

**PROCEEDINGS OF THE 127TH
ANNUAL MEETING
OF THE
IOWA ACADEMY OF SCIENCE**



The University of Iowa

**April 17—18, 2015
Iowa City, Iowa**

FRIDAY SCHEDULE

Room assignments are included with event descriptions inside

Time	Events	Location	Page
7:30	IJAS Registration	IMU Main Lobby	2, 3
7:30—4:30	IAS Bookstore Open	IMU Main Lobby	2, 3
8:00	Registration Desk Opens	IMU Main Lobby	2, 3
8:00	Silent Auction begins	IMU Main Lobby	2, 3
8:00-10:30	Morning Snack	North/South Foyer	2
8:00-10:45	IJAS Competition Posters	IMU Main Lounge	7-10
8:00-10:45	IJAS Competition Presentations	IMU Third Floor Rooms	10
11:00-Noon	General Session I	IMU Main Lounge	11
Noon-1:15	IJAS Award Luncheon	IMU Main Lounge	11
1:30-2:15	IAS Business Meeting	IMU Main Lounge	12
1:30-2:25	IJAS Activity with U of Iowa Robots-Physics-Biomedical	IMU 335 Nebraska	12
1:30—4:00	Iowa Science Leadership Team Meeting. Iowa Department of Education	IMU 347—Minnesota	12
2:30-4:30	Symposiums A, B, C	IMU 335, 337, 348	13
4:30—5:45	Senior Poster Session	IMU Main Lounge	14-21
4:45-6:00	Social Hour	IMU Main Lounge	22
6:00-7:30	President's Banquet	IMU Main Lounge	22
7:45-8:45	General Session II	IMU Main Lounge	23

Book Store: Friday 7:30—4:30; Saturday 8:00—3:30; Main Lobby, Iowa Memorial Union
Silent Auction: Friday ; Saturday Morning, Main Lobby; Pick up items Saturday 1:00—3:00

IMU = Iowa Memorial Union

SATURDAY SCHEDULE

Room assignments are included with event descriptions inside

Time	Events	Location	Page
8:00	Registration Desk Opens	IMU Main Lobby	2, 3
8:00—3:30	IAS Bookstore Open	IMU Main Lobby	2, 3
8:00-11:45	Silent Auction Pick up items 1:00—3:00	IMU Main Lobby	2, 3
8:00-10:30	Morning Snack	IMU Third Floor	3
8:20-10:45	Section Meetings	IMU Third Floor	24—31
11:00- Noon	General Session III	IMU 2nd Floor Ballroom	24
11:45	IJAS Silent Auction Bidding Closes	IMU Main Lobby	3
Noon-1:15	ESTA Award Luncheon	IMU 2nd Floor Ballroom	31
1:00-3:00	Pick up IJAS Auction Items	Registration Desk, Main Lobby	3
1:15-5:00	Section Meetings Continue	IMU Third Floor	24—31
1:30	Geological Society of Iowa Field Trip	Sign up at Registration	22
2:30—3:30	TriBeta Awards Ceremony	IMU 347 Minnesota	
3:30	Registration Desk Closes	IMU Main Lobby	3

Registration Desk Hours

Friday—7:30 a.m., Registration opens for IJAS; Friday — 8:00 a.m. to Noon and 1:15 p.m. to 5:00 p.m. for all attendees.
Saturday — 8:00 a.m. to Noon and 1:00 p.m.-4:00 p.m.

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Iowa Academy of Science

BRC 50

University of Northern Iowa
Cedar Falls, IA 50613-0508
319-273-2021 (v) 319-273-2807 (f)
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The Iowa Academy of Science
is established to further scientific research
and its dissemination, education in the
science,
public understanding of science,
and recognition of excellence
in these endeavors.

Affiliated with

American Association for the Advancement of Science (AAAS),
American Junior Academy of Sciences (AmJAS),
National Association of Academies of Science,
National Association of Biology Teachers (NABT),
National Science Teachers Association (NSTA),
and the Iowa Space Grant Consortium (ISGC)

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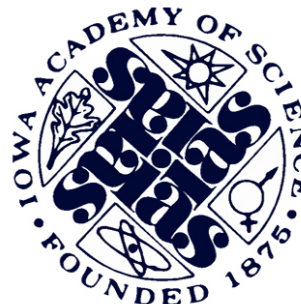
Special Thanks

Thank you to the following organizations & individuals for contributions to the meeting:

Dr. Sally Mason, President, University of Iowa
Dr. P. Barry Butler, Executive Vice President and
Provost, University of Iowa
Evalyn Van Allen—Shalash, Assistant to P. Barry
Butler
John Cory, Event Services, University of Iowa
Mark Anderson, University of Iowa
Ryan Clark, University of Iowa
Gary Coombs, Waldorf College
Larry Stone
Witold Krajewski, Iowa Flood Center
IJAS Judges
TriBeta Judges
Student Volunteers from the University of Iowa

Thank you to all section chairs, vice chairs and committee members and all who generously donated and/or purchased items in the IJAS Silent Auction.

And thank you to the many IAS members who provided speaker suggestions, volunteered to put up posters, and who volunteered throughout the year help the Academy promote science in Iowa.



Corporate Members

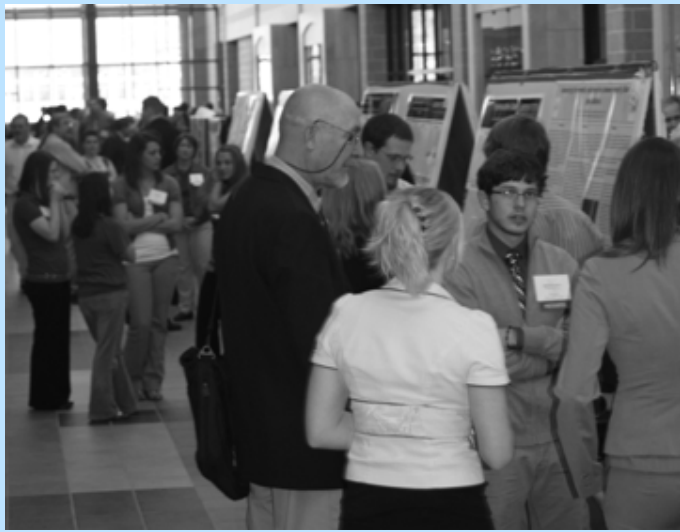
Platinum

Rockwell Collins

Bronze

BMC Aggregates
HON

Hy-Vee
Kemin



Welcome

to the 127th Annual Meeting of
the Iowa Academy of Science.

I am excited to welcome you to the University of Iowa and our 127th Annual Meeting of the *Iowa Academy of Science*. It's an auspicious time for our Academy as we continue to grow and adapt, while remaining relevant, motivated, and responsive to our members and to the public. This forum for inspired and energetic experts like you enables us to remain at the forefront of science research and science education in Iowa and beyond.

We will have many opportunities to keep ideas flowing in the next couple of days. On Friday we will engage in conversations with our youngest members, as the *Junior Academy* sponsors grades 6-12 students in poster and oral presentations, and later in the day the Senior posters will be exhibited. Whether you join some of the varied sessions, section meetings, or meals, may you plant a seed of an idea in someone else and also come away renewed to continue our science work in Iowa.

You are the strength of our Academy, guiding us with your vision, resources, and experiences. We could not accomplish what we do without your support and leadership. Throughout our meeting, stay energized, keep us proactive, and help us shape the impact of the *Iowa Academy of Science*. I look forward to talking with you.

With respect and thanks,
Nadine Weirather
President, *Iowa Academy of Science*

IOWA JUNIOR ACADEMY

IJAS Competition

The IJAS Competition takes place from 8:00 until 10:30 on Friday morning. Please feel free to browse the IJAS posters and attend IJAS presentations. Seniors compete for one of two \$500 college scholarships. Two 9th-11th graders are selected to represent Iowa at the American Junior Academy of Science/American Association for the Advancement of Science National Conference. Middle school students compete for the Most Promising Young Scientist award, which is a certificate and an IJAS T-shirt. All of these awards are made possible through support from the Iowa Space Grant Consortium, the Iowa Science Teaching Section of IAS, the IJAS Silent Auction, and Board allocated funds. The Iowa Space Grant Consortium has awarded IJAS \$8,000 in support of the Iowa Junior Academy of Science for 2013-2014.

National Youth Science Camp

For more than forty years, two seniors from every state have been selected to attend the National Youth Science Camp in West Virginia. The Iowa Academy of Science assists the Iowa Governor's Office by selecting Iowa's Delegates to NYSC. Delegates spend a month at the camp attending guest lectures, developing their own research projects and meeting scientists from many fields. Congratulations to this year's Iowa delegates.

Nicholas L. Arp
North Scott High School

Olivia Weaver
Dallas Center—Grimes High School

2014—2015 Starr Student Research Grants

IAS Member Frank Starr established the Starr Student Research Grants to support science fair research. IJAS Members submit grant proposals to the IAS Student Programs Committee. The committee grants awards of up to \$200 per project to assist students in gaining access to items not normally available in their science classrooms. The committee also provides feedback and suggestions for improving their project plans. This year the Student Program Committee awarded grants to the following student researchers:

Faith Cingle
Lilly Smith, Taylor Harrison
Brianna Galvan, Alicia Riffle
Andera Benner, Sophia Woodley
Kelsie Bryant
Michaela Bryant
Hannah Hoenig, Daly Brisby
Style Haefner, Cameron Edle
Kristyn Eaves
Nathan, Paskach, Benjamin Stewart, Hector Arbuckle
Tiffany Mayberry
Luke Dirks
Isak Anderson
Selaam Dollisso
Beth Cyr
Ani Yam
Abbie Eastman
Nicole Essner
Elena Andrews
Chloe Berry
Seamus O'Connor-Walker, Ryan Strum, Yuchen Lui
John Kim*
Sylvia Hollander, Janelle Moldonado
Noah Peterson, Dane Dorius
Kalyne Abel
Natalie Cross, Kavya Raju
Thomas DeLay, Griffin Meyer

Calvin Leslie*
Erin Noyes, Rachel Harms
Srishti, Laura Emery
Caroline Paxton
Julia White, Lydia Spurgeon*
Benjamin Eyles, Garret Cooper*
Matias Ibarburu, Alexander Bartlett
Emma Cai, Melissa Liu
Tiffany Chu
Olivia Jenks, Nicole Kreider
Rucha Kelkar, Polyphony Bruna
Golara Malaki
Eileen Murray
Deeksha Sarda, Jamie Zhang
Stephen McKown, Benjamin Moats
James Bentley, Zach Strohm
Sarah Shen
Jeremy Wessels
Ryan Jeong
Channing Che
Alex Berryhill, Ian Hillier
Tianxin Xu, Angie Song

*STARR research proposals requesting review without funding.

IJAS RESEARCH PRESENTATIONS

Posters—Iowa Memorial Union Main Lounge ; Oral Presentations—See page 10

Presentations by Iowa Junior Academy of Science students are listed below. The letter identifiers indicate the poster location for each presentation. The location of oral presentations is found on page.....

A. ARTIFICIAL SWEETENERS? DO THEY AFFECT BLOOD SUGAR LEVELS?

Emily Box

Holy Trinity Catholic, Fort Madison

B. HOW DOES THE SHAPE OF A STRING INSTRUMENT AFFECT SOUND

Andres Cordoba

Ames Middle School, Ames

C. THE EFFICIENCY OF PASSIVE SOLAR HEATING

Caleb Kong

Ames Middle School, Ames

D. FERTILIZER VS. FLOODING II

Alec Mehmert

Holy Trinity Catholic, Fort Madison

E. POP OR “NA”

Hannah Torgler

Holy Trinity Catholic, Fort Madison

F. GERMATIC: PHASE II

Daly Brisby & Hannah Hoenig

Central Lee Middle School, Donnellson

G. ALL ABOUT THAT GRADE: BETTER COTTON

Brianna Gruntmeir

Central Lee Middle School, Donnellson

H. DOES MUSIC INCREASE TEST SCORES?

Nakiah Hamer

Bunger Middle School, Waterloo

I. HOW MUCH BACTERIA ARE ON RESTURANT MENUS?

Serenity Haynes

Central Lee Middle School, Donnellson

J. BACTERIA BATTLE

Kaitlin Jordan

Central Lee Middle School, Donnellson

K. PIMPLE POPPERS

Madison Lozano & Amber Wagner

Central Lee Middle School, Donnellson

L. WHAT IS THE EFFECT OF ACID RAIN ON GLYCINE MAX?

Gavin Moeller

Central Lee Middle School, Donnellson

M. CRACKING UP: EGG SHELL STRENGTH

Hailey Tweedy

Central Lee Middle School, Donnellson

N. TO DISSOLVE OR NOT TO DISSOLVE, THAT IS THE QUESTION

Claire Wills

Central Lee Middle School, Donnellson

O. ANIMAL BEHAVIOR

Kalyne Abel

Ames High School, Ames

P. DEVELOPMENT OF A HIGH-THROUGHPUT ASSAY FOR ATP HYDROLYZING ENZYMES

Jay Amin

Ames High School, Ames

Q. SEVERE WEATHER PATTERNS IN IOWA

Elena Andrews & Chloe Barry

Ames High School, Ames

R. BREAKING POINT OF ICE

James Bentley & Zak Strohm

Ames High School, Ames

S. TEST FISH SPECIES FOR REACTIONS TO OIL SPILLS

Alex Berryhill & Ian Hillier

Ames High School, Ames

T. HOW TEMPERATURE AFFECTS A STUDENT’S FOCUS IN A CLASSROOM

Polyphony Bruna & Rucha Kelkar

Ames High School, Ames

U. THE EFFECT OF DIFFERENT GENRES OF MUSIC ON YOUR CONCENTRATION

Emma Cai & Melissa Liu

Ames High School, Ames

V. WHICH IS MORE EFFECTIVE? CLOROX OR CLORALEX

Perla Carmenate

Herbert Hoover High School

IJAS RESEARCH PRESENTATIONS

Posters—Iowa Memorial Union Main Lounge ; Oral Presentations—See page 10

Presentations by Iowa Junior Academy of Science students are listed below. The letter identifiers indicate the poster location for each presentation. The location of oral presentations is found on page.....

W. HOW DEFORESTATION AFFECTS THE QUALITY OF OUR SOIL FOR PLANT GROWTH

Channing Che

Ames High School, Ames

X. USING WASTE MATERIALS AS BIOSORBENTS TO REMOVE COOPER IN AN AQUEOUS SOLUTION

Tiffany Chu

Ames High School, Ames

Y. THE TRUTH ABOUT THE WATER WE DRINK

Natalie Cross & Kavya Raju

Ames High School, Ames

Z. CONDITIONS OF PLANT GROWTH

Thomas DeLay & Griffin Meyer

Ames High School, Ames

AA. THE EFFECTS OF PHARMACEUTICAL DRUGS ON MARIGOLDS

Luke Dirks

Ames High School, Ames

AB. HOW DO PREVIOUS EXPERIENCES WITH VARIOUS FOODS CHAINS AFFECT PEOPLE'S PERCEPTIONS?

Selaam Dollisso & Beth Cyr

Ames High School, Ames

AC. THE EFFECTS OF FOCUSED LIGHT ON SLIME MOLD GROWTH

Dane Dorius & Noah Peterson

Ames High School, Ames

AD. HOW DO DIFFERENT TYPES OF PERFUMES AND COLOGNES AFFECT HOUSEPLANTS?

Abbie Eastman

Ames High School, Ames

AE. HOW EFFECTIVE IS IT TO DISINFECT A SPONGE WITH CLOROX CLEAN-UP

Diana Echeverria

Central Campus, Des Moines

AF. DOES SEDIMENT NEAR WATER SOURCES CONTAIN HARMFUL COMPOUNDS FOR PLANTS?

Laura Emery & Srishti Mathur

Ames High School, Ames

AG. WHAT ARE THE IMPORTANT TRAITS THAT PROMOTE DROUGHT RESISTANCE IN PLANTS?

Nicole Essner

Ames High School, Ames

AH. THE EFFECT OF AN ENVIRONMENT WITH NOT LIGHT ON PHYSICAL PERFORMANCE OF MICE

Ben Eyles & Garrett Cooper

Ames High School, Ames

AI. THE EFFECT OF SODIUM AND NITRATE SALTS ON BACTERIA

Miles Graham

Central Campus, Des Moines

AJ. NON-BRAND VS. NAME BRAND DISINFECTORS

Karen Granados Nava

Central Campus, Des Moines

AK. DOES VINEGAR, BLEACH OR 409 WORK BETTER?

Cassandra Handley

Central Campus, Des Moines

AL. EFFECTS OF DEPTHS OF SOIL ON PLANT GROWTH

Matias Ibarburu & Alexander Bartlett

Ames High School, Ames

AM. DOES FERTILIZER MAKE UP FOR SOIL QUALITY?

GaJin Kim

Ames High School, Ames

AN. THE EFFECTS ON THE HUMAN WORK ETHIC BASED ON ISOLATION AND ENTERTAINMENT

Calvin Leslie

Ames High School, Ames

AO. WHAT IS THE BEST WAY TO MAKE CLOTHES WATERPROOF?

Philip Ma

Ames High School, Ames

AP. DO YOU JUDGE A BOOK BY ITS WARMTH?

Golara Malaki

Ames High School, Ames

AQ. THERMAL EXPANSION

Stephen McKown & Benjamin Moats

Ames High School

IJAS RESEARCH PRESENTATIONS

Posters—Iowa Memorial Union Main Lounge ; Oral Presentations—See page 10

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AR. RHIZOBIA: THE FUTURE NATURAL FERTILIZER OF LEGUMINOUS PLANTS

Rachel Mehmert

Holy Trinity Catholic, Fort Madison

AS. THE EFFECTS OF KEEPING OFFICE CATS

Eileen Murray

Ames High School, Ames

AT. THE EFFECTS OF WATER DISTRIBUTION OF AGRICULTURE

Erin Noyes & Rachel Harms

Ames High School, Ames

AU. HOW DOES THE USE OF WATER SUPPLIES CONTAMINATED WITH PERSONAL CARE CHEMICALS AFFECT THE GERMINATION, GROWTH, AND YIELD OF PLANTS?

Seamus O'Connor-Walker, Ryan Strum & Michael Liu

Ames High School, Ames

AV. AN INVESTIGATION INTO THE IMPROVEMENT OF SWITCHGRASS BIOFUEL PRODUCTION: PHASE II

Manasa Pagadala

Rivermont Academy, Rock Island, Illinois

AW. ANTIBACTERIAL PROPERTIES OF BLEACH VS. DISINFECTANT SPRAY

Mason Rhodes

Central Campus, Des Moines

AX. DOES LACTATION LENGTH AFFECT SOW PRODUCTIVITY

Josh Pieper

Holy Trinity Catholic, Fort Madison

AY. HAND SANITIZER EXPERIMENT

Kyle Roberts

Central Campus, Des Moines

AZ. THE EFFECTS OF PRECIPITATION PH ON THE GROWTH OF PLANTS

Sophie Roberts

Ames High School, Ames

BA. CONSPIRACY THEORIES

Deeksha Sarda & Jamie Zhang

Ames High School, Ames

BB. EFFECT OF VARYING ANTIBIOTICS ON GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIAL PATHOGENS

Eva Scheibe & Achala Thippeswamy

Ames High School, Ames

BC. VIABILITY OF TRANSMITTING POWER USING RADIO

Nathan Schmidt

East High School, Waterloo

BD. BURN, PLASTIC, BURN

Sarah Shen

Ames High School, Ames

BE. INVESTIGATING HUMAN IMPACT ON CLEAR CREEK STREAM BANK EROSION

Benjamin Steward, Hector Arbuckle & Nathan Paskach

Ames High School, Ames

BF. THE EFFECT OF GREENHOUSE GASES ON EARTH'S ATMOSPHERIC TEMPERATURE

Isak Werner Anderson

Ames High School, Ames

BG. HOW TO PEOPLE UNDERSTAND BLACK HOLES?

Jeremy Wessels

Ames High School, Ames

BH. THE EFFECT OF SLEEPING HABITS FROM MOON PHASES

Julia White & Lydia Spurgeon

Ames High School, Ames

BI. HOW DO COMMON HOUSEHOLD CHEMICALS AFFECT THE GROWTH OF WISCONSIN FAST PLANTS?

Tianxin Xu

Ames High School, Ames

BJ. IS THERE REALLY A DIFFERENCE? HOW DIFFERENT TYPES OF SWEETENERS AFFECT HEALTH AND TASTE

Ani Yam

Ames High School, Ames

BK. HOME REMEDIES IN THE WAR WITH BACTERIA

Benjamin Brewer

Central Campus, Des Moines

IJAS RESEARCH PRESENTATIONS

Posters—Iowa Memorial Union Main Lounge ; Oral Presentations—See page 10

Presentations by Iowa Junior Academy of Science students are listed below. The letter identifiers indicate the poster location for each presentation. The location of oral presentations is found on page.....

BL. ANTISEPTICS V. ANTIBIOTICS

Kyle Brooks

Central Campus, Des Moines

BM. COMPARING BATH AND BODY WORKS HAND SANITIZER TO GERM-X

Keelin Ladurini

Central Campus, Des Moines

BN. USING HYDROGEN PEROXIDE TO REMOVE CERUMEN AND BACTERIA FROM THE EAR CANAL

Kennady Lilly

Central Campus, Des Moines

BO. LICKING YOUR FINGERS GOOD OR BAD?

Gabriela Melendez

Central Campus, Des Moines

BP. DOES CHLORINE KILL EVERYTHING?

January Philavanh

Central Campus, Des Moines

BQ. BEAMED ELECTRICAL TRANSMISSION 2

Chris Schierbrock

Holy Trinity Catholic, Fort Madison

BR. WHAT SHOULD FAMILIES BE BRUSHING WITH?

Breanna Worley

Central Campus, Des Moines

IJAS Oral Presentations

Use the letter identifier associated with each research project to determine the room assignments for oral presentations.

For example: The oral presentation for project “F” will be in Room 341—Purdue

F-I	Room 341—Purdue
J-N	Room 345—Northwestern
O-V	Room 347—Minnesota
W-AD	Room 351—Michigan
AE-AL	Room 346—Indiana
AM-AT	Room 343—Ohio State
AU-BB	Room 348—Illinois
BC-BJ	Room 337—Penn State
BK-BR	Room 335—Nebraska

Projects A through E are not making oral presentations.

Judges Room: 256—Lucas Dodge

Iowa Delegates to the 2015 AmJAS Conference in San Jose, California

Pictured from left to right

Kaylie Wilson, Central Lee High School

Paulina Larova, Ames High School

Maya Chen, Ames High School

Rachael Kim, Ames High School



GENERAL SESSION I

Friday, 11:00 a.m., Iowa Memorial Union, Main Lounge



Ten Seasons in Antarctica

Paul Jones

Retired biology, chemistry and physics teacher

Montezuma, Iowa

Paul Jones spent the past 10 seasons “on the ice.” He also spent 25 days in a typical Antarctica science field camp, as well as 9 seasons working as a Power Plant, Wastewater Plant, or Water Plant operator at McMurdo Station, America’s Science Base on the continent. Learn about Antarctica and what it is like to live there in this fascinating look at life on the world’s southernmost continent.

In 1966 Paul Jones began working summers for the city of Montezuma for the Water, Wastewater, and Power plant. During these years he attended 36 National Science Foundation sponsored Teacher Enhancement projects. He had four “wild” projects, including SEA Education at Woods Hole Oceanographic, Trek of the Mammoth at Chadron State Nebraska, High Energy Physics at Stanford Linear Accelerator and my last project in 1997, Teachers Experiencing Antarctica (TEA) at McMurdo Dry Valleys Antarctica.

In 2004, Paul was hired by Raytheon Polar Services to work at McMurdo Station Antarctica (America’s Science Base) where he worked all three utilities, Water, Wastewater and Power Plant, usually working a 90-day contract from November through January. He left the continent on February 2, 2014

IJAS AWARD LUNCHEON

Friday, Noon, Iowa Memorial Union, Main Lounge

Luncheon Program

Iowa’s 2015 National Youth Science Camp Delegates

Announcement of IJAS Competition Awards

Most Promising Young Scientist

Iowa Delegates to the American Junior Academy of Science, 2015

Iowa Alternates to the American Junior Academy of Science, 2015

IJAS \$500 Senior Scholarships

Recognition of all IJAS Members, Judges, and Sponsors

SPECIAL EVENTS

Iowa Academy of Science Business Meeting

Friday, 1:30 —2:15 pm.

Iowa Memorial Union, Main Lounge

Open to all attendees. Learn about the Academy, ask questions and provide input.

Iowa Science Leadership Team Meeting

1:30 p.m. to 4:00 p.m., Iowa Memorial Union, Room 347 - Minnesota

Iowa Junior Academy of Science Event

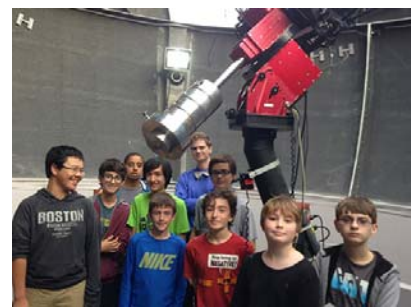
Presented by the University of Iowa

Friday, 1:15-2:15 p.m., Iowa Memorial Union, Room 335—Nebraska

Dancing Robots

Physics Road Show

Biomedical Student Panel



Return to Klein Quarry

Geological Society of Iowa Annual Field Trip

Saturday, 1:30 to 5:00 p.m.

Sign up at the Registration Desk—Limited to 50 people

- Steel toed footwear is recommended
- Closed toed hard soled shoes are required
- Hard hats and safety glasses advised—some will be provided
- Age limit is 16 and older

SYMPOSIUMS

Friday, 2:30-4:30, Iowa Memorial Union

Symposium A: Floods in Iowa

The Iowa Flood Center
The University of Iowa
Room 348—Illinois



Past, Present, and Future Floods in Iowa

Gabriele Villarini, Ph.D.

Assistant Professor in the Department of
Civil and Environmental Engineering
The University of Iowa



Flood Inundation Mapping in Iowa

Nathan Young, Ph.D.

Associate Research Engineer, IIHR—
Hydroscience & Engineering: Associate
Director, Iowa Flood Center
The University of Iowa



Real-time Flood Forecasting in Iowa

Ricardo Mantilla, Ph.D.

Research Engineer, IIHR—Hydroscience
& Engineering, Iowa Flood Center
The University of Iowa

Symposium B: The Past in Our Backyards:

An Introduction to Iowa City Archeology

Room 337—Penn State

Introduction by John F. Doershuk, Ph.D.
State Archaeologist



The Prehistory of Iowa City

William E. Whittaker, Ph.D.

Research Specialist, Office of the State
Archeologist
The University of Iowa



The Prehistory of Iowa City

Angela Collins, MA

Research Specialist, Office of the State
Archeologist
The University of Iowa



Hubbard Park Archaeological Findings: Work in a Lower Income Neighborhood

Cynthia L. Peterson, MA

Research Specialist, Office of the State
Archeologist
The University of Iowa

Symposium C: Modeling Human Disease

in Research Friendly Organisms

Room 335—Nebraska



Muscular dystrophy: What we have learned on the fly

Lori L. Wallrath, Ph.D.

Professor and Vice Chair
Department of Biochemistry
The University of Iowa



What nematodes can tell us about fighting cancer: Wnt signaling directs asymmetric cell division in *C. elegans*

Bryan Phillips, Ph.D.

Assistant Assistant Professor, Biology
The University of Iowa



Hubbard Park Archaeological Findings: Work in a Lower Income Neighborhood

Robert Cornell, Ph.D.

Associate Professor
Department of Anatomy & Cell Biology
The University of Iowa

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

Anthropology Section

1. FEELING HANDY? AN EXAMINATION OF HANDEDNESS BASED UPON LITHIC ANALYSIS IN RELATION TO SITE 13ML139

Zachary Altman

2. ARCHAEOLOGY IN IOWA'S PRAIRIE LAKES REGION: 13DK96

Maureen Lonergan, Jordan Bennett and John Doershuk

Cellular, Molecular & Microbiology Section

5. POLYMORPHISM OF TYPE 2 DEIODINASE GENE (DIO2) AND THE PROPENSITY TO DEVELOP TYPE 2 DIABETES IN HUMANS

Sydney Althoff, Vanessa Carlson and Rasika G. Mudalige-Jayawickrama

6. EFFECTS OF LEUCINE METABOLISM ON LYMPHOCYTE ACTIVATION AND CANCER GROWTH: A POTENTIAL TARGET FOR NUTRITIONAL IMMUNOTHERAPY IN CANCER

Elitsa Ananieva, Josh Bostic, Jonathan Powell, Chirag Patel and Susan Hutson

7. SYNTHESIS OF RECOMBINANT HCMV PROTEINS^{BBB&ISGC}

Margaret Armstrong, Brian Gentry and Marc Busch

8. RETINAL CIRCUITRY UNDERLYING NAVIGATION IN NEWLY HATCHED FRESHWATER TURTLES^{BBB}

Stuart Behling, Charlie Heller, Steve Freedberg and Jay Demas

9. FINDING AN EFFECTIVE METHOD FOR ENUMERATING BACTERIA IN THE ORAL CAVITIES OF CANIS LUPUS FAMILIARIS

Brian T. Bristow and Jordain A. Croker

10. RELATIONSHIPS BETWEEN THE POLYMORPHISMS OF BETA-3 ADRENERGIC RECEPTOR GENE AND THE DEVELOPMENT OF TYPE 2 DIABETES MELLITUS

Vanessa Carlson, Sydney Althoff and Rasika Mudalige-Jayawickrama

11. USING COMPARATIVE GENOMICS TO CHARACTERIZE THE DIVERSITY OF DEINOCOCCUS

Keith Christiansen and Michael LaGier

12. A TOXIN-ANTITOXIN PAIR IS RESPONSIBLE FOR TYPE VI SECRETION SYSTEM MEDIATED BACTERIAL KILLING AND SELF-IMMUNITY BY ACINETOBACTER NOSOCOMIALIS STRAIN M2

Holly Hulsebus and Michael Carruthers

13. GLUTATHIONE S-TRANSFERASE EXPRESSION IN LIVERS OF IN UTERO EXPOSED MUS MUSCULUS^{BBB}

Brandon Larsen

14. INSULIN RECEPTOR SUBSTRATE (IRS) SIGNALING PRESERVES CONTRACTILE FUNCTION AND STRUCTURE IN THE ADULT HEART

Nicholas McCarty, Christian Riehle and Dale Abel

15. DNA POLYMERASE INHIBITORS ENHANCE THE ANTI-VIRAL EFFECT OF TERMINASE INHIBITORS WHEN USED IN COMBINATION AGAINST HCMV^{ISGC}

Mary Shea O'Brien and Brian Gentry

16. CROSS SPECIES AMPLIFICATION OF THIRTEEN DISTINCT MICROSATELLITE LOCI IN ZIZANIA AQUATICA

Brendan Pinto and Anthony

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

17. ALPHA1-ADRENERGIC RECEPTOR INDUCED PHOSPHORYLATION OF THE Na^+ - H^+ EXCHANGER ISOFORM 1 REGULATES CELL GROWTH AND MOVEMENT^{BBP}

Anne Pius and Mark Wallert

18. A RAPID METHOD FOR FUNCTIONAL CHARACTERIZATION OF ORCHID FLOWER COLOR GENES USING MODEL PLANTS

Sharif Rahim, Nicole Toro, Teresita Amore and Rasika Mudalige-Jayawickrama

19. BIOSYNTHESIS OF MBX-2168 TRIPHOSPHATE IN HERPES VIRUS-INFECTED CELLS^{ISGC}

Hannah Sauer, Marie Nguyen and Brian Gentry

20. BORIC ACID LOWERS ETHANOL TOLERANCE OF YEASTS

Martin Schmidt

21. FUNCTIONAL CHARACTERIZATION OF ORCHID TCP GENES USING JAW MUTANTS OF ARABIDOPSIS MODEL PLANT

Lauren Smith, Tiffanee Kress and Rasika Mudalige-Jayawickrama

22. IN VITRO ANTI-TUMOR ACTIVITY OF COMMON PLANT EXTRACTS AND THEIR SUSPECTED ACTIVE CHEMICAL AGENTS

Sara Tolsma, Megan Feuchtenberger, Cody Hughes, Mariko Komatsu, Caleb Linn, Kierstyn Marker, Sun Mudiavita, Morgan Olhausen, Jordan Sexe, Samantha Thomson, Britta Wilson, Bethany Wood and Emily Wynja

23. DISCOVERING A FAST TRACK METHOD TO EVALUATE THE EFFICACY OF GENE SILENCING IN ORCHIDS BY ARTIFICIAL MICRORNA

Nicole Toro, Sharif Rahim, Teresita Amore and Rasika Mudalige-Jayawickrama

24. TESTOSTERONE, ANDROGEN RECEPTOR AND MALE SUSCEPTIBILITY IN *LEISHMANIA CHAGASI* INFECTION

Elizabeth A. Turcotte and Dr. Nilda E. Rodriguez

25. CHARACTERIZATION OF BACTERIAL STRAINS FOR FUTURE MICROBIAL COMPETITION ASSAYS

Erik Zorrilla and Rebecca Schmidt

Chemistry Section

37. METHANE ACTIVATION ON METAL OXIDE NANOPARTICLES: EFFECT OF SAMPLE PRETREATMENT IN CHEMICAL LOOPING COMBUSTION PROCESS

Hayder Alalwan and Vicki Grassian

38. SURFACE LIGAND ADSORPTION AND SURFACE FUNCTIONALITY STUDIES OF TITANIUM DIOXIDE AT DIFFERENT SIZES USING ATR-FTIR SPECTROSCOPY IN SIMULATED BIOLOGICAL FLUIDS^{ISF}

Alaa Alminshid

39. ENVIRONMENTAL ADVANTAGES OF CO-FIRING BIOMASS IN A COAL-FIRED POWER PLANT

Ibrahim Al Naghemah and Elizabeth Stone

40. DETERMINATION OF L-DOPA IN VELVET BEANS USING HPLC: A GREEN LABORATORY FOR ANALYTICAL CHEMISTRY

Hailey Benson, Nathanel Holte and Catherine Haustein

41. EXAMINING THE EFFECTS OF ROASTING METHODS ON THE CAFFEINE CONTENT OF COFFEE

Kristen Burd, Ashley Maloney, Emily Nienhuis, Abigail Stevens, Samantha Thomson, Karissa Carlson and David Arnett

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

Chemistry Section (continued)

40. DETERMINATION OF L-DOPA IN VELVET BEANS USING HPLC: A GREEN LABORATORY FOR ANALYTICAL CHEMISTRY

Hailey Benson, Nathanel Holte and Catherine Haustein

41. EXAMINING THE EFFECTS OF ROASTING METHODS ON THE CAFFEINE CONTENT OF COFFEE

Kristen Burd, Ashley Maloney, Emily Nienhuis, Abigail Stevens, Samantha Thomson, Karissa Carlson and David Arnett

42. OPTIMIZING PREPARATION CONDITIONS OF LIVE SAMPLES FOR TRANSMISSION ELECTRON MICROSCOPY

Amanda Dolley, Zachary Fritz, Hanna Stenzel, Keith Jarosinski and Joseph Nguyen

43. STUDY OF THE PROPERTIES AND CHEMISTRY OF SEA SPRAY AEROSOL USING SINGLE PARTICLE MICROSCOPY AND SPECTROSCOPY TECHNIQUES

Armando Estillore, Olga Laskina, Joshua Grandquist, Jonathan Trueblood and Vicki Grassian

44. ACCOUNTING FOR THE CHEMICAL ENVIRONMENT OF IRON IN OXIDE SURFACE CALCULATIONS

Xu Huang, Sai Kumar Ramadugu and Sara Mason

45. ANALYSIS OF ORGANOSULFUR COMPOUNDS IN THE ATMOSPHERE: A CASE STUDY OF URBAN ENVIRONMENTS

Josh Kettler and Elizabeth Stone

46. ATMOSPHERIC ORGANOSULFATES IN CENTREVILLE, ALABAMA: INSIGHTS TO AIR QUALITY EFFECTS

Anusha Priyadarshani Silva Hettiyadura, Elizabeth Stone, Shuvashish Kundu, Zach Baker, Thilina Jayarathne, Emily Geddes, Kaitlin Richards and Tim Humphry

47. SYNTHESIS OF 1,5-DICHLORO-2,4-DIODOBENZENE

Taylor Sanders and Jay Wackerly

48. SYNTHESIS AND APPLICATIONS OF IONIC LIQUID MONOMERS IN FREE RADICAL POLYMERIZATIONS

Mallory Sea and Brian McFarland

49. ANALYSIS OF DRIED BLOOD USING ELECTRON PARAMAGNETIC RESONANCE

Beth Weber and Lisa Mellmann, Dr.

