all non-ubiquitous Excel functions.

3:15pm **37** HS **How is AI Impacting Students' Learning?**

*Rachel Kim [Dunlap High School]

Artificial Intelligence (AI) usage has been a controversial subject for people today, and one of the main concerns regarding AI has been the impact on students' learning because students have been using AI as a tool for learning. Ever since ChatGPT and other types of AI chatbots were released to the public, many students took advantage of its many features and incorporated it into their study routine. This study was conducted to figure out if students used AI to help their learning process and how they incorporated AI into their studies.

This study used an online survey that was answered by students from Dunlap High School. The online survey asked students whether they used AI, if they thought that AI helped them understand school materials well, and whether they believed that AI helped them achieve better grades.

The sample of the survey was 226 participants and among the participants, there were 44.7% 9th graders, 19.9% 10th graders, 22.1% 11th graders, and 13.3% 12th graders. The participants were 58% Female and 42% Male. There were 54%

White Americans, 5.8% African Americans, 29.7% Asians, and 10.6% other races. 55.3% used AI. Only 23.1% of African Americans used AI while 74.6% of Asians used AI. (P<0.001) 47.5% of White Americans used AI too. Among AI users, 89.6% believed that it helped them understand the materials better, 87.2% believed that it helped them get better grades, and 90.4% of students used AI to help complete assignments.

In conclusion, there was racial disparity in AI usage. African Americans did not use a lot of AI while Asians used a lot of AI. Most AI users used AI to help their studies in order to get better grades and understand the materials better. In the future, studies should check for other disparities based on socioeconomic status.

ENVIRONMENTAL SCIENCE

4:15pm **38** Grad **Assessing the Impact of Increased Levonorgestrel Exposure on Surface Water Pathogen Detection**

*Dennis Fofie Kwarkye & Joseph Kusi [Southern Illinois University Edwardsville]

Levonorgestrel-based contraceptives represent significant advancements in reproductive health technology. Increased accessibility, such as recent over-the-counter (OTC) approval by the FDA on July 13, 2023, for a daily oral product with no age restrictions, represents even greater strides. However, this accessibility could increase pharmaceutical residues in surface waters. Recent studies have shown that high levels of endocrine disruptors and synthetic hormones found in contraceptives such as ethynylestradiol can alter gene expression in surface water pathogens which has the potential to impact their detection.

This study investigates the impact of levonorgestrel, a synthetic progestin on the detection of *Escherichia coli*and *Pseudomonas* spp. in efforts to confirm the hypothesis that increased levonorgestrel concentrations interfere with the detection of these microbes. Through controlled laboratory experiments, bacterium cultures are exposed to a gradient of levonorgestrel concentrations ranging from 0.1 ng/L to 1000 ng/L. The interference of levonorgestrel with bacterium detection is assessed using Polymerase Chain Reaction (PCR) for DNA amplification efficiency and enzyme activity assays for microbial viability. This approach helps to determine the concentration thresholds at which levonorgestrel begins to interfere with bacterium detection and identification, providing vital insights into the compound's ecological and public health implications. The findings aim to inform future water quality monitoring and management strategies, emphasizing the need for updated guidelines to address the presence of pharmaceuticals and pathogen detection in water systems.

3:15pm **39** UG **Selenium Accumulation and GSH-Px Activity in Different Cultivars of Garlic (*Allium sativum*)**

*Christopher Mueller , Nishi Hiteshkum Joshi , & Zhi-Qing Lin [Southern Illinois University Edwardsville]

Selenium (Se) is an essential nutrient element for humans. Selenoproteins are critically important for human health through diverse metabolic and physiological processes such as antioxidant defense, thyroid hormone metabolism, and immune function. Garlic (*Allium sativum*) is one of few Se accumulator species among common vegetables. Previous studies demonstrated that Se-enriched garlic showed significant chemopreventive properties, which has been linked to Se-methyl L-selenocysteine as the dominant Se compound in clove tissues. Selenium accumulation in garlic varies among different cultivars. This study determined the variation in Se accumulation among 24 different garlic cultivars in the St. Louis region. Concentrations of Se in fresh clove tissues ranged from 0.012±0.002 mg/kg in Transyl Vanian to 0.226±0.118 mg/kg in Georgian Crystal, and most of them with bioconcentration factors of <1. High Se concentrations were observed in leaf and scape tissues. The GSH-Px activity in fresh clove tissues of 11 garlic cultivars varied significantly from 4107 U/mg protein in Bavarian to 511 U/mg protein in Nootka Rose. No significant correlation between the GSH-Px activity and the Se concentration in clove tissues were observed among different garlic cultivars.

4:15pm **40** Grad **Molecular Interaction of Selenium and Mercury in Edible Tissues of Shellfish**

*Prakash Joshi, Wilson Gao , Cali Farris , & Zhi-Qing Lin [Southern Illinois University Edwardsville]

Shellfish provide high dietary intake of protein and many essential nutrients, but there are also concerns about toxic heavy metals accumulated in shellfish tissues. Because selenium (Se) and mercury (Hg) can form stable selenium-mercury complex, the bioavailability and toxicity of Hg in shellfish can be potentially reduced. The objectives of this study were (1) to measure the bioconcentrations of Se and Hg in edible shellfish tissues of different species that were harvested from different parts of the world, and (2) to determine the spatial variations of Se and Hg concentrations in shrimp (*Litopenaeus vannamei*) samples that were collected from four different ocean regions. Results showed that concentrations of Hg and Se varied significantly among different shellfish species, showing relatively high Hg concentrations of 0.166±0.074 mg/kg in squid (*Dosidicus gigas*) and also high Se concentrations of 1.034±0.341 mg/kg in snail (*Babylonia lutosa*). Higher concentrations of Se and Hg in shrimp samples were found in the shrimp samples from Venezuela. Overall, the highest molar ratio of Se to Hg was 282.1±93.0 in Oyster (*Crassostrea virginica*). The high Se accumulation in shellfish may partially mitigate the ecotoxicity of Hg.

3:15pm **41** Grad **Greenhouse Gas Inventories for Small Cities: A Case Study of Webster Groves, Missouri**

*Pragya Sharma & Sharon Locke [Southern Illinois University Edwardsville]

Greenhouse gas (GHG) inventories are critical for cities to quantify their emissions, develop climate action plans, and track emissions over time to assess progress toward sustainability goals. With accurate emissions data, municipalities have a strong foundation to develop mitigation strategies based on their specific emission sources. However, despite their importance, small municipalities often face economic and technical barriers that make it difficult to complete GHG inventories. This study aimed to conduct a comprehensive GHG inventory for the City of Webster Groves, Missouri, identifying key emission sources at both the community and government levels. Additionally, it explored how university-city partnerships can help small municipalities overcome technical barriers in emissions tracking, enabling them to develop informed climate policies. The inventory utilized ICLEI's ClearPath, a recognized emissions tracking tool, to analyze emissions from both community and government operations. Data was collected from local utility providers with the help of the Sustainability Coordinator of Webster Groves. The results showed that residential energy consumption and transportation were the primary sources of community-wide emissions, while municipal buildings and facilities accounted for the largest share of government emissions. An unexpected finding was that emissions from streetlights and traffic signals were higher than the city had anticipated. SIUE's successful partnership with the City of Webster Groves in conducting this inventory highlights the significance of university-city collaborations in overcoming technical challenges for small municipalities. Additionally, this study emphasizes how GHG inventories vary significantly across cities based on local policies, infrastructure, and demographics. These findings reinforce the critical role of GHG inventories in guiding sustainability efforts and shaping impactful climate policies at the municipal level.

4:15pm **42** UG **How is Urbanization Affecting the Morphology of Macromoths in the Family Erebidae in Central Illinois?**

*Allisa Busch, Harriet Barker, Jordan Schindler, Vanessa Frahm, & Anant Deshwal [Bradley University]

Habitat fragmentation as a result of urban development is changing the natural conditions that organisms reside in by altering vegetation, landscape, sunlight, and water availability, as well as creating heat islands. Urbanization introduces a gradient, and thus many separate niches, between natural and urban areas that organisms must respond to.This drastic alteration is hypothesized to affect the development of organisms capable of entering urban niches, especially those highly sensitive to thermal energy released from these settings such as insects. The rapid loss of insect biomass and biodiversity as a result of urban development has been dubbed an "ecological armageddon", as this group of organisms facilitate pollination and are prey to countless insect-consuming predators. The heat island effect may induce more rapid development and larger size due to increased metabolic activity while also favoring insects capable of withstanding the altered conditions. Thus, the response of any one species to urbanization is complex, as not all species present size plasticity. This study analyzes the gradient effect of urbanization on the morphology of three moth species from the family *Noctuidae*, subfamily Erebidae, collected from natural and urban parks in Central Illinois in 2024: *Halysidota tessellaris* (banded tussock moth), *Spilosoma congrua* (agreeable tiger moth), and *Apantesis phalerata* (harnessed tiger moth). Species were identified according to Peterson Field Guide to Moths of Northeastern North America. Using the program R, ANOVA and Tukey's HSD were used to compare the forewing, total length, wingspan, hindwing, thorax width, and body length of these species across 2 urbanization categories. Urbanization levels of urban and natural were determined using National Land Cover Database (NLCD) data.

3:15pm **43** Grad **Impact of Agricultural Practices and Nutrient Runoff on Water Quality in the Indian Creek-Cahokia Creek Watershed**

*Jenisha Adjikari & Sanoar Rahman [Southern Illinois University Edwardsville]

Agricultural dissolved and particulate phosphorus runoff poses substantial environmental challenges in the Indian Creek-Cahokia Creek Watershed of southwestern Illinois, with cascading effects reaching the Gulf of Mexico's hypoxic zone. Agricultural activities in this watershed served as a case study for nutrient pollution issues affecting the broader Mississippi River Basin. Using the Soil and Water Assessment Tool (SWAT), this research quantified the contribution of various agricultural practices to phosphorus loading and evaluates the effectiveness of Best Management Practices (BMPs) for mitigating nutrient pollution while maintaining agricultural productivity. The methodology integrated comprehensive time series water quality data from monitoring stations operated by the U.S. Geological Survey and Environmental Protection Agency, providing a strong base for the SWAT model calibration and validation. Three key intervention strategies: cover cropping, conservation tillage, and riparian buffer strips, were assessed across diverse spatial and temporal conditions to determine their relative effectiveness in reducing phosphorus runoff. The model explained factors including soil characteristics, topography, land use patterns, seasonal variations, and extreme weather events that influence phosphorus transport and BMP performance. Statistical and spatial analyses revealed the complex relationships between agricultural practices and water quality indicators, identifying critical areas within the watershed where targeted interventions would provide the greatest benefits. By examining both short-term responses and long-term trends, this study offered a comprehensive assessment of sustainable phosphorus management approaches. The findings will give valuable knowledge to broader nutrient reduction efforts in the Mississippi River Basin while providing practical guidance for reducing phosphorus loading in similar agricultural watersheds.

4:15pm 44 UG **Effect of Urbanization on Katydid Vocalization Events**

*Sophia Borjon, Kaiden DeAlmeida, & Anant Deshwal [Bradley University]

Katydids' acoustic communication is crucial in regulating various dynamics within and between populations and is sensitive to changes in environmental factors. Male katydids produce conspicuous vocalizations to attract mates, utilizing tremulations or vibrational signals generated by abdominal shaking, indicating a thermal component to their calls. However, urbanization-induced noise pollution significantly alters calling frequency and other acoustic cues crucial for mating, which reduces reproductive success. We hypothesize that the location of a park will impact the frequency and number of vocalization events. The noise pollution at the urban parks will affect the vocalization characteristics of Katydids. To test our hypothesis, Autonomous Recording Units (ARUs) were dispersed proportionately in urban and protected areas in central Illinois. The number of ARUs distributed in each park is relative to the park's size. RavenPro software was used to analyze the Katydid calls. The determined files were compared between the protected and urban parks using the GLMM model in R. We anticipate that katydids in urban parks will have different vocalization characteristics than those in protected parks and less frequent vocalizations than those in protected areas.

3:15pm 45 UG **Best Fit Model of Ant Abundance in Edwardsville, IL**

*Grace Witsken, Shannon McCarragher, & Alan Black [Southern Illinois University Edwardsville]

Ants, despite their small size, have a large impact on their surroundings. They are known to alter the structure and composition of soil, disperse seeds, manage populations of other insects, and overall improve vegetative and wildlife diversity. As urbanization increases, human impacts on the environment do too. This study examined the factors most predictive of ant abundance in Edwardsville, IL to provide insight into the effects of urbanization on ant populations. 15 survey sites were established spanning an urban-rural gradient throughout the Madison County Transit greenway network in Edwardsville, IL. At each site, vegetative assessments and ant abundance surveys were conducted. Non-correlated independent variables were used to construct models predictive of ant abundance; Akaike's Information Criterion was then used to determine the best-fit model. Temperature and shade were the most predictive factors, with peak ant abundance occurring between 30-35°C (86-95°F) and in shaded areas. Given that ants are ectothermic and sensitive to extreme temperatures, urban heat islands pose a threat to their survival by raising the environmental temperature potentially beyond their thermal critical limit (avg. 45°C or 115°F). As urbanization progresses, incorporating green spaces with tree canopies into cities to combat rising temperatures can protect ant populations.

4:15pm 46 UG **Exploring the Potential Application of Natural Organic Matter Capped Silver Nanoparticles in Antimicrobial Photodynamic Therapy**

*Brenden Auerbach, Viola Stangle, Milan James, Alayna Von Kiedrowski, Andres M. Durantini, & Nathaniel F. Adegboyega [Southern Illinois University Edwardsville]

The rising resistance of pathogenic microorganisms to antibiotics has led to the exploration of alternative therapies. Among these, antimicrobial photodynamic inactivation (aPDT) has emerged as a promising and widely accepted methodology over the past decade. aPDT treatment relies on an activatable molecule or nanoparticle that, upon excitation with light, generates cytotoxic reactive oxygen species (ROS) via photosensitization. In this context, silver nanoparticles (AgNPs) possess unique properties that make them suitable for various applications, including aPDT through singlet oxygen ($^1O_2$) generation. Typically, AgNPs are synthesized using combinations of reducing agents, precursor salts, and capping agents such as citrate and polyvinylpyrrolidone (PVP). However, little is known about the use of natural organic matter (NOM)-induced silver nanoparticles for similar applications. In this study, we employed NOM-capped AgNPs as $^1O_2$ photosensitizers for potential antimicrobial applications. NOM exhibits diverse functional properties, allowing it to serve as a reducing, tuning, and stabilizing agent. We confirmed the formation of AgNP by the appearance of a surface plasmon resonance (SPR) peak around 400-425nm. The synthesized AgNP produced $^1O_2$ with a quantum yield of ~0.28. Our results provide new opportunities to further explore the immense properties of naturally occurring AgNPs and their potential application in antimicrobial treatments.

3:15pm 47 UG **Analysis of Stress Responses in DDT-Susceptible and -Resistant Strains of *Drosophila melanogaster***

*Garrett Vanfossan, Blake Rentz, & Kyong Sup Yoon [Southern Illinois University Edwardsville]

A DDT-resistant strain of *Drosophila Melanogaster* (91-RPMP) and DDT-susceptible strains (CSPMP and 91-CPMP); exposed to two stressors (heat and starvation) were analyzed to determine if DDT-resistance was associated with altered sensitivity to the stressors. For the heat stress assay, male and female flies (10, 20, and 30-days old) were monitored to determine time to succumb under heat stress conditions (40 °C). 91-RPMP males died by heat stress 3 times faster than 91-CPMP and 7.83 times faster than CSPMP, while females of this subpopulation died 3.71 times faster than 91-CPMP and 5.14 times faster than CSPMP (Kruskal-Wallis, $p < 0.05$). Measurements of sensitivity to starvation indicated that 91-RPMP regardless of age and sex was significantly more sensitive to starvation than other strains (Kaplan-Meier survival analysis, $p < 0.05$). These findings suggest that 91-RPMP may be particularly vulnerable to environmental stresses, potentially reflecting a trade-off between DDT resistance and stress resilience. Further stress assays are needed to explore how DDT resistance may be influencing stress responses in this population.

4:15pm 48 UG **County-Level Water Use Efficiency and Demand Projection in Illinois**

*Sam McNamee & Sanoar Rahman [Southern Illinois University Edwardsville]

P Trends in water withdrawals in the US increased until 1980 before becoming steady, even with the continued growth of the population. Historical water use data from 1985 to 2015 was collected for this study. In tracking this trend there is a very complex combination of factors such as population growth, efficiency, and technological advances that make it important to account for the historical changes of water withdrawal drivers, such as population, irrigated areas, and energy in water resources projections. Water withdrawals have been projected for every county in Illinois from 2020 to 2070. Within each county, water withdrawal is estimated for individual water use sectors, including domestic and public supply, thermoelectric power, irrigation, aquaculture, and livestock. Efficiency for each sector is estimated through projecting historical trends with regional growth and decay factors. For the domestic and public sector water use efficiency is projected to decrease 15.1% by 2070 from the 2015 level, for the thermoelectric sector it is projected to decrease by 54.4%, for the livestock sector it is projected to decrease by 12.8%, while only for the aquaculture sector, the water use efficiency is projected to increase by 80.9%. This change in efficiency can be attributed to a decline in projected water withdrawals, along with the analysis of growth and decay factors influencing water use trends. The goal of this study is to provide policy makers with the ability to visualize and quantify projected water use. Giving them the access to use this resource to consider the potential adaptations of water use.

3:15pm 49 Grad **Determination of Antibiotic-Resistant Genes in *Pseudomonas* and *Salmonella* Species**

*Richard Owusu Ansah [Southern Illinois University Edwardsville]

Antibiotic resistance is a growing global health concern, particularly in bacterial pathogens such as *Pseudomonas* and *Salmonella* species. These bacteria are known for their ability to develop resistance to multiple antibiotic classes, posing challenges to clinical treatment and infection control. Understanding the genetic determinants of antibiotic resistance is essential for effective surveillance and the development of strategies to mitigate its spread.

This study aims to identify and characterize antibiotic-resistant genes (ARGs) in *Pseudomonas*and *Salmonella* species isolated from recreational waters. Bacterial isolates were collected and identified using standard microbiological and molecular techniques. Antibiotic susceptibility testing was performed according to Clinical and Laboratory Standards Institute (CLSI) guidelines to determine resistance profiles. DNA was extracted, and polymerase chain reaction (PCR) was employed to detect common ARGs associated with resistance to beta-lactams, tetracyclines, and aminoglycosides. Selected isolates will be sent for whole genome sequencing (WGS) to provide a more comprehensive analysis of resistance mechanisms.

Preliminary results suggest the presence of multiple ARGs in both *Pseudomonas* and *Salmonella*isolates, indicating the potential involvement of horizontal gene transfer and efflux pump mechanisms. Whole genome sequencing is expected to reveal additional genetic elements contributing to resistance, including mutations in regulatory genes and mobile genetic elements. These findings will provide insights into the genetic diversity of ARGs in these bacterial species and their potential implications for public health.

Understanding the molecular basis of resistance in Pseudomonas and Salmonella is crucial as antibiotic resistance continues to pose significant challenges. This study will contribute valuable information to the growing field of antimicrobial resistance research and help inform future surveillance and mitigation efforts. Further investigations are needed to assess these resistance determinants' clinical and environmental impact and explore potential strategies for their control.

4:15pm 50 UG **Analysis of Chill Coma Recovery and Geotactic Behavior in DDT-Susceptible and –Resistant Strains of *Drosophila melanogaster***

*Mohamed Saady, Blake Rentz, & Kyong Sup Yoon [Southern Illinois University Edwardsville]

The present study aimed to characterize the chill coma recovery and geotactic ability in DDT-susceptible (CSPMP and 91-CPMP) and DDT-resistant (91-RPMP) strains of *Drosophila melanogaster*. The study ascertained in flies of differing ages and sexes, 91-RPMP females recovered from chill coma at 1.6 times the rate of 91-CPMP females. In males, it was found 91-RPMP recovered 1.5 times and 1.9 times faster than CSPMP and 91-CPMP respectively. These differences were confirmed to be significant via one way ANOVA analysis ($p<0.05$). Further replications are still being conducted. Geotactic activity was assayed for the same sex and ages of flies as chill coma recovery. Preliminary data has illustrated no significant differences between the strains. Further replications are still being collected.

3:15pm 51 UG **Synthesis and Characterization of NOM-Induced Silver Nanoparticle for Potential Contaminant Degradation Studies**

*Viola Stangle & Nathaniel F. Adegboyega [Southern Illinois University Edwardsville]

Several studies have documented the effectiveness of engineered metallic silver nanoparticles (AgNP) as suitable candidates for contaminants removal, but less is known about their naturally occurring counterparts in similar matrices. The current work described the synthesis of natural organic matter (NOM)-induced AgNP (n-AgNP) under environmentally relevant conditions for potential application as sorbents. The extent of n-AgNP formation and size depended on the metal precursor salt and NOM concentrations, NOM type, and temperature. Increased n-AgNP absorbance was observed for mixtures containing elevated NOM, silver ions, and samples maintained at high temperatures, as monitored by the

appearance of the characteristics of surface plasmon resonance (SPR) of silver nanoparticles. Sample mixtures containing humic acids (HA) as model NOM formed AgNP faster than fulvic acid-mediated samples, likely due to stable free radical content in (HA). A dynamic light scattering (DLS) measurement revealed polydisperse samples with size distribution around 37.28 and 112.40 nm. Subsequent sample monitoring over time showed highly stable n-AgNPs, with potential for use as sorbent in future contaminant degradation studies.

4:15pm **52** Grad **Monitoring Microplastics in United States River Waters: A Review of Distribution, Sources, and Environmental Consequences**

*Mehedi Hasan & Sanoar Rahman [Southern Illinois University Edwardsville]

Microplastics are an emerging contaminant of growing concern in aquatic ecosystems. Although research on riverine microplastics has increased recently, there are still many unanswered concerns regarding their origins, migration routes, and the impact of land use patterns. The study provides a thorough analysis of microplastic contamination in river systems across the United States, including information on aquifers, sampling techniques, pollutant levels, polymer types, sizes, and environmental impacts. Key sources, such as urban runoff, wastewater effluent, industrial discharge, and air deposition, are investigated for their contributions to freshwater contamination. According to published research on the origins of microplastics, polyethylene terephthalate (PET) is the most common polymer, and fibers make up most of the particles identified. Clothing fibers and decomposing plastic waste are the source of microplastics, which are microscopic plastic particles smaller than 5 mm that contaminate rivers when they pass through water treatment filters. Numerous studies have used Fourier Transform Infrared (FTIR) analysis to identify polyethylene, polypropylene, and polystyrene as the dominant microplastic polymers. The analysis revealed higher microplastic concentrations in urban, industrial, and landfill sites, while areas with minimal human influence showed lower concentrations. The review also discusses regional and temporal trends in microplastic dispersion, finding high-contamination areas and possible hotspots. Through the possibility of ingestion, toxic additives, and accumulated contaminants such as PCBs (polychlorinated biphenyls), PAHs (polycyclic aromatic hydrocarbons), pesticides, and heavy metals, microplastics present a threat to both humans and wildlife. Despite growing awareness, there are still gaps in our understanding of microplastics long-term fate and transit in riverine ecosystems. By offering a thorough analysis, this review hopes to guide future research and contribute to effective environmental management and policy development.

3:15pm **53** Grad **Hot Spot and Directional Distribution Analysis of Alaskan Wildland Fires, 1980-2020**

*Christopher O'Steen [Southern Illinois University Edwardsville]

Wildland fire regimes change with alterations to climate and human interaction. Understanding changes to wildland fire regimes is critical for risk managers and fire service personnel in order to ensure adequate allocation of planning efforts and resource. The state of Alaska uses four Fire Management Options to protect settlements and infrastructure while allowing a nearly unregulated or natural fire regime in other portions of the state. This study utilizes hot spot analysis and directional distribution to explore changes in Alaska's fire regime since 1980 and evaluate the effectiveness of the Fire Management Options. This study found that separation of wildland fire clusters was only viable outside of the Interior and at low values due to the density of wildland fire activity in the Interior. Hot spot analysis found a higher percentage of hot spots associated with less restrictive fire management zones, and the presence of temporally emerging hot spots in the vicinity of Fairbanks. Directional distribution shows a consistent pattern within the interior consistent with an increase in fire size across the state. Statistical examination of the ratio of burned to unburned acres within each fire management zone found no significant change in the ratio based on management status.

4:15pm **54** Grad **Fecal Indicator Bacteria Monitoring and Microbial Source Tracking in Horseshoe Lake**

*Confidence Ikpe & Joseph Kusi [Southern Illinois University Edwardsville]

Water quality deterioration due to fecal contamination poses risks to aquatic ecosystems and public health, hence efficient monitoring and source identification are essential. This study aims to assess the distribution and prevalence of fecal indicator bacteria (FIB) in Horseshoe Lake, Illinois, and employ microbial source tracking (MST) techniques to identify potential contamination sources. Water samples were collected from various sites across the lake for seven months (May - November 2024) and analyzed for total coliforms and Enterococcus spp., key indicators of fecal pollution. MST markers were used to distinguish between human and non-human sources of contamination, providing insight into potential pollution contributors. Integrating FIB monitoring with MST will aid in identifying contamination hotspots and guiding water quality management efforts. This research will contribute to a better understanding of fecal pollution dynamics in freshwater ecosystems and inform mitigation strategies to protect aquatic resources and public health.

HEALTH SCIENCE

3:15pm **55** Grad **Antimicrobial Properties of Agmatine and Epigallocatechin Gallate (EGCG): An In-Vitro Investigation**

*[1]Amanda Tannehil, [2]Barbara McCracken, & [2]Alan Wickenhauser [[1]Southern Illinois University Edwardsville, [2]Southern Illinois University School of Dental Medicine]

The research examines how Agmatine and Epigallocatechin Gallate (EGCG), both known for their bioactive properties, influence bacterial growth and their potential to reduce or eliminate this pathogen in culture. In previous studies, the combination of isolated agmatine and isolated epigallocatechin gallate (EGCG) has been shown to yield a synergistic antimicrobial effect against *S. mutans*. The current study extends to Gram-negative bacteria *Aggregatibacter actinomycetemcomitans* (AA) and *Porphyromonas gingivalis* (*P. gingivalis*), both implicated in periodontal disease. Additionally, the study focuses on the Gram-positive bacterium *Streptococcus mutans* (*S. mutans*), a major contributor to dental caries. The investigation assesses how these compounds modulate the growth of these bacteria and whether they possess the potential to inhibit, reduce, or abolish their proliferation. Our results showed that the preferred concentration of Agmatine and EGCG had a bacteriostatic effect on all the bacteria involved, inhibiting their growth without causing bacterial death. All bacteria growth was significantly reduced over a 24hr period. This research could contribute to the development of novel, non-antibiotic therapeutic strategies for managing oral infections and preventing the progression of oral diseases.