50. SIZE-DEPENDENT DIELECTRIC PROPERTIES OF GOLD: A NOVEL INSIGHT ON SIZE-DEPENDENT INTERACTIONS

Lahiru Wijenayaka, Christopher Cheatum and Amanda Haes

Ecology & Conservation Section

58. THE UTILITY OF HIGH-DIVERSITY PRAIRIE MIXTURES AS BIOENERGY FEEDSTOCKS

Jessica Abernathy and Mark Sherrard

59. HOW DO PREDATORS LOCATE NESTS OF ORNATE BOX TURTLES (TERRAPENE ORNATA)? A FIELD EXPERIMENT

Neil Bernstein, Andrew McCollum and Robert Black

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

60. SAND DUNE SUCCESSION FOLLOWING REMOVAL OF PINE PLANTING: IMPACTS ON MICROCLIMATES AND HABITAT SUCCESSION

Neil Bernstein, Callie Ochs, Adam Coats, Benett Vrbicek and Thomas Rosburg

61. SOIL, CEDARS, AND FIRE: INTERACTIONS AND EFFECTS ON INVERTEBRATE DIVERSITY AT NIOBRARA VALLEY PRESERVE

Anna Daumer, Jennifer Inge, Lincoln Morris, Allison Schweighart, Emily Stricklin, Joshua Tampio, Emma Thies, Joseph Tolsma, Katie Thompson and Todd Tracy

62. PHYSIOLOGICAL CONSEQUENCES OF COMPENSATORY GROWTH IN THE CHECKERED GARTER SNAKE, THAMNOPHIS MARCIANUS

Kaitlyn Holden, Anne Bronikowski and Neil Ford

63. PLANT NITROGEN USE IN BIOENERGY FEEDSTOCKS

Jordan Koos, Zachary Kockler and Mark Sherrard

64. DIFFERENCES IN BIODIVERSITY AND SPECIES RICHNESS OF INVERTEBRATES IN REMNANT PRAIRIES AND POLYCULTURE ORGANIC FARMS IN IOWA^{βββ}

Mauricio Leon, Alexzandra Mehmen, Kieran Cullen and Johanna Foster

65. THE INFLUENCE OF HUNTING SEASON AND SNOWFALL ON LEAD EXPOSURE OF WILD BALD EAGLES IN THE UPPER MISSISSIPPI RIVER VALLEY

Ronald Lindblom

66. SURVIVAL AND GROWTH OF JUVENILE ORNATE BOX TURTLES IN EAST-CENTRAL IOWA

Andy McCollum, Niki Martinson, Emma Narotzky, Neil Bernstein, Adam Coats, Virginia Brust and Emilie Jacobsen

67. PLANT HERBIVORE INTERACTIONS WITH VARIED HERBIVORE INTENSITY: THE ROLES OF LEAF DEFENSES AND NUTRIENTS

Carolyn McDermott, Kyle Haynes and Anurag Agrawal

68. A COMPARISON OF IOWA'S ORIGINAL CORN SUITABILITY RATING INDEX TO THE NEW CORN SUITABILITY RATING 2 INDEX

Aaron Sassman and C. Lee Burras

69. IF YOU FARM IT, WILL THEY COME? ROUTE-LEVEL DIVERSITY TRENDS IN IOWA'S BREEDING BIRD SURVEY RESULTS

Todd Tracy, Joseph Tolsma, Joshua Tampio, Allison Schweighart, Jennifer Inge and Anna Daumer

70. WAYS TO WING IT: CORRELATION OF WING SHAPE WITH HABITAT PREFERENCES, TOXICITY AND MIGRATION IN BUTTERFLIES

Rhea Waldman, Morgan Muell, Miranda Salsbery, Diane Debinski and Dean Adams

71. MACROINVERTEBRATE CONCENTRATIONS ON OPPOSING BORDERS OF CASTOR CANADENSIS ESTABLISHMENTS

Beth Weber, Ethan Wilson, Bobby Ivey and Melinda Coogan, Dr.

72. PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*) PRESENCE IN IOWA WETLANDS: SITE VISITS AND SOIL SEED BANK ANALYSES

Paul Weihe, Clarissa LaPlante and Zane Peters

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

Engineering Section

85. TECHNO-ECONOMIC ANALYSIS OF BIOFUELS FROM HIGH MOISTURE FEEDSTOCK VIA HYDROTHERMAL LIQUEFACTION AND ANAEROBIC DIGESTION

Mitch Amundson and Mark Wright

86. BIOFUELS POTENTIAL IN GHANA

Nataliya Apanovich

87. INCREASING PATIENT SAFETY: REDUCING TRAFFIC IN THE LABOR AND DELIVERY OPERATING ROOM

Brennan Ayres, Salvador Rojas-Murillo, Farzaneh Dolati, Loreen Herwaldt and Priyadarshini Pennathur

88. MATHEMATICS OF MASS TRANSPORT FOR THE DESIGN OF ARTIFICIAL ORGANS

Scott Beckman, Xinhang Shen, Kathleen Wilcox and Kaitlin Bratlie

89. WATER QUALITY PROBES PROVIDE IN-SITU MONITORING OF BIOCHEMICAL REACTIONS IN AN ENGINEERED BIOREACTOR

Ellen Black

90. THE EFFECT OF HEAT CARRIER PROPERTIES ON PYROLYSIS PRODUCTS IN AN AUGER PYROLYZER

Tannon Daugaard and Mark M. Wright

91. IN SITU METHODS TO ANALYZE GENE EXPRESSION IN PSEUDOMONAS SP. ADP BIOFILMS^{BBB}

Michael Delcau and Tonya Peebles

92. PREDICTING EPISODIC AMMONIUM EXCRETION BY FRESHWATER MUSSELS VIA GAPE RESPONSE AND HEART RATE

Lee Hauser

93. COMPARATIVE TEA MODELS OF TECHNICAL DEVELOPMENT FOR ADVANCED BIOFUEL AND BIOPRODUCTS VIA THE PYROLYSIS PLATFORM

Wenhao Hu, Mark M. Wright and Robert C. Brown

94. A TECHNO-ECONOMIC ANALYSIS OF BIO-OIL STABILIZATION FOR INSERTION INTO PETROLEUM REFINERIES AND UPGRADING TO TRANSPORTATION FUELS

Wenqin Li, Mark M. Wright and Robert C. Brown

95. A NEW POINTING SYSTEM FOR AN INSTRUCTIONAL RADIO TELESCOPE AT THE UNIVERSITY OF IOWA

Abram Nothnagle, Joseph Sink and Steven Spangler

96. SIMULATION OF GRANULAR MIXING IN DUAL-SCREW AUGER REACTORS BASED ON THE DISCRETE ELEMENT METHOD

Fenglei Qi and Mark M. Wright

97. THE PARTITIONING OF 2,4-DINITROANISOLE WITHIN HYBRID POPLAR AND WILLOW TREES

Hunter Schroer and Craig Just

98. EX-SITU CATALYTIC FAST CO-PYROLYSIS OF RED OAK AND POLYETHYLENE IN MICRO-PYROLYZER^{ISF}

Yuan Xue and Xianglan Bai

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

Environmental Science & Health Section

106. THE EFFECTS OF ATRAZINE ON THE PLANARIAN DUGESIA DOROTOCEPHALA

Shaylia Barber, Jonathan Ehrlich and Melinda Coogan

107. A COMPARISON OF HIGH VELOCITY HAND DRYERS EQUIPPED WITH OR WITHOUT HEPA FILTERS AND THE IMPACT ON BACTERIAL LOAD OF HUMAN FINGERTIPS

Brian T. Bristow, Joel C. Hoyman and Andy L. Segura

108. MATERNAL USE OF COUGH MEDICATIONS CONTAINING DEXTROMETHORPHAN AND MAJOR BIRTH DEFECTS

Yanyan Cao, Paul Romitti and Trudy Burns

109. A RAPID METHOD FOR EVALUATING THE PRESENCE OF PSEUDOGYMNOASCUS DESTRUCTANS THAT CAUSES WHITE-NOSE SYNDROME IN BATS

Ryan Cleary, Kayla McLaughlin, Tiffanee Kress, Raika Mudalige-Jayawickrama and Gerald Zuercher

110. ACID WASHED GENES: THE POSSIBLE EPIGENETIC EFFECT OF GIBBERELLINS

Josh Hoard

Geology Section

114. PARTNERSHIPS IN PALEONTOLOGY: PUBLIC PARTICIPATION IN THE COLLECTION, CURATION, PREPARATION, AND RESEARCH OF A FOSSIL FAUNA FROM THE DEVONIAN OF IOWA^{ISF}

Tiffany Adrain, James Preslicka and Thomas Blume

115. PEDOGENESIS OF OUTWASH-DERIVED SOILS ON TERRACES OF THE DES MOINES RIVER

Ethan Dahlhauser and C. Lee Burras

116. QUSAIBA "HOT SHALE" AND SHARAWRA SANDSTONE MEMBERS OF QALIBAH FORMATION (SILURIAN): AN OVERVIEW FOR UNCONVENTIONAL SHALE GAS FORMATION IN SAUDI ARABIA

A. Umran Dogan and Michael Kaminski

117. SARAH FORMATION (ORDOVICIAN-SILURIAN): AN OVERVIEW FOR UNCONVENTIONAL "TIGHT-GAS" FORMATION IN SAUDI ARABIA

A. Umran Dogan and Abdulaziz Quwazani

119. GEOLOGICAL MODELING FROM PRESSURE COMPUTATION: ALT IN "HORNBLLENDE" CRYSTAL STRUCTURE

Meral Dogan and A. Umran Dogan

120. ASSESSING IMPACT OF WIND STEP (STEM TALENT EXPANSION PROGRAM) ON MIDDLE SCHOOL STUDENTS ATTITUDES AND BELIEFS TOWARDS STEM

Mary Nyaema, Tracy Peterson and Jessica Rodriguez

121. MODERN CATENAS OF NORTH-CENTRAL IOWA: EPIPEDON THICKNESS AND GEOMETRIC MEAN PARTICLE SIZE DISTRIBUTION

Jennifer Richter and C. Lee Burras

Iowa Science Teaching Section

126. SOIL SCIENCE AND CONSERVATION CONTINUING EDUCATION

Heidi Dittmer, Thomas Paulsen, Richard Cruse and C. Lee Burras

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

Organismal Biology Section

127. PHYSIOLOGICAL STRESS RESPONSE IN THE COMMON GARTER SNAKE, *THAMNOPHIS SIRTALIS*^{ISF}
Caitlyn Corwin, Eric Gangloff and Anne Bronikowski

Physics, Atmospheric & Space Sciences Section

130. MEASURING MASS TRANSFER EVENTS IN CONTACT BINARY STARS USING ECLIPSE TIMING OBSERVATIONS

Wyatt Bettis and Mary Feng

131. OBSERVING CHANGES IN THE ORBITAL PERIOD OF W URSAE MAJORIS VIA EXAMINATION OF ITS LIGHT CURVE

Wyatt Bettis and Mary Feng

132. PROBING THE MAGNETIC FIELD WITHIN THE SHELL OF THE ROSETTE NEBULA STELLAR BUBBLE
Allison Costa and Steven Spangler

133. NEAR-EARTH OBJECT CONFIRMATION

Sophie Deam and Tyler Stercula

134. THE VAN ALLEN TEACHING OBSERVATORY

Dominic Ludovici and Robert Mutel

135. VAN ALLEN OBSERVATORY DIGITAL FIBER-FED SPECTROMETER IMPLEMENTATION

Erin Maier and Bryan Prather-Huff

136. THE MASS RATIO IN THE ECLIPSING BINARY STELLAR SYSTEM 68-HERCULIS DEDUCED FROM DOPPLER-SHIFTS IN ITS SPECTRUM

Kenneth McLaughlin and Janak Panthi

137. MEASURING THE DISTRIBUTION OF IONIZED GAS AROUND YOUNG STAR CLUSTERS (HII REGIONS)

Joseph Sink, Allison Costa and Steven Spangler

Physiology & Health Sciences Section

142. THE EFFECT OF ARONIA BERRIES ON MICROBIAL GROWTH^{BBB}

Megan Carlson, Shelby Ewalt, Stephanie Long and Dobrusia Bialonska

143. OFF-SEASON LAZINESS? PULMONARY FUNCTION IN OFF-SEASON AND ON-SEASON ATHLETES^{BBB}

Megan Carlson, Meg Wilson, Sarah Sorenson and Aaron Bunker

144. THE EFFECT OF COMBINATION THERAPY OF B VITAMINS AND ANTIOXIDANTS ON MEMORY AND LEARNING

Austin Chinn and Brenda Peters

145. THERMAL CHARACTERIZATION OF BLENDS OF MONOGLYCERIDES FOR TRIGGERABLE LOCAL DRUG DELIVERY SYSTEMS^{ISGC}

Midhad Mrvoljak and Abebe Mengesha

146. EFFECTS OF IN-UTERO FLUOXETINE EXPOSURE ON BRAIN DEVELOPMENT

Tasha Nelson and Kristy McClellan

POSTER SESSION

Friday, 4:30 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

147. EFFECTS OF IN-UTERO FLUOXETINE EXPOSURE ON BRAIN DEVELOPMENT

Tasha Nelson and Kristy McClellan

148. EFFECTS OF CAFFEINE SUPPLEMENTS ON RESISTANCE EXERCISE PERFORMANCE ON MALE ATHLETES

Rachel Ricke, Justin Trier, Raquel Relph and Kelsey Price

149. CENTRAL SYMPATHOINHIBITION ABROGATES ANGIOTENSIN II-INDUCED AUTONOMIC DYSREGULATION, HYPERTENSION AND BLOOD PRESSURE VARIABILITY IN CONTROL AND METHIONINE SULFOXIDE REDUCTASE-A DEFICIENT MICE

Rasna Sabharwal, Francois Abboud and Mark Chapleau

150. THE EFFECTS OF FOOTWEAR ON FORCE PRODUCTION DURING BARBELL BACK SQUATS^{ISF}

Thomas Schermoly, Ian Hough and David Senchina

151. LYSOPHOSPHATIDIC ACID SIGNALING PHOSPHORYLATES MULTIPLE LOCATIONS ON THE $\text{Na}^+\text{-H}^+$ EXCHANGER ISOFORM 1 TO STIMULATE CELL GROWTH AND MIGRATION^{BBB}

Whitney Swanson and Mark Wallert

152. TMEM16B IS A DOMINANT COMPONENT OF THE CHOLECYSTOKININ-ACTIVATED Cl^- CONDUCTANCE IN VAGAL AFFERENTS THAT IS DOWN-REGULATED IN MICE ON HIGH FAT DIET

Runping Wang, Yongjun Lu, Michael Cicha, Kamal Rahmouni, Mark Chapleau, Christopher J. Benson and François M. Abboud

153. FOOT TEMPERATURE DURING THIRTY MINUTES OF TREADMILL RUNNING IN RUNNING SHOES WITH MESH VERSUS VINYL UPPERS^{ISF}

Allison White, Haley Hicks, Melissa Parks and David Senchina

SOCIAL HOUR

Friday, 4:45 p.m., Iowa Memorial Union, Main Lounge, Refreshments in the North/South Foyer

Join colleagues and friends
for refreshments and conversation
during our annual social hour.

Be sure to visit the Senior Poster Presentations.



PRESIDENT'S BANQUET

Friday, 6:00 p.m., Iowa Memorial Union, Main Lounge

President Nadine Weirather Presiding Program

Welcome and Introductions, Craig Johnson, Executive Director

Executive Director Remarks

President's Address by Nadine Weirather

Distinguished Awards Presentations

Presentation of Incoming President's Gavel by Nadine Weirather

Incoming President's Address by Carol Schutte

Closing Remarks

IAS Corporate Members



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DISTINGUISHED AWARDS

2015 Distinguished Awards



Harry T. (Jack) Horner
Iowa State University
Distinguished Iowa Scientist



Gene Lucas
Drake University—Retired
Distinguished Service

About the Iowa Academy of Science Distinguished Awards

The contributions of Iowa's Scientific Community have transformed our world view, protected our natural heritage and fostered succeeding generations of eager science researchers. In recognition of the best contributions of Iowans to science research, science education, and service to science, the Iowa Academy of Sci-

GENERAL SESSION II

Friday, 7:45 p.m., Iowa Memorial Union, Main Lounge



The Internet, Past Present, and Future

Daniel Reed, Ph.D.

Vice President for Research & Economic Development

The University of Iowa

Daniel A. Reed is Vice President for Research and Economic Development, as well as University Chair in Computational Science and Bioinformatics and Professor of Computer Science, Electrical and Computer Engineering and Medicine, at the University of Iowa. Previously, he was Microsoft's Corporate Vice President for Technology Policy and Extreme Computing, where he helped shape Microsoft's long-term vision for technology innovations in cloud computing and the company's associated policy engagement with governments and institutions around the world.

Before joining Microsoft, he was the Chancellor's Eminent Professor at UNC Chapel Hill, as well as the Director of the Renaissance Computing Institute (RENCI) and the Chancellor's Senior Advisor for Strategy and Innovation for UNC Chapel Hill. Prior to that, he was Gutgsell Professor and Head of the Department of Computer Science at the University of Illinois at Urbana-Champaign (UIUC) and Director of the National Center for Supercomputing Applications (NCSA). He was also one of the principal investigators and chief architect for the NSF TeraGrid. He received his PhD in computer science in 1983 from Purdue University. Dr. Reed served as a member of the President's Council of Advisors on Science and Technology (PCAST) and the President's Information Technology Advisory Committee (PITAC).

GENERAL SESSION III

Saturday, 11:00 a.m., Iowa Memorial Union, 2nd Floor Ballroom



Wind Energy, Past, Present, and Future

P. Barry Butler, Ph.D.

Executive Vice President and Provost

The University of Iowa

Wind energy is a growing component of America's energy portfolio. In 2012, investments in new wind power generation exceeded \$25 Billion, making the U.S. the second largest global market. Iowa is at the heart of the nation's wind resource and the gateway to satisfying demand for renewable energy.

Butler serves Executive Vice President and Provost of The University of Iowa. Prior to his appointment, Butler was dean of the UI College of Engineering, where he holds the rank of full professor in the Department of Mechanical and Industrial Engineering. He earned his bachelor's and master's degrees in aeronautical engineering from the University of Illinois at Urbana-Champaign in 1979 and 1981, respectively. He received his Ph.D. in mechanical engineering in 1984, also from the University of Illinois at Urbana-Champaign. He currently co-chairs the American Wind Energy Association's Research and Development Committee, and is a member of the U.S. Department of Energy's advisory group to develop a renewed U.S. wind strategic vision.

SATURDAY—SECTION MEETINGS

Saturday, See individual sections for room and schedule.

All section meetings will be held on the third floor of the Iowa Memorial Union. Stop at the Registration Desk for directions to the elevators and stairs. Refreshments on Saturday will be stationed on the third floor.

Anthropology Section

8:30-10:30, Iowa Memorial Union, Room 343—Ohio State

- 8:40 THE HOOK MOUND GROUP LOST AND FOUND
Michael Perry
- 9:00 A PRELIMINARY ANALYSIS OF FAUNAL REMAINS RECOVERED FROM THE MIDDLE TO LATE WOODLAND BRUGGEMAN CAVE SITE IN JONES COUNTY IOWA
Virginia C Brust, Nicolas R. Wilson, Anna J. Waterman, Colton G. Bulicek, Miles J. Meyers and Bryan S. Kendall
- 9:20 Discussion of Poster Presentations
- 9:40 Section Business Meeting— Please report election of new officers to the Registration Desk before leaving the conference.

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Cellular, Molecular & Microbiology Section

8:20-3:30, Iowa Memorial Union, Room 348—Illinois

- 8:20 THE EFFECT OF SPLENDA CONTAINING SUCRALOSE ON THE HUMORAL IMMUNE RESPONSE IN MUS MUSCULUS^{BBB}
Amy Zawacki
- 8:40 A GENETIC ANALYSIS OF THE ROLE OF YEDR IN *ESCHERICHIA COLI* CELL DIVISION
David Stanek, Ryan Bezy and David Weiss
- 9:00 CAN HONEY BE USED TO COMBAT TOMATO AND PEPPER PATHOGENIC BACTERIUM XANTHOMONAS CAMPESTRIS PV. VESICATORIA?^{BBB}
Brandon Ruddell
- 9:20 BREAK
- 9:40 IDENTIFYING POSSIBLE IRON-DEPENDENT ENZYMES THAT POSITIVELY REGULATE CANONICAL WNT SIGNALING
Kaylee Vitale, Karissa Vilks, Gary Coombs, Bryan Phillips, Amy Clemons, Ivana Mihalek, Dawn Quelle and Jacqueline Reilly
- 10:00 EFFECTS OF ESCORT[®] XP ON *MYXOCOCCUS XANTHUS* MOTILITY AND PREDATION
Kristin Thatcher, Ariel Dickerson and Mary Shawgo
- 10:20 Section Business Meeting—Please report election of new officers to the Registration Desk before leaving the conference.
- 10:40 Break for General Session III
- 11:00 General Session III
- 12:00 ESTA Luncheon—Ticket required
- 1:10 THE PHOSPHORYLATION OF NA⁺-H⁺ EXCHANGER ISOFORM 1 INITIATED BY THE PLATELET DERIVED GROWTH FACTOR RECEPTOR REGULATES CELL GROWTH AND MOVEMENT^{BBB}
Molly Strong and Mark Wallert
- 1:30 THE EFFECTS OF SPLENDA, CONTAINING SUCRALOSE, ON INTERLEUKIN-2 AND TUMOR NECROSIS FACTOR- α production by splenocytes from *Mus musculus*^{BBB}
Jacquelyn Bongard
- 1:50 SELECTIVE PATHWAYS OF INNATE IMMUNE RESPONSES OF HEART AND KIDNEY DURING ANGIOTENSIN II HYPERTENSION
Madhu Singh, Michael Cicha, Mark Chapleau and Francois Abboud
- 2:10 BREAK
- 2:30 BACTERIA AND FUNGI IN HOUSE ROOM AIR - SAVING STUDENT LABORATORY DATA FOR EVALUATION AT MULTIPLE LEVELS
Gary Fulton
- 2:50 BORIC ACID PREVENTS THE GENOTOXIC STRESS RESPONSE OF HISTONE ACETYL TRANSFERASE RTT109 IN *CANDIDA ALBICANS*
Benjamin Pointer, Michael Boyer and Martin Schmidt
- 3:10 AUTOPHAGY IN HERPES SIMPLEX VIRUS 1 INFECTED HEP-2 AND HTERT-HME-1 CELLS
Felisha Montero-Watson, Prajakta Pradhan and Marie Nguyen

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Chemistry Section

8:40-2:10, Iowa Memorial Union, Room 351—Michigan

- 8:40 SEA SPRAY AEROSOL: DEFINING THE SELECTIVITY AND PARTITIONING OF ORGANIC MOLECULES
Richard Cochran, Thilina Jayarathne, Olga Laskina, Jon Trueblood, Holly Morris, Alexei Tivanski, Elizabeth Stone and Vicki Grassian
- 9:00 USING QUANTUM CHEMISTRY TO EXPLORE SHAPE EFFECTS ON REACTIVITY IN GEOCHEMICAL MODELS
Katie W. Corum and Sara E. Mason
- 9:20 BREAK
- 9:40 BIOLOGICAL AND ENVIRONMENTAL MEDIA CONTROL OXIDE NANOPARTICLE SURFACE COMPOSITION: THE ROLES OF BIOLOGICAL COMPONENTS (PROTEINS, PEPTIDES AND AMINO ACIDS), INORGANIC OXYANIONS AND HUMIC ACID
Imali Mudunkotuwa and Vicki Grassian
- 10:00 PATTERN RECOGNITION OF GAMMA-RAY EMITTING RADIOISOTOPES
Brian Dess and Gary Small
- 10:20 Section Business Meeting—Please report election of new officers to the Registration Desk before leaving the conference.
- 10:40 Break for General Session III
- 11:00 General Session III
- 12:00 ESTA Luncheon—Ticket required
- 1:10 FUNDAMENTAL INSIGHTS ABOUT GEOCHEMICAL MODEL SYSTEMS FROM DENSITY FUNCTIONAL THEORY CALCULATIONS
Sara Mason, Katie Corum, Xu Huang and Sai Kumar Ramadugy
- 1:30 COMPARATIVE INHIBITION OF DEODORANT COMPOUNDS AS ANTIMICROBIAL AGENTS
Sandra Valverde Mateo, Erik Olson and Rebecca Schmidt
- 1:50 SYNTHESIS OF CUMENE HYDROPEROXIDE MICROCAPSULES AND AN ANALYSIS OF THEIR STORAGE PROPERTIES
Lynsay Haverland and Brian McFarland

Community College Biologists

1:15-4:00, Iowa Memorial Union, Room 349—Michigan State

- 10:40 Section Business Meeting
- 11:00 General Session III
- 12:00 ESTA Luncheon—Ticket required

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Ecology & Conservation Section

8:20-3:50, Iowa Memorial Union, Room 335—Nebraska

- 8:20 PUTTING ALL THEIR EGGS IN ONE BASKET? *DROSOPHILA MELANOGASTER* LAY MOST BUT NOT ALL OF THEIR EGGS IN AGGREGATIONS^{ISF}
Andrea Bixler and Fred Schnee
- 8:40 OVIPOSITION SITE PREFERENCE OF *DROSOPHILA MELANOGASTER*: INFLUENCES OF REARING CONDITIONS AND FOOD TOXICITY
Mike Dietzel, Fred Schnee and Andrea Bixler
- 9:00 OVIPOSITION SITE PREFERENCE IN *DROSOPHILA MELANOGASTER*: INFLUENCES OF ADULT FLY DENSITY AND FOOD QUALITY^{ISF}
Stephanie Ihde, Andrea Bixler and Fred Schnee
- 9:20 BREAK
- 9:40 MACROINVERTEBRATE BACTERIAL RESISTANCE TO TRICLOSAN AT THE OUTLET CREEK (IA) WWTP OUTFALL AND POTENTIAL FOR DOWNSTREAM RESISTANCE MIGRATION
Ethan Wilson
- 10:00 EFFECTS OF ALLELOCHEMICALS FROM GARLIC MUSTARD (*ALLIARIA PETIOLATA*) ON RHIZOBIUM LEGUMINOSARUM
Veronica Andraski and Aditi Sinha
- 10:20 Section Business Meeting—Please report election of new officers to the Registration Desk before leaving the conference.
- 10:40 Break for General Session III
- 11:00 General Session III
- 12:00 ESTA Luncheon—Ticket required
- 1:10 USING PLASMA SEX STEROIDS TO DETERMINE REPRODUCTIVE STATUS OF PADDLEFISH IN THE UPPER MISSISSIPPI^{BBB}
Madelyn Stiehl and Joshua Lallaman
- 1:30 VASCULAR PLANT DIVERSITY IN WOODLAND SEEPS OF WINNESHIEK COUNTY^{BBB&ISF}
Anna Burke and Beth Lynch
- 1:50 SEASONAL CHANGES IN POLLINATOR FLORAL RESOURCE AVAILABILITY IN FOUR TYPES OF GRASSLANDS^{ISF}
John Delaney, Karin Grimlund and Diane Debinski
- 2:10 CONSERVATION ASSESSMENT OF MANIKOWSKI PRAIRIE, CLINTON COUNTY, IOWA
Wayne Schennum and John Pearson
- 2:30 BREAK (presentations continue on next page)

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Ecology & Conservation Section continued...

8:20-3:50, Iowa Memorial Union, Room 335—Nebraska

- 2:50 QUANTITATIVE EFFECTS OF GOAT BROWSING AND TREE CUTTING ON VEGETATION IN A SAVANNA RESTORATION
Thomas Rosburg
- 3:10 EASTERN TIGER SALAMANDER (*AMBYSTOMA TIGRINUM*) OCCUPANCY AND DISTRIBUTION WITHIN RESTORED WETLANDS OF WINNEBAGO COUNTY, IOWA
Alyse DeVries and Paul Bartelt
- 3:30 WOLVES IN IOWA
Ron DeArmond

Engineering Section

1:10-3:50, Iowa Memorial Union, Room 341—Purdue

- 1:10 NONDESTRUCTIVE EVALUATION OF MICROCRACKING IN FIBER-REINFORCED EPOXY SYSTEMS DUE TO AGING^{ISGC}
Brian M. Fuchs, Connor S. Daily and Nicola Bowler
- 1:30 HETEROGENEOUS ELASTIC PROPERTIES OF ASCENDING THORACIC ANEURYSMS
Yuanming Luo
- 1:50 SCALABLE COMMUNITY DETECTION FOR LARGE DATA
Rahil Sharma and Suely Oliveira
- 2:10 Section Business Meeting—Please report election of new officers to the Registration Desk before leaving the conference.
- 2:30 BREAK
- 2:50 EXPERIMENTAL STUDY OF COMBUSTION OF POLYMER ADDED N-DECANE AND N-DODECANE DROPLETS
Mohsen Ghamari and Albert Ratner
- 3:10 PARAMETRIC STUDY OF BIOMASS GASIFICATION IN A PILOT-SCALE GASIFIER
Yunye Shi, Tejasvi Sharma and Albert Ratner
- 3:30 PROPER ORTHOGONAL DECOMPOSITION ANALYSIS OF THERMOACOUSTIC INSTABILITY
Jianan Zhang and Albert Ratner

Environmental Science & Health Section

8:20-10:40, Iowa Memorial Union, Room 346—Indiana

- 8:20 TOWARDS AN INTEGRATED FLOOD PREPAREDNESS IN IOWA USING CYBERINFRASTRUCTURE
Ibrahim Demir and Witold Krajewski
- 8:40 EFFECTS OF ATRAZINE METABOLITES, DEA AND DIA, ON HUMAN LIVER CELLS
Brittnie Dotson and Kavita Dhanwada

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Environmental Science & Health Section continued...