3:15pm **57** Grad **Illegal Mining: An Environmental Enemy and a Public Health Threat in Ghana**

*Joseph Agyemang [Southern Illinois University Edwardsville]

Illegal mining, locally known as "galamsey," has become a pressing environmental and public health issue in Ghana, with severe repercussions for both ecosystems and human well-being. This study investigated the impact of illegal mining activities in the Amansie West District in Ghana, focusing on its dual threat to the environment and public health. Data were formally obtained from the hospital records of the Amansie West District Health Directorate, ensuring adherence to ethical guidelines and data protection protocols. Hospital records revealed a consistent annual increase in mining-related diseases such as malaria, skin diseases, respiratory tract infections, typhoid, diarrhoea and hypertension from 2017 to 20233. We found that, 43 out of 288 forest reserves in the country were affected by illegal mining activities. The two forest reserves; about 49% of Apamprama Forest Reserve and 3% of Oda River Forest Reserve in the district have been destroyed by illegal mining. The widespread illegal mining in the district has resulted in biodiversity loss, water pollution exposing communities to heavy metals and other pollutants, and soil erosion. The study underscores the urgent need for comprehensive policy measures to address illegal mining, restore degraded ecosystems, and mitigate its adverse effects on public health. It calls for a collaborative approach involving government agencies, local communities, and environmental organizations to combat this multifaceted threat and promote sustainable development in the region.

4:15pm **58** UG **The Effect of Additives of Bacterial Growth**

*[1]Robert Mense & [2]Cinnamon VanPutte [[1]Southern Illinois University Edwardsville, [2]SIU School of Dental Medicine]

In the study titled “Validation of a Triiodothyronine (T3) ELISA for Mouse Fecal Samples” by Lucia M. Thompson et al., a method to measure T3 levels in mouse fecal samples using an enzyme-linked immunosorbent assay (ELISA) was developed and validated. Building upon Thompson's findings, one important question emerged: Does adding various solutions to mice's drinking water in vivo encourage bacterial growth, and could this have impacted the gut microbiome observed in her study?

This study aims to address that question by investigating whether the addition of different solutions to the drinking water of mice promotes bacterial growth. To achieve this, Aggregatibacter actinomycetemcomitans (AA) and Porphyromonas gingivalis (PG) were cultured and exposed to various, isolated solutions used in Thompson's research. Subsequently, these bacterial cultures were analyzed using ELISA, followed by a bacterial growth curve analysis. AA and PG are significant bacterial species implicated in periodontal disease, a condition that leads to gum recession and weakening of the supporting periodontal ligaments.

3:15pm **59** CANCELLED

4:15pm **60** Grad **Chronic Inflammation in the Dental Pulp of Marfan Syndrome Mouse Model Fbn1 C1041G+/-**

*Sanam Talwar & Alicia De Maria [Southern Illinois University Edwardsville]

To study inflammation in the dental pulp of a mouse model of Marfan Syndrome (MFS), we researched blood vessel (BV) dilation and metalloprotease 2 (MMP2) expression to assess the potential increased risk of pulpitis in MFS mice. We used the mouse model Fbn1 C1041G, heterozygous and wild-type on the same genetic background. *In-situ* immunostaining was used to identify the BVs (anti-perlecan) and to show inflammatory marker MMP2 expression. DAPI was used for DNA counterstaining. Images were obtained on an LSM microscope, and image analysis was performed using ImageJ software. We determined the total pulp area and the area occupied by BVs, after which the ratio was calculated (the area unit is

pixels). The mean intensity value per pixel was calculated to assess the expression of MMP2. ANOVA was used for statistical analysis to ascertain if a statistically significant difference existed between the two groups of animals in vessel vasodilation and MMP2 upregulation. We found no statistically significant difference regarding the dilation state of pulp BVs. However, our results suggest that the capillaries at the pulp periphery might be dilated in the MFS mice. MMP2 appeared upregulated in MFS mice with a *p*-value of 0.00001, indicative of a statistically significant difference with wild-type mice. MMP2 was also found in higher concentrations in the dentinal tubules of MFS mice. No BVs dilation was observed in MFS mice. The higher MMP2 expression suggests chronic inflammation in dental pulp in mice with Marfan Syndrome. The infiltration of higher amounts of MMP2 into the dentine tubule may lead to predentin collagen degradation. A secondary inference would be an increase in permeability in pulpal capillaries leading to chronic inflammation, which, in turn, could lead to the presentation of pulp stones, frequently seen in patients with MFS syndrome. Further studies may influence MFS patients in the future.

3:15pm 61 UG **Does Dual-Task Walking Affect Cognitive Performance in Individuals With and Without Concussion 'Negatively Or Positively'?**

*[1]Tsilate Tadesse, [1]Maddison Webb, [1]Prasanna Acharya, & [2]Marc Dalecki [[1]Illinois College, [2]German University of Health & Sports]

Previous studies reported slight physical activity (SPA) enhances cognitive performance (CP), while others showed CP declines in individuals post-concussion during single-tasks without SPA. We examined whether CP of young individuals with (CH) and without concussion history (NoH) was affected by concurrent cognitive and motor tasks (CCMT), with SPA during dual-task (DT) walking compared to standing.35 college students (M=20 yrs.) participated, 18 CH (8 females; 45 months post-injury) and 17 NoH students (11 females). They performed two computerized cognitive tasks while standing or walking on a treadmill in randomized order. Cognitive tests were performed on a laptop placed atop the treadmill: 1) Stroop Color word test (48 congruent, 48 incongruent trials) and 2) D2 sustained attention test (computerized version of the D2 test, with varying sequences of d and p letters). Participants' comfortable walking speed (CWS) was determined before testing (M=1.7 mph) and used in walking conditions. We analyzed response time (RT; ms) and error rate (ER; %) in both Stroop test conditions and RT, ER, and Sustained Attention Score (CS) of the D2 test. For the D2 test, there was a significant effect of body position on ER (p0.05), suggesting Stroop performance was not negatively affected during DT walking compared to standing. Results suggest CP declines during DT walking only for sustained attention levels while Stroop performance remained unaffected. No additional CP decline was observed in CH compared to NoH, contrasting previous work in CH without concurrent SPA, suggesting concurrent SPA may mask potential CP declines in CH individuals. Further research is needed to assess CCMT effects with SPA on CP in CH individuals, including mental state screening.

4:15pm 62 HS **The Role of Genistein Modeling Estrogen in the Blood Brain Barrier as a Treatment for Alzheimer's Disease**

*Sahana Garapati [Illinois Math and Science Academy]

Previous studies have found that women have increased levels of Alzheimer's disease (AD), thought to be caused by a post-menopausal drop in estrogen. However, studies observing effects of estrogen on AD pathology found mixed results and no exact cause. A key area in AD is the blood brain barrier (BBB), as increased permeability stresses the brain. To address gaps in previous studies, this experiment used genistein, a phytoestrogen with an estrogen-like structure, on C6 rat glioma cells to model estrogen's effects on glial cells in the BBB. Concentrations 1µl, 5µl, and 10µl were created with serial dilutions to model low to high concentrations. Cells were incubated with solutions in 96 well plates over four hours for a short-term and twenty-four hours as a long-term period. Afterward, cell health was observed using the MTT viability assay and measured with a fluorescent plate reader. After statistical analysis using ANOVA and Tukey's HSD, data showed short-term groups had significantly fewer healthy cells at ($p<0.05$). Over the long term, low and medium concentrations had similar effects to the control at ($p>0.05$) while high concentrations had negative effects at ($p<0.05$). Overall, genistein may act as a treatment in AD in low and medium doses in long-term, and estrogen may have similar effects; the experimental hypothesis stating in the short and long term, doses of genistein will have a significant effect on C6 cell viability, was therefore partially supported. Future research confirmation and expansion is necessary for confirmation of conclusions.

4:15pm 64 UG **Impact of Physical Activity Intensity on Academic Achievement in Middle School Students in Illinois**

*[1]Colin McLeod-Demers & [2]Alex Wolfe [[1]Illinois College, [2]University of Illinois Springfield]

This study examined the link between exercise intensity and academic achievement among middle school students. Specifically, it investigated how varying levels of physical activity intensity—ranging from sedentary to vigorous—affect academic performance, using accelerometers for accurate assessment. Participants from one rural public school and one urban laboratory school in Central Illinois were recruited. After obtaining parental consent and participant assent, 45 students wore accelerometers for five days. Data from 31 students meeting wear-time criteria were analyzed. Physical activity was measured using ActiGraph GT3X+ accelerometers, while academic achievement was assessed via GPA. Covariates like age, race, ethnicity, and socioeconomic status were controlled. Descriptive statistics and partial Pearson correlations were used to examine the relationship between physical activity intensity and academic performance. For

boys, GPA was negatively associated with sedentary activity ($r(10) = -0.563$, $p = 0.245$) and positively associated with light ($r(10) = 0.239$, $p = 0.649$) and moderate ($r(10) = 0.237$, $p = 0.652$) activities, though none were statistically significant. For girls, moderate activity was positively associated with GPA ($r(21) = 0.442$, $p = 0.076$) while vigorous activity showed a negative association ($r(21) = -0.436$, $p = 0.080$), both also non-significant. The study found boys' academic achievement was linked to lower sedentary activity and higher physical activity levels, while girls' academic achievement was weakly associated with sedentary activity and negatively linked to light and vigorous activities. Overall, results suggest a slight relationship between physical activity intensity and academic performance. This study highlights the nuanced relationship between physical activity and academic achievement, suggesting the need for further objective research to understand how different types of physical activity impact specific academic skills and inform targeted interventions.

MICROBIOLOGY

3:15pm **63** UG **Sticking Together: Characterizing Locust Olfactory Responses to Bacterial Volatile Signals**

*Amanda Ekstrand, Jacob Kelley, Barani Raman, & Brittany F. Peterson [Southern Illinois University Edwardsville]

Swarming locusts are one of the most devasting agricultural pests in the developing world. The ability to shift from a solitary grasshopper to a plague-causing locusts is a phenomenon called phase change. In locusts, phase change includes a suite of phenotypic and behavioral shifts that can begin manifesting just hours after being crowded with conspecifics. These characteristics include color change (from camouflaging greens and browns to aposematic blacks and red), aggregation or gregarization (being attracted to conspecifics), increased musculature (which facilitates long migrations), marching and swarming long distances, and physiological changes in neurohormones. Locusts who are attracted to, march in bands, or fly in swarms with other locusts are demonstrating gregarization. But what cues are locusts using to find each other? Olfactory stimuli, along with visual cues, seem to be critical to understanding locust behavior. In the early 2000s, one chemical cue guaiacol was linked with fecal bacteria (Dillon et al. 2002). Locusts are also known to be attracted to fecal cues that are over 24 hours old, which is thought to allow latecomers to follow a marching band even after its past (Vernier et al. 2022). For this study, we aim to understand if common locust gut bacteria from conspecific and congeneric hosts elicit olfactory, neuronal or behavioral responses. This project will provide insights into the specificity of bacterial cues within and across locusts and help elucidate the role of gut bacteria in locust gregarization.

3:15pm **65** UG **Impact of Media Composition on Culturing Acidophiles**

*Matthew Skelley, Olivia Viele, & Kai F. Hung [Eastern Illinois University]

"Ferroplasma acidarminus" is an acidophilic microorganism which can be found in highly acidic places such as poorly maintained mines and geothermal areas. This organism, as well as other acidophilic microbes, play critical roles in the sulfate dissolution process at these sites. While studies on cultivating *"Ferroplasma acidarminus*" has been done to examine their physiology, similar studies have not been carried out for a related species, *Ferroplasma acidiphilum.* This study will examine how two difference media compositions can affect the growth and propagation of these acidophiles. The medium JSM283 and mfer will be used in this study. Three independent trials will be carried out. For each trial, both kinds of media will be created and adjusted to either pH 1.5 or pH2. After inoculation, cultures will be monitored using a spectrophotometer over 10 days. Data will be analyzed using MS Excel software to detect statistical significance. These findings not only facilitate further physiological and genomic studies of "*F. acidarminus"* but also have implications for bioleaching and bioremediation processes.

4:15pm **66** UG **Surveying the Environment for Antimicrobial Resistance**

*Princess Akyea-Obesebea & Gwendowlyn S. Knapp [Illinois College]

Antimicrobial resistance (AMR) is a growing global health problem. Understanding the prevalence of AMR in the environment is important to combating the AMR problem. Therefore, environmental soil samples from various locations in Morgan County, Illinois were collected, and the resistance levels to different antibiotics determined. Additional testing using Kirby-Bauer tests was carried out to confirm the observed resistance. PCR analysis was attempted to detect known genes involved in resistance mechanisms.