8:20-10:40, Iowa Memorial Union, Room 346—Indiana

- 9:00 IMPACT OF SPRING RAIN ON BIOAEROSOLS IN IOWA
Chathurika M. Rathnayake, Josh Kettler, Thilina Jayarathne and Elizabeth A. Stone
- 9:20 Break
- 9:40 Section Business Meeting

- 10:40 Break for General Session III
- 11:00 General Session III
- 12:00 ESTA Luncheon—Ticket required

Geology Section

9:40 –10:40, Iowa Memorial Union, Room 347— Minnesota

- 8:20 SEDIMENTOLOGY AND PROVENANCE OF MIDDLE-LATE PENNSYLVANIAN STRATA FROM THE
APPALACHIAN FORELAND BASIN IN WESTERN MARYLAND
Daniel Alberts and Dr. Emily Finzel
- 8:40 THE AVVOLTOIO PALEOSOL, WESTERN SICILY - USING SOIL AS A KEY TO THE PAST
Chad Heinzl and Riley Mullins
- 9:00 APPLYING GEOLOGY EASTERN IOWA'S ARCHAEOLOGICAL RECORD
Caitlin Kelly and Chad Heinzl
- 9:20 BREAK
- 9:40 HEAVY METAL CONCENTRATIONS IN THE NORTHWEST IOWA DRIFT PLAIN
Joe Reinders and Chad Heinzl
- 10:00 SUITABILITY OF SAND USED FOR HYDRAULIC FRACTURING (FRAC SAND) FROM THE ST. PETER
FORMATION, WINNESHIEK COUNTY, IA
Elaine Jordan and Dr. Emily Finzel
- 10:20 Section Business Meeting
- 10:40 Travel to General Session III
- 11:00 General Session III
- 12:00 ESTA Luncheon—Ticket required

Iowa Science Teaching Section

8:40-3:30, Iowa Memorial Union, Room 349—Wisconsin
NO PRESENTATIONS

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Organismal Biology Section

9:40-10:40 Iowa Memorial Union, Room 341—Purdue

- 9:40 THE EFFECT OF DIET ON THE CUTICULAR HYDROCARBON SIGNATURE AND BEHAVIOR OF *FORMICA OBSCURIPES*^{BBB}
Aleah Bingham
- 10:00 UNDERSTANDING LAND USE EFFECTS ON BEHAVIOR AND PHYSIOLOGY IN THE COMMON GARTER SNAKE (*THAMNOPHIS SIRTALIS*)
Eric Gangloff, Caitlyn Corwin, Alexander Wendt and Anne Bronikowski
- 10:20 Section Business Meeting
- 10:40 Travel to General Session III

Physics, Atmospheric & Space Science Section

8:40-10:40, Iowa Memorial Union, Room 345—Northwestern

- 8:20 FARADAY ROTATION AS A PROBE OF CORONAL MASS EJECTIONS
Jason Kooi, Patrick Fischer, Jacob Buffo and Steven Spangler
- 8:40 THE UNUSUAL GALACTIC CENTER RADIO SOURCE N3
Dominic Ludovici and Cornelia Lang
- 9:00 BREAK
- 9:20 SEMI-REGULAR VARIABLE STAR POPULATION AND EVOLUTION STUDIES
Jeff Wilkerson and David Pfotenhauer
- 9:40 DETECTOR R&D FOR CMS PHASE II UPGRADE
Emrah Tiras
- 10:00 Section Business Meeting
- 10:40 Travel to General Session III
- 11:00 General Session III
- 12:00 ESTA Luncheon—Ticket required

Physiology & Health Science Section

10:20-10:40, Iowa Memorial Union, Room 337—Penn State

- 8:20 UNDERSTANDING THE EPIGENETIC EFFECTS OF SMOKING THROUGH PROTEIN-PROTEIN INTERACTION NETWORK ANALYSIS
Meeshanthini Dogan and Robert A. Philibert

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Physiology & Health Science Section continued...

- 8:40 DECREASED SERUM LEPTIN LEVELS IN MICE EXPOSURE TO ATRAZINE *IN UTERO*^{βββ}
Mary Moats-Biechler
- 9:00 SERUM CORTICOSTERONE LEVELS AND THE METHYLATION OF THE GLUCOCORTICOID RECEPTOR GENE IN THE HIPPOCAMPUS OF *MUS MUSCULUS* EXPOSED IN UTERO TO ATRAZINE^{βββ}
Katherine Stolz
- 9:20 BREAK
- 9:40 LOW SERUM CONDITIONS CHANGE CALCINEURIN B HOMOLOGOUS PROTEIN ISOFORMS 2 EXPRESSION AND FUNCTION IN NON-SMALL CELL LUNG CANCER CELLS^{βββ}
Clarice Wallert and Mark Wallert
- 10:00 THE IMPACT OF SUCRALOSE CONSUMPTION ON SPATIAL MEMORY IN *MUS MUSCULUS*^{βββ}
Daniel Carroll
Saint Mary's University of Minnesota
- 10:20 Section Business Meeting
- 11:00 General Session III

ESTA AWARDS LUNCHEON

Saturday, Noon, Iowa Memorial Union, 2nd Floor Ballroom



DeEtta Anderson
**General/Multiple
Science**
Center Point Urbana
High School
Center Point



Kathryn E. Borton
**Middle/Junior
High Science**
Nevada Middle
School
Nevada



Maureen Griffin
**Science
Supervisory**
Hoover High School
Des Moines



Collin Reichert
Physical Science
Ames Middle School
Ames



Thad Sheldon
Life Science
City High School
Iowa City

The Iowa Academy of Science Excellence in Science Teaching Awards were founded in 1969. Outstanding teachers of all grade levels and areas of science are recognized for their work and innovations in science education. ESTA winners demonstrate through knowledge and practice the characteristics of an exemplary educator.

ABSTRACTS BY SECTION

Abstracts are listed by section with posters listed first and oral presentations listed second. Oral presentation abstracts are listed in the order of presentation.

Abstracts submitted by Tri-Beta members are labeled with a ^{BBB} symbol at the end of the abstract title. Abstracts submitted for a project which was funded in part by the Iowa Science Foundation are labeled with an ^{ISF} at the end of the abstract title. Abstracts supported by the Iowa Space Grant Consortium are labeled with an ^{ISGC} at the end of the abstract title.

A nthropology Section Poster Presentations

1. FEELING HANDY? AN EXAMINATION OF HANDEDNESS BASED UPON LITHIC ANALYSIS IN RELATION TO SITE 13ML139

Zachary Altman
Cornell College

In the past there have been attempts to examine handedness in our ancestral population through the analysis of lithic cores and the flakes associated with them. However, these attempts all deal with flakes of a certain type and only reveal information about the creators of flakes. This presentation presents a possible method of determining handedness based upon the location of scarring and polish on utilized flakes. If proven, this method would then reveal information about the handedness of those using a flake rather than those making the flakes. This is then all tied into the examination of site 13ML139 as a way of demonstrating the possible applications of this method as well as the ease with which it could be used through the flow charts within the presentation itself.

2. ARCHAEOLOGY IN IOWA'S PRAIRIE LAKES REGION: 13DK96

Maureen Lonergan¹, Jordan Bennett¹, John Doershuk²
University of Iowa¹, Office of the State Archaeologist²

Preliminary results are presented of a field school excavation of a Middle/Late Woodland prehistoric archaeological site (13DK96) in the Prairie Lakes region of northwest Iowa. Data from lithic, botanical, zooarchaeological, and ceramic artifacts

were collected and analyzed. Extended analyses of the zooarchaeological and ceramic artifacts further situate the site regionally both culturally and temporally. We discuss how the zooarchaeological and ceramic artifacts document the site inhabitants' economic strategies regarding diet choice and other kinds of subsistence behaviors during a period of regional experimentation with incipient horticulture.

A nthropology Section Oral Presentations

3. THE HOOK MOUND GROUP LOST AND FOUND

Michael Perry
University of Iowa

The Hook Mound Group, a large group of prehistoric burial mounds in Louisa County, Iowa, was visited and mapped by Charles Keyes and Ellison Orr in the 1920s and 1930s. Later researchers investigating the site area recovered artifacts but found no mounds at the mapped location, apparently due to destruction by farming activities. The most recent mapping work at the site reflected the absence of mounds. Work to bring the historical mapping into the modern site records using GIS has clarified the site's location and extent. The recovered artifacts also were analyzed, clarifying the site's temporal position.

4. A PRELIMINARY ANALYSIS OF FAUNAL REMAINS RECOVERED FROM THE MIDDLE TO LATE WOODLAND BRUGGEMAN CAVE SITE IN JONES COUNTY IOWA

Virginia C. Brust¹, Nicolas R. Wilson¹, Anna J. Waterman¹, Colton G. Bulicek¹, Miles J. Meyers¹ and Bryan S. Kendall²
Mount Mercy University¹ and University of Iowa²

In this research faunal remains recovered from the late prehistoric Bruggeman Cave site in Jones County, Iowa were analyzed in order to understand more about hunting strategies and dietary practices during this time. Based upon recovered material culture, the Bruggeman Cave site (site number 13JN12) dates minimally to the Middle to Late Woodland period (1-1000 CE). Excavations aimed at salvaging artifacts and restoring the cave surface were undertaken in the summer of 2013 under the di-

rection of Bryan Kendall of the University of Iowa Office of the State Archaeologist. The archaeological deposits at the Bruggeman Cave site had been disturbed in the past by artifact collectors, however during these incidents it appears that stone tools rather than bones were removed. Thus, we expect the faunal remains to be representative of the original deposits. The faunal remains recovered from the site were highly fragmented, making identification beyond fauna type and size class impossible for the majority of small bone fragments. For the larger skeletal portions and whole bones that were recovered and analyzed, most were identified as deer. The bone of rabbits, raccoon and rodents were also frequently found in the assemblage. Although the remains of shellfish are common in this assemblage, fish bones or other evidence of riverine resources are rare. Thus, it appears that this cave was primarily used as a location to process and consume large terrestrial mammals.

Cellular, Molecular & Microbiology Poster Presentations

5. POLYMORPHISM OF TYPE 2 DEIODINASE GENE (DIO2) AND THE PROPENSITY TO DEVELOP TYPE 2 DIABETES IN HUMANS

Sydney Althoff, Vanessa Carlson and Rasika G. Mudalige-Jayawickrama
University of Dubuque

Type 2 Diabetes mellitus is a chronic disease associated with a varying degree of insulin insufficiency or insulin resistance. Insufficient amounts of thyroxine, a major hormone involved in energy metabolism and blood glucose regulation, is also associated with type 2 diabetes. Type 2 deiodinase (DIO2) converts the pre active thyroxine to the active triiodothyronine form. A single-nucleotide polymorphism that changes the 92nd amino acid from Threonine to Alanine (Thr92Ala) was shown to be associated with 20% lower glucose disposal rate in various human tissues (Mentuccia et al., 2002). A second gene involved in lipid and energy metabolism, β -3-adrenergic receptor (ADRB3), was suggested to have a synergistic effect with Thr92Ala variant of DIO2. Our objective is to ascertain whether the Thr92Ala of deiodinase and Trp64Arg variant in β -3-adrenergic receptor predispose a person even more towards type 2 diabetes. We have used an Isohelix DNA extraction kit to isolate DNA from buccal swabs. Purified genomic DNA was used to isolate a fragment of the DIO2 gene via Polymerase Chain Reaction (PCR) as described by Mentuccia et al., 2002. The resultant PCR fragment was digested with BsrGI to identify

the presence of the Thr92Ala variant. Results were tallied with the Trp64Arg variant of the ADRB3 gene. We will present pedigree analysis results to show whether double polymorphism synergistically predisposes a subject towards type 2 diabetes.

6. EFFECTS OF LEUCINE METABOLISM ON LYMPHOCYTE ACTIVATION AND CANCER GROWTH: A POTENTIAL TARGET FOR NUTRITIONAL IMMUNOTHERAPY IN CANCER

Elitsa Ananieva¹, Josh Bostic², Jonathan Powell³, Chirag Patel³ and Susan Hutson²

Des Moines University¹, Human Nutrition, Foods and Exercise, Virginia Tech², School of Medicine, Johns Hopkins University³

Cancer and immune cells use glycolysis to maintain high levels of glycolytic intermediates to support their increased biosynthetic demands. The mammalian target of rapamycin (mTOR), a primary regulator of cell growth, increases glycolysis in both cancer and immune cells. The branched-chain amino acid leucine is a nutrient activator of the mTOR pathway. Intracellular leucine concentrations are regulated by the branched-chain aminotransferase (BCAT) isoenzymes, BCATc and BCATm. By using immune cells (T cells) from global knockout BCATc and BCATm mice as well as mouse lymphoma cells treated with leucine, we explored the role of leucine and leucine metabolism in regulating glycolysis. Our results showed that loss of BCATc and BCATm expression in T cells lead to increased glycolysis and upregulation of the mTOR pathway as seen by increased phosphorylation of mTORC1 downstream target proteins, S6 and 4EBP-1. Lymphoma cells treated with leucine also showed increased glycolysis and mTOR. Our results suggest that BCATc and BCATm enzymes affect glycolysis by down-regulating the mTOR pathway likely by modulating intracellular leucine concentration. Leucine activation of mTOR stimulates glycolysis, possibly triggering T cell activation or cancer cell proliferation. Understanding the role of leucine metabolism in immunity and cancer will provide new strategies for nutritional cancer immunotherapy.

7. SYNTHESIS OF RECOMBINANT HCMV PROTEINS^{BBB&ISGC}

Margaret Armstrong, Brian Gentry and Marc Busch
Drake University

Human cytomegalovirus (HCMV) infects 40 to 80 percent of the global human population. Drug resistance is reducing effectiveness of current treatments, making identification of novel compounds with fewer adverse effects and new mechanisms of action important. Previous studies have found that specific mutations within the open reading frames of UL56 and UL89 result in resistance to potential anti-HCMV compounds, suggesting that these genes are the targets of these drugs. However, the

mechanism of action for these drugs has not been identified. The objective of this project is to generate recombinant UL56, UL89 and UL104 proteins to determine the mechanism of action of these potential compounds. The recombinant HCMV proteins are being generated in both mammalian and insect cells. In the mammalian system, individual expression plasmids have been generated for each gene, with a C-terminal fusion to either GFP or mCherry. These fluorescently labeled proteins will be used to observe and verify the expression and localization of individual and combinations of proteins in transfected mammalian cells. In addition, plasmids have been generated for the production of recombinant baculoviruses, which can then be utilized to produce large quantities of purified recombinant protein for development of in vitro assays.

8. RETINAL CIRCUITRY UNDERLYING NAVIGATION IN NEWLY HATCHED FRESHWATER TURTLES^{PPP}

Stuart Behling, Charlie Heller, Steve Freedberg and Jay Demas
St. Olaf College

In freshwater turtles the navigation of hatchlings towards water is crucial to survival. If hatchlings take too long to get from their nest to a body of water they are likely to die from predation or desiccation. Previous studies have shown that snapping turtles primarily use light cues in order to orient towards the water upon hatching. The retinal substrate for this phototactic behavior is not well understood. However, in newborn mice, which lack functional rods and cones, phototactic behavior is mediated by intrinsically photosensitive retinal ganglion cells (ipRGCs). These findings raise two questions: are ipRGCs present in the retinas of turtles? If so, do ipRGCs mediate hatchling navigation? Using a multi-electrode array and pharmacology we performed extracellular recordings to confirm the existence of ipRGCs. We also performed PCR and immunostaining for melanopsin, the photopigment in mammalian ipRGCs. Our results suggest that the common snapping turtle has ipRGCs similar to those found in mice. In addition, we were able to show strong phototactic behavior of hatchling snapping turtles in a laboratory setting. In the future, we will be able to combine this behavioral assay with pharmacology in order to test whether ipRGCs can drive phototaxis independently of rod and cone mediated signals.

9. FINDING AN EFFECTIVE METHOD FOR ENUMERATING BACTERIA IN THE ORAL CAVITIES OF CANIS LUPUS FAMILIARIS

Brian T. Bristow and Jordain A. Croker
Iowa Lakes Community College

Over the past several years the microbiology classes at Iowa Lakes Community College, Estherville Campus, have been enumerating bacteria collected from the oral cavities of both Canis lupus familiaris and Homo sapien subjects to answer some

of life's deeper questions such as "Is a dogs mouth cleaner than a humans?", or "Do those expensive dog treats that claim to reduce odor causing bacteria actually work?" In these studies, simple oral swabs were used to inoculate and start an immediate serial dilutions to get an accurate estimate of the bacterial load within the subjects oral cavity. During these studies, sample consistency from an individual subject varied greatly depending upon several factors, but especially when sampling was attempted on adolescent Canis subjects. Generally, the older calmer dogs and the humans cooperated with the technician collecting the sample so sample variability was lower, however when attempting to sample puppies and young dogs, sampling consistency was so variable that we devised an alternative sampling technique that although results are very preliminary and testing is continuing as this abstract has been prepared, our technique provides a more consistent number of bacteria when taking repeated samples from an individual subject than standard swabs.

10. RELATIONSHIPS BETWEEN THE POLYMORPHISMS OF BETA-3 ADRENERGIC RECEPTOR GENE AND THE DEVELOPMENT OF TYPE 2 DIABETES MELLITUS

Vanessa Carlson, Sydney Althoff and Rasika Mudalige-Jayawickrama
University of Dubuque

Impaired energy metabolism and thermogenesis, and visceral fat deposition are key factors in the development of obesity and type 2 diabetes mellitus (DM). One of the most important genes involved in lipid metabolism and thermogenesis is the beta 3-adrenergic receptor gene (ADRB3). A single nucleotide polymorphism that changes the 64th amino acid of the ADRB3 protein from tryptophan to arginine (Trp64Arg) has been associated with increased risk of type 2 diabetes (Widen et al., 1995) due to impaired energy metabolism. The objective of this study is to find whether there is any relationship between the distribution of the Trp64Arg polymorphism of ADRB3 and the occurrence of DM in a random sample of the Iowa population. We isolated human DNA from buccal swabs using an Isohelix DNA extraction kit. Samples from 18 participants were subjected to amplification by PCR using the method described by Widen et al., 1995. The resultant PCR fragment was digested with BstNI to determine the presence or absence of the Trp64Arg polymorphism in the nucleotide sequence. Each sample was scored for Trp, or Arg. We also developed a pedigree for each individual and related the Trp64Arg polymorphism to the presence of type 2 DM. Our results do not indicate a strong association of type 2 DM with the Trp64Arg polymorphism. We are continuing the research to clarify phenotypes of people in one pedigree to determine whether an association exists in a single family.

11. USING COMPARATIVE GENOMICS TO CHARACTERIZE THE DIVERSITY OF *DEINOCOCCUS*

Keith Christiansen and Michael LaGier
Grand View University

Historically, studies of the *Deinococcus* genus of bacteria have focused on *Deinococcus radiodurans*. However, recent genomic sequencing of several *Deinococcus* species has presented new opportunities to better characterize similarities and differences between members of this group. In general, deinococci display tolerances to ionizing radiation and oxidative stress. Due to these tolerances, there is interest in using deinococci for bioremediation applications. In this study, 24 deinococci genomes were compared using a suite of bioinformatics tools available at IMG (Integrated Microbial Genomes, <http://img.jgi.doe.gov/>) and GENI-ACT (Genomics Education National Initiative, <http://geni-act.org/>). Differences in genomic content were identified among the compared genomes; suggesting future studies of deinococci should expand beyond the model species *D. radiodurans*. The utility of using comparative genomics to study deinococci was suggested by the identification of a gene (LuxS) known to be involved in biofilm formation among 23 of 24 genomes examined. The conservation of LuxS suggests that the ability to form biofilms may be an important feature of the genus *Deinococcus*.

12. A TOXIN-ANTITOXIN PAIR IS RESPONSIBLE FOR TYPE VI SECRETION SYSTEM MEDIATED BACTERIAL KILLING AND SELF-IMMUNITY BY *ACINETOBACTER NOSOCOMIALIS* STRAIN M2

Holly Hulsebus and Michael Carruthers
Des Moines University

Type VI secretion systems (T6SS) are a class of bacterial secretion machinery by which bacteria can inject proteins into target cells to elicit responses such as cell death. We recently demonstrated that a clinical isolate of the pathogen *Acinetobacter nosocomialis* produces a functional T6SS that is utilized to kill bacteria. Using Tn-Seq, we identified a gene cluster in the *A. nosocomialis* strain M2 genome that we hypothesize encodes a T6SS effector (Ase1) that is used to kill other bacteria and a protein (Asi1) that confers immunity from T6SS killing. Herein, we present data that suggests Ase1 is a T6SS effector that is required for strain M2 T6SS-mediated bacterial killing and that Asi1 is required to be immune to this killing. Unmarked, in-frame mutations in both *ase1* and *asi1* were generated in strain M2. This double mutant was assessed for its ability to kill *Escherichia coli* and survive co-incubation with wild-type M2. The *ase1 asi1* double mutant was unable to kill *E. coli*, indicating that either *ase1* or *asi1* is a T6SS effector. In competition with wild-type strain M2, the *ase1 asi1* mutant was out-competed, suggesting that either Ase1 or Asi1 acts as an anti-toxin, protecting cells from T6SS killing.

13. GLUTATHIONE S-TRANSFERASE EXPRESSION IN LIVERS OF IN UTERO EXPOSED *MUS MUSCULUS*^{PPP}

Brandon Larsen
Saint Mary's University of Minnesota

Atrazine (ATR) is a common herbicide used in much of the Midwest United States. This herbicide is unique in that it can remain in water sources and is not easily broken down for months to even years. The EPA has set 3 ppb as the safe concentration. Watershed monitoring has found instances in which atrazine concentrations surpass this amount. Multiple studies have shown atrazine can have an array of negative physiological effects on organisms, but few have looked at developmental effects in utero. The current study used the offspring ($n = >20$ /group) of female *Mus musculus* exposed during gestation to three different doses of atrazine. A previous study gave preliminary evidence that Glutathione S-transferase (GST), a major protein in cellular detoxification, had varying expression *in utero* in exposed mice ($n=3$ /group). Using a protein immunoblot assay, the levels of GST in liver were determined using the samples harvested from 24 to 48 hours after birth. Statistical analysis of the data indicated that there was a significant *in utero* decrease in liver GST in exposed mice at both 3 ppb and 30 ppb compared to the control (0 ppb) with $p < 0.01$. There was no significant difference when comparing 3 ppb and 30 ppb.

14. INSULIN RECEPTOR SUBSTRATE (IRS) SIGNALING PRESERVES CONTRACTILE FUNCTION AND STRUCTURE IN THE ADULT HEART

Nicholas McCarty, Christian Riehle and Dale Abel
The University of Iowa

Cardiac insulin signaling is transduced by insulin receptor substrates (IRS) 1 and 2. Previous studies have shown that mice with combined cardiomyocyte-specific deletions of IRS 1 and 2 die of early onset heart failure. To test the hypothesis that IRS proteins preserve cardiac structure and contractile function in the adult heart, we generated mice with cardiomyocyte-specific knockouts of IRS 1 and 2. Transgene induction was performed at 8 weeks of age. We observed dilated cardiomyopathy 4 weeks post-induction, with the majority of mice dying by 10 weeks. Histological analysis revealed cardiomyocyte disarray 4 weeks post induction. Western blot analysis revealed increased pro-apoptotic signaling as early as 1 week post transgene induction, when contractile function was still relatively preserved. This was further supported by qRT-PCR analysis revealing increased mRNA transcript levels of genes involved in cell death as early as 1 week post induction. These data indicate that pro-apoptotic signaling precedes heart failure. Furthermore, IRS proteins preserve contractile function and structure in the adult heart. Their absence results in increased cell death and heart failure.

15. DNA POLYMERASE INHIBITORS ENHANCE THE ANTI-VIRAL EFFECT OF TERMINASE INHIBITORS WHEN USED IN COMBINATION AGAINST HCMV^{1SGC}

Mary Shea O'Brien and Brian Gentry
Drake University College of Pharmacy

Human cytomegalovirus (HCMV) infects 80% of the world's population and can prove detrimental in immunocompromised and immunologically immature individuals. All approved pharmacotherapies – ganciclovir (GCV), valganciclovir, cidofovir (CDV), and foscarnet– inhibit the viral DNA polymerase. Due to recurrence of infection upon cessation of therapy, lifelong adherence is necessary and strains with decreased susceptibility to drug are common. Additionally, because all approved therapies share a viral target, the incidence of cross-resistance is high. The benzimidazole ribonucleosides (BDCRB) and deoxy-ribosylindole nucleosides (Indole 1896) exert their effects late in the viral replication cycle by targeting the HCMV terminase. Since these compounds exhibit a unique mechanism of action along the same pathway as current therapies, a positive pharmacodynamic drug interaction is possible. We hypothesize that the combination of DNA polymerase and terminase inhibitors will result in a synergistic anti-viral effect. Combination viral plaque reduction assays demonstrate high synergy indexes: 89.0 (GCV and BDCRB), 74.2 (GCV and Indole 1896), and 79.3 (BDCRB and CDV). The results indicate a highly synergistic relationship between the DNA polymerase and terminase inhibitors. We therefore conclude that the combination of DNA polymerase and terminase inhibitors can delay the onset of viral resistance, lower the incidence of cross-resistance, and enhance anti-viral efficacy.

16. CROSS SPECIES AMPLIFICATION OF THIRTEEN DISTINCT MICROSATELLITE LOCI IN *ZIZANIA AQUATICA*

Brendan Pinto and Anthony Kern
Morningside College

Zizania aquatica is an annual emergent aquatic grass with significant ecological importance. It is related closely to *Zizania palustris*, which produces an edible grain. According to the National Resources Conservation Service department (USDA), *Z. aquatica* is native throughout Canada and to the U.S. from Minnesota to both Florida and Maine. Although native to such a large area, severe environmental changes, due to human activity, have led to a drastic reduction in habitat. *Z. aquatica* is protected by law in several states (OH, RI, and PA). In order to conserve this plant species, new information about its genetic diversity must be discovered. In this study, we show the utility of cross-species amplification of highly polymorphic genetic markers (microsatellites) originally isolated in *Z. palustris*, and screened against individuals from a wild population of *Z. aquatica*. Using these markers, the polymorphism information content (PIC value) of each established molecular marker can

be determined throughout different populations encompassing the native range of *Z. aquatica*.

17. ALPHA1-ADRENERGIC RECEPTOR INDUCED PHOSPHORYLATION OF THE NA⁺-H⁺ EXCHANGER ISOFORM 1 REGULATES CELL GROWTH AND MOVEMENT^{PPP}

Anne Pius and Mark Wallert
Minnesota State University Moorhead

Alpha1-adrenergic receptor signaling has been implicated in cancer progression through stimulation of cell proliferation, migration and invasion. Conversely, blocking Alpha1-adrenergic receptor signaling decreases tumor formation in animal models. The Alpha1-adrenergic receptor is a G protein-coupled receptor that initiates a series of intracellular signaling events. Receptor activation stimulates phospholipases, protein kinases, and intracellular calcium release. The $\alpha 1$ -adrenergic receptor can activate three distinct protein kinases that phosphorylate NHE1 in four locations. These kinases and the locations they phosphorylate are: 1) Rock which phosphorylates NHE1 at T653, 2) Rsk which phosphorylates NHE1 at S703, and 3) Erk which phosphorylates NHE1 at both S770 and S771. To evaluate the role of each of these phosphorylation sites in the regulation of cellular function we have created a series of cell lines each expressing human NHE1 with one of the phosphorylation sites mutated to an alanine, thus removing that ability for NHE1 to be phosphorylated at that location. We will evaluate each of these cell lines, PSNT653A, PSNS703A, PSNS770A, and PSNS771A to determine the role of each phosphorylation site. We will use an XTT assay to evaluate cell proliferation, AlexaFluor 488 phalloidin to evaluate stress fiber formation, and ibidi wound healing inserts to evaluate cell migration.

18. A RAPID METHOD FOR FUNCTIONAL CHARACTERIZATION OF ORCHID FLOWER COLOR GENES USING MODEL PLANTS

Sharif Rahim¹, Nicole Toro¹, Teresita Amore² and Rasi-ka Mudalige-Jayawickrama¹
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Orchids provide us with an astounding array of beauty and diversity. Most orchids have a large genome, long life cycles, and are difficult to manipulate genetically. Our lab has isolated many orchid floral genes that control important horticultural traits such as flower color and shape. The overall goal of the proposed research is to find easy methods to characterize flower color genes and to create novel colors by redirecting the anthocyanin biosynthesis in commercial orchids. We use a gene complementation test in which a copy of the gene of interest is inserted into a mutant plant that lacks its function. We have chosen Flavonoid 3'-hydroxylase (F3'H) as the main flower color

gene for this study. We constructed a binary vector with a Cauliflower Mosaic virus 35S promoter (CaMV 35S::F3'H) and the nopalene synthase (nos) terminator to construct the expression cassette. *Arabidopsis thaliana*, *Petunia* and *Nicotiana tabacum cv Xanthi* are used as model plants to characterize the function of the F3'H gene of *Dendrobium*. We used a floral dip method to transform *Arabidopsis* mutants while co-cultivation of leaf explants with *Agrobacterium* harboring the binary vector containing CaMV 35S::F3'H::nos is used to transform *Petunia* hybrids and *N. tabacum* plants. We are currently selecting and characterizing the transformants. Once the function of the gene is proven we will use RNA interference to shut down the purple color and redirect the anthocyanin synthesis in commercial orchids.

19. BIOSYNTHESIS OF MBX-2168 TRIPHOSPHATE IN HERPES VIRUS-INFECTED CELLS^{ISGC}

Hannah Sauer¹, Marie Nguyen² and Brian Gentry¹
Drake University¹, Des Moines University²

Human cytomegalovirus (HCMV) and herpes simplex virus type 1 (HSV-1) can have detrimental effects on patients with compromised or immature immune systems. Drawbacks for currently approved pharmacotherapies include the development of viral strains with decreased drug susceptibility and high incidences of adverse effects. A third generation methylenecyclopropane nucleoside analog (MBX-2168) demonstrated greater efficacy against these infections than earlier generations without observed increase in cytotoxicity. The purpose of this study was to characterize the biosynthesis of MBX-2168-triphosphate in HCMV- and HSV-infected cells against their respective standard of therapy. Incubation of HCMV-infected cells with 4.0 μM MBX-2168 or 25 μM ganciclovir (GCV; both concentrations $5\times\text{EC}_{50}$) resulted in a time-dependent increase in triphosphate levels reaching a maximum of 48.1 ± 5.5 or 42.6 ± 3.7 pmol/ 10^6 cells at 120 hours, respectively. Similarly, HSV-infected cells incubated with 33.5 μM MBX-2168 or 5.0 μM acyclovir (ACV; both concentrations $5\times\text{EC}_{50}$) demonstrated a time-dependent increase in triphosphate levels reaching a maximum of 12.3 ± 1.5 or 11.6 ± 0.7 pmol/ 10^6 cells at 24 hours, respectively. We therefore conclude that the biosynthesis of MBX-2168-TP in HCMV- and HSV-infected cells is equal to that of their respective standard of therapy under equivalently effective concentrations.

20. BORIC ACID LOWERS ETHANOL TOLERANCE OF YEASTS

Martin Schmidt
Des Moines University

Boric acid (BA) is a ubiquitous element that is beneficial at low concentrations but toxic at higher doses. Neither the beneficial nor the harmful actions of BA have been understood on a mo-

lecular level, complicating assessment of the agent's safety for therapeutic applications. A promising approach to describe the action of BA is to assess toxicity in combination with other substances with a known mode of action. In this approach, similarities, synergies and antagonisms reveal the impact of BA on pathways that mimic, reinforce or counteract the other drug's actions. In order to quantify such interactions, a microdilution protocol has been adapted to visualize the growth inhibitory effects on baker's yeast and *Candida albicans*. The assay shows that sub-inhibitory concentrations multiply the toxicity of ethanol on yeast while having virtually no impact on the effect of other toxins or drugs. In particular, we could not find a BA effect on the potency of genotoxic stressors, surfactants, reactive oxygen generators or lipid synthesis inhibitors. We are currently broadening our studies to include other yeast species and environmental stressors. The data suggest that the potency of ethanol solutions as a disinfectant can be enhanced by the addition of BA.