3:15pm **67** UG **Playing in Dirt: The Search for New Antibiotics**

*Ashley Olson, Brent D. Chandler, & Gwendowlyn S. Knapp [Illinois College]

Bacterial resistance to antibiotics has emerged as a global public health threat. The overuse of antibiotics in both clinical and agricultural settings has contributed to the spread of multidrug-resistant (MDR) bacterial pathogens. New antibiotics are needed to combat this growing problem. To identify new sources of antibiotics, environmental soil samples were collected and the bacteria tested for the ability to inhibit growth against potential pathogens. Several antimicrobial-producing bacterial strains were isolated and underwent characterization through biochemical testing and 16s rRNA sequencing. Ongoing research will characterize the chemical compounds causing the antimicrobial activity.

4:15pm **68** UG **Antimicrobial Screening of Orchid Mycorrhizal Fungi as a potential Source of New Antibiotics**

*Beamlak Hiltework, Rachael L. Rosenstengel, Ashley L. Olsen, Princess Akyea-Obesea, Brent D. Chandler, Lawrence W. Zettler, & Gwendowlyn S. Knapp [Illinois College]

Antibiotic resistance is a global crisis driven by antibiotic misuse, the evolution of resistant genes, and environmental factors. The rise of multidrug-resistant bacteria, including ESKAPE pathogens (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa,* and *Enterobacter* spp.), poses a severe threat to public health, highlighting the urgent need for novel antimicrobial compounds. This study explores fungi from orchids as a potential source of new antimicrobial compounds. Isolated mycorrhizal fungal strains were tested against various bacterial pathogens to identify new antimicrobial agents. Bioactive strains demonstrating inhibitory effects were extracted, purified, and analyzed to determine their therapeutic potential. In total, nine strains of mycorrhizal fungi demonstrate reactivity. The findings underscore the promise of mycorrhizal fungi as a valuable reservoir for potent antibiotics, offering a potential avenue for combating antibiotic resistance.

3:15pm **69** UG **Impact of Sulfate on Growth of an Acidophilic Archaeon**

*Olivia Viele , Matthew Skelley, & Kai F. Hung [Eastern Illinois University]

Acid mine drainage (AMD) has become a significant environmental concern due to the rise in iron ore mining during the 19th century. Abandoned mines expose ores to the environment, where they react with water and air through oxidative dissolution to form highly concentrated sulfuric acid contaminated with high levels of heavy metals. As the sulfuric acid is mixing into the bodies of water surrounding these abandoned mines, an extremely acidic environment is created that not only kills aquatic lifeforms but also contaminates human drinking water.

Acidophilic microbes, such as *Ferroplasma* species, play a critical role in acid mine drains. "*Ferroplasma acidarmanous"* is a microorganism found in the acid mine drainage environments. *Ferroplasma acidiphilum* is a microbe that is similar to "*Ferroplasma acidarimus*." The two organisms have the same adaptations to extreme conditions and are members of the same genus. However, while the nutritional needs and growth conditions of *"F. acidarmanus"* has been studied in some details, this is not true for "*F. acidiphilum."* In our research, we will assess the pH range in the growth conditions of "*F. acidiphilum"* under different concentrations of sulfate. I plan on conducting 3 independent trials, each with 3 pH levels of 1.5, 2, and 2.5. For each pH value, sulfate will be added at either 100 mM or 175 mM concentration. Cultures will be inoculated using aseptic techniques and cultivated at 35^{o}C. The growth will be monitored using optical density. The media will be prepared following published protocols. Data will be analyzed for statistical significance. Our data will shed light on the impact of sulfate on the growth and maintenance of an acidophile. A better understanding of nutrition need of acidophiles will allow researchers to determine ways to control the process of oxidative dissolution.

4:15pm **70** UG **Single-Cell Imaging Reveals Phage-Induced Bacterial Heterogeneity in Membrane Lysis**

*Yusra Armena, Ashleigh Stults, Lucia Gomez, Brooke Harms, Duong Nguyen, Susanne DiSalvo, & Andres M. Durantini [Southern Illinois University Edwardsville]

A bacteriophage is a virus that specifically infects bacterial cells. They are typically highly selective, targeting only a narrow range of bacterial species or strains. In an effort to reduce antibiotic use, bacteriophages have been engineered over the past two decades to selectively eliminate pathogenic bacteria. Their primary mechanism of action involves intracellular replication of the viral genome, followed by phage assembly and host cell lysis. However, the mechanistic details governing this process remain poorly understood. Here, we shed new light on this microbiological enigma by monitoring phage-mediated bacterial inactivation at the single-cell level. Using fluorescence microscopy, we investigate the interaction between the bacterial strain *Paraburkholderia bonniea* 859r and the bacteriophage Bonzo8. Our results reveal significant heterogeneity in bacterial survival times, which we attribute to metabolic and phenotypic variations among individual cells. This heterogeneity is masked in bulk experiments using a microplate reader, which only detects overall bacterial growth inhibition after 2–4 hours of incubation with the phage. Understanding bacterial heterogeneity in real-time phage therapy will be crucial for optimizing antibacterial treatments.

3:15pm **71** Grad **Comparative Study of the Biodegradation Potential of Foreign and Indigenous Bacteria in Pharmaceutical Effluent**

*[1]Mary Olorunkosebi, [2]Victoria O. Adenigba, [2]Iyabo Olunike Omomowo, [3]Olawale Israel Omomowo, [1]Abdul Latif Penddah, [1]Mary Tomi Olorunkosebi, & [1]Afeez Adesina Adedayo [[1]Western Illinois University, [2]Ladoke Akintola University of Technology, [3]University of Maiduguri]

Organic environmental contaminants are found in abundance in industrial effluents, posing a major challenge due to their release into surface water. The ability of microorganisms to break down these contaminants is important for wastewater

treatment. The objective of this study is to monitor the physicochemical parameters of water contaminated with pharmaceutical wastewater effluent in Irewole, Ilorin, Kwara State, Nigeria before and after biodegradation. The wastewater was characterized to evaluate the effect of microbial biodegradation on its physicochemical properties. Physicochemical parameters such as total dissolved solids (TDS), biochemical oxygen demand (BOD), total suspended solids (TSS), turbidity, pH, and degradation efficiency were monitored. Our findings show that the physicochemical properties at the effluent discharge point had a high chemical oxygen demand (COD) compared to the surface water where the waste was discharged. *Pseudomonas putida* exhibited less growth in the surface water. Despite TSS and TDS levels being lower than 50%, there was a reduction in BOD. This indicates that microorganisms such as *Bacillus* sp. and *P. putida* are cost-effective and environmentally friendly alternatives for the bioremediation of pharmaceutical wastewater effluents, which cause significant environmental harm.

4:15pm **72** UG **Real-Time Imaging of Bacterial Predation Highlights Variability in Prey Survival Times**

*Zoey Lane, Sophie Lorton, Allie Fishering, Hayden Trezek, Emalie Mosher, Jenna Gorsuch, Barbara McCracken, & Andres M. Durantini [Southern Illinois University Edwardsville]

Numerous studies have demonstrated that predatory bacteria, such as *Bdellovibrio bacteriovorus* (Bb), can effectively target and reduce Gram-negative bacterial populations. These bacteria function as natural antimicrobial agents by invading and lysing their prey, making them a promising alternative to traditional antibiotics, particularly in combating antibiotic-resistant pathogens. Among the Gram-negative bacteria implicated in human diseases, periodontitis is a major oral infection caused by pathogenic species capable of forming resilient biofilms. One such pathogen, *Aggregatibacter actinomycetemcomitan*s (Aa), is commonly associated with aggressive periodontitis and is difficult to eradicate due to its biofilm-forming ability and resistance mechanisms. In this study, we investigated the predatory effects of Bb on Aa to assess its potential as a biocontrol agent in oral health applications. To monitor the interaction, we employed a combination of cell viability markers and fluorescence microscopy, allowing us to visualize membrane disruption and quantify predation dynamics over time. Our results demonstrate that Bb effectively depleted planktonic Aa populations. However, single-cell microscopic analysis revealed significant variability in prey survival times, suggesting heterogeneity in Aa susceptibility to predation. These findings highlight the potential of predatory bacteria as a novel preventive strategy for reducing pathogenic biofilm buildup in the oral cavity, which could complement existing periodontal treatments and enhance overall oral health.

3:15pm **73** Grad **Gut Warfare: Investigating Type VI Secretion System-Mediated Competition in Termite-Associated *Serratia***

*Alyssa Culver & Brittany F. Peterson [Southern Illinois University Edwardsville]

Termites are pests that cause millions of dollars of damage annually. Infestations are commonly treated with pesticides, which can be toxic to the environment as well as negatively impact human health. In the last few decades, a move toward greener pest control efforts has led to investment in alternative methods of controlling the pest is necessary. *Reticulitermes flavipes*, the Eastern subterranean termite, has been found to harbor a beneficial gut bacterium, *Serratia* sp. that protects it from would-be pathogen *Serratia marcescens*. *Serratia sp.*, the termite gut symbiont, is able to out-compete *S. marcescens* (100:1) *in vitro*. Both *Serratia sp.* and *S. marcescens* bacteria have two complete Type VI Secretion Systems (T6SS). Additionally, previous work in our group has demonstrated that *Serratia* sp. lacking a T6SS grows 1:1 with the pathogen. To investigate this further, we look to *Serratia* sp.'s genome which encodes 22 putative T6SS effectors. In this project, we have screened a subset of these putative effectors for antibacterial toxicity in a bioassay. Finally, to better understand this competitive relationship, bioassays were performed *in situ*, where termites were treated with Kanamycin (a broad-spectrum antibiotic) and then exposed to either *Serratia sp.* or *S. marcescens*, or a combination of the two. Termite mortality was monitored overtime with the hypothesis that termites exposed to their symbiotic bacterium would fare better than those only challenged with the pathogen. Together this project has identified a suite of T6SS-meditated toxins and new insights about the dynamics of this interaction *in vivo* were uncovered..

4:15pm **74** UC **Investigating Regulatory Factors Influencing bcp Gene Expression in *Bacillus subtilis* Using Transposon Mutagenesis**

*Diana Guzman [Bradley University]

Aerobic living organisms inherently produce reactive oxygen species (ROS) as byproducts of cellular metabolism (Imlay, 2008). These are generated through the interaction of unstable free radicals with oxygen molecules. However, the accumulation of ROS becomes toxic to bacterial cells and can result in poor growth, high rates of mutagenesis, and even death (Mishra and Imlay, 2012). To counteract the harmful effects of ROS, bacteria have evolved a defense mechanism involving multiple ROS scavenging enzymes. For example, *Bacillus subtilis* codes for nine distinct peroxide scavenging enzymes (Zwick et al., 2016). Among these enzymes, the physiological role and the regulatory factors controlling the production of bacterioferritin comigratory protein (Bcp) are not well established. The aim of my research project is to identify the regulators responsible for altering the expression of the *bcp* gene in *B. subtilis* using transposon mutagenesis. In my initial screens, I identified eight transposon insertions that potentially increase the expression of *bcp*. I am currently verifying a subset of these insertions and using arbitrarily primed PCR and DNA sequencing to identify their location in the bacterial chromosome. I have successfully sequenced two isolates, confirming that they increased β-galactosidase

activity. However, these were identified as false positives linked to cryptic β-galactosidase genes; these genes were previously identified during a proof-of-concept analysis of the transposon (Dempwolff et al, 2020). I am now analyzing the remaining six isolates to determine if they are associated with regulatory elements that influence *bcp* expression. The overall goal of this project is to better understand the role of Bcp in the complex oxidative stress response of *B. subtilis*.

3:15pm 75 UG **Investigating Factors that Promote Expression of bcp in *Bacillus subtilis***

*Danielle Ashton [Bradley University]

Oxygen is a fundamental element for everyday function in bacteria, but it can be damaging when left in abundance. Reactive oxygen species (ROS) are formed from O_2 as a natural byproduct of normal cellular activity and can cause disruptions in the functioning of bacteria. This disruption is called oxidative stress. Nitrogen can undergo similar reactions, forming reactive nitrogen species (RNS). Bacteria and other organisms express scavenger enzymes to help reduce the concentration of ROS and RNS in bacteria. One type of scavenger enzyme is a peroxiredoxin; bacterioferritin comigratory protein (Bcp) is an example of a peroxiredoxin found in *Bacillus subtilis. Bcp* has been shown to scavenge peroxides *in vitro,* but little is known about its *in vivo*function. In this study, a strain containing the promoter of *bcp* transcriptionally fused to *lacZ* was used to monitor *bcp* expression. This strain was exposed to a range of oxidants including diamide, sodium nitroprusside (SNP), dithiothreitol (DTT), cumene hydroperoxide (CHP), hydrogen peroxide (H_2O_2), and tert-butyl hydroperoxide (tBHP), and *bcp-lacZ* expression was observed on agar plates containing X-gal. SNP, DTT, and diamide induced expression of *bcp* the most in this assay. However, when this induction of *bcp* was quantified, the results were inconclusive. Since *B. subtilis* is a common soil microorganism, we hypothesized that the interaction of *B. subtilis* with other soil bacteria may induce the expression of *bcp*. Current studies aim at testing this hypothesis. The overall aim of this project is to gain more knowledge on the function of Bcp in the oxidative stress response of *B. subtilis.*

4:15pm 76 UG **Impact of Mosquitocidal Fungal Entomopathogens on the Mosquito Microbiome**

Emily Everett, Swaksha Kallepalli, Haley Gore, John Marino, & Jose Ramirez (Bradley University]

With the rising prevalence of vector-borne diseases and growing resistance of mosquitoes to synthetic chemical pesticides, it is critical to develop alternative vector control strategies. Fungal entomopathogens have been proposed as an environmentally friendly method of vector control with a decreased likelihood of developing resistance in mosquito populations. While fungal entomopathogens have shown promising mosquitocidal properties, the mechanisms by which each fungi induces mortality in the host remain poorly understood. In this study we evaluated the impact of diverse entomopathogenic fungi on the microbiome of the yellow fever mosquito (*Aedes aegypti*) using fungal infection bioassays and targeted 16s rRNA microbiome sequencing. Our results revealed significant shifts in the microbiome diversity and composition suggesting that entomopathogenic fungi have complex interactions with the mosquito and its microbiome. Our findings advance our understanding of the mechanism by which these fungi promote mortality and provide new insights to enhance the efficacy of fungal biopesticides for mosquito control.

3:15pm 77 UG **Investigation of Antimicrobial Molecules in Osage Orange (*Maclura pomifera*) Extracts**

*Maciej Zalinski, Ashley Miller, Ethan Brooks, & Shaylin Roark [Lewis University]

Studies show that the natural products found in the fruit of the Osage orange tree (*Maclurapomifera*) exhibits antimicrobial properties. This group demonstrated that an extract prepared from the Osage orange fruit is effective in preventing the growth of Gram-positive and Gram-negative bacteria. The purpose of this ongoing study was to characterize the antimicrobialcompound present in these extracts. In multiple attempts to heat inactivate the antimicrobial factor, extracts were subjected to various treatments, which included submersion for 20 minutes in a 65°C water bath, or 10 minutes in a 90°C water bath, or autoclaving the extract for 20 minutes. A freeze-thaw approach was also used to inactivate the extract, which included freezing at -80°C for 20 minutes, then submersion in a 65°C water bath for 20 minutes. Dialyzed extracts were prepared that excluded molecules less than 500 Daltons from the extract Different concentrations of the dialyzed product and heat-treated extracts were prepared in sterile tryptic soy broth that were then inoculated with 100 µL of liquid bacterial cultures. After 18 hours of incubation at 37°C, the turbidity of the samples was measured. The results indicated that antimicrobial activity after heat inactivation remained. The results also indicated that longer periods of dialysis removed the antimicrobial factor from the extracts. The conclusions are that the antimicrobial molecules in the Osage orange extracts are heat stable and less than 500 Daltons. Future work will focus on identifying the antimicrobial agent and testing it against clinically relevant strains of bacteria.

4:15pm 78 Grad **Degradation of the Toxic Chemical P-Nitrophenol by Environmental Water Samples**

*Allisha Ishaque & Scott Holt [Western Illinois University]

P-nitrophenol (PNP) is a synthetic nitroaromatic compound used as an intermediate in several industrial processes such as the manufacture of leather dyes, insecticides, and drugs. This chemical, alongside other nitroaromatics, is known to be harmful to the health of humans and animals. It is therefore important to know the fate of these chemicals once they enter the environment through industrial effluent entering waterways. This study aims to determine if environmental water samples contain indigenous strains of bacteria that are able to break down p-nitrophenol in their native environments. Environmental water samples were collected from 11 sites such as marshes, rivers, and streams and were incubated in a

PNP enrichment medium. After incubation, PNP degradation was measured in each culture by determining the loss of PNP and formation of nitrite. All samples collected in this study tested positive for PNP degradation. Results from this study indicate that PNP-degrading activity is prevalent among the tested water samples and thus must harbor indigenous bacterial populations that can degrade this toxic chemical.

4:15pm **80** Grad **Oligotrophic Bacterial Carbon Compound Utilization Mechanisms**

*Hasini Gamage Don, Viet Bui, & Gopal Periyannan [Eastern Illinois University]

Caulobacter crescentus is a Gram-negative, dimorphic α-proteobacterium that serves as a premier model for bacterial cell biology and differentiation. Its ability to thrive in oligotrophic freshwater ecosystems is facilitated by its capability to utilize both plant-derived polysaccharides and toxic aromatic hydrocarbons. This study investigates the molecular mechanisms of carbon compound metabolism and biofilm formation such as Two-Component System (TCS) and Extra-cytoplasmic Function Sigma Factors (ECSF) found in *C. crescentus*. These mechanisms are crucial for nutrient acquisition and stress response and similar to mechanisms observed in pathogenic bacteria like *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Legionella* spp.

A comprehensive study conducted to understand the plant polysaccharide xylan metabolism by *C. crescentus.* Biochemical, genomic, and analytical methods reveal that the bacterium employs a surface-bound, coordinated enzyme system, including membrane-bound xylanases, periplasmic xylosidases, and accessory enzymes, to deconstruct xylan into xylo-oligosaccharides. Transport of degradation products across the outer membrane is facilitated by TonB-dependent transporters (TBDTs), ensuring efficient uptake without nutrient loss. This mechanism resembles nutrient acquisition strategies in gut and plant pathogenic bacteria, highlighting the evolutionary conservation of carbohydrate metabolism pathways.

Beyond polysaccharide utilization, *C. crescentus* manifests an adaptive response to aromatic hydrocarbons by forming a gel-like biofilm, suggesting a survival strategy against environmental stressors. The study aims to uncover the genetic and regulatory networks governing biofilm formation and antibiotic resistance. Overall, these studies advance knowledge of bacterial adaptation mechanisms in low-nutrient environments and provide insights into the evolutionary parallels between non-pathogenic *C. crescentus* and human pathogenic bacteria like *Pseudomonas* spp. Outcomes of this study could contribute to the development of novel antibiotics and the utilization of *C. crescentus* as a bioremediation agent for the removal of toxic organic environmental pollutants.

4:15pm **82** UG **Microbial Activity of Rhizosphere in Soils Amended with Biochar Produced from Different Species of Invasive Plants**

*Octavio Ortiz, Aidan Fisher, & Jerry Kavouras [Lewis University]

Biochar is a carbon rich substance made from plant biomass combusted in the presence of limited oxygen that can be applied as a soil amendment to improve the quality of soil. This research examined the microbial activity in soils amended with biochar produced from the leaves of invasive plants. Microbial activity can vary significantly depending on the properties of the biochar used to amend soils. The hypothesis is that microbial activity will vary due to the source of biochar. Biochar produced from the invasive plants was mixed with soil collected from the Lewis University campus. These mixtures were used to grow lettuce and cilantro in planting trays over eleven weeks. The plants were then removed from the soil, and soil samples from each treatment were collected. The hypothesis was tested by analysis of microbial community metabolic profiles using EcoPlate. Dilutions were prepared to inoculate the microplates. Absorbance measurements were recorded daily over seven days. The metrics used to analyze microbial activity included carbon richness, average well color density, Shannon diversity index, similarity index, Simpson diversity index, and Shannon Evenness index, which were calculated using the absorbance measurements. The results indicated that there was an increase in carbon richness and average well color density in treatments of cilantro grown in soil amended with biochar compared to unamended soils with cilantro. The carbon substrates α-ketobutyric acid and α-cyclodextrin were utilized in biochar treatments but not in unamended soil treatments. The results also indicated that lettuce grown in soil without biochar amendments exhibited greater carbon richness and average well color density value than lettuce grown with biochar. The conclusions are that biochar does not universally improve soil microbial activity, and the degree of improvement depends on the source of biochar as well as the crop planted in the amended soil.

PHYSICS, MATHEMATICS, & ASTRONOMY

3:15pm **79** Grad **Spectroscopic Analysis of Rare Earth Ions (Pr^{3+} and Dy^{3+}) Co-Doped Bismuth Boro-Tellurite Glasses**

*Philip Ambe Omiah, P.K. Babu, & Saisudha B. Mallur [Western Illinois University]

The need for glasses that are durable, resistant and have good optical properties is on the rise to enhance the quality and properties of existing materials or be used to develop new materials for applications. Rare earth (RE) doped bismuth boro-tellurite glasses are considered special due to their unique optical properties. In the current research, the following glass series is studied; $30Bi_2O_3{:}(69 - x - y)B_2O_3 : yTeO_2 : 1Pr_2O_3 : xDy_2O_3$where x=0.5, 1.0, 1.5 mol % and y=10, 20 mol%. These glasses are prepared by melt quench technique and quantities like refractive index, density and RE ion concentration are measured. Data of absorbance of glass samples as a function of wavelength collected using Cary 5G

UV-VIS NIR Spectrophotometer are analyzed. Analysis reveals that the oscillator strength and peak position of hypersensitive transition (HST) of Pr^{3+} and Dy^{3+} change with the composition. This result is important as it does not only cause a parity-forbidden transition to be possible but also reveals the particular composition that will cause the transition to be significantly stronger.

3:15pm 81 UG **Studying the Formation of Persistent Holographic Grating in Tellurium Barium Glass**

*Nathan Oliveira, Abdullatif Hamad, & Eric Voss [Southern Illinois University Edwardsville]

For this project we studied the formation of persistent holographic gratings in barium tellurite glasses using the four-wave mixing technique. The gratings were written using two laser beams from an Argon laser operating at 476.5 nm with a crossing angle of 3.84°. A laser beam from a He-Ne laser operating at 632.8nm was used to read the grating. The composition of the synthesized glass samples is based on (100-X)% TeO_2+ [X]% BaO, where X = {10, 15, 20}. We also measured the indices of refraction via the Fresnel equation using power reflected vs transmitted using three laser wavelengths. We found that by increasing the content of barium the index of refraction decreased. Our results from the four-wave mixing experiment showed that the diffracted signal increased with increasing barium content. We believe that the phonons resulted from the exciton the Te^{4+} ions is responsible for the structural change in the glass.

3:15pm 83 UG **Tunable Polarization-Entangled Photon Pairs for Testing Bell's Inequalities and Demonstrating Quantum Nonlocality**

*Thu Thanh Minh Do & Hernando Garcia [Southern Illinois University Edwardsville]

Entanglement is a fundamental aspect of quantum mechanics that challenges classical intuitions about locality and realism. In this project, we use polarization-entangled photon pairs to experimentally demonstrate quantum nonlocality and test Bell's inequalities. The entangled photons are generated through spontaneous parametric down-conversion in a beta barium borate (BBO) crystal setup, using a 405 nm diode laser as the pump source. After generation, the photon pairs travel along separate paths to two polarization analyzers and detectors, where their correlations are measured. By analyzing polarization correlations at various angles, we compute the correlation function and use it to evaluate the Clauser-Horne-Shimony-Holt (CHSH) inequality. Our results demonstrate an S value exceeding the classical limit of 2, confirming strong agreement with quantum mechanical predictions and ruling out the local hidden variable theory. This experiment provides a hands-on approach to understanding the principles of quantum entanglement and the implications of nonlocality, making advanced quantum mechanics concepts accessible at the undergraduate level.

4:15pm 84 UG **Laser Induced Persistent Change in the Index of Refraction in Praseodymium-Doped Zinc-Tellurite Glass Using the X-Scan Technique**

*Blake Abernathy, Marissa Feldhake, Abdullatif Hamad, & Eric Voss [Southern Illinois University Edwardsville]

In this project, the x-scan pump-probe technique was used to determine the profile, sign, and strength of the persistent laser induced change in the index of refraction for various concentrations of praseodymium doped tellurite glasses. The composition of the synthesized glass samples is based on [80-X]% TeO_2+20% ZnO + [X]% Pr^2O^3, where X = {0, 0.5, 1}. This study examined the induced change and the profile of the lens as a function pump beam power and exposure time to the pump beam in addition to the europium concentration. We found that the change in the index of refraction of the exposed part of the sample is positive in all cases. The change in the index also increases with exposure time, pump beam power, and praseodymium concentration. Experimental results indicate that the change in the index of refraction is due to the structural change in the glass as result of the phonons due to the excitation of the praseodymium ions.

3:15pm 85 UG **Investigating the Thermo-Optical Coefficient of Telluride Glass with Different Concentrations of Praseodymium**

*Marissa Feldhake, Blake Abernathy, Abdullatif Hamad, & Eric Voss [Southern Illinois University Edwardsville]

For this project, we investigated the laser-induced thermal lens in various praseodymium-doped tellurite glass samples using the pump-probe x-scan technique. A continuous wave (CW) blue laser with a wavelength of 476.5 nm was used as the pump beam, and a red He-Ne laser operating at 632.8 nm was used as the probe beam. To prevent the formation of persistent change in the index of refraction while measuring the thermal induced lens, we pulsed the blue pump beam using an optical shutter which produces square pulses with a 20-millisecond duration and a 1-second delay. The thermal x-scan was performed on a fresh spot in the sample. Then we exposed the spot to the blue beam for 30 minutes to form persistent change in the index of refraction. The thermal x-scan was performed again to see if the persistent change has any effect on the thermal lens. We found that the thermal lens is independent of the persistent change in the index. Therefore, the structural change in the glass which is responsible for the persistent change in the index does not affect the thermal lens. We found that the thermal lens is positive in these glasses as expected for most solids. From our data, we find the thermo-optical coefficient which is the change in index of refraction due to the change in temperature (dn/dT).