21. FUNCTIONAL CHARACTERIZATION OF ORCHID TCP GENES USING JAW MUTANTS OF ARABIDOPSIS MODEL PLANT

Lauren Smith, Tiffanee Kress and Rasika Mudalige-Jayawickrama
University of Dubuque

The TCP gene family is named after the founding members: teosinte branched-1 (tb-1) responsible for maintaining apical dominance and plant architecture, CYCLOIDEA (CYC) involved in development of floral bilateral symmetry, and PROLIFERATING CELL FACTOR-1 (PCF-1) and PCF-2 proposed to be involved in promoting cell proliferation and plant growth. We have isolated two full-length TCP genes, Den-TCP-1 and Den-TCP-2, from orchid floral buds. Modulation of expression of these developmental transcription factors can bring about subtle changes in the organism's appearance (morphology). Hence, they are crucial for the evolutionary development of plants. Den-TCP-1 also contains a binding domain for a specific microRNA known as miR319, suggesting its expression is regulated by miR319. Therefore, we have chosen *Arabidopsis* mutants known as JAW mutants with increased miR319 activity to be transformed with Den-TCP-1 gene. We developed an expression cassette of Den-TCP-1 attached to a CaMV 35S promoter and a nopalene synthase terminator. We used an *Arabidopsis* floral dip method to transform JAW mutants with a binary vector containing the expression cassette via *Agrobacterium* mediated transformation. We are currently characterizing the transformed plants to find out whether JAW mutants can be rescued by the Den-TCP-1 gene by providing excess TCP mRNA as targets. We will find the amount of Den-TCP-1 accumulated in each transformant via reverse transcription Polymerase Chain Reaction (rt-PCR).

22. IN VITRO ANTI-TUMOR ACTIVITY OF COMMON PLANT EXTRACTS AND THEIR SUSPECTED ACTIVE CHEMICAL AGENTS

Sara Tolsma, Megan Feuchtenberger, Cody Hughes, Mari-ko Komatsu, Caleb Linn, Kierstyn Marker, Sun Mudiavita, Morgan Olhausen, Jordan Sexe, Samantha Thomson, Britta Wilson, Bethany Wood and Emily Wynja
Northwestern College

Numerous studies show that a wide variety of plants possess anti-tumor activity. While some plants, such as the Pacific yew, have yielded highly effective chemotherapeutic drugs (taxanes), the chemical components responsible for inhibiting tumor growth in other plants have not been fully defined. It is also not clear whether individual chemical components of these plants are as effective as the combination of chemical components present in plant extracts. We are measuring the growth inhibitory activity of ethanol extracts solubilized in dimethyl sulfoxide (DMSO) from the leaves of *Calendula officinalis* (marigold), *Vinca rosea* (periwinkle), *Viscum cruciatum* (mistletoe), and *Rosmarinus officinalis* (rosemary), all plants with reported anti-tumor activity that are available to our laboratory. We are also testing the ability of the chemicals contained in these extracts suspected to be the active growth inhibitory agents: carnosic acid, 2-methoxy-1,4-naphthoquinone, vinblastine, and mistletoe lectins. Our experiments are focused on growth inhibition in a variety of adherent human and mouse tumor cell lines including HeLa (adenocarcinoma), RAW 264.7 (leukemia), MDA-MB-231 (adenocarcinoma), and A549 (carcinoma). Because the plants we are testing have reported anti-tumor activity, we predict that the whole plant extracts as well as the pure chemicals will inhibit or retard growth of tumor cells in vitro in a dose dependent manner.

23. DISCOVERING A FAST TRACK METHOD TO EVALUATE THE EFFICACY OF GENE SILENCING IN ORCHIDS BY ARTIFICIAL MICRORNA

Nicole Toro¹, Sharif Rahim¹, Teresita Amore² and Rasi-ka Mudalige-Jayawickrama¹
University of Dubuque¹, University of Hawaii at Manoa²

Targeted silencing of single genes has been facilitated by the recent discovery of the phenomenon known as RNA interference (RNAi) or post transcriptional gene silencing (PTGS). The mechanism of RNAi became apparent with the discovery of a different type of RNA molecule known as microRNA (miRNA). These tiny miRNA molecules have the ability to bind specific target messenger RNA (mRNA) molecules via complementary base pairing and silence the target gene via mRNA degradation or down-regulation of gene translation. We are testing the efficacy of RNA interference to reroute anthocyanin biosynthesis thereby creating new colors in commercial *Dendrobium* orchids. In this experiment, six different artificial

microRNAs (amiRNA) were designed to target the mRNA of Flavonoid 3'-hydroxylase (F3'H). Multiple methods were tested to introduce these amiRNA into developing *Dendrobium* flower buds. One method, in which cut ends of the buds were inserted into microfuge tubes with amiRNA solutions was selected as the best method. After feeding, buds were frozen and the amount of F3'H expression of each bud was evaluated for before and after feeding via semi-quantitative reverse transcription-Polymerase Chain Reaction (rt-PCR). Our results indicate that the expression of F3'H is affected by three of the amiRNAs we have chosen. Currently we are making vectors to shut down the activity of F3'H and redirect anthocyanin biosynthesis towards red or blue colors.

24. TESTOSTERONE, ANDROGEN RECEPTOR AND MALE SUSCEPTIBILITY IN *LEISHMANIA CHAGASI* INFECTION

Elizabeth A. Turcotte and Dr. Nilda E. Rodriguez
University of Northern Iowa

Every year, millions of people are infected with the parasitic protozoa that cause Leishmaniasis. Parasites are transmitted to humans through the bite of infected sand flies, whereupon they are internalized by macrophages, replicate, and cause disease. Leishmaniasis is challenging because the pathogen subverts macrophages, part of the immune system, to disseminate infection. Children and the immunocompromised are at greater risk. There is also a male bias, but the reasons for this trend are unclear. To investigate the mechanisms of parasite survival, we examined gene expression patterns of macrophages infected with *Leishmania chagasi*. Unexpectedly, infected macrophages showed increased expression of Androgen Receptor, the receptor for testosterone. Furthermore, *in vitro* addition of physiological levels of testosterone increased *Leishmania chagasi* infection in macrophages, especially in those of male origin. These results support a model in which the parasite-driven increase in Androgen Receptor and testosterone signaling exacerbate infection and provide a basis for the increased susceptibility observed in adult males.

25. CHARACTERIZATION OF BACTERIAL STRAINS FOR FUTURE MICROBIAL COMPETITION ASSAYS

Erik Zorrilla and Rebecca Schmidt
Upper Iowa University

Lactic acid-producing bacteria are found in fermented foods such as cheese, yogurt, and pickled vegetables. There is interest in the food industry in determining whether helpful lactic acid-producing bacterial strains can also compete against the food-borne pathogen *Listeria monocytogenes* in ready to eat foods such as deli meats, soft cheeses and seafood. The purpose of this study is to isolate and characterize lactic acid-producing bacteria cultured from fermented dairy products. Four subcul-

tures were differentiated from Greek yogurt containing active bacteria cultures. The four different bacterial strains were isolated using spread and streak plate techniques and were differentiated by staining, analysis of single colony and slant culture morphology, growth on general (nutrient and LB agar) versus selective media (MRS agar), and metabolic tests. Future directions may include testing competition between *Listeria monocytogenes* strains and lactic acid-producing bacteria as isolated here or from stock cultures. These studies will help develop an improved understanding of nontoxic microorganisms that can be used as potential competitors to inhibit growth of pathogens such as *Listeria* to ultimately reduce food-borne illnesses.

Cellular, Molecular & Microbiology Oral Presentations

26. THE EFFECT OF SPLENDA CONTAINING SUCRALOSE ON THE HUMORAL IMMUNE RESPONSE IN MUS MUSCULUS^{PPP}

Amy Zawacki

Saint Mary's University of Minnesota

Artificial sweeteners have received much scrutiny over the years, including many studies evaluating their safety. Splenda, containing sucralose, is one of five artificial sweeteners approved by the United States Food & Drug Administration (FDA). To date, over 110 safety studies have been conducted. One area that has received little focus is the effect of sucralose on the immune system. The purpose of this study was to examine effects sucralose might have on the immune system, with particular focus on humoral immunity. In this study, mice were fed varying doses of Splenda containing sucralose for a period of eight weeks. After the eight weeks, the mice were immunized with the foreign protein, ovalbumin. Serum samples were then collected every two weeks for a total of six weeks, and the levels of antibodies to ovalbumin were measured using an indirect enzyme linked immunosorbent assay (ELISA). Statistical analysis (ANOVA) done on the data showed no significant difference in antibody levels to ovalbumin between varying groups of mice. This suggests that sucralose does not have an effect on antibody production (humoral immunity) in a mouse model.

27. A GENETIC ANALYSIS OF THE ROLE OF YEDR IN *ESCHERICHIA COLI* CELL DIVISION

David Stanek¹, Ryan Bezy¹ and David Weiss²

Mount Mercy University¹, The University of Iowa²

Escherichia coli cell division is a complex process mediated by a highly regulated group of proteins. These division proteins are unique to bacteria and serve as targets for antibiotics that stop bacteria from growing. With bacterial resistance to antibiotics on the rise, characterization of novel cell division proteins might provide additional targets to disrupt bacterial growth. Data from a previously performed suppression screen, and sub-cellular localization of the novel protein YedR imply that it might have a role in *E. coli* cell division. This role is nonessential, as deletion of the *yedR* gene produced no noticeable division phenotypes under conditions assayed. To further investigate the role of *yedR* in bacterial cell division a series of double mutants were created by pairing the $\Delta yedR$ mutant with other known cell division mutants. These double mutants were assayed for synthetic phenotypes by comparing their growth to that of wild type, $\Delta yedR$ single mutants, and single mutants of known cell division genes. One double mutant assayed, the *ftsI* (Ts)/ $\Delta yedR$ double mutant, expresses a much more filamentous phenotype than the *ftsI*(Ts) single mutant does by itself. This is additional evidence that YedR is a nonessential cell division protein. This synthetic phenotype will be used to further characterize the role and importance of YedR in *E. coli* cell division in a number of follow up experiments.

28. CAN HONEY BE USED TO COMBAT TOMATO AND PEPPER PATHOGENIC BACTERIUM *XANTHOMONAS CAMPESTRIS* PV. *VESICATORIA*?^{PPP}

Brandon Ruddell

St. Ambrose University

The plant-pathogenic bacterium *Xanthomonas euvesicatoria* infects plants worldwide, and is one of the most devastating diseases of tomato and pepper plants. The use of agrochemicals to control these infections increases public, worker, and environmental chemical exposure. Honey has antimicrobial properties and may provide a safe alternative to these chemicals. It is hypothesized that treatment of pepper (*Capsicum annuum*) leaves and seeds with honey will inhibit growth of the model bacteria *Pseudomonas fluorescens*, *Pseudomonas putida*, and *Escherichia coli* on these plants. An *in vitro* system will be used to determine the minimum inhibitory concentration (MIC) of honey against each of these bacterial species. These MIC results will then be used to test the feasibility of using honey to prevent *Xanthomonas euvesicatoria* infection of pepper plants.

29. IDENTIFYING POSSIBLE IRON-DEPENDENT ENZYMES THAT POSITIVELY REGULATE CANONICAL WNT SIGNALING

Kaylee Vitale¹, Karissa Vilks¹, Gary Coombs¹, Bryan Phillips², Amy Clemons², Ivana Mihalek³, Dawn Quelle² and Jacqueline Reilly²

Waldorf College¹, The University of Iowa², A*star, Singapore³

Wnt signaling is mediated by 19 related protein hormones that signal through 1 of 11 Frizzled family receptors and LRP5/6. Wnt interaction with Frizzled/LRP prevents degradation of β -catenin in the cytoplasm. β -catenin then enters the nucleus and binds TCF to activate transcription of Wnt target genes. Wnt signaling guides cell behavior in prenatal development. In mammals, Wnt signaling affects gender, limb formation, and axes of asymmetry. Mutations in Wnt pathway components underlie various defects, and abnormal Wnt signaling underlies multiple cancers.

Wnt signaling in mammals is iron dependent. We have identified and ranked 36 potential iron-dependent Wnt-upregulating proteins by bioinformatics. Several high-ranking candidates suggest a mechanism in which iron is required for translocation of β -catenin from cytoplasm to nucleus. We have tested this hypothesis in 2 colon cancer cell lines. We have also demonstrated that the iron dependence of Wnt signaling seen in mammalian cells is conserved in the model organism *C. elegans*. We intend to knock out *C. elegans* genes via RNAi to identify iron dependent Wnt upregulators from our list of candidates.

30. EFFECTS OF ESCORT® XP ON *MYXOCOCCUS XANTHUS* MOTILITY AND PREDATION

Kristin Thatcher, Ariel Dickerson and Mary Shawgo
Graceland University

Herbicides are commonly used both residentially and agriculturally. Escort® XP, used for the latter, inhibits the enzyme acetolactate synthase which is essential in amino acid synthesis. Protein synthesis is therefore adversely affected in organisms treated with this herbicide. The presence of herbicides may have detrimental effects on both environmentally harmful and beneficial microorganisms found in the soil. One beneficial soil microorganism, *Myxococcus xanthus*, is a motile, social, predatory bacteria. Its motility is necessary for its ability to prey on harmful soil organisms such as *Escherichia coli*. Using traditional predation assays this research investigates increasing concentrations of Escort® XP on *M. xanthus*'s ability to prey on *E. coli*. Furthermore, this research investigates both single-cell and social motility of *M. xanthus*. It is hypothesized that exposure to higher concentrations of Escort® XP will result in decreased motility and predation by *M. xanthus*.

31. THE PHOSPHORYLATION OF NA⁺-H⁺ EXCHANGER ISOFORM 1 INITIATED BY THE PLATELET DERIVED GROWTH FACTOR RECEPTOR REGULATES CELL GROWTH AND MOVEMENT^{BBB}

Molly Strong and Mark Wallert
Minnesota State University Moorhead

The hallmarks of cancer are a collection of phenotypic changes that define cancer development and progression. One of these hallmarks, sustained proliferative growth, can occur through

changes in growth factor secretion and signaling. The Na⁺-H⁺ Exchanger Isoform 1 (NHE1) is a transmembrane protein that regulates growth and migration. Platelet derived growth factor receptor is a receptor tyrosine kinase that can activate four distinct protein kinases. Each kinase phosphorylates NHE1 at 1-2 distinct locations. The kinases and the locations they phosphorylate are: 1) Akt/Protein Kinase B phosphorylates NHE1 at S648, 2) Rho-associated protein kinase (Rock) phosphorylates NHE1 at T653, 3) Ribosomal S6 kinase (Rsk) phosphorylates NHE1 at S703, and 4) Extracellular signal-related kinase (Erk) phosphorylates NHE1 at both S770 and S771. To evaluate the role of these phosphorylation sites in the regulation of proliferation, stress fiber formation, and migration we have created cell lines each expressing human NHE1 with one of the phosphorylation sites mutated to alanine, removing the ability for NHE1 to be phosphorylated at that location. We will present the impact of removal of these sites on proliferation measured via XTT assay, stress fiber formation evaluated using AlexaFluor 488 phalloidin, and migration measured with an assay using wound-healing inserts (Ibidi).

32. BACTERIA AND FUNGI IN HOUSE ROOM AIR - SAVING STUDENT LABORATORY DATA FOR EVALUATION AT MULTIPLE LEVELS

Gary Fulton
Marshalltown Community College

Data collected from student laboratory experiments can be evaluated at three levels: for the individual student, for the whole class, and for multiple classes and years. Samples of airborne bacteria and fungi were collected on agar Petri dishes from 5 different rooms in each student home. Colonies of bacteria and fungi were counted. Different species were estimated by colony color and morphology.

Each student evaluated her/his own results describing factors which could explain room differences in colony counts and species. Students then listed their individual results on the lab room white-board in bacteria, fungi, colony, and species columns by room: kitchen, bathroom, bedroom, living-dining-family room, basement-laundry-utility room. Colony and species counts in rooms of some houses were quite similar, while others were substantially different. Students evaluated the class results describing factors which could explain the differences in houses.

Results from several years of classes were averaged by the students to compare fall semester (August) samples and spring semester (January) samples. Students then compared the seasonal results and described factors which could explain differences (temperature, bare soil, snow cover, rainfall, open windows).

33. SELECTIVE PATHWAYS OF INNATE IMMUNE RESPONSES OF HEART AND KIDNEY DURING ANGIOTENSIN II HYPERTENSION

Madhu Singh, Michael Cicha, Mark Chapleau and Francois Abboud
The University of Iowa

Angiotensin II (Ang II) infusion induces cardiac hypertrophy and hypertension through pro-inflammatory gene expression in heart and kidney. Because cardiac hypertrophy and hypertension may be coupled to inflammation, we tested whether two major pathways of activation of innate immune receptors differ in these phenomena. Specifically, we asked whether MyD88 and TRIF, the adaptor proteins of toll-like receptors (TLR), are necessary for the responses to Ang II. In an earlier study, we reported that MyD88^{-/-} mice are protected from cardiac hypertrophy and pro-inflammatory gene expression after myocardial infarction. In contrast, our current results with infusion of pressor doses of Ang II indicate that the pressor response and cardiac hypertrophy seen in wild type (WT) mice were preserved in MyD88^{-/-} mice. Pro-inflammatory gene expression was increased in both heart and kidney of WT and MyD88^{-/-}, and IL-6, Mmp9, TGF- β 1 and TGF- β 2 RNA expression increased similarly in MyD88^{-/-} and WT kidney. Ang II receptor (AT1R), Nox4, TNF- α and CTGF were greater in MyD88^{-/-}. Thus the pro-inflammatory effects of Ang II are MyD88-independent. In TRIF-mutant mice, the Ang II induced pressor response and cardiac hypertrophy were abrogated. We conclude that Ang II induced cardiac hypertrophy is TRIF dependent but not MyD88 dependent. The translational relevance is that the molecular targets for the abrogation of end-organ damage may differ from those for blood pressure reduction in hypertensive disease.

34. THE EFFECTS OF SPLENDIA, CONTAINING SUCRALOSE, ON INTERLEUKIN-2 AND TUMOR NECROSIS FACTOR- α PRODUCTION BY SPLENOCYTES FROM MUS MUSCULUS

Jacquelyn Bongard
Saint Mary's University of Minnesota

Sucralose, the active component of Splenda, is an artificial sweetener used to sweeten food and beverages without the added calories of sucrose. Safety studies have been conducted, but few studies have focused on effects of sucralose on the immune system. The purpose of this study was to determine the effects of sucralose consumption on cytokine production using mice (*Mus musculus*) as an animal model. More specifically, the objective was to assess production of interleukin-2 (IL-2) and tumor necrosis factor- α (TNF- α) secreted by splenocytes from mice treated with sucrose, or Splenda, which contains sucralose. This was done by providing CD1 mice with drinking water supplemented with sucrose or varying concentrations of Splenda. Splenocytes from the mice were stimulated with

Concanavalin A to induce IL-2 production or lipopolysaccharide (LPS) to induce TNF- α production. There were no statistically significant differences in IL-2 production by ConA-stimulated splenocytes obtained from the various groups of mice. However, LPS-stimulated splenocytes obtained from mice treated with high concentrations of Splenda exhibited significantly decreased TNF- α production compared to LPS-stimulated splenocytes obtained from control mice splenocytes.

35. BORIC ACID PREVENTS THE GENOTOXIC STRESS RESPONSE OF HISTONE ACETYL TRANSFERASE RTT109 IN CANDIDA ALBICANS

Benjamin Pointer, Michael Boyer and Martin Schmidt
Des Moines University

Candida albicans is an opportunistic pathogen that is commonly found on skin, and on mucous membranes of the oral cavity, the gastrointestinal tract, and the vaginal tract. Under certain conditions, previously asymptomatic colonizations of *C. albicans* become virulent. The *C. albicans* fungal-specific histone acetyltransferase (HAT) Rtt109 is integral to surviving DNA damage, and is important for pathogenesis within a host. Rtt109 post-translationally acetylates histone H3 at lysine 9 and 56 immediately after histone synthesis, or in response to DNA damage. Rtt109 has been suggested as a target for novel drugs to treat serious *C. albicans* infections (Wurtele et al., 2010). The broad-spectrum anti-biological agent boric acid (BA) specifically inhibits the invasive phenotype of *C. albicans* while leaving the commensal phenotype largely unaffected, and is commonly used to treat vaginal candidiasis. Prevention of Rtt109 action by BA could partially account for inhibition of *C. albicans* virulence. The present study shows that sub-lethal concentrations of BA greatly reduce acetylation at both H3K9 and H3K56. BA prevents the H3K9 and H3K56 acetylation response to the genotoxic agent methyl methanesulphonate (MMS). Acetylation at H3 lysine 14 and phosphorylation at H3 serine 10 were also assayed and there was no significant change during BA exposure.

36. AUTOPHAGY IN HERPES SIMPLEX VIRUS 1 INFECTED HEP-2 AND HTERT-HME-1 CELLS

Felisha Montero-Watson^{1 & 2}, Prajakta Pradhan¹ and Marie Nguyen¹

Des Moines University¹ & Mercy College of Health Sciences²
Herpes simplex virus 1 (HSV-1) is a neurotropic, double stranded DNA virus of the family *Herpesviridae*, which causes painful lesions on oral mucosa. Our laboratory previously showed that HSV-1 infected cells treated with the negative control for caspase inhibitors, z-FA-fmk, produce less virus and exhibit altered morphologies distinct from apoptosis. A possible explanation is that infected, z-FA-fmk treated cells undergo autophagy. To investigate this possibility, cells were infected

with either wild-type or ICP27-null HSV-1, \pm z-FA-fmk. Immunoblotting was then performed to detect autophagy markers microtubule-associated protein 1A/1B-light chain 3 (LC3II) and sequestosome 1 (p62). z-FA-fmk induced LC3II and p62 accumulation in HSV-1 infected cells. To determine whether LC3II accumulation is due to increasing autophagy flux, or blocking fusion or degradation of autophagic targets, the lysosomal inhibitor, chloroquine, was used. No further LC3II accumulation was observed in the z-FA-fmk, chloroquine treated cells, suggesting that autophagic degradation is suppressed. Together, these results indicate that z-FA-fmk suppresses HSV-1 infection, likely by disrupting autophagy.

Chemistry Section Poster Presentations

37. METHANE ACTIVATION ON METAL OXIDE NANOPARTICLES: EFFECT OF SAMPLE PRETREATMENT IN CHEMICAL LOOPING COMBUSTION PROCESS

Hayder Alalwan and Vicki Grassian
The University of Iowa

The chemical looping combustion (CLC) process is a promising method that provides an active, simple and economical way to reduce the effect of greenhouse gases by trapping CO₂ from natural gas combustion. Currently, there is a lack of detailed knowledge about CH₄ reactions on metal oxide surfaces which represents an important step in CLC reaction mechanism. In this study, in situ diffuse reflectance infrared Fourier transform spectroscopy was used to investigate the reaction of CH₄ on three transition metal oxides (CoO, CuO, and α Fe₂O₃) which are commonly used in CLC. In particular, we have investigated the effect of pretreatment method of these metal oxides on the activity of CH₄ conversion, as well as the effect of temperature. The results of this comparison will be presented.

38. SURFACE LIGAND ADSORPTION AND SURFACE FUNCTIONALITY STUDIES OF TITANIUM DIOXIDE AT DIFFERENT SIZES USING ATR-FTIR SPECTROSCOPY IN SIMULATED BIOLOGICAL FLUIDS^{ISF}

Alaa Alminshid
The University of Iowa

Due to the different uses of metal oxide nanoparticles (NPs), their applications have been increased in industrial products such as catalysts, sunscreens and pharmaceuticals. These appli-

cations have brought attention to their environmental fate and toxic effects. Many investigations have been made on metal oxide NPs in vitro; however, the adsorption abilities of metal oxides of very small NPs (namely TiO₂ 2 and 5 nm) in different biological media, in order to better understand their surface charges and compositions, have not been reported yet. In order to investigate the surface ligand adsorption and surface functionality of NPs, ATR-FTIR spectroscopy is used as an analytical tool to characterize the interfacial region between NPs and the environmental and biological media; for examples, HEPES, moderately hard water (*Daphnia magna*), Danieau buffer (*Zebra fish*), RPMI (A 549-lung cell). Artificial fluids at different pH, such as stomach and lung fluids, are used to investigate the dissolution behavior of TiO₂ 2 and 5 nm. Thus, the implications of this research addressed the following: (1) to better understand how the surface charge can be altered by surface ligand adsorption, which can affect the aggregation and sedimentation and (2) how the chemical functionality of NPs can affect the cell uptake. These studies will allow us to better understand the fate and potential toxicity of TiO₂ nanoparticles at small sizes.

39. ENVIRONMENTAL ADVANTAGES OF CO-FIRING BIOMASS IN A COAL-FIRED POWER PLANT

Ibrahim Al Naghemah and Elizabeth Stone
The University of Iowa

Biomass co-firing is the process of replacing part of the coal supplied to the boiler with biomass. It draws upon widely-available existing infrastructure and presents immediate opportunity for the production of low-cost renewable energy. Biomass is renewable and sustainable source of energy that holds significant potential for electricity generation, and has environmental benefits of reducing the emissions of carbon dioxide and other air pollutants. In this study, gas and particle emissions from co-firing coal with two types of biomass compared to coal only was evaluated in a circulating fluidized-bed boiler at the University of Iowa Power Plant. Coal only and co-firing either 50% oat hulls or 3.8% wood chips (by weight) were fueled to the boiler at a constant energy input. Co-firing 50% oat hulls with coal significantly reduced the emission of atmospheric pollutants, including particulate matter by 90%, polycyclic aromatic hydrocarbons by 40%, and metals by 51%. In addition, co-firing oat hulls reduced fossil carbon dioxide emission by 40%. In contrast, co-firing a small fraction of wood chips shows negligible impact on these atmospheric pollutants. This study demonstrates that co-firing oat hulls as a renewable source of energy offers several benefits to air quality.

40. DETERMINATION OF L-DOPA IN VELVET BEANS USING HPLC: A GREEN LABORATORY FOR ANALYTICAL CHEMISTRY

Hailey Benson, Nathaniel Holte and Catherine Haustein
Central College

The purpose of this study was to develop a method for the determination of L-dopa in a natural sample. The goal was to have minimal sample preparation and to minimize using hazardous solvents. This provides a “green” HPLC laboratory for an Analytical Chemistry class. *Mucuna pruriens*, velvet bean, have been used as a nerve tonic for nervous system disorders because of the high concentration of L-dopa found in the seed. Results show that simply soaking the beans in water, followed by reverse phase HPLC that relies on an aqueous mobile phase gives valid results. This represents a safer lab than is found in Analytical Chemistry text books and cuts down on hazardous waste generation.

41. EXAMINING THE EFFECTS OF ROASTING METHODS ON THE CAFFEINE CONTENT OF COFFEE

Kristen Burd, Ashley Maloney, Emily Nienhuis, Abigail Stevens, Samantha Thomson, Karissa Carlson and David Arnett
Northwestern College

As you sip your morning Joe, have you ever wondered if your coffee is providing the amount of caffeine you crave? This study measured the caffeine content of coffee brewed from single source beans using high performance liquid chromatography (HPLC) to determine if the length of roasting time influences the concentration of caffeine. Samples were analyzed using a reverse-phase C18 HPLC column with a methanol/water mobile phase. Results suggest that roasting conditions do influence the concentration of caffeine in coffee. The findings of this study may change your morning habits.

42. OPTIMIZING PREPARATION CONDITIONS OF LIVE SAMPLES FOR TRANSMISSION ELECTRON MICROSCOPY

Amanda Dolley¹, Zachary Fritz¹, Hanna Stenzel¹, Keith Jarosinski² and Joseph Nguyen¹
Mount Mercy University¹, The University of Iowa - Carver College of Medicine²

Hosts can be infected with multiple herpesviruses, known as superinfection; however, superinfection of cells is rare due to the phenomenon known as superinfection inhibition. While it is believed that dual infection of cells can occur in nature, it has not been directly shown in a natural model. Thus, it is important to find and study a good natural model for dual infection of cells so we can better understand pathogenic principles

of human herpesvirus disease. Gallid herpesvirus 2 (GaHV-2), better known as Marek's disease virus (MDV), in chickens is an excellent pathogen-host model because the early and late stages of infection of chickens with MDV largely mimic those of varicella-zoster virus (VZV), which commonly causes chicken pox in children and adults. Recently, fluorescently tagged viruses were developed so they can be tracked in the feather follicle epithelial skin cells for easy identification. However, it is essential to better identify the viruses infecting the feather follicles using transmission electron microscopy (TEM). Unfortunately, there are not established protocols to prepare in vivo or live samples for TEM. The presentation will discuss the efforts made towards establishing optimal conditions for the preparation of feather shafts for transmission electron microscopy.

43. STUDY OF THE PROPERTIES AND CHEMISTRY OF SEA SPRAY AEROSOL USING SINGLE PARTICLE MICROSCOPY AND SPECTROSCOPY TECHNIQUES

Armando Estillore, Olga Laskina, Joshua Grandquist, Jonathan Trueblood and Vicki Grassian
The University of Iowa

Sea spray aerosol (SSA) is a major source of natural aerosol particles in the atmosphere. These aerosol particles are composed of a complex mixture of inorganic and organic components. Understanding the role and impact of SSA on climate requires investigation on its chemical properties and its interaction with water. We are using a multi-faceted approach in investigating the complex chemistry of SSA particles collected from the 2014 Investigation into Marine Particle Chemistry and Transfer Science (IMPACTS) campaign in the Center for Aerosol Impacts on Climate and the Environment (CAICE) Ocean-Atmosphere Facility in San Diego, CA (<http://caice.ucsd.edu/>). We used two spectrochemical imaging and microanalysis techniques: electron microscopy (EM) coupled with energy dispersive X-ray spectroscopy (EDX) to probe the size and morphology of individual substrate deposited particles as well as spatially resolved elemental information and micro-Raman spectroscopy to study the chemical composition of the individual SSA particles. The Raman microscope equipped with environmental cell was also used to study the water uptake of collected particles. Results of these experiments will be presented and discussed.

44. ACCOUNTING FOR THE CHEMICAL ENVIRONMENT OF IRON IN OXIDE SURFACE CALCULATIONS

Xu Huang, Sai Kumar Ramadugu and Sara Mason
The University of Iowa

Despite wide-spread interest in hematite (Fe₂O₃) surfaces in environmental, geological, catalytic, and technological processes, disagreements between theoretical and experimental surface

phase diagrams persist. The computational method DFT + *U*, designed to improve the calculated band structure of strongly correlated materials like hematite, has been found to worsen surface stability predictions. Conventionally, *U* is treated as a bulk parameter; however, considering the wide range of bonding behaviors between surface Fe and bulk Fe, it is necessary to extend the DFT + *U* method by deriving specific *U*(Fe) parameters. Furthermore, we demonstrate that *U*(Fe) alone leads to unrealistic repulsions between Fe *d* and O *p* orbitals, and discuss how to correct for this in the calculations. With these new methods, we revisit the surface stability diagram by using an ab initio thermodynamics model.

45. ANALYSIS OF ORGANOSULFUR COMPOUNDS IN THE ATMOSPHERE: A CASE STUDY OF URBAN ENVIRONMENTS

Josh Kettler and Elizabeth Stone
The University of Iowa

Aerosols can have a profound impact on our climate through radiative forcing, influencing chemical processes, and as cloud condensation nuclei. Organosulfates (R-O-SO₃⁻) are a type of secondary organic aerosol (SOA) that **have** **has** been observed in urban areas in the US and Asia. The atmospheric abundance of organosulfates is relatively uncertain, with reported values ranging from 4-30% of fine organic particle mass. However, the contribution of a single organosulfate species to this mass is less than 1%, with several hundred individual compounds identified in urban environments. It has been suggested that, due to their stability in atmosphere and unique chemical structures, aromatic organosulfates could be useful tracers for SOA. This study focuses on the development of a highly sensitive ultra-performance liquid chromatography (UPLC) tandem mass spectroscopy (MS/MS) method to detect aromatic organosulfates and sulfonates. Preliminary results will include discussion of qualitative and quantitative analyses of fine particulate matter (PM_{2.5}) from megacities in Pakistan and Bangladesh.

46. ATMOSPHERIC ORGANOSULFATES IN CENTREVILLE, ALABAMA: INSIGHTS TO AIR QUALITY EFFECTS

Anusha Priyadarshani Silva Hettiyadura¹, Elizabeth Stone¹, Shuvashish Kundu¹, Zach Baker¹, Thilina Jayarathne¹, Emily Geddes², Kaitlin Richards² and Tim Humphry²
The University of Iowa¹, Truman State University²

Secondary organic aerosols (SOA) are a significant fraction of atmospheric aerosols. These include organosulfates that form from biogenic volatile organic compounds in the presence of sulfuric acid. Organosulfates may be used as tracers of anthropogenically-influenced SOA. Quantification of organosulfates is limited due to lack of commercially available authentic stand-

ards and quantification methods. Therefore, a sensitive and a precise quantification method was developed using hydrophilic interaction liquid chromatography and mass spectrometry (MS) with synthesized authentic standards. The developed method was applied to ambient aerosols collected from Centreville, Alabama in 2013 to determine the absolute abundance of organosulfates. This gives the first measurement of hydroxyacetone sulfate in the atmosphere. Two methods of sample preparation were assessed; sonication and rotary-shaking. Both gave high extraction efficiencies with higher precision in sonication. Assessment of sampling artifacts indicate glycolic acid sulfate and hydroxyacetone sulfate can form on filters from gas phase molecules in the presence of sulfuric acid. Other organosulfates with strong MS signals were also identified and semi-quantified. Time series analysis was used to examine temporal and meteorological influences on organosulfate formation. This work demonstrates the development of a sensitive quantification method for atmospheric organosulfates providing insights to air quality in Centreville.