4:15pm 86 UG **Electro-Physical Properties of a Nematic Liquid Crystal Dispersed with Silver Nanoparticles**

*Gregory Wilson & K. Vardanyan [Southern Illinois University Edwardsville]

We studied the effects of doped silver nanoparticles (NPs) with 60nm size and 1.0 and 2.4wt% concentrations on electrical and physical properties of 5CB nematic: 4-pentyl-4'-cyanobiphenyl. The prepared samples were studied using electrical measurements: ALCTE characterization device and PSM-1735 impedance analyzer. A polarizing microscope with the thermal stage is utilized to monitor the samples and phase transitions. The optical textures showed defect-free homogeneous dispersions; and the samples thermal behavior proved that the dispersed NPs don't affect the nematic-isotropic liquid transition temperature. We report that the doped NPs decrease the dielectric anisotropy, elasticity and viscosity of the material with higher concentrations of NP. The threshold voltage is increased with the inclusion of NPs, more so with the sample with 1wt % concentration, while the switching-off time is decreased for the sample with 1.0wt% concentration but increased with the 2.4wt% concentration. The doped NPs affect also the conductivity of the nematic as higher concentrations of NP-causing disorder in nematic phase, reduces the conductivity at higher frequencies (related to the change in dielectric loss due to dipolar relaxation processes). The conductivity at lower frequency: ionic conductivity, increases with the increase of temperature. We propose that the dispersed NPs lower the orientational order parameter of the nematic, hence affecting it's electrical and physical properties.

4:15pm 88 UG **Variations in Refractive Index and Sm-Fluorescence in Barium Bismuth Borate Glasses**

*Sydnee Osgood, Saissudha Mallur, & P.K. Babu [Western Illinois University]

Bismuth borate glasses have been previously used to study the optical properties of rare earth ions. We investigated samarium-doped barium bismuth borate glasses to study the refractive index and the fluorescence spectra of Sm^{3+} ions as a function of glass composition. Five glasses were prepared with the formula $xBaO{:}30\ Bi_2O_3{:}69\text{-}xB_2O_3{:}1Sm_2O_3$ where x is equal to 0, 5, 10, 15, and 20 mol%. The glasses were prepared using the melt-quench method and they were then annealed, ground, and polished. The refractive index was determined by finding Brewster's Angle, and the fluorescence spectra were recorded using a double grating spectrometer with a laser excitation at 405 nm. The refractive index value increases with the addition of BaO. Both peak positions and peak widths of the Sm^{3+} fluorescence show that incorporating BaO makes significant changes to the bismuth borate glass network.

PLANT BIOLOGY

3:15pm 87 UG **Assembly of an Inducible Gernaylgeranyl Diphosphate Synthase 11 (GGPPS11) Construct to Better Understand Variegation in the ggpps11-1 Mutant**

*David Revelle [Southern Illinois University Edwardsville]

Illinois sand prairies are found on sand deposits resulting from erosional events related to Pleistocene glaciation. These prairies contain few trees or shrubs and are dominated by grasses and sedges. In addition, they support an assemblage of non-graminoid herbaceous forb species and a unique community of animal species, including the Illinois chorus frog (Pseudacris streckeri illinoensis), which is a sand prairie specialist. Today sand prairies are becoming increasingly degraded due to human disturbances such as urban expansion, overexploitation of prairie species, conversion to agricultural fields, fire suppression etc., which are negatively impacting plant and animal communities. This is particularly true in Southwestern Illinois, which continues to lose sand prairie habitat at a rapid pace. To assist with management efforts in remaining sand prairie habitat, we conducted vegetation surveys in three sand prairies located in the Poag sand terrace and managed by Heartlands Conservancy—Heartlands Easement, Poag Sand Prairie, and the Knoll Family Wildlife Sanctuary which has not been managed as a sand prairie and has features that make it suitable as a reference site. We divided the three prairies into six sites to exclude woody vegetation and non-sand prairie plant communities. We then compared diversity based on family abundance and species richness. A total of 104 plots were sampled using 1 m^2 quadrats in fall 2023. We identified plants to species when possible and estimated cover percentages using Braun-Blanquet cover classes. Species were grouped into their respective families and statistical analysis of species richness, percent forb cover, compositional variation among quadrats and sites are being done. We hypothesize that sites that have been least exposed to human disturbance will have more diverse plant communities with fewer invasive species. This study will provide insight into the types of vegetation currently present in Southwestern Illinois sand prairies and aid in future restoration efforts.

3:15pm 89 UG **Comparing Interior and Exterior Forest Amur Honeysuckle Growth Metrics**

*Jacob Sutton [Southern Illinois University Edwardsville]

Amur honeysuckle, *Lonicera maackii,* is well known across the Midwest US as a very invasive species that outcompetes native plants and reduces local woodland biodiversity. I wanted to know if honeysuckle that grew in the more interior parts of a forest were older or had better survivability than those that grew near the exterior or edge of a forest. I ran a 220 meter transect line from the edge to the interior of a private rural forest plot in Jersey, Illinois. The forest plot was a fragmented woodland adjacent to residences, CRP restored prairie, consisting of many native trees including: Green Ash, Shingle oak, Black Cherry, Hack Berry, Osage Orange, Shagbark Hickory, Sycamore, and White Oak. I outlined two 5m-diameter observation areas each in the interior and exterior of the forest transect. Within these observation areas I counted the total

number of target species of three different trunk sizes indicating relative age: very young ≤1 cm-d; young >1cm to <5cm-d, and older ≥5cm-d. Trees with a trunk 5cm-d were aged by counting tree rings. I hypothesized that the forest exterior supported more target species overall and a greater representation of younger trees than the interior forest. Furthermore, I hypothesized that interior forests supported older trees. If non-native invasive species demonstrate allelopathic patterns, then this information could prove useful landowners participating in CRP programs, as well as ongoing conservation and land management efforts.

4:15pm 90 UG **Using Machine Learning to Track and Quantify Circumnutation in *Arabidopsis thaliana* Inflorescence Stems**

*Yaksh Patel, Darron Luesse, & Mike Buzzard [Southern Illinois University Edwardsville]

Plants exhibit multiple movements to maximize nutrient acquisition and environmental adaptation. Although these movements are important for survival and overall fitness, the underlying mechanisms remain unclear. Circumnutation is a rhythmic helical motion observed in growing plant organs—stems, roots, tendrils, leaves, and flower stalks. Multiple hypotheses have been proposed to explain the presence of circumnutation ranging from an intrinsic growth-driven process that allows environmental sampling to a byproduct of overshoot correction in gravitropic responses. To investigate this, we are analyzing circumnutation in six gravitropic mutants of *Arabidopsis thaliana*. These mutants exhibit defects in auxin transport, gravity sensing (defects in statolith-containing cells), and cell elongation and differentiation (gibberellin synthesis), which will help determine if circumnutation is dependent on gravitropism, and if so, if mutations in individual aspects of that process impact circumnutation differently. To quantify circumnutation, long-day Arabidopsis plants at roughly five weeks old are grown to 8 cm under controlled conditions, and time-lapse videos are recorded using a dual-camera setup (side and top views) inside a blackout box whose interior is lined with reflective aluminum foil to ensure uniform lighting and eliminate the interference of phototropism. Another aspect of this work is the automation of video analysis. We are training an AI-based tracking software, SLEAP AI, to identify the circumnutating plant tip in each frame of the timelapse, providing X and Y coordinates for downstream analysis. These coordinates will be used to analyze velocity, duration, and shape of the circumnutation movements. By analyzing circumnutation patterns in wild-type and gravitropic mutants, this study will help determine whether circumnutation is an inherent oscillatory pattern or a direct influence of gravity. Understanding the mechanism behind circumnutation could have broader applications in plant biomechanics and space biology.

3:15pm 91 UG **The Effect of Hypoxia on *Arabidopsis* Knockouts of Genes Showing Altered Expression During Spaceflight**

*Leyla Zeynep Loga, Victoria Anselm, & Darron Luesse [Southern Illinois University Edwardsville]

When growing in space, plants must overcome a variety of stressors, including absence of a gravitational signal, increased radiation, and altered gas movement due to a lack of buoyancy and convection. The reduced spread of gaseous particles has been shown to detrimentally impact plant growth by creating hypoxic microenvironments near non-photosynthesizing tissue. The BRIC20 experiment using transcriptomic and proteomic approaches to identify transcripts and proteins in three-day-old Arabidopsis seedlings grown on the international space station. Of the over 1000 candidates that showed altered regulation under spaceflight conditions, a subset are completely uncharacterized with no easily identifiable domains. To determine if some of these genes are involved in regulating a plant's response to hypoxic conditions, T-DNA insertion mutants were obtained and confirmed as homozygous using PCR. Five-week-old mutant and wild type plants were submerged for 3, 4, or 5 days. Preliminary results suggest that a mutation in one of the genes that was slightly downregulated on the International Space Station leads to improved resistance to flooding, with multiple plants showing renewed growth after six days of treatment

4:15pm 92 UG **Analysis of Biomass in *Arabidopsis thaliana* Berberine Bridge Enzyme-Like Mutants**

*Jacob Blameuser & Darron Luesse[Southern Illinois University Edwardsville]

Arabidopsis GERANYLGERANYL DIPHOSPHATE SYNTHASE 11 (GGPPS11) is a critical branchpoint enzyme in the Methylerythritol Phosphate pathway, responsible for the synthesis of many isoprenoid compounds. Transcriptomic analysis of the temperature-sensitive mutant *ggpps11-1*revealed the differential regulation of 12 members of the *BERBERINE BRIDGE ENZYME-LIKE*(BBEL) family of genes. These were named for their sequence similarity to the *BERBERINE BRIDGE ENZYME*, a flavoprotein oxidase originally found in *Berberis* species, involved in berberine biosynthesis. While *Arabidopsis* has not been shown to produce berberine, its genome contains 28 BBEL genes that remain mostly uncharacterized. To determine if these BBEL family proteins impact plant growth, development, and survival, Transfer-DNA (T-DNA) lines were obtained from the Arabidopsis Biological Research Center that contains individual T-DNA insertions in all 28 of the *BBEL* genes. Homozygous mutants were confirmed with PCR. Mutants were grown under standard conditions (10/14 light/dark cycle, 23°C, ample water, fertilizer) for five weeks and harvested. Wet mass was recorded followed by drying in an over and dry mass measurements. Preliminary results indicate that several of the *bbel* mutants may have reduced wet and dry mass when compared to wild type. This suggests that the mutations may have an adverse impact on carbon assimilation and resource use efficiency.

3:15pm **93** UG **Comparison of Root and Surrounding Soil Microbiome of the Invasive Orchid *Epipactis helleborine* with the Threatened *Platanthera leucophaea***

*Kylie Pearman, Noah Pyles, Michaela Barter, & Elizabeth Esselman [Southern Illinois University Edwardsville]

Epipactis helleborine (Broad-leaf Helleborine) is a species of orchid native to Eurasia and invasive but widely naturalized across North America. Classified as an agricultural or environmental weed, Broad-leaf Helleborine has a highly variable preference for habitat; from Woodland environments, to anthropogenic habitats like roadsides and parks. It is commonly found growing in nutrient rich soils across a wide range of pH values. *Epipactis helleborine* adapted to many different climatic conditions upon invasion of North America and can now be found in states like California, Wisconsin, and Missouri. The microbiome of orchids that thrive under various conditions often include a less diverse mix of fungi and bacteria. Rare orchids that grow in specialized habitats, like *Platanthera leucophaea* (Eastern Prairie fringed orchid, or EPFO), exhibit diversity in both fungi and bacteria populations. The purpose of this research was to examine how the microbiome within the roots of the Broad-leaf Helleborine and the surrounding soil compares to the microbiome of the roots and surrounding soil in EPFO.

4:15pm **94** UG **Microbiome Analysis of Roots and Soil Surrounding *Platanthera leucophaea***

*Michaela Barter, Noah Pyles, & Elizabeth Esselman [Southern Illinois University Edwardsville]

The soil microbiome is a critical component of terrestrial ecosystems, harboring millions of diverse microbes, including fungi, bacteria, viruses, and protozoa. Soil microbes interact with soil and plants to help facilitate a range of interactions that promote plant growth and productivity. Since their terrestrialization almost 400mya, many plants have depended on symbiotic relationships with bacteria and fungi to survive and reproduce. *Platanthera leucophaea,* the Eastern Prairie Fringed Orchid, is a federally threatened terrestrial orchid species restricted to fragmented wetlands and grasslands. While habitat loss and fragmentation have led to their decline, loss of symbionts may be an additional cause for their unsuccessful reintroduction.*Platanthera leucophaea* requires mycorrhizal symbionts for successful seed germination. A better understanding of the microbial diversity associated with this species could provide insight into future conservation strategies. This research aims to compare the diversity of fungal and bacterial communities associated with the roots of *P. leucophaea* and the surrounding soil.

STEM EDUCATION

4:15pm **106** Grad **Geographic Thinking in Interdisciplinary Research: Examining Conceptualization, Experience, and Communication Among Watershed Scholars**

*Hunter Hansen, Adriana Martinez, Andreia Figueiredo Dexheimer, & Shannon McCarragher [Southern Illinois University Edwardsville]

Geographic understanding is paramount within the academic sphere, particularly in STEM and the geosciences, as it provides essential frameworks for interpreting natural phenomena and analyzing environmental change. Science and geoscience research often requires interdisciplinary collaboration and an appreciation of the interconnectedness of natural processes across various spatial scales. Despite its significance, limited research has explored how geographic methods influence research methodologies, interdisciplinary engagement, and communication strategies. The Watershed Scholars Program at Southern Illinois University Edwardsville, funded by the National Science Foundation, aims to increase diversity in STEM and train graduate students to address watershed sustainability challenges through interdisciplinary approaches. This study examines the role of geographic understanding among students in the Watershed Scholars Program, comparing those with and without formal geographic training. Using a qualitative approach, I conducted semi-structured interviews and used thematic coding to identify patterns in geographic thinking, interdisciplinary integration, and research dissemination. Findings reveal that scholars with geography backgrounds exhibit greater confidence in applying spatial reasoning, while those without formal training often develop geographic awareness reactively when confronted with spatial challenges. Additionally, scholars' past academic and professional experiences influenced their geographic thinking, with some gaining spatial awareness through hands-on research or fieldwork rather than formal education. Many scholars applied geographic thinking only when facing research obstacles, indicating a gap in proactive geographic integration within STEM curricula. While some scholars demonstrated confidence in applying geographic concepts, others hesitated despite recognizing their importance. By examining how graduate students engage with geographic thinking, this study reinforces the need for intentional geographic integration in interdisciplinary research training, highlighting the role of geographic literacy in fostering problem-solving, effective communication, and interdisciplinary collaboration in scientific inquiry.

ZOOLOGY

4:15pm 56 UG **The Effect of Incubation Temperature on Salamander Survival and Fitness**

*Laura Tayon & Tom Anderson [Southern Illinois University Edwardsville]

Climate change is a primary driver of the worldwide decline in amphibians, whose functioning is highly dependent on local climate. In salamanders, temperature influences many physiological processes, including embryo development rate. This effect has been studied in many salamanders in the genus *Ambystoma*, but not in the ringed salamander (*Ambystoma annulatum*), a species of conservation concern in Missouri. Determining *A. annulatum*'s response to rising egg incubation temperatures is crucial to conservation and management efforts and will contribute to the scientific literature on this understudied species. I determined the effect of incubation temperature on survival, larval size, and egg incubation period in *A. annulatum*. *A. annulatum* eggs were collected from three wild populations in the St. Louis area, subjected to three different incubation temperature treatments, and monitored for five months after hatching.

3:15pm 95 UG **Lyme Disease in Field Mice in the Edwardsville Area**

*Riley Brown, Brittany Peterson, & Danielle N. Lee [Southern Illinois University Edwardsville]

Lyme Disease is a bacterial infection caused by *Borrelia burgdorferi* that is spread via tick bite. Ticks often infect field mice, making them a concerning group of animals for carrying and contributing to the spread of Lyme disease. White-footed mice, *Peromyscus leucopus*, a common locally occurring species of field mice, serve as a natural reservoir for the bacterium. This means that they can house the bacteria without major effects of the disease but still pass it on to more susceptible species. Other field mice species such as Prairie voles, *Microtus ochrogaster*, are not often associated with Lyme Disease, but may also serve as a reserve for the bacterium. We captured and collected tissue and urine samples from field mice on SIUE campus and tested for Lyme Disease presence. We are comparing the incidence of Lyme disease between the two species and across different micro habitats.

4:15pm 96 UG **Influence of CO_2 on Parasitic Infection of the American Bullfrog (*Rana catesbeiana*)**

*Avril Enciso, Kailani Vazquez, & John Marino [Bradley University]

Amphibian populations are experiencing global declines, in part due to environmental stressors, such as parasitism and water acidification due to increased carbon dioxide (CO_2) concentrations. Such stressors may have interactive effects; for example, elevated CO_2 can impair the immune responses of frogs, which may increase susceptibility to parasite infection. Our research investigates the effects of increased CO_2 levels and resulting reductions in pH on infection in American bullfrog *(Rana catesbeiana*) tadpoles by a common group of parasites, trematodes. We hypothesized that higher parasite infection levels will occur under elevated exposure to CO_2 compared to ambient conditions, due to CO_2 effects on the immune system. In a controlled laboratory experiment, tadpoles were exposed to four treatments: ambient CO_2 without parasite exposure, elevated CO_2 without parasite exposure, ambient CO_2 with parasite exposure, and elevated CO_2 with parasite exposure. Each treatment was replicated six times, and the experiment ran for three weeks. We measured tadpole mortality, parasite infection (number of cysts), and final mass, as well as water temperature and pH. Preliminary findings show that reduced survival occurred under elevated CO_2 compared to ambient CO_2. We are in the process of analyzing the parasite infection and final mass data. Our findings will be informative for understanding how climate change-related stressors affect the vulnerability of amphibian populations to disease.

3:15pm 97 UG **Examining the Response of Bats to the Playback of Conspecific and Heterospecific Distress Calls**

*Abigail Beddingfield, Ysabella Adubato, & Bryan Arnold [Illinois College]

Distress calls are vocalizations produced by many vertebrates in response to a perceived threat. For some species, these calls have been shown to elicit assistance from a social groupmate, to startle or confuse the predator increasing the likelihood of escape, or possibly warn others of the threat. In some cases, the calls attract the attention of both heterospecifics and conspecifics, but the reasons why are often unclear. Playback experiments are a powerful method that can be used to explore the function of vocalizations like distress calls. While this method is deployed often in bird studies, it is less common for bats. In this study, we utilized field recorded distress calls of evening bats and big brown bats as playback stimuli, in addition to a white noise control, in a field playback experiment. We measured the responses of bats using automated recorders arranged in an array with an ultrasound amplifier and speaker in the middle playing back the sounds and the recorders 4 meters to either side. Our response variable was scored as the difference between activity during a 5-minute silent period prior to the sound playback and the 5-minutes of sound playback. We also monitored activity during a 5 minute period after the playback. We used Kaleidoscope to score bat passes, analyze recordings, and identify bats to species based on their species specific echolocation calls when possible. While this is a preliminary study, thus far we have found reduced activity during the playback compared to the silent periods. This effect was somewhat stronger for distress calls versus the control. Big brown bats also showed the highest level of response compared to other species.

Further work will continue to explore species specific responses to examine conspecific and heterospecific activity in relation to the presence of distress calls.

4:15pm 98 UG **A Comparative Study of Lab vs. Field Based Aerial Exposure on Zebra Mussel Survival**

*Kristen Fisher & Tomi Sewell [Bradley University]

Zebra mussels, *Dreissena polymorpha*, have become one of the most economically and ecologically damaging invasive species in the US. Their rapid spread is facilitated by their ability to attach to boats and survive aerial exposure during overland transport. Our research focuses on the environmental conditions that allow for survival in air. In addition, we examine the potential for potassium chloride (KCl) to serve as a topical spray for zebra mussel control. Prior work in our lab relied on 72hr exposures under controlled environmental conditions (15°C with 75% humidity) and found that: (1) zebra mussels are able to survive at least 72hrs (2) there is little effect of substrate type or orientation, and (3) KCl has the potential to induce mortality in conditions that mussels would otherwise survive. However, less is known about the impacts of biologically relevant conditions on their survival. For this study, mussels were collected from Banner Marsh, submerged, allowed to attach to fiberglass or aluminum substrates for one week, and subjected to 72hr aerial exposure under field conditions in one of three orientations: vertical, horizontal, or slanted. To simulate how mussels may be transported overland, substrate tiles were affixed to the exterior of a boat located in a parking deck. After 72hrs, the tiles were submerged for a 24hr recovery. The number of living mussels attached to each tile was recorded after the attachment period, following 72hrs in air, and again after recovery. In a separate trial, the experiment was repeated, but a treatment of KCl (1500mg/L KCl) was applied to each tile at the start of aerial exposure. Due to the fact that this experiment relies on real-time environmental conditions, it was not possible to conduct experiments earlier this spring when conditions dropped below freezing at night. Therefore, experiments are ongoing and results are forthcoming.

3:15pm 99 Grad **Behavioral Flexibility in Tool Use of *Aphaenogaster rudis***

*Isabelle Walker & Paul Brunkow [Southern Illinois University Edwardsville]

Aphaenogaster rudis is the most common ant in North American hardwood forests and is the most important disperser of understory wildflowers. *A. rudis* belongs to the subfamily Myrmicinae which contains species characterized by a chitinous gaster and lack of a distensible crop. These physiological features make *A. rudis* poor transporters of liquid carbohydrates. Lacking this distensible crop has driven the evolution of tool-using behavior in the form of debris dropping for retrieval of liquid food. *A. rudis* is known to use many different types of tools, and they exhibit clear preferences in tool choice. The purpose of this research is to examine the degree of flexibility in tool use by trying to force selection of a tool known to be less preferred. We observed that *A. rudis* will use a less preferred tool in a natural setting when other tools were kept at a distance. This suggests that tool use is shaped by the energetics of tool proximity and not simply tool availability. Future work will further examine behavioral flexibility of tool use in *A. rudis.*

4:15pm 100 Grad **Adaptive Tool Use in Response to Resource Viscosity: A Study of *Aphaenogaster rudis***

*Dylan Krohe & Paul Brunkow [Southern Illinois University Edwardsville]

Tool use in animals provides valuable insights into cognitive abilities and adaptive behaviors, particularly in response to environmental challenges. Ants of the genus *Aphaenogaster* exhibit unique tool use behavior, employing debris to transport liquid food. This study investigates how *Aphaenogaster rudis* responds to variation in liquid food viscosity as decoupled from food reward. By systematically altering viscosity of honey solutions using povidone, we examined whether increased resistance to flow influences the selection of tools, deposition frequency, and overall retrieval efficiency. Preliminary observations indicated that *A. rudis* does not perceive povidone as a food source, suggesting that ants can distinguish nutritional content independently of viscosity. Furthermore, we observed a clear preference for solutions with higher sucrose concentrations and lower viscosities, demonstrating that food reward plays a dominant role in influencing foraging behavior and tool selection. As viscosity increased, ants exhibited reduced tool deposition and retrieval efficiency, indicating a possible trade-off between energy expenditure and resource acquisition. The findings contribute to understanding the role of physical properties of food in shaping tool-use behavior and provide a broader ecological perspective on resource exploitation by *A. rudis*. Future projects will observe how sympatric competing ant species respond to liquid viscosity as well.

3:15pm 101 UG **West Nile Virus in Birds of Prey: Minor Pest or Major Problem?**

*[1]Abby Heberling, [2]Jacques Nuzzo, [2]Beth Chan, [2]Jane Seitz, & [1]Travis E. Wilcoxen [[1]Millikin University, [2]Illinois Raptor Center]

West Nile Virus is an important pathogen for its role in affecting wildlife and its role as a zoonotic disease. However, with birds as the primary reservoir host, many birds can tolerate the infection with few ill effects. For this study, we explored West Nile Virus infection history from September 2023 to January 2025 in birds of prey captured as apparently health birds and in birds of prey admitted to the Illinois Raptor Center for rehabilitation. This survey included samples from five species: American Kestrels, Barred Owls, Cooper's Hawks, Red-shouldered Hawks, and Red-tailed Hawks. Plasma from blood samples were run through an enzyme-linked immunosorbent assay – each for immunoglobulin M (which indicates a recent infection) and immunoglobulin Y (which indicates an infection at some point on the scale of months). The

percentage of rehabilitation birds with significantly elevated IgM to West Nile Virus antigen was 23.24% while the percentage of elevated IgM to West Nile Virus in the blood of wild caught birds was 2.94%. The percentage of IgY positive in rehab birds was 27.91% and wild caught birds was 23.53%. A significantly higher prevalence of birds with elevated IgY to the virus compared to the prevalence of IgM shows that the birds are surviving West Nile Virus. Our results clearly demonstrate that West Nile Virus is a cause for illness and admission for rehabilitation in birds of prey in Central Illinois.

4:15pm **102** UG **Tradeoffs in Reproduction, Body Condition, and Immune Defense in Breeding and Non-Breeding Northern Cardinals (*Cardinalis cardinalis*)**

*Aleyda McPherson & Travis E. Wilcoxen [Millikin University]

he physiological demands of songbirds changes year round associated with breeding, molting, and overwintering. The changing demands can lead to changes in investment in immune defenses and investing in one costly physiological process may require tradeoffs that limit another. We examined tradeoffs in immunity and reproductive investment in Northern Cardinals during the breeding season and seasonal differences in immune/body condition relationships. We measured cloacal protuberances of breeding male cardinals and brood patches on breeding female cardinals, collected other morphometrics, and took blood samples from each bird. From blood samples, we completed a bacterial killing assay for breeding birds and made blood smears in the field, staining them, and counting the number of white blood cells (WBC) within 50 fields of view using oil immersion, to compare immune investment across seasons. We found significant, linear relationships between reproductive investment and immune defense in breeding birds. We also found that the relationship between body condition and WBC count differed by season. In the Fall, outside of breeding, only 12.7% of the variance in WBC could be explained by body condition. However, in the Summer, during breeding, 30.7% of the variance in WBC could be explained by body condition. We also found that birds were in better body condition on average when captured during breeding than in the Fall after breeding. Our results demonstrate how physiological tradeoffs develop in Northern Cardinals across seasons and with different physiological demands.