47. SYNTHESIS OF 1,5-DICHLORO-2,4-DIIODOBENZENE

Taylor Sanders and Jay Wackerly
Central College

The Wackerly research lab focuses on the organic synthesis of novel macrocyclic chemical structures. We design and build these molecules to have the capability to bind smaller “guest” molecules. The so called “supramolecular host-guest” systems are interesting from the level of studying the basic, fundamental chemistry as well as through technological applications. These compounds could eventually be used for drug delivery in medicine or carbon sequestration to combat global warming. My project involves the attempts to synthesize and characterize by x-ray crystallography for the first time a C₄ symmetric oxacalixarene macrocycle. Interest in oxacalixarenes has been rapidly growing over the last decade, but in that time all groups have focused on creating either C₂ or C₁ symmetric versions of the macrocycle. The higher order of symmetry should give rise to a previously unseen molecular shape which could lead to new applications of these molecules as supramolecular hosts. My current goal on this project is to make 1,5-dichloro-2,4-diiodobenzene. I am doing this through the chlorination of 4,6-diiodoresorcinol, which I synthesized in Fall 2014. A challenging feature of my current goal is that my molecule is unstable and subject to hydrolysis. Currently the primary focus is to find a way to add both chlorine atoms, since it seems that there is only mono-chlorination occurring. In order to identify a process different procedures, using different solvents are being done.

48. SYNTHESIS AND APPLICATIONS OF IONIC LIQUID MONOMERS IN FREE RADICAL POLYMERIZATIONS

Mallory Sea and Brian McFarland
Morningside College

This presentation seeks to analyze how ionic liquids can be synthesized for use in free-radical polymerizations. This includes a summary of primary research methods and techniques for acid-base neutralizations involved in creating such monomers. This presentation also explores various applications of ionic liquid monomers and the polymerization of several different cross-linked polymers. Several of these polymers were successfully synthesized. The polymers were tested for adhesive properties and toxicity at varying initiator concentrations. Results from these tests will be used to ascertain practicality of these cross-linked polymers in real-world applications.

49. ANALYSIS OF DRIED BLOOD USING ELECTRON PARAMAGNETIC RESONANCE

Beth Weber and Lisa Mellmann, Dr.
Buena Vista University

Oxy-hemoglobin is oxidized over time to form met-hemoglobin and hemichromes. This transition was examined to determine if electron paramagnetic resonance (EPR) analysis was a useful method in determining how long the blood had been 'out of the body'. Testing was done on a short and long-term basis, from fresh smears to smears that were weeks old. The smears were re-hydrated with a buffer solution, frozen, and placed into an EPR instrument. In addition, the sample was analyzed in a UV-VIS. EPR was used to determine the type of hemichromes formed as blood aged and also the relative amounts of met-hemoglobin to hemichrome. Concentrations were then determined through mathematical decomposition of the UV-VIS data.

50. SIZE-DEPENDENT DIELECTRIC PROPERTIES OF GOLD: A NOVEL INSIGHT ON SIZE-DEPENDENT INTERACTIONS

Lahiru Wijenayaka, Christopher Cheatum and Amanda Haes
The University of Iowa

Van der Waals interactions govern the stability and fate of nanostructures suspended in a medium. Hence, understanding these interactions presents an ongoing challenge to contemporary nanoscience research. The origin of van der Waals forces are interactions of electromagnetic waves evolved from macroscopic objects via the collective oscillation of their electrons as controlled by dielectric permittivity. For metals, however, the bulk dielectric properties cannot be used for nano-sized particles as a result of quantum confinement of free electrons that occur when the particle size falls below the mean free path of

electron in the given metal. Here, we extensively calculate the size-dependent dielectric properties of gold based upon the Drude model to observe that dielectric properties of gold change significantly as the size of the particles fall into the nanometer regime where electron confinement is likely. Further, exploiting these size-dependent dielectric properties, we calculate size-dependent van der Waals interactions between nanoparticles. We find that van der Waals interactions indicate a distinct size-dependence that exponentially increases as the particle size decrease; an effect that has not been reported to date, but agree with the many theoretical and experimental evidence suggesting that smaller nanoparticles indicate stronger attractive interactions, thus altering their native properties.

C hemistry Section Oral Presentations

51. SEA SPRAY AEROSOL: DEFINING THE SELECTIVITY AND PARTITIONING OF ORGANIC MOLECULES

Richard Cochran, Thilina Jayarathne, Olga Laskina,
Jon Trueblood, Holly Morris, Alexei Tivanski, Elizabeth Stone
and Vicki Grassian
The University of Iowa

Atmospheric aerosols have long been known to have both direct and indirect impacts on the Earth's energy balance (i.e., radiative forcing). Sea spray aerosol (SSA) are a major component with estimated global emissions of 2000-10,000 Tg yr⁻¹. Recent studies have shown that SSA are not only composed of sea salt (i.e., NaCl) but are rather a complex and variable mixture of inorganic and organic compounds as well as biological components. While a large number of organic compounds have been observed in SSA, it is still unclear how the transfer of the OC species from the sea water to SSA occurs. This limits the ability of current models to predict the extent of the organic fraction in SSA across the globe and its overall impact on radiative forcing. In this work the influence of the chemical and physical properties of a representative body of compounds (fatty acids, dicarboxylic acids and keto-acids) in their transfer and partitioning into sea spray aerosols is investigated. Using a novel technique, the process of sea spray aerosol generation was simulated under controlled conditions while monitoring the concentrations of the representative compounds in both sea water and generated SSA.

52. USING QUANTUM CHEMISTRY TO EXPLORE SHAPE EFFECTS ON REACTIVITY IN GEOCHEMICAL MODELS

Katie W. Corum and Sara E. Mason
The University of Iowa

Due to the many (oxy)hydroxide surfaces in the environment that participate in adsorption processes, detailed understanding of the reactivity of these environmental interfaces is an actively developing area of computational research. Polyaluminum cation species, such as $[\text{Al}_{30}\text{O}_8(\text{OH})_{56}(\text{H}_2\text{O})_{26}]^{18+}$ (Al_{30}), can be utilized as model geochemical compounds to provide molecular-level details of adsorption processes. Our previous work, using DFT calculations, shows that the semi-pores sites exhibit high reactivity towards outer-sphere adsorption. We determined that cations and anions show opposite trends in site preference on Al_{30} . Here, we address how the reactivity differs between Al_{30} and other Keggin-type cations. We model inner-sphere cation and outer-sphere anion adsorption onto $\epsilon\text{-Al}_{13}$ ($[\text{Al}_{13}\text{O}_4(\text{OH})_{24}(\text{H}_2\text{O})_{12}]^{7+}$). $\epsilon\text{-Al}_{13}$ is the building block of Al_{30} and exists in a spherical shape. By varying the shape, we are able to isolate how shape and topography govern reactivity making Al_{30} 's reactivity unique. Having determined the impact of nanoparticle topology on reactivity in Al_{30} , we compare the reactivity between this 3-D geochemical model and 2-D alumina surface model. Our results show that while outer-sphere adsorption is stronger and more tunable on the 3-D nanoparticle; inner-sphere bonding is stronger on the 2-D surfaces. These new insights offer molecular-level understanding of an important class of geochemical reactivity.

53. BIOLOGICAL AND ENVIRONMENTAL MEDIA CONTROL OXIDE NANOPARTICLE SURFACE COMPOSITION: THE ROLES OF BIOLOGICAL COMPONENTS (PROTEINS, PEPTIDES AND AMINO ACIDS), INORGANIC OXYANIONS AND HUMIC ACID

Imali Mudunkotuwa and Vicki Grassian
The University of Iowa

Nanoparticle surfaces have high free energy and thus thermodynamic driving forces will work towards minimizing the surface energy. In environmental or biological systems, the surrounding milieu will drive these interactions. Therefore it is important to consider nanoparticles as dynamic entities that undergo rapid transformations that depend on the solution pH, ionic strength and composition. The current practices of initial nanoparticle characterization with respect to particle size, shape, surface and bulk composition prior to experiments may not be adequate as they may not accurately describe these materials in a given medium. The use of initial characterization data in the subsequent analysis inherently assumes that nanoparticles are static entities. Thus, nanoparticle characterization, which is crucial in all the studies related to their applications and implications, should

also include information about the dynamics of the interfacial region between the nanomaterial surface and the surrounding medium. The objective of this study is to highlight some examples of in situ characterization of metal oxide nanoparticle surfaces in different environmental and biological media so as to show the importance of the milieu on oxide surface composition. The study highlighted that the extent of surface adsorption depends on the solution phase composition and the affinity of different components to adsorb to the nanoparticle surface.

54. PATTERN RECOGNITION OF GAMMA-RAY EMITTING RADIOISOTOPES

Brian Dess and Gary Small
The University of Iowa

The U.S Environmental Protection Agency (EPA) Airborne Spectral Photometric Environmental Collection Technology (ASPECT) program is designed to provide first respondents with radiological mapping of potentially hazardous locations. This program utilizes an aircraft fitted with a gamma-ray spectrometer capable of remote detection of radioisotopes. The challenges present in remotely detecting a radioisotope signal are strongly tied to the signal-to-noise ratio of the collected gamma-ray spectra and the specific signal processing and pattern recognition methods used in the data analysis. Depending on the distance from the detector to the radioisotope source, weakened signals from scattering can pose a challenge when attempting to design a classifier for detecting radioisotopes. Advances have been made in the automated detection of radioisotopes using several different field locations. New signal processing methods and optimized classification techniques have been applied to achieve these results. This classification methodology makes use of a background correction procedure in conjunction with digital filtering and linear discriminant analysis. The performance of the developed classifiers will be assessed by use of gamma-ray spectra collected from airborne mapping of field locations in which Cesium (Cs-137), Cobalt (Co-60), and Europium (Eu-152) radioisotope signatures were present.

55. FUNDAMENTAL INSIGHTS ABOUT GEOCHEMICAL MODEL SYSTEMS FROM DENSITY FUNCTIONAL THEORY CALCULATIONS

Sara Mason, Katie Corum, Xu Huang and Sai Kmar Ramadugy
The University of Iowa

Adsorption processes of ionic species onto hydrated minerals and aqueous metal hydroxides have a large influence on controlling aqueous pollutant transport and fate, and are also fundamentally related to other geochemical and technological processes. Essential chemical information about environmental interface and nanoparticle structure-reactivity is becoming ac-

cessible through quantum mechanical modeling studies. Computational studies provide a means to interpret experimental information, to predict properties that cannot be measured, and to develop conceptual, molecular-level understanding of these systems. While the adsorptive capabilities of these particles and surfaces have been established, identification of the specific reactivity factors and a mechanistic understanding of the adsorption process is lacking. We highlight how we use our DFT studies to extract new chemical understanding of the surface and particle properties that dictate reactivity and discuss ongoing work and future goals, including issues of DFT accuracy and towards the development of new conceptual models. Long term goals include harnessing our new molecular-level understanding of environmental nanoparticles towards the rational design of engineered reactive surfaces.

56. COMPARATIVE INHIBITION OF DEODORANT COMPOUNDS AS ANTIMICROBIAL AGENTS

Sandra Valverde Mateo, Erik Olson and Rebecca Schmidt
Upper Iowa University

OBJECTIVE: This study examines the sensitivity of underarm microbiota to different chemical antimicrobial agents in deodorant.

INTRODUCTION: Antimicrobial compounds in deodorant inhibit microbial growth, reducing odoriferous volatile compounds metabolized by bacteria living under the arm. The varying chemistry of different deodorant agents determines their mechanism of antimicrobial action. Here, the antimicrobial activity of three chemical compounds in deodorant was analyzed against bacteria cultured from human sweat.

MATERIALS AND METHODS: The disk diffusion technique was used to determine biochemical growth inhibition from three deodorants containing different antibacterial agents: Triclosan, polyaminopropyl biguanide stearate (PHMB), and aluminum chlorohydrate, with sterile water as a negative control. Individual bacterial strains were identified using staining and metabolism tests.

RESULTS: Triclosan was a more effective inhibitor of growth compared to PHMB, while aluminum chlorohydrate and sterile water had no effect, as expected. Mixed culture sensitivity to Triclosan changed over time, due to both reduction in Triclosan efficacy or stability, and different sensitivities of microbiota strains. Pure colonies with different sensitivities were isolated, including *Micrococcus luteus* and two different strains of *Staphylococcus aureus*.

CONCLUSIONS: Deodorant effectiveness depends on the antimicrobial agent, its chemical stability, and intrinsic bacterial resistance.

57. SYNTHESIS OF CUMENE HYDROPEROXIDE MICROCAPSULES AND AN ANALYSIS OF THEIR STORAGE PROPERTIES

Lynsay Haverland and Brian McFarland
Morningside College

In this study, microcapsules were synthesized with an initiator core of cumene hydroperoxide and their leakage/storage properties within different storage media were analyzed. The leakage properties were analyzed in connection to differing polarities of the storage media. Testing in various solvents was performed, as well as in various monomer media. We looked for evidence of leakages in these different media; data was found using gas chromatography and UV-vis spectroscopy to find and analyze data. Our hypothesis is that if the capsules are stored in more polar media, then they will exhibit a higher degree of core leakage because of increased permeability to the storage media.

E **cology & Conservation Sec- tion Poster Presentations**

58. THE UTILITY OF HIGH-DIVERSITY PRAIRIE MIXTURES AS BIOENERGY FEEDSTOCKS

Jessica Abernathy¹ and Mark Sherrard²

Tallgrass Prairie Center¹, University of Northern Iowa²

Two opposing ecological challenges are the loss of biodiversity and rising demand for energy. Biodiversity is vital to ecosystem function but the simultaneous demand for energy necessitates conversion of natural landscapes to energy crops. One potential solution to this challenge is to grow diverse native vegetation for bioenergy. Tallgrass prairies produce large amounts of biomass but also provide ecosystem services. We compared the productivity of 4 bioenergy feedstocks of varying diversity: 1 species - a switchgrass monoculture; 5 species - a C4 grass mix; 16 species - a mix of grasses, forbs, and legumes; and 32 species - a mix of grasses, forbs, and legumes. Each diversity treatment was replicated four times on three soil types. We compared productivity by harvesting tissue in 10 randomly placed 0.3m² quadrats per plot. Over the 5-yr study, the switchgrass monoculture, 16 species mix and 32 species mix produced similar amounts of biomass, with the switchgrass monoculture producing significantly more biomass than the 5 grass mix. Our results indicate that a mixed crop of native vegetation enhances ecosystem function and also provides a reliable source of bioenergy.

59. HOW DO PREDATORS LOCATE NESTS OF ORNATE BOX TURTLES (*TERRAPENE ORNATA*)? A FIELD EXPERIMENT

Neil Bernstein¹, Andrew McCollum² and Robert Black²
Mount Mercy University¹, Cornell College²

Turtles are subject to high rates of nest destruction from meso-predators. Scents associated with nest contents, proximity to woody edge, and marker flags are suggested cues influencing nest predation. With few exceptions, most turtle nest predation studies involve aquatic turtles. During studies of terrestrial Ornate Box Turtles (*Terrapene ornata*), we documented high rates of nest predation. We designed an experiment to simultaneously compare combinations of factors which may influence predation using artificial nests on two sand prairies used for nesting. Disturbed soil was the only significant predictor of excavation. With the exception of the undisturbed soil with flag, effectively untouched by predators for 22-24 d, average nest survival was low (range: 2- 3 d). There were no significant differences between distances from the woody edge and artificial nests. Because undisturbed soil did not elicit digging, we suggest that nesting in soft sandy soil is not only adaptive because of ease of excavation, but rain and wind also hide surface evidence and/or odor of digging quickly and, therefore, obscure the nest. Additional data on deterrents to nest predators are also investigated.

60. SAND DUNE SUCCESSION FOLLOWING REMOVAL OF PINE PLANTING: IMPACTS ON MICROCLIMATES AND HABITAT SUCCESSION

Neil Bernstein¹, Callie Ochs², Adam Coats¹, Benett Vrbicek¹ and Thomas Rosburg³
Mount Mercy University¹, Washington High School², Drake University³

In the late 1970s/early 1980s, a conifer planting was established on the northwest side of a sand dune at Hawkeye Wildlife Area. Prior to this time, aerial photographs indicate an open sand dune with blow outs and little woody vegetation in the surrounding area. The purpose of the conifer planting was to reduce soil erosion because the blowing and shifting sand was viewed as a negative.

In 2010, the new IDNR manager of Hawkeye Wildlife Area agreed to remove the conifers in three successive winters. Recognizing the research potential, we asked that the initial cutting be delayed until the following winter so that baseline data could be collected and the subsequent succession following removal of the conifers monitored.

The baseline survey was done in summer of 2011. Six dataloggers were established to monitor microclimates at several times during the summer, and plant surveys were conducted in the same general area.

We repeated the 2011 study in 2014, the first summer in which

all the pines had been cut. We compare the microclimate and vegetation data from 2011 to the present, specifically focusing on solar radiation, wind speed, and percentages of native plants.

61. SOIL, CEDARS, AND FIRE: INTERACTIONS AND EFFECTS ON INVERTEBRATE DIVERSITY AT NIOBRARA VALLEY PRESERVE

Anna Daumer, Jennifer Inge, Lincoln Morris, Allison Schweighart, Emily Stricklin, Joshua Tampio, Emma Thies, Joseph Tolsma, Katie Thompson and Todd Tracy
Northwestern College

This is a follow-up study to our 2013 study that examined the effects of eastern red cedar and a large wildfire on soil properties and invertebrate diversity at the Nature Conservancy's Niobrara Valley Preserve in north-central Nebraska. Ecosystems burned include mixed grass prairie, ponderosa pine and oak woodlands, and stands of eastern red cedar, a fire-intolerant species that has become problematic in the Great Plains in the absence of fire. In September 2014, we collected soil samples and pitfall-trapped invertebrates in a partially burned section of the preserve that had not been previously surveyed. We compared soil properties and invertebrate diversity between burned and unburned areas, focusing on differences between areas with and without cedars and between areas with burned and unburned cedars. In this poster, we discuss our findings regarding interactions between fire history, soil properties, tree type (deciduous vs. cedar), and invertebrate diversity.

62. PHYSIOLOGICAL CONSEQUENCES OF COMPENSATORY GROWTH IN THE CHECKERED GARTER SNAKE, *THAMNOPHIS MARCIANUS*

Kaitlyn Holden¹, Anne Bronikowski¹ and Neil Ford²
Iowa State University¹, University of Texas at Tyler²

Variation in the physical and developmental environments can influence life-history traits through phenotypic plasticity. Poor natal nutrition can lead to subsequent energy intake being diverted between compensatory growth or delayed maturation. If an organism does allocate energy to compensatory growth and "on-time" maturation, there may be consequences across physiological axes. For example, immune defense is an energetically expensive biological process, which can trade-off with traits such as growth. Here we test how poor natal nutrition impacts growth, immune function and glucocorticoid production both during a natal phase of poor nutrition and a subsequent phase of rich nutrition in the checkered garter snake, *Thamnophis marci*anus. We found accelerated growth rates after the switch to high-quality food, with no impact on innate immune function and glucocorticoid production, but with negative impacts on subsequent reproduction. With those individuals experiencing poor natal nutrition producing smaller offspring. This suggests

that innate immune function is not compromised when excess energy is allocated towards growth compensation. Thus immune function may be maintained during periods of stress.

63. PLANT NITROGEN USE IN BIOENERGY FEEDSTOCKS

Jordan Koos, Zachary Kockler and Mark Sherrard
University of Northern Iowa

Increasing global energy demand and decreasing fossil fuel reserves have generated interest in renewable energy sources. Diverse prairie vegetation could be an ideal biomass crop in Iowa. Prairies are highly productive, resistant to weeds, and require little fertilization because of legumes, which form symbiotic associations with nitrogen-fixing bacteria. In this study, we tested whether switchgrass plants in low-diversity feedstocks (without legumes) show evidence of nitrogen depletion relative to switchgrass plants in high-diversity feedstocks (with legumes). We sampled 200 plants in four diversity treatments: 1 species – a switchgrass monoculture, 5 species – a C4 grass mix, 16 species – a grass, forb, and legume mix, and 32 species – a grass, forb, legume, and sedge mix. We measured four traits associated with nitrogen content: chlorophyll concentration, leaf florescence (FvFm), photosynthetic rate, and leaf tissue nitrogen. Chlorophyll concentration, FvFm, and photosynthesis were higher in the high-diversity mixtures than the C4 grass mix, but photosynthesis and chlorophyll content were highest in switchgrass monocultures. These results suggest that more nitrogen depletion has occurred in the C4 grass mix than the other three treatments. Big bluestem, little bluestem, and indiangrass all have faster nitrogen uptake than switchgrass which could explain why nitrogen depletion was greater in this treatment.

64. DIFFERENCES IN BIODIVERSITY AND SPECIES RICHNESS OF INVERTEBRATES IN REMNANT PRAIRIES AND POLYCULTURE ORGANIC FARMS IN IOWA^{BBB}

Mauricio Leon, Alexzandra Mehmen, Kieran Cullen and Johanna Foster
Wartburg College

Tallgrass prairies were the most common ecosystem in Iowa prior to Euro-American settlement, but currently they only exist as small remnants due to conversion into agriculture. Although most modern farms are large monocultures, the numbers of polyculture organic farms (POF) are increasing. With a variety of crop species, POF might contain enough habitat variation to support a diverse collection of invertebrates. This study focused on measuring the similarities in biodiversity between POF and remnant prairies in Iowa. We predicted that invertebrate diversity levels on the POF would be similar to those of the native

prairies. Two POF and two remnant prairies were surveyed for invertebrate biodiversity during four different months. One farm and prairie pair was in southcentral Iowa, and the other pair was in northeast Iowa. Vacuuming, pitfall traps, and sweep-netting were employed for capturing invertebrates. Invertebrates were identified to morphospecies, and then used to calculate species richness and diversity. Paired t-tests compared Simpson Biodiversity Indices (D) between the organic farms and prairie remnants. There were no significant differences between POF and remnant prairies. POF are not a substitute for remnant prairies but they may be capable of supporting the same level of invertebrate biodiversity.

65. THE INFLUENCE OF HUNTING SEASON AND SNOWFALL ON LEAD EXPOSURE OF WILD BALD EAGLES IN THE UPPER MISSISSIPPI RIVER VALLEY

Ronald Lindblom
Northeast Iowa Community College

Lead poisoning of eagles and raptors occurs primarily via spent ammunition which has informed a trend to ban lead in hunting ammunition. Availability of lead is caused by humans, yet a mixture of natural and anthropogenic factors influence uptake of lead in a population. The availability of lead in carcasses scavenged by raptors has been broadly associated with the hunting season, and snowfall has been proposed as mitigating exposure - but never tested. Our analysis of lead exposure in relation to the hunting season is the first from a large population (n=55) of wild Bald Eagles east of the Rocky Mountains in North America. We captured Bald Eagles overwintering in the Upper Mississippi River Valley, and blood analysis revealed 31% of individuals as recently exposed to lead - about half the exposure level found in local clinical data from eagles admitted to recovery centers or found dead. Our analysis reveals that the availability of firearm harvested White-Tailed Deer remains and snowfall are the primary factors influencing this population's lead exposure. The negative association we found between snowfall and lead exposure is a necessary consideration for accurate collection and interpretation of similar data.

66. SURVIVAL AND GROWTH OF JUVENILE ORNATE BOX TURTLES IN EAST-CENTRAL IOWA

Andy McCollum¹, Niki Martinson¹, Emma Narotzky¹, Neil Bernstein², Adam Coats², Virginia Brust² and Emilie Jacobsen²
Cornell College¹, Mount Mercy University²

Ornate Box Turtles, *Terrapene ornata*, are listed as a threatened species in Iowa, and as near threatened by the IUCN. In order to conserve this species, we must understand basic life history information, such as age- or size-specific growth and survival.

For *T. ornata*, as with many turtle species, we know little about early life history in the wild, as young individuals are rarely encountered. In order to monitor growth and survival, we used radio telemetry to monitor juvenile turtles over the past two summers. We checked on transmitted turtles at least every other day from May through August and at least weekly in September to determine whether they were alive. Upon first encounter in the spring and before turtles burrowed underground for the summer, we measured and weighed each individual in the study. The smallest individuals, which bore transmitters with approximately one-month battery lives, were weighed and measured each time their transmitters were replaced during the summer. Over two years, we obtained growth data over 58 intervals from 45 individuals. Overwintering turtles lost negligible body mass. During the growing season, turtles gained about 0.2% of body mass per day. For 2013 and 2014 combined, the daily mortality rate for hatchlings is on the order of 0.005, while for juveniles, which includes a broad range of size and ages from one to 10 years or more, the probability of mortality is an order of magnitude lower at around 0.0005.

67. PLANT HERBIVORE INTERACTIONS WITH VARIED HERBIVORE INTENSITY: THE ROLES OF LEAF DEFENSES AND NUTRIENTS

Carolyn McDermott¹, Kyle Haynes² and Anurag Agrawal³
Buena Vista University¹, University of Virginia², Cornell University³

Reciprocal evolution between herbivores and their host plants has given rise to considerable variety of plant defenses and herbivore counter defenses. Adaptations to chemical and physical defenses have forced many herbivores to specialize in their host plants, impacting the effectiveness of host plant defense. Interestingly there is minimal research into how plant defense mechanisms are affected by varying degrees of herbivory, or if there are threshold amounts of herbivory above which plant defenses are no longer beneficial. A field experiment using *Chrysochus auratus* and its host plant *Apocynum cannabinum* was conducted by caging *A. cannabinum* stems and treating them with three densities of *C. auratus*. Assessments on the effects of plant defense (latex exudation and cardenolides) and nutritional quality (water and nitrogen concentration) traits were recorded. The second part of the field test assessed *C. auratus* reproduction on exposed stems with varied herbivore damage. My results suggest, in this plant-herbivore system, later arriving herbivores would likely benefit from reduced plant defenses but also suffer from lowered nutritional value resulting from earlier herbivory.

68. A COMPARISON OF IOWA'S ORIGINAL CORN SUITABILITY RATING INDEX TO THE NEW CORN SUITABILITY RATING 2 INDEX

Aaron Sassman and C. Lee Burras
Iowa State University

In 1971 Dr. Thomas Fenton and several colleagues at Iowa State University (ISU) developed the Corn Suitability Rating (CSR) providing producers and assessors a soil productivity index for Iowa. The CSR for a soil is based on its inherent soil properties to a depth of 152- to 203-cm, mean weather data for a 30-yr period, and its potential for row crop production. Since the establishment of the CSR, changes in the way soils are classified have been made while advances in technology have enhanced and expanded our knowledge of soil properties. In turn, this changed the way CSR is calculated making it a more robust, yet, an expert driven index. In 2013, ISU introduced a more transparent and consistent method for calculating CSR, called CSR2, so interested individuals could clearly understand the factors underlying the index. The factors used for calculating CSR2 are inherent soil properties, specific field conditions for a soil map unit, soil depth and erosion resilience, and expert judgment while weather was removed as a factor from the calculation. Soil CSR2 values are generally comparable to CSR. An exception to this is greater CSR2 values in areas where the weather factor was limiting with CSR.

69. IF YOU FARM IT, WILL THEY COME? ROUTE-LEVEL DIVERSITY TRENDS IN IOWA'S BREEDING BIRD SURVEY RESULTS

Todd Tracy, Joseph Tolsma, Joshua Tampio, Allison Schweighart, Jennifer Inge and Anna Daumer
Northwestern College

The Breeding Bird Survey (BBS) was launched in 1966 as a nationwide project with the purpose of monitoring the status and trends in breeding bird populations in North America. Of the 4100 BBS routes in the U.S. and Canada, almost 3000 are surveyed annually. There are currently 33 active BBS routes in Iowa, 9 of which are currently available for "adoption". Each route is 24.5 miles in length and is surveyed annually during the breeding season by a local bird expert. In this study, we analyzed Iowa's BBS data to determine whether there exist any route-level biodiversity trends. We also examined routes for changes in land use during the time period.

70. WAYS TO WING IT: CORRELATION OF WING SHAPE WITH HABITAT PREFERENCES, TOXICITY AND MIGRATION IN BUTTERFLIES

Rhea Waldman, Morgan Muell, Miranda Salsbery, Diane Debinski and Dean Adams
Iowa State University

The shape of a wing influences the airflow over its surface and governs the aerodynamic forces acting on the wing. Therefore, wing shape is tightly correlated with flight performance. For bats and birds, faster fliers generally have more slender and elongated wings (high aspect ratio), while slower fliers have more broad and short wings (low aspect ratio). The preferred flight speed, and therefore wing shape of an animal is usually adapted to its habitat, foraging strategy, and flight behavior. We examined the relationship of aspect ratio and wing shape (i.e., leading edge curvature and wing pointiness) of butterfly forewings, relative to habitat preferences, toxicity, and migration using geometric morphometrics. Pictures of 22 butterfly species from three different habitats (forest, open forest and open habitat) were digitized and analyzed using morphometric methods. Our preliminary results indicate that the previously shown relationship of wing shape and flight performance for larger fliers might not scale down to butterflies. We found a significant difference in aspect ratios for butterflies in different habitats. Suspected slower fliers had a higher aspect ratio than faster fliers. This could mean that we need to adjust our ecological interpretation of wing shapes for small fliers such as butterflies.

71. MACROINVERTEBRATE CONCENTRATIONS ON OPPOSING BORDERS OF CASTOR CANADENSIS ESTABLISHMENTS

Beth Weber, Ethan Wilson, Bobby Ivey and
Melinda Coogan, Dr.
Buena Vista University

Biological, physical, and chemical assessments were conducted on an upstream and downstream American beaver dam site during April, 2014 in Buena Vista County, IA. Data were further analyzed for macroinvertebrate diversity to determine stream health. Methods included using a D-frame kick-net for macroinvertebrate collections, with the specific goal of identifying richness and abundance of Ephemeroptera, Plecoptera, and Trichoptera (EPT). These three Orders are used to quantify EPT levels and to develop an Index of Biotic Integrity (IBI). Using data collected from not only EPT levels, but also physical stream characteristics, the IBI water quality comparison of the two sites resulted in the upstream site being “fair” and downstream being “poor.” The research hypothesis stating that the American beaver dam would have a positive effect on the downstream water quality was not supported. Due to the agricultural land use conditions of the local watershed, the stream system showed signs of degradation, which may have resulted in low macroinvertebrate diversity and overall low IBI scores. Further and more extensive assessments would need to be conducted for better accuracy.

72. PURPLE LOOSESTRIPE (*LYTHRUM SALICARIA*) PRESENCE IN IOWA WETLANDS: SITE VISITS AND SOIL SEED BANK ANALYSES

Paul Weihe, Clarissa LaPlante and Zane Peters

Central College

The Iowa DNR and local conservationists have monitored the presence of Purple Loosestrife (*Lythrum salicaria* L.), an invasive perennial plant of shallow wetlands, streambanks and lakeshores. Control efforts have included release of biological control insects, in particular Galerucella beetles. Using information from the DNR database, we visited 47 (36%) of the sites in 26 counties. These visits were July 23 (eastern Iowa) July 28 (southern Iowa) and August 3 (northern Iowa), 2013 and July 2 (central Iowa), and September 20 (Northern Iowa), 2014. Of the 47 sites visited, seven (7) were listed as release sites for biocontrol insects.

Only 15 of the 47 sites visited (32 %) contained Loosestrife. The beetles were present at about one-fourth of all sites, similar in sites listed as a biocontrol release site or not. Insect presence and effects were difficult to ascertain, and we did not attempt to trap insects. Biocontrol activity and effects will be studied in future work.

Ongoing seed bank analysis indicates the presence of Loosestrife seeds in the soil for long periods, even at sites lacking actively-growing plants. Emergence of seedlings from these soil samples indicates a long-term, persistent challenge in control of Loosestrife and ongoing monitoring is indicated.

E **cology &** **Conservation** **Section Oral** **Presentations**

73. PUTTING ALL THEIR EGGS IN ONE BASKET? *DROSOPHILA MELANOGASTER* LAY MOST BUT NOT ALL OF THEIR EGGS IN AGGREGATIONS^{ISF}

Andrea Bixler¹ and Fred Schnee²
Clarke University¹, Loras College²

Female *Drosophila melanogaster* mate and lay eggs on their food source; the eggs hatch into larvae that feed in that location until they pupate. Thus, choice of an appropriate oviposition substrate is critical for female fitness. Females are known to aggregate their egg-laying. This is believed to increase survival of larvae by improving their ability to control harmful fungal growth on the food. We hypothesized that there must be an upper limit to aggregation because of increased competition of larvae at very high densities. Females were placed on grape

agar in densities ranging from 1 per 17,000 mm² of medium to 1 per 12 mm² and allowed to lay eggs for 15 hours. At higher densities, females continued to aggregate eggs and there was no decrease in eggs laid per female. However, even at the lowest densities, females that laid more than 1 egg always laid at least 1% of their eggs away from the main aggregation. Experiments with oviposition substrates of varying quality suggest that this behavior is not accidental but adaptive, since females tend to lay their non-aggregated eggs on the second-best substrate.