3:15pm **103** UG **An Examination of the Trailing Ability of Neonate Snakes: Preliminary Findings**

*[1]Michelle Le, [1]Benjaman Jellen, & [2]Justin Elden [[1]University of Health Sciences and Pharmacy, [2]St. Louis Zoo]

Animals rely on chemosensation to provide directional cues to locate shelter, food, and mates. For temperate zone species, locating suitable overwintering sites is essential for their survival. Though snakes typically return to the same overwintering sites annually, how they initially locate those sites remains largely unknown. Anecdotal reports suggest that some viviparous species can successfully follow a maternal terrestrial pheromonal trail. However, being able to successfully follow either terrestrial and/or air-borne cues from non-maternal conspecifics, and/or sympatric heterospecific species would be beneficial in this endeavor as well. In this study, we used y-mazes to test the trailing ability of neonatal Armenian vipers (*Montivipera raddei*) on maternal, non-maternal conspecific, and sympatric heterospecific terrestrial and airborne cues. Our preliminary results indicate that neonates can successfully follow trails from their mother (65%), conspecifics (75%), and potentially heterospecifics (60%). Additionally, neonates demonstrated a stronger ability to follow terrestrial trails (75%) than airborne ones (60%). Other studies have observed the ability of neonates to follow conspecific trails, but the potential to additionally follow heterospecific and non-maternal conspecific trails has important implications for dispersal, gene flow, and for oviparous species who may not directly encounter the scent trail from their mother.

4:15pm **104** UG **Canopy Cover Influences on Arthropod Abundance in Giant Cane Patches**

*Hannah Bendler [Southern Illinois University Edwardsville]

Bat populations have faced a decline in recent years due to human-induced factors like wind farm development, habitat destruction, and white-nose syndrome. White-nose syndrome is a fungal disease that most prominently affects cave-hibernating bats. Among those affected, the tricolored bat, northern long-eared bat, and little brown bat are species that have been hit the hardest with the northern long-eared bat recently listed as a federally endangered species. To better understand the changes in bat species populations in west central Illinois, we analyzed acoustic data collected using automated recorders from the summers of 2017 to 2023 in Siloam Springs State Park. This is part of a long-term study investigating the effects of prescribed burns and habitat type (open areas vs. woodland flight corridors) on bat activity at the park with recorders placed in areas that are historically unburned, burned the year of recording, and burned the previous year. The recorders gathered data daily from 30 minutes before sunset until 30 minutes after sunrise. The files were then uploaded to Kaleidoscope Pro's Bat Auto-ID software and processed. We then analyzed the data and determined if there was a bat presence in each file to distinguish noise files from bat passes and manually check the identifications made by the program. Upon doing so, we observed any changes in bat populations from 2017 to 2023 in the park in terms of species distribution changes as well as activity changes as a function of prescribed burning activity and habitat type. The information gathered will be used to help manage and conserve bat habitats in the park.

GETTING TO AND AROUND THE SIUE CAMPUS

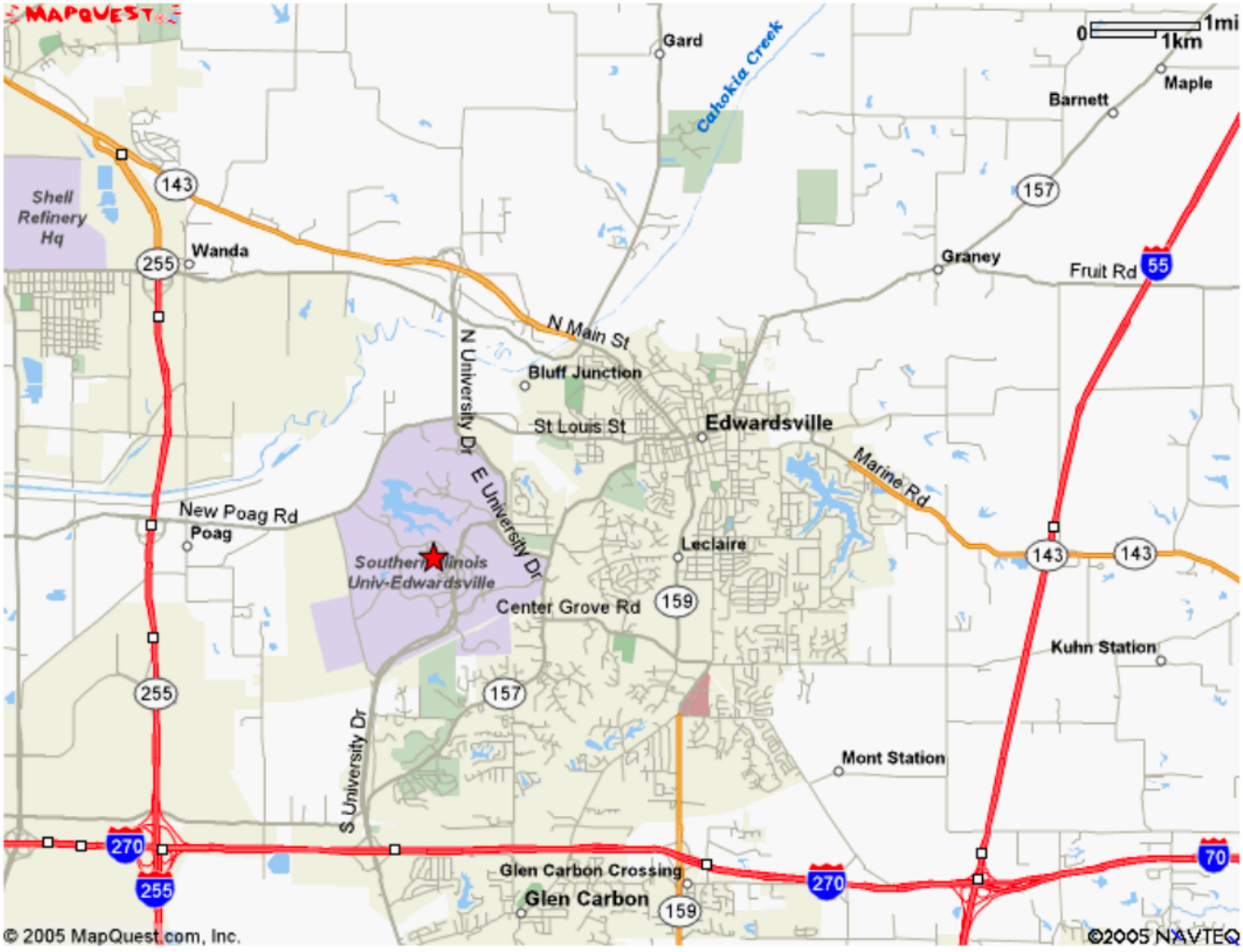
DIRECTIONS TO SIUE CAMPUS

From I-55 north of campus: Take I-55 South to Illinois 143 West (Exit 23) straight at the light onto Governor's Parkway. Take Governor's Parkway across town to campus, entering on E. University Dr. Turn left on N. University Drive and then right on Circle Dr., which will take you around to Lot A.

From I-55 south of campus: Take I-55 North to I-255 North (Chicago) to I-270 East. Use the I-270 directions below for the final directions to campus.

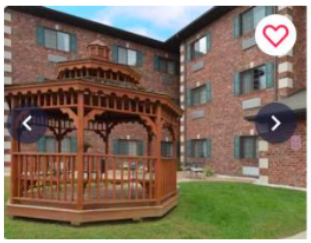
From I-255: Take exit 3 for New Poag Rd east toward campus. Turn right on NW University Drive and then left on Circle Dr and proceed to Lot A.

From I-270: Take the Illinois 157 North exit. Once you're on Illinois 157 North, going straight at the stop light (instead of following 157 to the right) will bring you straight to the campus core on S. University Dr. Turn left on Circle Dr. and follow that around to Lot A.



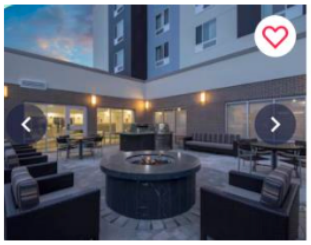
EDWARDSVILLE HOTEL INFORMATION

A



Country Hearth Inn & Suites Edwardsville St. Louis
0.98 mi from address
Breakfast included
Fully refundable
Reserve now, pay later
8.6 Excellent
569 reviews
We have 2 left at
$165
$190 total
includes taxes & fees

B



TownePlace Suites by Marriott St. Louis Edwardsville, IL
1.02 mi from address
Breakfast included
Pool
Fully refundable
Reserve now, pay later
9.0 Wonderful
170 reviews
We have 1 left at
$259
$298 total
includes taxes & fees

C

Comfort Inn Edwardsville - St. Louis
2.03 mi from address
Breakfast included
Pool
8.4 Very Good
698 reviews
$169
$195 total
includes taxes & fees

D

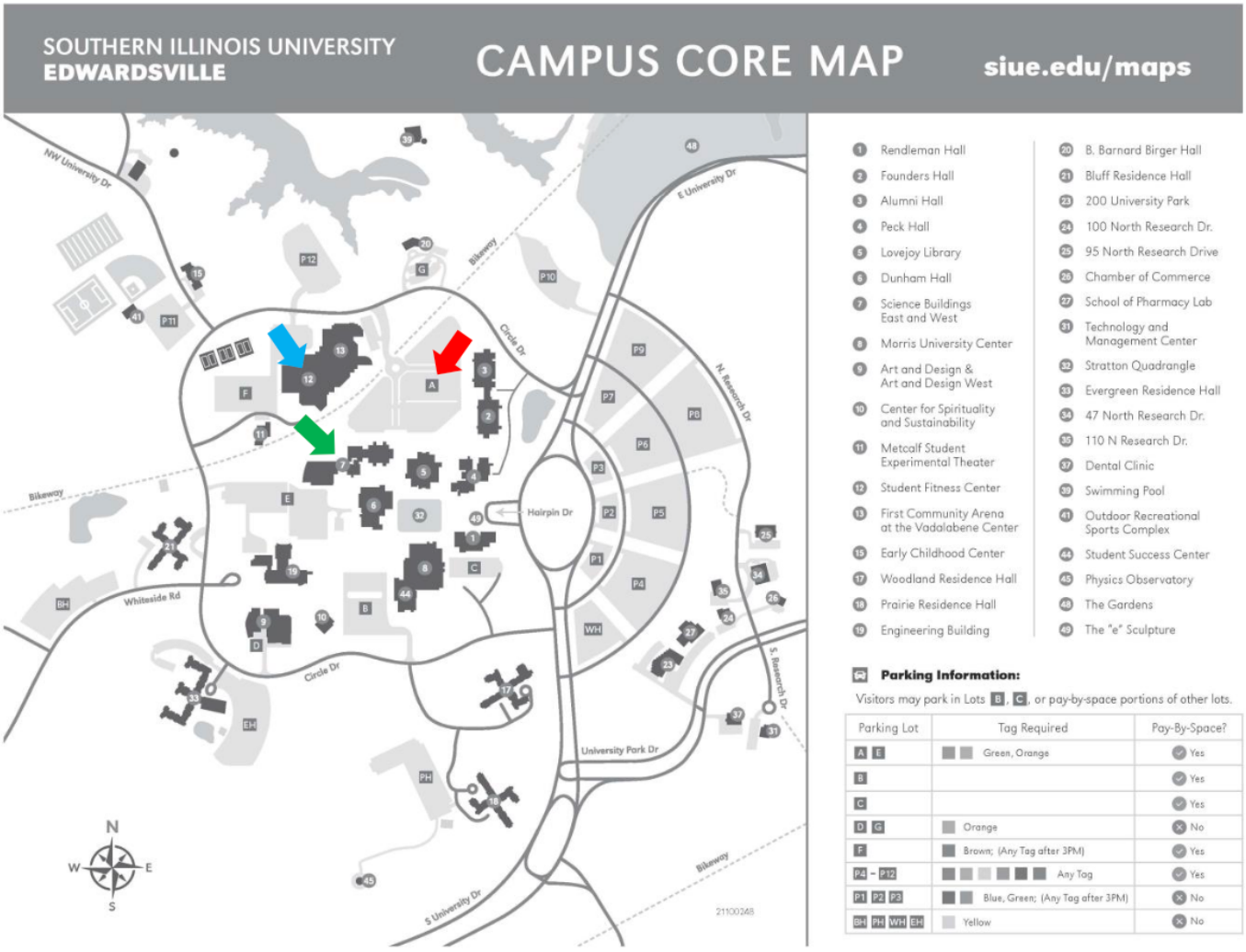
Hampton Inn & Suites St. Louis-Edwardsville
2.87 mi from address
Breakfast included
Pool
7.4 Good
20 reviews
We have 1 left at
$176
$195 total
includes taxes & fees

CAMPUS PARKING AND EVENT LOCATIONS

We recommend parking in the southwest corner of **Lot A**. Parking is free on the day of the event.

Registration, oral presentations, and keynote will be in **Science East** (building 7).

The poster session will be in the **Student Fitness Center** (building 12).



Directions to lunch at **GC Cuisine & Crystal Garden** (off campus at 1230 University Drive): From campus Lot A, take Circle Dr. east to N. University Dr. Go north on N. University Dr. and take a right on Lewis Dr. After crossing highway 157, the road will curve to the right and Crystal Garden will be on your right.