74. OVIPOSITION SITE PREFERENCE OF *DROSOPHILA MELANOGASTER*: INFLUENCES OF REARING CONDITIONS AND FOOD TOXICITY

Mike Dietzel¹, Fred Schnee¹ and Andrea Bixler²
Loras College¹, Clarke University²

Oviposition site preference is an important decision that affects the fitness of *Drosophila melanogaster*. Many variables affect oviposition behavior. For example, it is known that females tend to seek environments similar to their rearing conditions and avoid environments with heavy metals such as cadmium chloride (CdCl₂). However, the relative importance of these factors is not clear. In order to examine this question, we set up fly stocks reared on a food source with or without 0.1mM CdCl₂. During testing, females were placed in a chamber containing three plates with and without CdCl₂. Eggs were counted after 15 hours and an ANOVA was used to compare egg laying patterns. Initial results suggest that while flies reared on CdCl₂ oviposited on the plates containing CdCl₂ significantly more than the control flies did, both groups still showed a significant avoidance of the heavy metal. Our results suggest that quality of oviposition site, and in particular, avoidance of heavy metals, is the more important factor in the oviposition behavior of *Drosophila*.

75. OVIPOSITION SITE PREFERENCE IN *DROSOPHILA MELANOGASTER*: INFLUENCES OF ADULT FLY DENSITY AND FOOD QUALITY^{ISF}

Stephanie Ihde¹, Andrea Bixler¹ and Fred Schnee²
Clarke University¹, Loras College²

Oviposition site preference (OSP), an important factor in reproductive success of *Drosophila melanogaster*, is influenced by factors including nutrient availability; toxins, including heavy metals; and adult female density. Females prefer to aggregate eggs. This is beneficial because resultant larvae can better eliminate harmful fungi on food. If aggregation becomes too extreme, food sources become limited, increasing mortality. Food quality is also important in OSP. Cadmium's presence in food can cause developmental delays and decrease larval survival. Both increased female density and the presence of cadmium are factors reducing fitness of *Drosophila* offspring, but their exact

roles on aggregation remain unclear. To test this, groups of females were placed in chambers containing six dishes of grape agar of same or varying quality. Eggs were counted after 15 hours. ANOVA showed females were significantly less likely to oviposit on agar containing CdCl₂. In tests where flies were presented with variation in agar quality, significantly higher levels of aggregation were produced than in tests with uniform agar. However, larger numbers of females laid significantly more eggs and tended to distribute them across available dishes rather than aggregate them in one dish. Results suggest food quality and adult female density are important in OSP.

76. MACROINVERTEBRATE BACTERIAL RESISTANCE TO TRICLOSAN AT THE OUTLET CREEK (IA) WWTP OUTFALL AND POTENTIAL FOR DOWNSTREAM RESISTANCE MIGRATION

Ethan Wilson
Buena Vista University

Triclosan is an antibiotic that has been found in waste water treatment plant (WWTP) effluent water, with about 5% being released back into local bodies of water (Waltman et. al, 2006). This is significant because of the possible effects on the environment caused by triclosan's behavior to negate the pathway of lipid production in bacteria and algae. A greater concern is that this antibiotic can cause the push towards triclosan-resistant bacteria in areas of high triclosan concentrations. Among the bacteria sampled in this study, there was shown to be an inhibition towards triclosan in the upstream water, but at the outfall where the triclosan level was 0.03007 ppb and methyl-triclosan level was 0.06265 ppb there were relatively high levels of resistant bacteria. Downstream bacteria sampled showed an increased resistance compared to that of the upstream, and a similar amount to that of the outfall. The downstream triclosan levels measured 0.00997 ppb and the methyl-triclosan levels measured 0.00485 ppb. These results suggest that the bacterial resistance to triclosan may be carried further downstream as the bacteria are moved along Outlet Creek from the WWTP outfall.

77. EFFECTS OF ALLELOCHEMICALS FROM GARLIC MUSTARD (*ALLIARIA PETIOLATA*) ON RHIZOBIUM LEGUMINOSARUM

Veronica Andraski and Aditi Sinha
Loras College

Garlic mustard, an invasive species, releases allelochemicals such as allyl isothiocyanate (AITC) and benzyl isothiocyanate (BITC) into the soil that inhibit germination and growth of other plants and microbes. Most studies have focused on the allelopathic effects of garlic mustard on other plants and fungi,

with few studies examining these effects on soil bacteria. The objective of this study was to determine if the allelochemicals found in garlic mustard inhibit the growth of *Rhizobium leguminosarum*, a nitrogen-fixing soil bacterium. The Kirby-Bauer disc diffusion method was used on cultures of *R. leguminosarum* to test the effects of AITC and BITC. Both separate and combined effects of the chemicals were examined at three concentrations. The lowest concentrations of both chemicals used simulated the levels found in soils. The results demonstrated that BITC inhibited bacterial growth at the highest concentration but not at the lowest. AITC did not inhibit growth except when combined with BITC; the level of inhibition caused by the lowest combination treatment was significant, indicating a combinatory effect. The results suggest that allelochemicals released by garlic mustard may have an inhibitory effect on symbiotic soil bacteria and may partly explain the success of garlic mustard as an invader.

78. USING PLASMA SEX STEROIDS TO DETERMINE REPRODUCTIVE STATUS OF PADDLEFISH IN THE UPPER MISSISSIPPI^{BBB}

Madelyn Stiehl and Joshua Lallaman
St. Mary's University of Minnesota

Freshwater fish species are experiencing great changes to their environment as human impact on freshwater ecosystems becomes more detrimental and persistent. The paddlefish (*Polyodon spathula*) is a large freshwater fish species that is particularly sensitive to human disturbances and has experienced a decline over the last century due to its traits of maturing late in life and not spawning annually. These traits make accurate sex ratios and spawning estimates very important for management and restoration strategies for the species. One way this information can be obtained is through the analysis of plasma sex steroids, a minimally-invasive and non-lethal method in identifying sex and spawning status of individual fish. Paddlefish were collected from the Upper Mississippi River using monofilament gill and trammel nets. Approximately 5ml of blood was taken from each fish, along with length (cm) and weight (kg). Plasma sex steroids concentrations of both testosterone and estradiol were measured using ELISA kits in order to determine the sex and spawning status of the individual. Results of this analysis will provide for a better understanding of reproductive dynamics in this small and potentially imperiled population.

79. VASCULAR PLANT DIVERSITY SEEPS OF WINNESHIEK COUNTY^{BBB&ISF}

Anna Burke and Beth Lynch
Luther College

Small wetlands occur where groundwater slowly emerges from hillsides creating areas of moist, organic-rich soil. Previous studies have documented high plant diversity in larger seeps and fens of northeast Iowa, however small seeps within forested areas have not been described in this region and their ecological importance is largely unknown. The objective of this study was to document plant diversity and to measure water quality in six forested seeps near Decorah, IA. All seeps in this study had high vascular plant diversity and there were several species on the fringes of their range such as *Symplocarpus foetidus*, *Liparis loeselii* and *Acorus americanus*. I measured nitrate levels, conductivity, and pH of the water at different locations in each seep over the summer of 2013. Results of water tests showed that seeps with high diversity of rare wetland plants had nitrate levels averaging 0.68 +/- 0.37 parts per million, pH levels of 7.54 +/- 0.26, and average conductivity of 500.3 +/- 66.59 μ S/m. These nitrate and conductivity levels are low compared to the surface water in streams in the area. The information obtained by this study is important to work at preserving these diverse habitats from destruction due to livestock or development

80. SEASONAL CHANGES IN POLLINATOR FLORAL RESOURCE AVAILABILITY IN FOUR TYPES OF GRASSLANDS^{ISF}

John Delaney, Karin Grimlund and Diane Debinski
Iowa State University

Pollinators are declining globally, and this decline in ecosystem services threatens the stability of agricultural and natural systems. Pollinators in agro-ecosystems depend on a diversity of floral resources (pollen and nectar) that are primarily found in uncultivated areas such as grasslands. Understanding seasonal changes in the abundance and diversity of floral resources is an essential consideration in pollinator conservation and restoration efforts. Here we investigated how different types of grasslands important for pollinator conservation (remnant prairies, reconstructed prairies, conservation grazed cattle pastures, and old fields) in the tallgrass prairie ecoregion differed in their seasonal changes of floral resources by counting inflorescences (cluster of flowers on a stem) every two weeks from May through October 2013. Remnant prairies had greater richness of inflorescences and were least similar to the other grassland types in terms of composition. Reconstructed prairies exhibited the most similarity in composition to remnant prairies only during the middle of the growing season. Pastures had more periods where turnover in composition from one survey to the next was low. Old fields had the lowest richness of inflorescences. Additionally, we will present preliminary results on responses of butterflies to the four grassland types and their relationship with changes in inflorescences.

81. CONSERVATION ASSESSMENT OF MANIKOWSKI PRAIRIE, CLINTON COUNTY, IOWA

Wayne Schennum and John Pearson¹
Iowa Department of Natural Resources¹

Manikowski Prairie is a 40-acre state preserve owned and managed by the Clinton County Conservation Board. It lies on the northeast edge of the Southern Iowa Drift Plain. Its 2 most significant features are a 20-acre dry limestone prairie and a small population of the very rare Wall-rue Spleenwort (*Asplenium ruta-muraria*). The 2014 Conservation Assessment of this prairie determined its ecological quality, compiled a plant species list with relative abundances, checked for any state-listed butterflies, and made management recommendations. Information was gathered on 3 visits spanning the growing season. The majority of the prairie is very high quality (grade A) dry dolomite prairie on thin soils. Species richness and diversity are very high, and its structure is very open with forbs and grasses well integrated, not patchy. Dominant species are *Schizachrium scoparium*, *Sporobolus heterolepis*, and *Heterostipa spartea*. The most common forbs are conservative dry prairie indicators including *Amorpha canescens*, *Echinacea pallida*, *Liatris cylindracea*, *Minuartia michauxii* (an SC species), *Symphyotrichum oolentangiense*, and *Viola pedata*. A total of 82 native species were recorded. The mean coefficient of conservatism is high at 5.086. Nearly 50% of the species have C-values exceeding 5. The most level plateau areas have low species richness and are dominated by *Andropogon gerardi* and *Sorghastrum nutans*, mixed with Eurasian Smooth Brome. Patches of surficial dolomite and cliffs frequently have *Aquilegia canadensis* and *Pellaea glabella*. The population of *A. ruta-muraria* is thriving on the south cliff. In mid-summer, 5 individuals of the Special Concern Regal Fritillary butterfly were observed. Management activities needed to maintain and improve the preserve include implementation of a long-term burning regime and the removal of adventive brush from the cliffs.

79. QUANTITATIVE EFFECTS OF GOAT BROWSING AND TREE CUTTING ON VEGETATION IN A SAVANNA RESTORATION

Thomas Rosburg
Drake University

Restoration of oak savanna was studied from 2006 to 2011 at Chichaqua Bottoms Greenbelt in Polk County. Vegetation data were collected in 2006, 2008 and 2011 on control plots, plots with only tree cutting, and plots with tree cutting followed by 3 seasons of goat browsing. Data were analyzed for 63 vegetation variables representing the richness, species composition and structure of herbaceous, shrub, sapling and tree layers. Two-sample tests were used to compare the change from 2006 to 2008 between control and cut plots. One-way ANOVA was

used to compare the change from 2006 to 2011 among control, cut and cut & browse plots. Among the 63 variables, 11 exhibited significant patterns for 2006 to 2008, while 20 were significant for 2006 to 2011. Cutting alone resulted in a decrease in sapling and tree density, tree basal area and buckthorn abundance, and increase in violet frequency, sedge, forb and native herbaceous richness, relative frequency of exotic herbs, and herbaceous seedlings/juvenal plants. The addition of goat browsing demonstrated increases in total herbaceous abundance, graminoid and sedge frequency, and decreases in jumpseed abundance, tree density, and shrub and tree richness. Goat browsing was effective in creating a favorable herbaceous layer while reducing shrub richness.

83. EASTERN TIGER SALAMANDER (*AMBYSTOMA TIGRINUM*) OCCUPANCY AND DISTRIBUTION WITHIN RESTORED WETLANDS OF WINNEBAGO COUNTY, IOWA

Alyse DeVries and Paul Bartelt
Waldorf College

Eastern tiger salamanders (*Ambystoma tigrinum*) range throughout much of the U.S., from Southern Canada to Northern Mexico. Though abundant, this species is vulnerable to many man-made threats, such as, introduced species and habitat destruction by agriculture and urban development. Habitat destruction has resulted in a steady decline in salamander numbers over the last decade. These declines are being reported at a time when salamanders are increasingly being recommended for use as bio-indicators to assess the ecological health of natural areas. Through joint efforts of several government agencies and private landowners, >12,000 acres of wetlands have been restored within Winnebago County in north central Iowa. We began a multi-year study to determine patterns of recolonization of restored wetlands by Eastern Tiger salamanders. Last year we estimated the occupancy and distribution of *A. tigrinum* in 45 restored ponds among 19 restored wetlands in Winnebago County. Using visual encounter surveys and minnow traps, we detected salamander larvae and adults in 27 of 45 ponds among 15 of 19 sites. Occupancy modeling (when detection is imperfect) estimated that salamanders occupied 74+21% of the ponds. We are employing radio-telemetry and biophysical modeling this year to estimate their movement patterns and factors affecting their habitat selection.

78. WOLVES IN IOWA

Ron DeArmond
Pella Wildlife Company

Wolves are historically native to Iowa. Due to legislative efforts in January 1840 wolves were targeted for removal. Wolves were considered extirpated by the 1860's. Placed on the endan-

gered species list in 1973, Iowa is part of the recovery zone for the Western Great Lakes Distinct Population Segment of gray wolves in the Midwest. Today there are more wolves in the Midwest than the rest of the lower 48 states combined (approximately 4000). Once considered recovered and taken off of the endangered species list in 2012 the wolf once again has been relisted as an endangered species through the efforts of animal rights organizations.

Pella Wildlife Company has been working with Wisconsin DNR to monitor the population and territories of wolves in the central forest and south. In 2015 a new survey block was created on the Iowa/Wisconsin border. Pella Wildlife Company has been given the responsibility to monitor this block as well as three other survey blocks in the state. Pella Wildlife Company has also expanded surveys into northeast Iowa. This presentation will share field research and look at dispersal patterns as wolves move into Iowa, Illinois and Missouri.

Engineering Section Poster Presentations

85. TECHNO-ECONOMIC ANALYSIS OF BIOFUELS FROM HIGH MOISTURE FEEDSTOCK VIA HYDROTHERMAL LIQUEFACTION AND ANAEROBIC DIGESTION

Mitch Amundson and Mark Wright
Iowa State University

The purpose of this study is to develop an economic model that analyzes the logistics and conversion technology of biofuel production from high moisture feedstocks including corn silage, sweet sorghum, miscanthus and microalgae. The study evaluates the costs of anaerobic digestion and hydrothermal liquefaction of these feedstocks. Biofuels have proven to be a viable alternative to petroleum through biochemical and thermochemical conversion technologies of biomass. However, logistic and conversion costs have hindered the growth of biofuels as a major player in the transportation market. Many of the logistics costs have been attributed to preprocessing such as drying and grinding. One solution to cut down on these preprocessing costs has been to develop a conversion method that negates the need for a dried feedstock. Hydrothermal liquefaction and anaerobic digestion are two conversion technologies that do not require a dry feedstock. These four feedstocks are compared based on energy efficiency and economic costs for a variety of plant operating sizes, processing scenarios and mini-

mum fuel-selling prices. The US Department of Energy determined that economic biofuel production requires that the logistics cost do not exceed 19% of the final ethanol production price (\$/gge). High moisture content feedstock presents an opportunity to decrease biofuel costs by reducing pretreatment requirements of biofuel production technologies.

86. BIOFUELS POTENTIAL IN GHANA

Nataliya Apanovich
Iowa State University

Developed countries are heavily promoting biofuels production through economic incentives to mitigate climate change effects and to ensure energy security. Developing countries, on the other hand, promote biofuels to achieve development goals, poverty reduction, and economic enhancement. Africa's biofuels potential is significantly higher than that of Europe or North America. The fuels, derived from biomass materials such as agricultural crops and plant oils, can improve farmers' incomes and decrease dependence on foreign energy. Agriculture is Ghana's most important economic sector, accounting for almost half of the GDP and export earnings. The country produces a variety of crops in various climatic zones which range from dry savanna to wet forest. By 2020 Ghana could develop the capacity to produce about 766.1 million and 869.6 million gallons of biodiesel and ethanol respectively. While Ghana is capable of producing significant amounts of biofuels from the available feedstocks, currently, there is no biofuels policy mandate to incentivize such production. The Ghanaian government could employ cap-and-trade policies that would provide maximum incentives and opportunities for the agricultural and forestry sectors to provide high-quality offsets and GHG emissions reductions for credit or financial incentives.

87. INCREASING PATIENT SAFETY: REDUCING TRAFFIC IN THE LABOR AND DELIVERY OPERATING ROOM

Brennan Ayres, Salvador Rojas-Murillo, Farzaneh Dolati, Loreen Herwaldt and Priyadarshini Pennathur
The University of Iowa, Department of Mechanical and Industrial Engineering

Door openings (DO) in the operating room may increase the risk of surgical site infections by disrupting air flow and disrupting the surgical procedure, but no existing studies that assessed either DO during Cesarean sections or providers' perceptions of DO were found. To understand healthcare providers' perceptions of DO during Cesarean sections, we observed 14 Cesarean sections and electronically surveyed providers at a teaching hospital. Ninety-nine providers responded: 43 labor and delivery staff (OBS), 35 pediatrics staff (PS), and 21 anesthesia providers (AP). Answers to 13 scale of agreement ques-

tions indicated that respondents understood the significance of DO. Among respondents, 46.5% of OBS, 57.1% of AP, and 25.7% of PS ($p = 0.047$) thought doors opened 11-20 times/Caesarean section. Doors actually opened 40.4 times/Caesarean section, indicating a discrepancy between team perceptions and reality. Respondents suggested that automatic doors and procedural changes for checking into a Caesarean section could reduce DO. To reduce DO, we must understand how different provider groups think about: DO as an issue, the number of DO during a procedure, consequences of DO, and possible interventions to decrease DO. This study builds upon previous research to come up with recommendations to reduce or prevent door openings and thus limit their impact on surgical outcomes.

88. MATHEMATICS OF MASS TRANSPORT FOR THE DESIGN OF ARTIFICIAL ORGANS

Scott Beckman, Xinhang Shen, Kathleen Wilcox and
Kaitlin Bratlie
Iowa State University

In this presentation a mathematical framework is presented for studying mass transport into and out of artificial organs. In particular diffusion through polymer coated alginate/cell core/shell geometries are examined. This geometry has been proven relevant for biomedical applications such as pancreatic islets encapsulated in alginate for treating diabetes. The governing equations are presented and then transformed into non-dimensional form. A semi-analytical solution is produced that can be solved using a simple finite difference approach. A diffusion model is presented to describe the uptake of proteins from an aqueous solution by an antibody laced alginate bead. The model is fit to experimental data and the phenomenological parameters are determined.

89. WATER QUALITY PROBES PROVIDE IN-SITU MONITORING OF BIOCHEMICAL REACTIONS IN AN ENGINEERED BIOREACTOR

Ellen Black
The University of Iowa

Water quality instruments monitored biochemical activity of anaerobic ammonium oxidizing (anammox) bacteria in an attached growth bioreactor containing high concentrations of inorganic nitrogen. Anammox bacteria consume ammonium (NH_4^+) with nitrite (NO_2^-) as an electron acceptor to a final product of nitrogen (N_2) gas. A UV-spectrophotometer (S::CAN Spectro::lyser™) tailored to wastewater influent was locally-calibrated for use in the anammox bioreactor. The spectrophotometer continuously monitored NO_2^- , NO_3^- , chemical oxygen demand (COD), and total suspended solids (TSS). A multiparameter sonde (Hydrolab® DS5) contained specific probes for detection of NH_4^+ , NO_3^- , dissolved oxygen (DO),

pH, and temperature. Together, the spectrophotometer and multiparameter sonde provided a low maintenance, reliable, and continuous method for in-situ water quality monitoring as well as an indicator of biological activity. Chemical concentrations from probes were correlated with anammox DNA concentrations to form a systems approach to biochemical kinetics. In a broader picture, sensor technology used in wastewater treatment plants could simplify nutrient management by eliminating time-consuming sampling and chemical analysis, immediately alert water treatment specialists to sudden changes in influent chemical concentrations, activity of microbial communities, and efficacy of treatment goals for effluent.

90. THE EFFECT OF HEAT CARRIER PROPERTIES ON PYROLYSIS PRODUCTS IN AN AUGER PYROLYZER

Tannon Daugaard and Mark M. Wright
Iowa State University

The objective of this research was to determine how different heat carrier properties affect the yield and characteristics of pyrolysis products in an auger reactor. Auger pyrolyzers have gained interest as alternative reactors due to their minimal inert gas requirement while still achieving similar yields to fluidized bed reactors. Additionally, auger pyrolyzers with direct heating via heat carrier provide higher heat transfer rates over conventional indirect heating auger pyrolyzers. For this study we pyrolyzed up to 1 kg/hr of red oak in a twin-screw, lab-scale auger reactor at 515°C. Multiple heat carriers with varying specific heat capacities (500-830 J/kg-K) and thermal conductivities (0.2-120 W/m-K) were tested. The heat carriers tested included stainless steel, silicon carbide, fine sand (250-600µm) and coarse sand (600-1000µm). A cold gas quench system was used to collect the bio-oil into two fractions: a heavy phase and an aqueous phase. Proximate and ultimate analyses were conducted on both bio-oil fractions and char. Moisture and solids content was also determined for both bio-oil fractions. Identification of select bio-oil compounds was conducted. Bio-oil yields ranged from 64-68 wt. % across all heat carriers. Char and non-condensable gas yields ranged from 15-25 wt. % and 10-15 wt. %, respectively. More fundamental studies are needed to optimize the yields and quality of pyrolysis products in an auger pyrolyzer.

91. IN SITU METHODS TO ANALYZE GENE EXPRESSION IN PSEUDOMONAS SP. ADP BIOFILMS^{PPP}

Michael Delcau and Tonya Peebles
The University of Iowa

Due to the substantial use of the herbicide atrazine, it frequently contaminates surface water, groundwater, and drinking water from runoff on row crops and exceeds the EPA's Maximum Contaminant Level of 3 ppb. A well characterized strain with

the ability to degrade the contaminant, *Pseudomonas* sp. ADP (P.ADP), completely mineralizes atrazine to yield carbon dioxide and ammonia. The catabolic pathways consists of a series of genes (AtzA-AtzF) each encoding for specific enzymes that assist in the sequential breakdown into various metabolites. Due to an increased horizontal exchange of catabolic genes in biofilm mode of growth, P.ADP biofilms are hypothesized to have a higher frequency of gene expression compared to P.ADP planktonic cells. Initially, the specific growth rate was determined for P.ADP growing on LB, NHNO_3 -based medium, and Mandelbaum medium to be 0.451, 0.068, and 0.045 hr^{-1} , respectively. In this study we employ a sensitive method using multiple nucleotide incorporation, In Situ Reverse Transcription, to localize the extent of gene expression in P.ADP biofilms and free cells. Spatial elements in relation to expressed AtzA and AtzD genes were configured using Confocal Laser Scanning Microscopy. Further research will explore using DIG-labelling and antibody layer amplification to obtain an increased signal

92. PREDICTING EPISODIC AMMONIUM EXCRETION BY FRESHWATER MUSSELS VIA GAPE RESPONSE AND HEART RATE

Lee Hauser

The University of Iowa

Freshwater mussels are a viable option to detect real-time changes in water quality within aquatic ecosystems. Known as ecosystem engineers, freshwater mussels are constantly filtering particles and recycling nutrients in the benthic community. Therefore, identifying their physiological responses to alterations in water quality will enable mussels to not only serve as biomonitors but help model their impact on nitrogen cycle. This research focuses on identifying how mussel gape and heart rate respond to the addition of phytoplankton following a period of limited food availability. Immediately following phytoplankton addition, mussels show a decreased gape angle linked with a decreased heart rate. As the gape returns to an open position, overlying ammonia concentrations increase showing an end of the metabolism process. As a result, pairing physiological changes with increases in phytoplankton, freshwater mussels' impact on ammonium concentrations can be accurately predicted.

93. COMPARATIVE TEA MODELS OF TECHNICAL DEVELOPMENT FOR ADVANCED BIOFUEL AND BIOPRODUCTS VIA THE PYROLYSIS PLATFORM

Wenhao Hu, Mark M. Wright and Robert C. Brown
Iowa State University

The economic production of biofuels and bioproducts is a key factor to meeting our energy security and environmental goals.

Biomass pyrolysis is a pathway for producing bio-oils that can serve as a platform feedstock for the chemical industry. A variety of chemicals and fuels can be acquired via separation and subsequent upgrading of bio-oil fractions. Separation and upgrading processes require investment in additional processing stages to recover target compounds into a suite of products. Several techno-economic factors determine whether a portfolio of bio-oil derived products is profitable. This study evaluates several pyrolysis product portfolios and investigates their profitability and investment requirements. Four portfolios are explored in this study: 1) transportation fuels, 2) commodity chemicals, 3) alternative products such as bio-asphalt and 4) mixed products. Pyrolysis TEA models and experimental data, which are developed by Iowa State University, will be used to evaluate the performance of each scenario based on the projected internal rate of return (IRR) and maximum investment cost (MIC). The findings from this study will identify economic portfolios for the combined production of biofuels and bioproducts via the pyrolysis platform based on process performance and product market prices.

94. A TECHNO-ECONOMIC ANALYSIS OF BIO-OIL STABILIZATION FOR INSERTION INTO PETROLEUM REFINERIES AND UPGRADING TO TRANSPORTATION FUELS

Wenqin Li, Mark M. Wright and Robert C. Brown
Iowa State University

Bio-oil contains complex oxygenated compounds and other impurities lend it unsuitable for upgrading in existing refineries. In this study, we evaluate the economic cost of stabilizing bio-oil recovered from the fast pyrolysis of red oak and corn stover in a fluidized bed pyrolyzer and condensed in a fractionation recovery system. The fractionation system consists of a series of condensers, and electrostatic precipitators designed to separate bio-oil into four fractions. Preliminary results indicate that bio-oil can be fractionated into 26% oxygenates, 20% carbohydrates, 8.5% middle fraction, and 46% CPO. A two-stage stabilization processes are employed in the upgrading section for the CPO, middle fraction, and soluble carbohydrates. The light oxygenate fraction undergoes steam reforming to produce H_2 for the hydroprocessing reactors. The light oxygenate fraction can also be upgraded into alcohols via ketonization and alkylation for more benefits. Techno-economic analysis has been done for the stabilization process to evaluate the commercial viability of bio-oil stabilization for the production of renewable transportation fuels.

95. A NEW POINTING SYSTEM FOR AN INSTRUCTIONAL RADIO TELESCOPE AT THE UNIVERSITY OF IOWA

Abram Nothnagle, Joseph Sink and Steven Spangler
The University of Iowa

Radio astronomy is a major branch of modern astronomy and astrophysics. Since 1992, the University of Iowa has had a small (4.5 meter diameter) instructional radio telescope on the roof of Van Allen Hall to teach students the fundamentals of radioastronomical instrumentation and measurement techniques. One component of the radio telescope is the pointing system, that changes the elevation angle of the antenna to see different radio sources. The original system became incompatible with modern computer hardware and software and had to be replaced. We have developed a new system that is based on an Arduino microcontroller board. The telescope communicates with the Arduino, which controls the pointing motors. The new system also features a sensor that reads the antenna elevation angle. We will also describe other projects in progress, such as the construction of a new receiver for the radio telescope.

96. SIMULATION OF GRANULAR MIXING IN DUAL-SCREW AUGER REACTORS BASED ON THE DISCRETE ELEMENT METHOD

Fenglei Qi and Mark M. Wright

Iowa State University

Auger reactors are a promising alternative for conversion of biomass to transportation fuels via fast pyrolysis. They can achieve high mixing effectiveness and heat transfer rates. Previous studies have demonstrated that mixing effectiveness of biomass with heat carrier is important for increasing fast pyrolysis bio-oil yields. However, there is limited understanding of mixing characteristics of fast pyrolysis auger reactors. The purpose of this research is to develop a discrete element method (DEM) for simulating granular flows confined by complex geometry structures and identify parameters that influence the mixing of biomass and heat carrier particles in dual-screw auger reactors. Reactor design parameters that are investigated include screw rotation speed, rotation orientation, and heat carrier type. Results show that increasing rotation speed reduces particle mean residence/mixing time. It was also determined that biomass particles that have different mixing times display distinctive flow patterns under the same operation conditions. In terms of mixing indices, increasing the screw rotating speed promotes mixing effectiveness and employing sand as heat carrier achieves better mixing than steel under similar operating conditions. DEM simulation has proven useful in understanding fundamental granular flow behaviors in auger reactor and could aid in improving the design and operation of auger reactors.

97. THE PARTITIONING OF 2,4-DINITROANISOLE WITHIN HYBRID POPLAR AND WILLOW TREES

Hunter Schroer and Craig Just

The University of Iowa

The environmental fate of 2,4-dinitroanisole (DNAN), a component of new insensitive munitions explosives (IMX) formula-

tions, is an emerging global issue. The new IMX formulations – which all contain DNAN – are replacing old formulations at a rapid pace. However, DNAN has a relatively unknown fate and ecosystem toxicity. DNAN is a nitro-substituted aromatic compound that is similar to 2,4,6-trinitrotoluene (TNT). TNT and other nitroaromatics have been shown to cause harm to human health and ecosystems, leading to concern over the impacts of widespread DNAN use. The research presented will focus on uptake of DNAN from hydroponic solution by poplar and willow trees and subsequent partitioning to roots, stems and leaves. The findings will elucidate potential metabolic pathways and the extent of translocation of DNAN inside the trees. The results will inform the possibility of in situ remediation by poplar trees toward field-scale implementations. Full-scale remediation will be necessary for military training and testing sites around the world, as more countries adopt the new IMX formulations. This research will confirm the viability of the energy-efficient and economical technique of tertiary treatment by poplar trees, as opposed to costly techniques such as incineration or landfilling of contaminated soils. Results and implications will be presented.

98. EX-SITU CATALYTIC FAST CO-PYROLYSIS OF RED OAK AND POLYETHYLENE IN MICRO-PYROLYZER^{ISF}

Yuan Xue and Xianglan Bai

Iowa State University

Catalytic pyrolysis of biomass to biofuel usually suffers from low conversion efficiency mainly attributed to highly oxygenated and hydrogen deficient nature of the feedstock. Waste plastics, on the other hand, are petroleum -derivatives that rich in hydrogen content. Thus co-converting plastics and biomass could potentially improve the conversion efficiency while utilizing the two streams of abundant energy feedstock simultaneously. In present study, ex-situ catalytic fast pyrolysis (CFP) of red oak and polyethylene (PE) over zeolite catalyst was conducted using a micro-pyrolyzer coupled with online GC/MS system. Effects of both pyrolysis temperature (500-800°C) and catalyst temperature (400-700°C) on products distributions are studied. It was found that strong synergistic effect among red oak with PE during co-pyrolysis suppresses the formation of pyrolysis char, catalytic coke and oxygenated gases whereas it improves the production of olefins and aromatic hydrocarbons. Hydrogen transfer from PE to red oak promoted deoxygenation reactions that forming water and also significantly reduced carbon retention on coke. Co-upgrading with red oak is also likely to improve the cracking of PE. Increasing pyrolysis temperature and catalyst temperature enhanced both the yields of olefins and aromatics hydrocarbons. However, too high temperatures resulted in a slightly decrease in olefin yield. The reaction mechanisms of the synergetic effect were also investigated using model components.

99. APPLICATION OF VALIDATED AUTOMATED AXON COUNTING SOFTWARE (AXONJ) TO MULTIPLE RODENT MODELS OF GLAUCOMA

Kasra Zarei, Mark Christopher, John Fingert, Kathy Miller, Michael Anderson, Adam Hedberg-Buenz, Anamika Tandon, Todd Scheetz and Michael Abramoff

The University of Iowa, Wynn Institute of Vision Research

Purpose: To validate and apply our publicly-available, novel, automated method (AxonJ) of optic nerve section analysis for precise phenotyping of normal and glaucomatous mouse models.

Methods: To maximize the strength of the validation, a variety of mouse strains were evaluated at several time points. PPD stained optic nerve sections were imaged at 40x and 100x magnification. Two human experts independently counted sampling regions at 100x magnification. AxonJ was used to determine whole nerve axon counts and axon density on all images. Manual and automated counts were compared using correlation coefficients. Extrapolated and automated 40x counts were also compared and AxonJ inter-section reliability was assessed. Our method was applied to genetic glaucoma models and age-matched wild type mice to compare optic nerve metrics between different groups.

Results: Counts from AxonJ correlated closely with counts obtained from humans at 100x, $r^2 = 0.95$, while human-to-human correlation was $r^2 = 0.97$. AxonJ whole nerve counts at 40x also correlated with counts extrapolated from human grading of 10% of the optic nerve area, $r^2 = 0.94$. Inter-section repeatability was high, $r^2 = 0.95$.

Conclusion: AxonJ counts all axons in whole optic nerve images with a performance equivalent to human experts. AxonJ is fully-automated, parameter-free, runs in less than a minute on a standard desktop, and does not make assumptions about the distribution of axons across the optic nerve.

E

ngineering Section Oral Presentations

100. NONDESTRUCTIVE EVALUATION OF MICROCRACKING IN FIBER-REINFORCED EPOXY SYSTEMS DUE TO AGING^{ISGC}

Brian M. Fuchs, Connor S. Daily and Nicola Bowler
Iowa State University

Organic-matrix composites are enjoying a boom in structural applications. As these materials age, they are susceptible to

microcracking brought on by matrix embrittlement and local internal stresses. These phenomena are difficult to detect using traditional nondestructive evaluation techniques. The goal of this research is to determine whether dielectric and/or infrared spectroscopy can be used to predict brittle behavior and microcracking in a structural epoxy. Neat epoxy strips (Aeropoxy 2032, five samples per group) were subjected to thermal aging at various temperatures for periods of seven and 14 days. Measurements were performed on each sample and results compared with those measured on a control group. Samples were also subjected to 3-point bending to failure and the fracture surfaces examined for microcracking and brittle fracture characteristics. Correlations between the ultrasonic and spectroscopic data and those describing the mechanical characteristics of the aged samples were sought.

101. HETEROGENEOUS ELASTIC PROPERTIES OF ASCENDING THORACIC ANEURYSMS

Yuanming Luo
The University of Iowa

Heterogeneous nonlinear properties were identified point-wise in 12 human thoracic aortic aneurysm samples using a newly combined experimental and computational method. Three dimensional surface displacements were recorded using a digital image correction system (DIC). Surface strains were computed from the DIC data, and the wall stresses were predicted using an inverse membrane analysis. The material parameters were identified at every Gauss point from the local stress-strain data. The identified heterogeneous properties were validated by using a forward finite element analysis. Results show that the aneurysm samples are highly heterogeneous and exhibiting significant intra-subject variability in its property. They appear to be moderately anisotropic. In terms of the average stiffness over the sample there is no dominating strong direction.

102. SCALABLE COMMUNITY DETECTION FOR LARGE DATA

Rahil Sharma and Suely Oliveira
The University of Iowa

The modern science of networks has brought significant advances to study of networks. One of the most relevant and widely studied structural properties of networks is their community structure or clustering. Detecting communities is of great importance in sociology, biology and computer science, disciplines where systems are often represented as network. We are designing algorithms that focuses on the methodology for detecting community structures in weighted large scale networks such as the users' relationship on social networks like Facebook, Twitter, etc. Most social net-

works are very large and tackling this volume of graph-structured data requires parallel tools. Using C++ libraries for graphs we incorporate parallel multicore directives to achieve scalable algorithms, which will be applicable for huge data-sets. It involves pre-processing the given graph to compute the topological features, then use label-propagation technique to find communities, followed by post processing to improve the quality of the result. We perform a comparative study using various bench mark data-sets. We observe that our algorithm gives better modularity clusters and running time, as compared to previous well known algorithms. We perform all our simulations on the University of Iowa's Neon cluster using high-memory node with 24 cores.

103. EXPERIMENTAL STUDY OF COMBUSTION OF POLYMER ADDED N-DECANE AND N-DODECANE DROPLETS

Mohsen Ghamari and Albert Ratner
The University of Iowa

In spite of recent attentions to renewable sources of energy, liquid hydrocarbon fuel is still the main source of energy for transportation systems. Manufacturers and consumers are consistently looking for ways to optimize the efficiency of fuel combustion in terms of cost, emissions and consumer safety. Recent experimental research has shown that the addition of long chain polymers to hydrocarbon fuel imparts non-Newtonian characteristics to the fuel which results in suppressed splashing behavior upon spilling over a surface. However, the combustion characteristic of these polymer added fuel (PAF) have not been investigated yet. In this study, combustion of stationary fuel droplets of n-Decane and n-Dodecane doped with different percentages of a long chain polymer (Polybutadiene) was examined and compared with the normal hydrocarbon behavior. In contrast with hydrocarbon droplets with no polymer addition, several zones of combustion including a slow and steady burning zone, a strong swelling zone and a final fast and fairly steady combustion zone were also detected. In addition, increasing polymer percentage resulted in a more extended swelling zone and shorter slow burning zone in addition to a shorter total burning time.

104. PARAMETRIC STUDY OF BIOMASS GASIFICATION IN A PILOT-SCALE GASIFIER

Yunye Shi, Tejasvi Sharma and Albert Ratner
The University of Iowa

A parametric study of the gasification of corn kernels has been performed on an experimental, pilot-scale (250 lbs/hour) gasification unit. A comparison was made of the performance of the gasifier as a function of operational parameter, in terms of producer gas production and composition. In these experiments,

corn kernels was used, so that the shapes and sized of the materials did not influence the results. Experiments were conducted with varying temperature of fuel bed, fuel-to-air ratio and fuel bed level. For each experimental condition, the permanent gas composition was measured continuously by gas chromatography (GC). Tars were collected according to CEN Standard. Bio-char were weighted for mass balance. The results from the study indicate that there were significant differences between various operational parameter in terms of producer gas concentration, tar production and char percentage.

105. PROPER ORTHOGONAL DECOMPOSITION ANALYSIS OF THERMOACOUSTIC INSTABILITY

Jianan Zhang and Albert Ratner
The University of Iowa

Thermoacoustic instability of a low swirl flame is investigated with a Proper Orthogonal Decomposition (POD) method. By applying the POD method to the images taken from Planar-Laser-Induced-Fluorescence of OH radicals (OH-PLIF) system, the dominating modes of the flame oscillation are clearly demonstrated. Besides, the POD analysis is used to gain the global phase information from the OH-PLIF result of the flame. With POD results, a symmetric flame oscillation is detected based on the shape of the flame reconstructed from the leading modes.

Environmental Health & Science Section Poster Presentations

106. THE EFFECTS OF ATRAZINE ON THE PLANARIAN DUGESIA DOROTOCEPHALA

Shaylia Barber, Jonathan Ehrlich and Melinda Coogan
Buena Vista University

The similarities between planarian and human stem cells allow us to see the effects that chemicals may have on the human body through the study of metabolomics with GC/MS analysis. Planarians are able to regenerate, which makes it possible to study the role of environmental pollutants on planarian tumor production. Our study incorporated the use of environmentally-relevant concentrations of atrazine, which is a widely used agricultural herbicide. The initial study involved dosing concentrations and behavioral assays to observe physiological responses when compared to control planarians after 5 days of exposure. Light and tactile sensitivity were observed with the 100 ppb samples, while only light sensitivity was observed with the 10

ppm samples. Additionally, using 2 subsamples of 10 *Dugesia dorotocephala* each, 10 planarians were maintained in control water and 10 in control water dosed with 100 ppb atrazine for 5 days. Following preparation, samples were analyzed with an Agilent 5973C mass spectrometer coupled with an Agilent 7890A gas chromatograph. The GC/MS results were inconclusive, although it is hypothesized that environmentally-relevant concentrations of atrazine may result in tumorigenesis due to atrazine's secondary amine group reactions with nitrites that form N-nitrosoatrazine, which are known to increase abnormal chromosomes in lymphocytes.

107. A COMPARISON OF HIGH VELOCITY HAND DRYERS EQUIPPED WITH OR WITHOUT HEPA FILTERS AND THE IMPACT ON BACTERIAL LOAD OF HUMAN FINGERTIPS

Brian T. Bristow, Joel C. Hoyman and Andy L. Segura
Iowa Lakes Community College

Over the past 6 years the Biology and Microbiology classes at Iowa Lakes Community College, Estherville Campus, have been evaluating the effectiveness of various hand drying techniques regarding bacterial numbers collected from the fingertips before and after hand washing. Our findings support those of other researchers where studies indicate that high velocity hand dryers (hvhd) mobilize microbes and could lead to the spread of potentially infective pathogens among users. Most health care facilities and even the hvhd manufacturers themselves have taken steps to prevent this risk. The manufacturer of the hvhd model tested at Iowa Lakes Community College now installs a HEPA filter within new models and sells a retrofit kit for older models. The purpose of our current investigations has been to evaluate the efficacy of the retrofit models with filters, and to compare those findings with tests done on unfiltered dryers of the same model. Preliminary results indicate that the filters may indeed reduce the likelihood of bacterial transmission, but even filtered, the results were significantly poorer when compared to alternative drying techniques.

108. MATERNAL USE OF COUGH MEDICATIONS CONTAINING DEXTROMETHORPHAN AND MAJOR BIRTH DEFECTS

Yanyan Cao, Paul Romitti and Trudy Burns
Public Health College, The University of Iowa

Prenatal exposure to dextromethorphan (DM) has been shown to be teratogenic in animal models. Data from human studies are limited and inconclusive. Using data from the population-based National Birth Defects Prevention Study, we examined associations between maternal periconceptional (one month before through three months after conception) use of cough medications containing DM and major birth defects. Cases

comprised 19,620 live births, stillbirths, and elective terminations with isolated major birth defects, and controls 9813 live births without defects delivered from 10/1997-12/2009. Telephone interview reports of pregnancy exposures, including periconceptional use of cough medications, were obtained from case and control mothers. Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) for maternal use of cough medications containing DM and 22 types of birth defects were estimated using logistic regression analysis. Increased, marginally significant associations were found between maternal periconceptional use of cough medications containing DM and anencephaly (aOR=1.9, 95% CI=1.0-3.7) and also cleft lip with or without palate (aOR=1.3, 95% CI=1.0-1.8). Estimates for the remainder of birth defects studied were near or below unity. Our findings suggest that maternal use of cough medications containing DM may cause malformations of infants. Further research is needed to confirm these positive associations.

109. A RAPID METHOD FOR EVALUATING THE PRESENCE OF PSEUDOGYMNOASCUS DESTRUCTANS THAT CAUSES WHITE-NOSE SYNDROME IN BATS

Ryan Cleary, Kayla McLaughlin, Tiffanee Kress, Raika Mudalige-Jayawickrama and Gerald Zuercher
University of Dubuque

White-Nose Syndrome (WNS) in bats is an emerging disease causing unprecedented decline in bat populations of the North Eastern United States. New data suggests it is spreading towards the state of Iowa. Objective of the current research is to evaluate the bats at Effigy Mounds National Monument (EMNM) for signs of WNS. We sampled bats at eight locations within EMNM by using mist nets. All captured bats were weighed, measured, and examined. In addition, DNA samples were taken from the oral cavity and facial region using Isohelix DNA swabs and sterilized cotton swabs; these samples were used to test for the presence of *Pseudogymnoascus destructans*, the fungus that causes WNS. Five bat species were captured in mist nets between mid-July and late September 2014 with Northern long-eared bats (*Myotis septentrionalis*) and little brown bats (*Myotis lucifugus*) being the most common. All captured bats appeared healthy after physical examination and wing scores provide no evidence for prior exposure to the WNS fungus. We used the facial swabs to isolate DNA from the bat facial microflora. Our results identify several bats with positive results for the *P. destructans* DNA. One PCR result has been confirmed by sequence data. We will discuss the merits of this rapid method of evaluation and the future implications of positive results for the bat populations in EMNM.

110. ACID WASHED GENES: THE POSSIBLE EPIGENETIC EFFECT OF GIBBERELLINS

Josh Hoard

Kirkwood Community College

This experiment is designed to determine the epigenetic effect of Gibberellic acid on the organism *Brassica rapa*. Gibberellic acid or Gibberellins promote elongation in plants and fungi. Elongation occurs by the acceleration of metabolic pathways such as respiration and protein synthesis. Agriculture has now employed gibberellins in hopes of higher and bigger yields. *Brassica rapa* is a plant that has many sub-species that include but are not limited to turnips, broccoli and cabbage. This experiment began by growing Parental plants (P generation) and 2 (two) subsequent generations being identified as F1 and F2 generations accordingly. The specimens have Gibberellic acid applied according to protocol of the Wisconsin Fast Plants kit from Carolina Biological supply, results were produced by monitoring and comparing a control group following the same protocol but without gibberellic acid being applied. My hypothesis: "if gibberellic acid is applied to a dependent variable for 2 (two) generations, then the F2 (3rd generation) will show residual effect in biomass as compared to a control independent variable without gibberellic acid applied." My results have shown that there is a residual effect on the plant.

E

nvironmental Science & Health Section Oral Presentations

111. TOWARDS AN INTEGRATED FLOOD PREPAREDNESS IN IOWA USING CYBERINFRASTRUCTURE

Ibrahim Demir and Witold Krajewski

The University of Iowa

Recent advances in cyberinfrastructure technologies have provided the capability to understand the hydrological and meteorological systems at space and time scales that are critical for making accurate understanding and prediction of flooding, and emergency preparedness. A successful example of cyberinfrastructure systems is the Iowa Flood Center's Iowa Flood Information System (IFIS). IFIS is a one-stop web-platform to access community-based flood conditions, forecasts, visualizations, inundation maps and flood-related data, information, and applications. An enormous volume of real-time data from a variety of sensors (radars, stream and rain gauges) and ad-

vanced inundation models are staged on a user-friendly maps environment for general public. IFIS has developed into a very successful tool used by agencies, decision-makers, and the general public throughout Iowa with over 130,000 users to better understand their local watershed and their personal and community flood risk, and to monitor local stream and river levels. IFIS helps communities make better-informed decisions on the occurrence of floods, and alerts communities in advance to help minimize flood damages. IFIS is a great platform for educators and local authorities to educate students and public on flooding with games, easy to use interactive environment, and data rich system.

112. EFFECTS OF ATRAZINE METABOLITES, DEA AND DIA, ON HUMAN LIVER CELLS

Brittnie Dotson and Kavita Dhanwada

University of Northern Iowa

Atrazine, a triazine, is one of the most commonly used herbicides in the United States. While quite effective, altered health effects have been seen in non-target organisms after exposure including decreased cell growth and development. The herbicide produces two primary metabolites: Deethylatrazine (DEA) and Deisopropylatrazine (DIA). These have also been found in high concentrations in groundwater, along with the parent compound, and have also been shown to produce altered cell growth and delaying pubertal development. There is not much consistent information on the cellular effects of DEA and DIA. Thus to study such effects, we have used immortalized HepG2 cells to determine if there are alterations in cell cycle distribution. Flow cytometry results showed there were fewer cells in the G2/M phase after 72 hours of exposure to 500 and 750 parts per billion (ppb) DEA compared to control cells with an increase of cells in the S phase, however this increase was not shown to be significant. Additionally, 500 ppb DIA had significantly fewer cells in S phase compared to untreated controls. This study demonstrated that exposure to the atrazine metabolites, DIA and DEA, can affect the distribution of cells in the cell cycle and may affect normal progression.

113. IMPACT OF SPRING RAIN ON BIOAEROSOLS IN IOWA

Chathurika M. Rathnayake, Josh Kettler, Thilina Jayarathne and Elizabeth A. Stone

The University of Iowa

Bioaerosols include viruses, bacteria, fungal spores and plant pollens suspended in the air and act as allergens, exacerbating asthma and respiratory conditions. The particle size determines where bioaerosols deposit in the human respiratory tract and the extent of their health effects. In this study, chemical tracers of bioaerosols are measured in coarse and fine particulate matter

(PM_{10-2.5} and PM_{2.5}, respectively) from April-May of 2013. Total PM decreased significantly on days when it rained, due to scavenging of particles by water droplets. Fungal spores range 1 - 30 µm in size and pollens range 5 - 100 µm and were predominately present in coarse particles. Ambient concentrations of fungal spore and pollen markers peaked on days immediately following rain events, due to the active release of bioaerosols after maturation. However, on May 2 during very heavy rainfall, fine pollen granules were released, due to the osmotic rupture of pollen grains. Thus, human exposure to very fine pollen particles can be enhanced during rain events. These fine pollen particles can penetrate deeper in to the respiratory tract reaching alveoli, exacerbating asthma and rhinitis. Overall, these results suggest enhanced risks of respiratory symptoms during rain, even when total particle levels are low.

Geology Section Poster Presentations

114. PARTNERSHIPS IN PALEONTOLOGY: PUBLIC PARTICIPATION IN THE COLLECTION, CURATION, PREPARATION, AND RESEARCH OF A FOSSIL FAUNA FROM THE DEVONIAN OF IOWA^{ISF}

Tiffany Adrain, James Preslicka and Thomas Blume
University of Iowa Paleontology Repository

Members of the Blackhawk Gem and Mineral Society (BHGMS) have collected fossils from quarries in Independence, Iowa (Middle Devonian, Givetian, Cedar Valley Group, Little Cedar Formation). Specimens were deposited at the University of Iowa Paleontology Repository (UIPR) and curated by BHGMS members with the help of a student funded with a grant from the Iowa Science Foundation. Although the initial intent was to collect one cabinet's worth of specimens, BHGMS members collected enough material to require a new collections room to be allocated at the UIPR's Oakdale Research Facility. So far, over 500 specimens of nautiloids, ammonoids, and bivalves have been catalogued. The BHGMS' collecting has revealed the most diverse Devonian cephalopod fauna in Iowa with at least 13 species (12 nautiloids, 1 ammonoid) recognized. BHGMS collected over 100 specimens of Iowa's earliest known ammonoid, *Tornoceras* (*Tornoceras*) *iowaense* Miller 1936, known from only three specimens previously. These new specimens are a variety of sizes and may even show signs of sexual dimorphism. The new material provides a far greater data set for studying this species. A diverse

fauna of brachiopods, gastropods, and bivalves has been collected along with solitary and colonial corals, bryozoans, echinoderm skeletal plates, and fish material.

115. PEDOGENESIS OF OUTWASH-DERIVED SOILS ON TERRACES OF THE DES MOINES RIVER

Ethan Dahlhauser and C. Lee Burras
Iowa State University

Soils formed from glacial outwash constitute around 3% of Iowa's land surface. The Natural Resources Conservation Service's official soil series descriptions show that these soils' A and B horizons are generally loams and/or sandy loams. Their BC and C horizons are generally composed of sands, gravels, and cobbles. These stark soil particle size differences have been traditionally interpreted as evidence of loamy sediments being deposited on top of coarser sediments before the onset of pedogenesis.

This study attempts to determine the origin of these soil profiles formed in Wisconsinan Age glacial outwash. Specifically, this project is examining whether the upper profile is the product of chemical and physical weathering of the lower outwash sediments or if it reflects a fining upward sequence of sediments (i.e. pedogenic versus geogenic origin).

Some early observations in this study have already shown evidence of labile sediments weathering to smaller particles. Meanwhile calcareous sediments have been dissolved and leached.

116. QUSAIBA "HOT SHALE" AND SHARAWRA SANDSTONE MEMBERS OF QALIBAH FORMATION (SILURIAN): AN OVERVIEW FOR UNCONVENTIONAL SHALE GAS FORMATION IN SAUDI ARABIA

A. Umran Dogan and Michael Kaminski
KFUPM

The Qusaiba "hot shale" of the Qalibah Formation is the maximum extent of the Silurian transgression after the retreat of the Ordovician glaciers. These organically rich black shales are found throughout North Africa and Arabian Peninsula. It is believed that this organically rich shale/mudstone may contain economic quantities of unconventional gas similar to the proven unconventional shale gas reservoirs in the United States and Canada. However, no research has been performed to understand the Qusaiba "hot shale" in terms of clay type and diagenesis. Our detailed measured sections in surface outcrops showed that the Qusaiba member is dominantly laminated shale with some interbedded rippled siltstones. It is organic rich and contains abundant graptolites in its lower part. Toward the top, the sequence includes increasing amounts of detrital sand and mica

-rich siltstone, and mostly sandstone in the upper part, which is called the Sharawra Member. The Sharawra Member is conformable throughout Saudi Arabia. It consists of alternating silty micaceous shale and fine grained sandstone, it is enriched in sand content toward the top, and is generally highly burrowed and bioturbated. The basal "hot shale" of the Qusaiba member is the principal source rock for Paleozoic hydrocarbons along the Arabian region.

117. SARAH FORMATION (ORDOVICIAN-SILURIAN): AN OVERVIEW FOR UNCONVENTIONAL "TIGHT-GAS" FORMATION IN SAUDI ARABIA

A. Umran Dogan and Abdulaziz Quwazani
KFUPM

The Sarah Formation sandstone is a potential petroleum reservoir in Saudi Arabia that is potentially charged and sealed by the overlying Qusaiba shale. Additionally, stratigraphically and genetically equivalent North African systems are considered important reservoir targets. However, the Sarah Formation was drilled in several places in Saudi Arabia with positive hydrocarbon shows, but undesirable reservoir properties that prohibited the development of Sarah as a conventional reservoir. Representative stratigraphic sections were measured in Qasim and Hail regions of central Arabia. Samples were collected including glaciation pavements, concretion, fracturing, sedimentary structures, and under and overlying shale for possible sedimentological records. Glaciation paleo channels were observed and their shape and size were evaluated. Photographs were taken of bedrock, contacts, and glacial paleo channels and pavements. Thin sections were made from the collected rock samples, and mineralogy, matrix, cement, grain maturity, and estimate of porosity were reported. More than 1000 optical microscopy photographs are recorded from these thin sections. Our detailed descriptions of the surface measured sections and comprehensive study on sandstone petrology helped the evaluation of the Sarah Formation. This study is part of a comprehensive study to evaluate stratigraphy, sedimentary facies, and reservoir parameters of the Sarah Formation.

118. GEOLOGICAL MODELING FROM PRESSURE COMPUTATION: ALT IN "HORNBLENDE" CRYSTAL STRUCTURE

Meral Dogan¹ and A. Umran Dogan²
Hacettepe University & University of Iowa¹, University of Iowa²

We propose to use pressure (P) data computed from total Al (AIT) in crystal structures of "hornblende" group minerals for geological modeling. The "Al-in hornblende" geobarometer can be calculated from solidus pressures of hornblende crystal-

lization and is based upon a linear relationship between pressure and the AIT of the "hornblende" group minerals. The structural formula of "hornblende" group minerals can be written as $A_0-1 B_2 C_5 T_8 O_{22} (OH,F)_2$, where the A-site is occupied by Na; B-site by Mg, Ca, Na; C-site by Mg, Al; and T-site by Si, Al. A simplified structural formula of individual mineral groups can be written as: "hornblende" $Ca_2 (Mg_4Al) [Si_7Al] O_{22} (OH,F)_2$, AIT=2; "tschermakite" $Ca_2 (Mg_3Al_2) [Si_6Al_2] O_{22} (OH,F)_2$, AIT=4; "edenite" $Na Ca_2 (Mg_5) [Si_7Al] O_{22} (OH,F)_2$, AIT=1; "pargasite" $Na Ca_2 (Mg_4Al) [Si_6Al_2] O_{22} (OH,F)_2$, AIT=3. In this model, we used six hornblende group minerals "hornblende", "tschermakite", "edenite", "pargasite", "hastingsite", and "sadanagaite" from various sources. In the computation, we used two empirical formulae (1) $PHZ = -3.92 + 5.03AIT$ ($R^2 = 0.80$, error + 3 kbar) and (2) $PH = -4.76 + 5.64AIT$ ($R^2 = 0.97$, error + 1 kbar); and two experimental formulae (1) $PJR = -3.46 + 4.23AIT$ ($R^2 = 0.99$, error + 0.5 kbar), and (2) $PS = -3.01 + 4.76AIT$ ($R^2 = 0.99$, error + 0.6 kbar) in our computations.

119. ASSESSING IMPACT OF WIND STEP (STEM TALENT EXPANSION PROGRAM) ON MIDDLE SCHOOL STUDENTS ATTITUDES AND BELIEFS TOWARDS STEM

Mary Nyaema, Tracy Peterson and Jessica Rodriguez

The University of Iowa

The WINDSTEP Program's curriculum is focused on determining appropriate locations for placing wind turbines. Each site analysis includes researching zoning regulations, existing infrastructure, and the locations of wetlands. Nineteen middle school-age males from the Iowa City and Cedar Rapids area participated in the pilot program of WINDSTEP, which took place on the University of Iowa (UI) campus in June 2014. The program was staffed by UI graduate and undergraduate students with assistance from UI faculty. The students did a pre- and post-assessment based on their interest in STEM related careers and knowledge of renewable energy. They participated in a hands on learning through a wind turbine placement exercise based on Arc GIS software to determine important factors to consider while placing their wind turbine in the Iowa City area. These factors included, engineering soils, airports, heliports, communication towers, transportation, non-populated areas and wetlands. They also visited various sites that focused on renewable energy, wind turbines and flood prevention. The results of the study showed that students were able to effectively present their ideas related to wind turbine placement and to explain why they thought the factors they chose were more important than others.

120. MODERN CATENAS OF NORTH-CENTRAL IOWA: EPIPEDON THICKNESS AND GEOMETRIC MEAN PARTICLE SIZE DISTRIBUTION

Jennifer Richter and C. Lee Burras
Iowa State University

Four benchmark closed-basin catenas located on the Des Moines Lobe in Iowa were re-examined to determine the changes within the soil landscape resulting from decadal scale agriculture. Fieldwork consisted of collecting soil cores at 20-30 meter intervals along one transect in each catena to a depth of 1-2 meters. Each core was described and information about horizon type and depth, color, texture, rock fragments, structure, consistence, clay films, roots, pores, presence of carbonates, and redoximorphic features was recorded. Laboratory analyses included bulk density, particle size, pH, and carbon content of each soil horizon, although herein we only discuss epipedon thickness and geometric mean particle size class (GMPS). We found that the thickness of the epipedon has decreased in the upper part of the catena and increased in the lower part. In addition, the GMPS has increased across the catena, which means that more/larger sand was found across the hillslope. This has occurred as large pulses of accelerated erosion created coarse textured fans that buried the naturally occurring clayey and organic rich basin sediments. These findings indicate that agriculture has altered sediment distribution within the catena, thereby inhibiting the ability of the current catena model to predict soil distribution.

G

eology Section Oral Presentations

121. SEDIMENTOLOGY AND PROVENANCE OF MIDDLE-LATE PENNSYLVANIAN STRATA FROM THE APPALACHIAN FORELAND BASIN IN WESTERN MARYLAND

Daniel Alberts and Dr. Emily Finzel
The University of Iowa

During Late Paleozoic time, the Appalachian Mountains continued to grow in elevation and contributed more eroded sediment to the foreland basin to the west. The record of sediment shed from the Appalachians during Middle-Late Pennsylvanian time is contained within the M-24 core from southwestern Maryland, which is over 400 feet long and was drilled for coal mining purposes. The lithologies observed in the core include quartz-rich sandstone, finely-laminated mudstone, and coal. The coals in the core have previously been correlated within a

preexisting stratigraphic framework. In particular, the Bak-erstown coal bed present in the core provides evidence that these strata are part of the Conemaugh Group. The first phase of this project was to describe the lithofacies and make interpretations about the depositional environments represented by the strata. The main depositional environment interpreted for the core is a meandering river system, including channel sandstones, floodplain muds, and marshy swamps. Following the core description, detrital zircons were collected from three sections of the core interpreted to represent channel sandstones and were analyzed for U-Pb to determine their crystallization ages. The resulting detrital zircon signatures suggest that the original igneous sources were the nearby Grenville plutons (950–1200 Ma), as well as igneous rocks formed during the Taconic orogeny (~450 Ma) and Iapetan rifting events (550–600 Ma). However, we cannot preclude recycling of sediment from older foreland basin deposits.

122. THE AVVOLTOIO PALEOSOL, WESTERN SICILY - USING SOIL AS A KEY TO THE PAST

Chad Heinzel and Riley Mullins
University of Northern Iowa

This project seeks to document and characterize the availability of natural resources in Partanna's Belice River Valley. Data of natural resources in Partanna's Belice River Valley. Data will allow us to interpret early human-landscape interactions, potential skill and labor developments and settlement and trade patterns in Western Sicily during the prehistoric era of the Neolithic. Western Sicily offers a well preserved record of human induced change through the presence of well-preserved Paleosol which contains many lithic artifacts and ceramic remains. A three-week geoarcheological survey was conducted in the area of Partanna, Sicily during the summer of 2013. This survey identified an extensive and varied geologic record including: stone (tufa, marl, flint, sandstone), and extensive evaporites/gypsum, clay (marine, alluvial and colluvial), water (perennial streams/rivers, artesian springs, and small ponds), and soil (paleosol). A well-preserved paleosol column was located and characterized in the field using a Munsell soil color chart, the hand ribbon method for sand, silt, clay composition, and horizon structures. The Avvoltoio Paleosol was laterally extensive (20 meters) and contained well-defined horizons with prismatic to sub-angular blocky structure, as well as root traces, and ceramic and lithic artifacts made of chert.

123. APPLYING GEOLOGY EASTERN IOWA'S ARCHAEOLOGICAL RECORD

Caitlin Kelly and Chad Heinzel
University of Northern Iowa

Our research applies geologic tools to the science of experi-

mental archaeology. We aim to delineate Iowa's chert and clay resources in relationship to the development of the area's Native American material cultures (tools and pottery), after M. Anderson, D. Horgen, T. Morrow and many others. Currently, we are exploring the physical (e.g. color) and chemical (major to trace element) signatures of Iowa's natural resources in controlled laboratory and field settings; using high-temperature ovens to fire Iowa cherts from multiple formations at 250°, 300°, and 600°C and an XRF. Preliminary results show that increased heat (@300°C) and longer (@ X>5 hour) durations commonly lead the white-gray cherts to transform into a light pink with reddish mottles along with the occasional streaks of dark gray. Initial pit firing of the same formations exhibit similar color changes as a product of increased heat and potentially the soil's chemistry. Our goal is to contribute to a growing database that compares and contrasts the physical and chemical properties of eastern Iowa's natural resources and archaeological artifacts. These geoarchaeological data may enhance our understanding of Native American, Oneota, production versus consumption zones, use of raw materials through specific technologies and much more.

124. HEAVY METAL CONCENTRATIONS IN THE NORTHWEST IOWA DRIFT PLAIN

Joe Reinders and Chad Heinzel
University of Northern Iowa

This research seeks to characterize the interrelationships between Iowa's landforms and the region's environmental sustainability (Hallberg et al., 1978; Ruhe, 1969). The two primary objectives include: 1. Delineating surficial geologic environments (approx. 1:12,000) to provide geographic context for geochemical investigations. 2. Investigate the development, distribution, and migration of heavy metals (e.g. Cd, As, Pb, Hg, Se and Cr) within Iowa's glacial sediments and soils. Monitoring Iowa's landscapes, their response to earth surface processes (e.g. flooding and soil erosion), and climatic variability are issues that are becoming increasingly more important to many groups: farmers, land-use planners, and government agencies. The focus of this presentation is the Northwest Iowa Drift plain. We are conducting laboratory analyses including clay mineralogy (XRF), heavy metal identification (XRF), and particle-size-analysis of the area's complex landforms to facilitate the development of baseline/background geologic data. We are attempting to use these data to identify specific geologic deposits, events, and model potential heavy metal translocation within Iowa's sediment-soil-plant systems.

125. SUITABILITY OF SAND USED FOR HYDRAULIC FRACTURING (FRAC SAND) FROM THE ST. PETER FORMATION, WINNESHIEK COUNTY, IA

Elaine Jordan and Dr. Emily Finzel
The University of Iowa

This project is administered through the Iowa Initiative for Sustainable Communities and aims to provide information to Winneshiek County regarding the optimal location for silica sand mining from the Ordovician St. Peter Formation. The purpose of this aspect of the project is to determine the suitability of the surface sands for frac sand mining. An additional goal is to compare the sand characteristics data for three different analytical methods. First, using a CamSizer that collects more than 60 images per second of the sand grains, grain size and shape were measured for eleven different outcrop samples. Then, traditional sieve analyses to analyze grain size were performed using 13 sieves with different mesh sizes. Finally, thin sections were analyzed using a petrographic microscope that provided additional information about grain size and shape. The preliminary results show that sand grains from the St. Peter Formation have the proper sphericity, roundness, and grain size proportions to be most suitable for 40/70 grade frac sands. Furthermore, all three methods of data collection produce similar results. .

Iowa Science Teaching Section Poster Presentation

126. SOIL SCIENCE AND CONSERVATION CONTINUING EDUCATION

Heidi Dittmer, Thomas Paulsen, Richard Cruse and C.
Lee Burras
Iowa State University

Soil science is at the center of agricultural and environmental issues, as soil is the medium which provides nutrients and stability to crops, and is the most effective system of water filtration and storage. As such, a more widespread understanding of soil science and conservation would result in better management decisions concerning personal and societal uses of soil. Therefore, we are offering a continuing education course to teachers in Iowa to give them a better understanding of soil development, physical and chemical soil properties, and soil conservation practices. The course will provide attendees with the resources and knowledge to teach soil science in their classrooms.

O

rganismal Biology Section Poster Presentation

127. PHYSIOLOGICAL STRESS RESPONSE IN THE COMMON GARTER SNAKE, *THAMNOPHIS SIRTALIS*^{ISF}

Caitlyn Corwin, Eric Gangloff and Anne Bronikowski

Iowa State University

In stressful conditions, the endocrine system of vertebrates mediates physiological shifts to prioritize immediate survival over other activities. These effects are often controlled by glucocorticoid hormones, including cortisol and corticosterone, which regulate an organism's energy balance. To characterize this endocrine system response in wild animals living under different ecological conditions, we subjected common garter snakes (*Thamnophis sirtalis*) from two different populations to a capture-restraint protocol. Using blood collected at 11 time points over six days in captivity, we measured plasma corticosterone and glucose to quantify stress response and subsequent energy mobilization. One population is from protected land in a county park and the other from a residential area where snakes are often subject to disturbance. We found that snakes from the natural area exhibited a much greater stress response, in terms of both maximum concentrations reached and total response, than the snakes from the more disturbed habitat. Determining how organisms respond to stressful conditions is essential in understanding their ability to persist in habitats altered by human activity.

O

rganismal Biology Section Oral Presentations

128. THE EFFECT OF DIET ON THE CUTICULAR HYDROCARBON SIGNATURE AND BEHAVIOR OF *FORMICA OBSCURIPES*^{BBP}

Aleah Bingham

Saint Mary's University of Minnesota

Cuticular hydrocarbons (CHCs) are molecules expressed on the external cuticle of insects. An important role for CHCs is interspecific and intraspecific recognition. Ants are an abundant and ubiquitous group of eusocial insects. Thus, the importance for

ants to recognize kin (colony members) from non-kin is necessary for ant interactions and survival. The composition of CHCs are colony-specific and affected by both genetics and diet. Studies understanding the role of diet in CHC signatures have been limited and focused on only a few species. In this experiment, single colonies of *Formica obscuripes* (Western thatching ant) were separated into two protein diet groups: insect-based (crickets) and non-insect based (eggs). The CHC signatures and degree of aggression behavior toward colony members were compared pre- and post-diet treatment. The results of this experiment help explain the effect of diet on CHC signatures in *F. obscuripes*.

129. UNDERSTANDING LAND USE EFFECTS ON BEHAVIOR AND PHYSIOLOGY IN THE COMMON GARTER SNAKE (*THAMNOPHIS SIRTALIS*)

Eric Gangloff, Caitlyn Corwin, Alexander Wendt and Anne Bronikowski

Iowa State University

Understanding physiological and behavioral responses to environmental variation is key to predicting the ability of species to persist in changing landscapes. To test for variation in these traits as well as correlations between traits, we measured anti-predator behavior and physiological stress response in common garter snakes (*Thamnophis sirtalis*) from two populations in central Iowa. To characterize the endocrine system response in wild animals living under different ecological conditions, we subjected snakes to a capture-restraint protocol and measured plasma corticosterone to quantify hormonal response. Snakes from a more natural area exhibited a greater stress response, as revealed by Bayesian non-linear modeling. Additionally, we quantified behaviors of wild-caught mothers and their captive-born offspring from one of these populations. Using a quantitative genetics framework, we found that individuals were consistent in their behavior and generally exhibited either a "fleeing" defense or a "striking" defense. Behavior of mothers changed before and after giving birth, correlating with shifts in hormone profiles. These results, combined with measures of potential ecological factors driving these differences, provide a thorough understanding of both the underlying mechanisms and evolutionary potential of complex phenotypes in natural populations.

P

hysics, Atmospheric & Space Sciences Section Poster

130. MEASURING MASS TRANSFER EVENTS IN CONTACT BINARY STARS USING ECLIPSE TIMING OBSERVATIONS

Wyatt Bettis and Mary Feng
The University of Iowa

Eclipsing binary stars have a periodically varying brightness caused by one component star blocking light as it orbits its companion. Precise measurements of the eclipse period over many orbits reveals small irregular period changes that are thought to be caused by episodic mass transfer between the components. Contact binaries are especially intriguing because they are in mutual contact and have very short periods (6-12 hours), so that an entire cycle can be measured in one night. We are using Iowa Robotic telescope to monitor the apparent magnitudes of several eclipsing binaries using differential photometry. We are determining period changes by comparing the times of minima with previous period determinations spanning many years. The period changes will be used to model mass ratio changes.

131. OBSERVING CHANGES IN THE ORBITAL PERIOD OF W URSAE MAJORIS VIA EXAMINATION OF ITS LIGHT CURVE

Wyatt Bettis and Mary Feng
The University of Iowa

Variable stars change in brightness over time. By studying variable stars, valuable information about properties of stars can be revealed. This project focuses on observing the variable star W Ursae Majoris (W UMa). In our research project we will closely examine changes in light produced by W UMa with respect to time, allowing us to determine changes in the orbital period of this contact eclipsing binary star system. Images will be taken each minute over the course of many eight hour periods. Maxim DL will be used to make light curves and data will be exported and analyzed to find when the minimum brightness occurs over each eight hour period we observe. Contact binaries are of great interest because we have not been able to previously predict these changes in the light curve with great accuracy. This is because the physics is not well understood. If we have more data on the orbital periods of these contact variable binary stars such as W Ursae Majoris, we will have a better chance of correctly constructing an accurate physical model for contact binary star systems.

132. PROBING THE MAGNETIC FIELD WITHIN THE SHELL OF THE ROSETTE NEBULA STELLAR BUBBLE

Allison Costa and Steven Spangler
The University of Iowa

Young massive stars dramatically modify the surrounding envi-

ronments from which they formed. They do so in two ways, by photoionizing the gas in their vicinity and through their stellar winds, which expand out into the ambient interstellar medium, sweeping up material, and inflating a bubble of ionized gas. These structures are called HII regions and stellar bubbles, and they can persist throughout the main sequence lifetimes of these massive stars. HII regions are plasmas, and they contain magnetic fields, which affect the dynamics of HII regions and stellar bubbles through magnetic pressure and magnetic tension. In this poster, we report results on the Rosette Nebula, which is an HII region with an associated stellar bubble. We have performed polarimetric observations of extra-galactic radio sources behind the Rosette Nebula using the Very Large Array to probe the magnetic field in the shell of the stellar bubble. We employ the technique Faraday rotation to measure the rotation measure, which yields information on the magnitude of the magnetic field when the electron density is known. We also discuss a simple shell model, which is intended to reproduce the magnitude and spatial distribution of the observed rotation measures. With this model, we can distinguish between the scenario where an excess in rotation measure is due to an amplification of the magnetic field or one where it is exclusively due to an increase in the density in the shell.

133. NEAR-EARTH OBJECT CONFIRMATION

Sophie Deam and Tyler Stercula
The University of Iowa

A near-Earth object (NEO) is an asteroid or comet whose orbit brings it in close proximity to the Earth. While many NEOs have been identified and catalogued through programs like NASA's NEO Observations program, many more are still being discovered. Once they are detected, it is important to make precise astrometric follow-up observations of their motion, in order to accurately refine their orbits and thus predict how close they will come to Earth. The Iowa NEO astrometry program uses the robotic telescope at the Iowa Robotic Observatory (IRO), located in southeastern Arizona, for this purpose. We are measuring sub-arcsecond NEO positions from the list of newly-discovered NEOs maintained by the Minor Planet Center (MPC). The derived positions are forwarded to the MPC where they are used to refine the NEO orbits. Through repeated observations, we are contributing to a large-scale effort of accurately cataloguing the orbits of NEOs, making it possible to identify potentially hazardous Earth-impacting objects.

134. THE VAN ALLEN TEACHING OBSERVATORY

Dominic Ludovici and Robert Mutel
The University of Iowa

The University of Iowa has recently commissioned the Van Allen Observatory. The observatory consists of a 17 inch primary telescope, a 3 inch planetary telescope, and a solar tele-

scope, a 3 inch planetary telescope, and a solar telescope. The instruments installed at the observatory include a high sensitivity CCD camera with filter wheel and off axis guiders, an adaptive optics system, and a spectrometer. The telescopes and instrumentation have been designed to serve as a teaching instrument for undergraduate courses. In addition to its applications in undergraduate courses, the observatory is also used for public outreach, and as a test-bed for the development of instrumentation for the university's robotic telescope in Arizona.

135. VAN ALLEN OBSERVATORY DIGITAL FIBER-FED SPECTROMETER IMPLEMENTATION

Erin Maier and Bryan Prather-Huff
The University of Iowa

During the summer of 2014, the University of Iowa Physics and Astronomy Department's Van Allen Observatory was commissioned, consisting of a 0.43 meter, f/6.8 optical telescope, a solar telescope, and a planetary telescope. The goal of this project is the implementation of a digital, fiber-fed spectrometer for the Observatory's primary telescope. We will be testing three spectrometers; the Ocean Optics Maya2000 Pro, which has a wavelength range of 300 – 750 nm over 2048 channels, and a spectral resolution of 1 nm, the Thorlabs CCS100, and the Avantes SensLine AvaSpec-ULS3648TEC, which have wavelength ranges of 350 – 700 nm and 200 – 1100 nm over 3648 channels, and spectral resolutions of <0.5 nm and 0.05 – 20 nm, respectively. We will then design and build a pick-off mirror / collimator assembly and write Python-based software for robotic control of the spectrometer and simple analysis of spectra. This project is in preparation for the installation of Gemini, the University of Iowa's new robotic telescope, at Win-er Observatory in Arizona later this year, where we will perform a similar implementation based on the results gained here.

136. THE MASS RATIO IN THE ECLIPSING BINARY STELLAR SYSTEM 68-HERCULIS DEDUCED FROM DOPPLER-SHIFTS IN ITS SPECTRUM

Kenneth McLaughlin and Janak Panthi
Loras College

Our differential photometry of the eclipsing binary 68Her through V- and R-filters show periodic minima in its apparent brightness consistent with a previously reported period. We have completed spectroscopic measurements as a function of the orbital phase with Doppler-shifts of both stars resolved in the hydrogen H-alpha 656.3 nm absorption line while only the more massive and hotter component of this binary system exhibits a significant helium 667.8 nm absorption in our spectra. The Doppler-shifts in this helium line support the radial velocity of the primary component we have deduced from the H-alpha line. Sinusoidal curve-fits to the radial velocities indicate

circular orbits with amplitudes that specify a mass ratio for the two stars of 2.72 (with an uncertainty of 3.8%) in agreement with a previously published value. A subtle Doppler shift associated with stellar rotation (often referred to as the 'Rossiter effect') is evident in our radial velocity curve of the primary component as it begins its eclipse; our modeling suggests that this rotation is synchronous with the orbital motion, a common result due to the expected tidal effects of such a near-contact binary system of orbiting stars.

137. MEASURING THE DISTRIBUTION OF IONIZED GAS AROUND YOUNG STAR CLUSTERS (HII REGIONS)

Joseph Sink, Allison Costa and Steven Spangler
The University of Iowa

Stars form from the gas in the interstellar medium. Hot, luminous young stars ionize the gas around them, producing regions of ionized gas called HII regions, and modifying the interstellar medium. Young stars also inject energy into the interstellar medium, and there is evidence that the ionized gas is swept up into annular shells. We are involved in a program to determine the physical properties of these ionized gas shells, such as the number density of atoms, the inner and outer radii of the shells, and the strength of the magnetic field. Our research uses radio astronomical observations, consisting of measurements of the intensity of radio emission produced by the hot, ionized gas via a mechanism called thermal bremsstrahlung. In this paper, we describe our results in a study of 3 HII regions, the Rosette Nebula, W4, and IC1396. Our basic technique is to measure the intensity of radio emission as a function of distance from the center of the nebula at several orientation angles. A model for a plasma shell is fit to the measurements. From these data and the associated fits, we obtain values for the inner and outer radii of the annular shells, and the mean number densities of the ionized gas. In the case of the Rosette Nebula, typical values are of the order of 7 parsecs and 17 parsecs for the inner and outer radii, and 13 atoms/cc for the number density.

Physics, Atmospheric & Space Science Section Oral Presentations

138. FARADAY ROTATION AS A PROBE OF CORONAL MASS EJECTIONS

Jason Kooi, Patrick Fischer, Jacob Buffo and Steven Spangler
The University of Iowa

Coronal mass ejections (CMEs) are large-scale eruptions of

ionized gas from the Sun that play an important role in space weather. If a CME collides with the Earth, it can cause disturbances in the near-Earth space environment and upper atmosphere that can produce consequences both beautiful (e.g., auroras) and terrible (e.g., GPS signal loss, power grid failure). Although CMEs have been an active field of research since their discovery in the 1970s, there is still much to understand about their structure and the effective trigger that initiates a CME. We used the Very Large Array, one of the world's premier radio telescopes, to observe background radio sources occulted by a CME to measure the CME's effects on the propagating radio waves. In particular, we measure Faraday rotation (FR) - a rotation in the plane of polarization that results when a linearly polarized radio wave passes through an ionized gas associated with a magnetic field - to probe the magnetic field structure of the CME. We present FR measurements for a radio source whose line of sight was occulted by a CME on August 2, 2012. For this source, the Faraday rotation measure changes from ~ 0 before CME occultation, to a value of about -12 rad/m^2 before declining after CME passage. In this paper, we discuss these results and their implications in terms of models for the internal structure of CMEs.

139. THE UNUSUAL GALACTIC CENTER RADIO SOURCE N3

Dominic Ludovici and Cornelia Lang
The University of Iowa

The Galactic Center is home to many unique structures not seen in the rest of the galaxy. The Galactic Center Radio Arc, a collection of long radio filaments, is one such structure. While the Radio Arc is well understood, the nature of the radio point source N3, located along the line of sight to the Radio Arc, remains a mystery after nearly 30 years after its discovery. Our recent VLA observations have revealed a wealth of new information on this source, including the detection of a compact molecular cloud coincident with the point source. Our observations suggest that N3 lies near the Galactic Center, however a physical counterpart for N3 still cannot be determined. Possible physical counterparts are discussed, along with observations needed to differentiate between these possibilities.

140. SEMI-REGULAR VARIABLE STAR POPULATION AND EVOLUTION STUDIES

Jeff Wilkerson and David Pfothenhauer
Luther College

We have used the astronomical observing facilities at Luther College to undertake long-term photometric monitoring of more than 1600 stars in the field of open star cluster M23. The quasi-continuous monitoring of the field for longer than a decade has revealed more than sixty new variable stars, primarily low-

amplitude semi-regular pulsating stars. The amplitude distribution of these semi-regular variables shows a break between 0.8 and 1.2 magnitudes, with stars above the break being largely mono-periodic oscillators with periods greater than 300 days and those below the break being largely multi-periodic oscillators with primary periods less than 250 days. Initial studies of potential secular evolution in these stars suggest that the mean luminosity of the multi-periodic oscillators may be decreasing with time. We will present details of these results and place them in the context of prior observations and stellar evolution theory.

141. DETECTOR R&D FOR CMS PHASE II UPGRADE

Emrah Tiras
The University of Iowa

The Compact Muon Solenoid (CMS) is one of the two large general-purpose particle detectors used with the Large Hadron Collider (LHC) project at CERN. The high luminosity upgrade of the LHC will necessitate a major detector transformation to handle the higher instantaneous luminosity and resulting radiation levels, including replacing the tracking detector, data acquisition and trigger systems, and many changes for the forward sub-detectors. One of the upgrade options being considered is to reconstruct the Endcap Calorimeter with a sampling calorimeter design and replace the current active media with radiation-hard materials. In this talk, the physics requirements and main issues such as radiation tolerance and natural aging of detector components will be reviewed. Also, the plans and ongoing research for Hadronic Endcap Calorimeter will be explained.

P hysiology & Health Science Poster Presentations

142. THE EFFECT OF ARONIA BERRIES ON MICROBIAL GROWTH^{BBB}

Megan Carlson, Shelby Ewalt, Stephanie Long and Dobrusia Bialonska
Morningside College

Aronia berries are rich in antioxidants and have huge potential in the prevention and treatment of pathogens, cardiovascular disease, and cancers. This project evaluated the effects of aronia berry extract on the growth of pathogens and probiotics naturally found in the human digestive system. It was hypothesized that the extract would inhibit the growth of two species of pathogenic bacteria, (*Escherichia coli* and *Staphylococcus aureus*)

while an intestinal probiotic bacteria (*Lactobacillus*) would flourish under the same conditions. The different bacteria were first grown in petri dishes using standard growth medium to observe a control amount of growth within a given period of time. Bacteria were then subjected to different concentrations of extract (0.02%, 0.05%, and 0.10%) and evaluated in liquid cultures via the optic density of each tube. The optic density was then used to find the amount of bacterial cultures contained in each test tube. The amount of pathogenic *Staphylococcus aureus* bacteria decreased by 1.44×10^9 cultures and the amount of *E. coli* decreased by 7.7×10^2 cultures. The amount of probiotic *Lactobacillus* bacteria increased by 310 cultures. Both hypotheses were supported by the data, which suggests that the aronia berry is a great dietary supplement to improve overall digestive health.

143. OFF-SEASON LAZINESS? PULMONARY FUNCTION IN OFF-SEASON AND ON-SEASON ATHLETES^{PPP}

Megan Carlson, Meg Wilson, Sarah Sorenson and Aaron Bunker
Morningside College

For college athletes the respiratory system plays an important role in maintaining oxygen levels during athletic performance. This study tested the hypothesis that in-season athletes would have better pulmonary function than off-season athletes. Basic respiratory functions (i.e. - Tidal Volume, Inspiratory Reserve Volume, Peak Inspiratory Flow, etc.) were all tested on in-season (n=8) and off-season (n=10) college athletes (males and females mixed). The resting pulmonary functions were obtained using a pneumotachometer attached to a Powerlab, and data was then analyzed using Labchart software. Data was collected while the athletes performed various pulmonary tests at rest while they were either in season or out of season for their respective college sport. Inspiratory reserve volume (IRV) for in-season athletes ($2.70 \pm 0.44\text{L}$) was larger than in off-season athletes ($1.37 \pm 0.13\text{L}$; $p=0.006$). All of the in-season athletes were participating in aerobic sports (i.e. – soccer, cross country, basketball, etc.), while off-season athletes had a mix of aerobic (n=4) and anaerobic (n=6) sports. These results indicate that in-season athletes are able to better utilize their IRV than off-season athletes, which further suggest that athletes should remain physically active during the off season in order to avoid loss of pulmonary function.

144. THE EFFECT OF COMBINATION THERAPY OF B VITAMINS AND ANTIOXIDANTS ON MEMORY AND LEARNING

Austin Chinn and Brenda Peters
St. Ambrose University

The effect of B vitamins, as well as antioxidants, has shown to

enhance memory and learning deficits among many different neurodegenerative disorders. High levels of total homocysteine or the presence of oxidative stress and reactive species have related to these impairments. Therefore, by incorporating vitamins that would combat these two factors, memory and learning should increase. Based on previous studies, mice that undergo a passive avoidance task should exhibit an increase in memory and learning when administered a combination of vitamin B6 and C, compared to administration of B6 alone and the control. This hypothesis will be tested using a light and dark box, where a mouse will be exposed to a light environment and tested on its ability to resist entering a dark environment consisting of an alarm through trials. An improvement of learning will be measured as a significant decrease in the number of trials the mouse had to undergo before resisting entry into the dark environment through time. Memory improvements can be related as a significant increase in time within the light compartment without entry into the dark compartment 48 hours after the learning protocol.

145. THERMAL CHARACTERIZATION OF BLENDS OF MONOGLYCERIDES FOR TRIGGERABLE LOCAL DRUG DELIVERY SYSTEMS^{ISGC}

Midhad Mrvoljak and Abebe Mengesha
Drake University

Context: Lipid matrices containing glyceryl monooleate (GMO) and monostearate (GMS) were shown promise in being used for a thermoresponsive local drug delivery system.

Objective: To evaluate the thermal properties of monoglycerides and understand the effects of storage conditions at 37 and 42°C.

Methods: Lipid matrices containing various mixtures of GMO:GMS were prepared by fusion and stored at 37 and 42°C for a week. The thermal properties, peak melting point (T_m) and heat of fusion (ΔH_f) were determined using a differential scanning calorimetry (DSC).

Results: The best model mixtures with melting points nearest to 42°C were GMO:GMS blends of 75:25 and 90:10 wt%. The 75:25 mixture at 37°C had two peaks at 33.95°C and 58.07°C. While samples stored at 42°C showed peaks at 39.5°C and 59.2°C. The 90:10 wt% mixture stored at 37°C has shown peaks at 33.18°C and 48.51°C. Then this mixture had peaks at 37.12°C and 48.56°C while stored at 42°C.

Conclusions: The storage conditions of these matrices do change their melting points. Testing the full GMO:GMS blends (including drug and nanoparticles) are needed to conclude what the melting points would be at different storage conditions as it may differ with additives.

146. EFFECTS OF IN-UTERO FLUOXETINE EXPOSURE ON BRAIN DEVELOPMENT

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Buena Vista University

Depression is a serious medical concern that affects roughly 20% of women during and after pregnancy. The most common form of depression medication are selective serotonin reuptake inhibitor (SSRI) medications, including the drug fluoxetine. The goal of this study was to examine the effects of fluoxetine given to stressed adult mice on the serotonin transporters and cortisol receptors of their pups. To do this, pregnant mice were stressed and treated with PBS, 0.3mg/ml fluoxetine, or 1.0mg/ml fluoxetine. Mouse pups from moms treated with either fluoxetine or PBS (control) were taken at birth, postnatal day (PN0). Brain tissue was analyzed for serotonin transporters and cortisol receptors in the ventromedial nucleus of hypothalamus (VMN), paraventricular nucleus of hypothalamus (PVN), and hippocampus. Results demonstrated a significant change in the serotonin transporters in the PVN region of the brain. In addition, preliminary data shows an increase in cortisol receptors in the pups exposed to the higher dose of fluoxetine. Together this data indicates that fluoxetine exposure may be altering the neurochemistry of cells in regions of the developing hypothalamus.

147. EFFECTS OF CAFFEINE SUPPLEMENTS ON RESISTANCE EXERCISE PERFORMANCE ON MALE ATHLETES

Rachel Ricke, Justin Trier, Raquel Relph and Kelsey Price
Grand View University

Athletes are always looking for the next best supplement to maintain peak performance. This experiment examines the effects of two different caffeine supplements on an athlete's performance during a bench press workout. The experiment tested the maximum repetitions per 30 seconds of 75% of the athlete's one-repetition maximum (1-RM). If the athlete did not fatigue after 30 seconds, repetitions were continued for another 30 second interval. Rating of perceived exertion (RPE) was also documented. Two trials were performed. Trial one consisted of consuming only water before the experiment, while trial two consisted of consuming either 5-hour Energy or Optimum Nutrition Essential AminN.O. Energy. One male acted as the control, consuming water for both trials, two males consumed a 5-hour Energy for trial two, while the other two consumed the recommended one serving of Optimum Nutrition Essential AminN.O. Energy for trial two. Data from this experiment will be analyzed to see if there is an ergogenic effect of caffeine supplements on resistance exercise.

148. CENTRAL SYMPATHOINHIBITION ABROGATES ANGIOTENSIN II-INDUCED AUTONOMIC DYSREGULATION, HYPERTENSION AND BLOOD PRESSURE VARIABILITY IN CONTROL AND METHIONINE SULFOXIDE REDUCTASE-A DEFICIENT MICE

Rasna Sabharwal, Francois Abboud and Mark Chapleau
The University of Iowa

We recently reported that mice deficient in methionine sulfoxide reductase-A (MsrA), a unique antioxidant, exhibit sympathovagal imbalance and exacerbation of angiotensin II (Ang II)-induced hypertension. In this study, we tested the hypothesis that central administration of the sympathoinhibitory drug rilmenidine (RIL) will improve autonomic regulation and abrogate the enhanced Ang II-induced hypertension in MsrA^{-/-} mice. Blood pressure (BP) and heart rate (HR) were measured in control C57BL/6 (n=7) and MsrA^{-/-} (n=8) mice by telemetry, before and during four weeks of Ang II infusion (1000ng/kg/min). Subgroups of mice were infused ICV with RIL (42 ng/g/hr, n=4) over the last 2 weeks of Ang II infusion. As expected, RIL profoundly inhibited sympathetic tone (HR response to propranolol) in Ang II-infused C57BL/6 and MsrA^{-/-} mice. RIL reversed hypertension and increased vagal tone and baroreflex sensitivity (sequence technique) in both groups of mice. Moreover, Ang II-induced increases in BP and BP variability (BPV, SD of systolic BP) in MsrA^{-/-} mice were abolished by RIL. We conclude that targeting excessive sympathetic activity with sustained infusion of RIL abrogates Ang II-induced autonomic dysregulation, hypertension, and BPV. (HL14388, VA)

149. THE EFFECTS OF FOOTWEAR ON FORCE PRODUCTION DURING BARBELL BACK SQUATS^{ISF}

Thomas Schermoly, Ian Hough and David Senchina
Drake University

Powerlifting shoes claim to help individuals keep their heels in contact with the ground during squatting, ensuring proper force transmission through the rearfoot. The purpose of this study was to determine if a 2.5-lb. weight plate placed under the heels would provide the same advantage powerlifting shoes do during barbell back squats. Fourteen healthy males performed five sets of three squats at 75% 1RM in four footwear conditions: low-end powerlifting shoes, high-end powerlifting shoes, cross-training shoes with weight plates under the heels, and cross-training shoes alone (control condition, performed twice). During squats, force plates measured rear- and forefoot force production and an electrogoniometer measured knee angles. Subjects reported perceived comfort, stability, exertion, and fatigue after completing each set. Force plate data suggest that footwear condition may influence an individual's pre-or post-squat stance but not the depth or nature of the actual squat. Footwear

condition did not influence knee angles or perceptions of comfort, fatigue, or exertion, though it did influence perception of stability (subjects felt significantly less stable when a weight plate was placed under the heel). Neither powerlifting shoes nor weight plates positioned under the heels had any effect on rearfoot force production in this study.

150. LYSOPHOSPHATIDIC ACID SIGNALING PHOSPHORYLATES MULTIPLE LOCATIONS ON THE $\text{Na}^+\text{-H}^+$ EXCHANGER ISOFORM 1 TO STIMULATE CELL GROWTH AND MIGRATION^{PPP}

Whitney Swanson and Mark Wallert
Minnesota State University Moorhead

Lysophosphatidic Acid (LPA) is a lipid mitogen that regulates cellular processes including proliferation, migration, and invasion. In cancer, LPA secreted from tumor associated cells can function through paracrine and autocrine signaling to stimulate cancer progression. LPA alters cellular functions through activation of a family of G Protein-coupled receptors. The LPA receptors can activate four distinct protein kinases that phosphorylate NHE1 in five different locations. These kinases and the locations they phosphorylate are: 1) Akt/PKB phosphorylates NHE1 at S648, 2) Rock phosphorylates NHE1 at T653, 3) Rsk phosphorylates NHE1 at S703, and 4) Erk phosphorylates NHE1 at both S770 and S771. To evaluate the role of these phosphorylation sites in the regulation of proliferation, stress fiber formation, and migration we have created a series of cell lines each expressing human NHE1 with one of the phosphorylation sites mutated to an alanine, thus removing that ability for NHE1 to be phosphorylated at that location. These cell lines are PSNS648A, PSNT653A, PSNS703A, PSNS770A, and PSNS771A. We will present the impact of the mutation of these phosphorylation sites on proliferation measured using an XTT assay; stress fiber formation evaluated using AlexaFluor 488 phalloidin; and migration measured with a wounding assay using Ibidi inserts.

151. TMEM16B IS A DOMINANT COMPONENT OF THE CHOLECYSTOKININ-ACTIVATED Cl^- CONDUCTANCE IN VAGAL AFFERENTS THAT IS DOWN-REGULATED IN MICE ON HIGH FAT DIET

Runping Wang, Yongjun Lu, Michael Cicha,
Kamal Rahmouni, Mark Chapleau, Christopher J. Benson and
François M. Abboud
The University of Iowa

We have reported cholecystokinin (CCK) sensitive Ca^{2+} -activated chloride (Cl^-) currents (CaCCs) in DiI labeled intestinal nodose ganglia neurons from C57BL/6 mice. These CaCCs were significantly reduced from 24.8 ± 4.9 (n=7) to 6.1 ± 2.9 pA/pF, (n=7, $p < 0.01$) with mice fed a 60% high fat diet (HFD) for

10 weeks. Here we characterize the effect of CCK on the anocramins (Ano1 and 2/TMEM16A and B) that function as Ca^{2+} -activated Cl^- conductance. They are expressed in nodose ganglia, downregulated by HFD, and hence may regulate satiety signaling. We found that the CCK-induced Cl^- current was only inhibited by a high dose of niflumic acid (NFA) (300 μM) which inhibits both TMEM 16A and 16B currents (26.9 ± 4.7 pA/pF before vs. 10.3 ± 2.1 pA/pF after NFA, n=10, $p < 0.01$). Specific TMEM16A inhibitor T16Ainh-A01 (30 μM) did not reduce the current (30.4 ± 6.1 pA/pF before vs. 26.9 ± 5.2 pA/pF after, n=8, $p > 0.1$). The excised inside-out patch recording showed that a very high $[\text{Ca}^{2+}]_i$ ($> 1 \mu\text{M}$) was required to activate the Cl^- current, which is more consistent with the response of the TMEM16B subunit rather than TMEM16A which is much more sensitive to $[\text{Ca}^{2+}]_i$. Transfection of lentivirus carrying shRNA targeting TMEM16B reduced the CCK-current to 22.03 ± 3.7 (n=8) from the value of 35.1 ± 3.4 pA/pF (n=6, $p < 0.05$) obtained with scrambled shRNA. We conclude that TMEM16B is a dominant component of the CCK-induced Ca^{2+} -activated Cl^- conductance. A dysfunctional TMEM16B may impair satiety in HFD obesity.

152. FOOT TEMPERATURE DURING THIRTY MINUTES OF TREADMILL RUNNING IN RUNNING SHOES WITH MESH VERSUS VINYL UPPERS^{ISF}

Allison White, Haley Hicks, Melissa Parks and David Senchina
Drake University

A runner's ability to perform at their best can be affected by an array of factors. This study looks at how shoe material can affect foot temperature, which simultaneously may affect a runner's perception of their performance. We hypothesized that higher temperatures, greater perceptions of heat, and lower comfort scores would be seen in vinyl shoes as compared to mesh shoes during a prolonged run. A pool of twelve male and female subjects, of varying running backgrounds, were recruited to complete two running trials on a treadmill. These trials consisted of a 3-minute warm-up at 75% of their selected running pace, a 30-minute run at their selected pace, and a 10-minute cool-down rest period. These trials were each completed one-week apart. One trial was completed in shoes made of mesh, whereas the second trial was completed in shoes made of vinyl, in counterbalanced order. Skin and sock temperature probes recorded temperatures throughout the trials. Perceptual scores of comfort and heat, sweat accumulation, and fluid consumption were recorded throughout the study. Based on preliminary results, shoe material may not be a significant factor in foot temperature during running, or perception of footwear variables such as comfort and heat.

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153. UNDERSTANDING THE EPIGENETIC EFFECTS OF SMOKING THROUGH PROTEIN-PROTEIN INTERACTION NETWORK ANALYSIS

Meeshanthini Dogan and Robert A. Philibert
The University of Iowa

Smoking is the largest preventable cause of morbidity and mortality in the United States. Regular smoking is associated with vulnerability and progression of diseases including cancer and COPD. Understanding mechanism(s) through which smoking increases vulnerability to complex disorders is crucial in delineating prevention and treatment options. Innovative epigenetic approaches may provide new insight. Recently, we conducted genome-wide methylation analysis of peripheral blood DNA from 111 African American women and found that smoking status was associated with profound genome-wide changes of DNA methylation in hundreds of genes including AHRR and GPR15. We then applied network theory and the miPALM algorithm to translate this methylation signature into an integrated understanding of the proteome. This analysis generated 10 significant protein sub-networks ranging from 5 to 25 proteins whose dysfunction is implicated in smoking associated morbidity. BiNGO analysis of these networks demonstrated enrichment for pathways mediating inflammation, immune function and coagulation. We conclude that smoking potentially increases vulnerability to diseases with inflammatory components by perturbing pathways through the alteration of DNA methylation signature of peripheral blood mononuclear cells.

154. DECREASED SERUM LEPTIN LEVELS IN MICE EXPOSURE TO ATRAZINE *IN UTERO*^{BBB}

Mary Moats-Biechler
Saint Mary's University of Minnesota

Atrazine (ATR) is a common pesticidal water contaminant in the USA. Extensive research has investigated the risks of ATR on humans and animals, and it has suggested that chronic exposure might contribute to the development of insulin resistance and obesity. The purpose of this project was to determine if *in utero* exposure to ATR could affect metabolism by assessing blood serum, liver and fat pad levels of Leptin, a hormone linked to obesity. For this project, 27 pregnant female CD1 mice were randomly separated into three groups and given either 0 ppb ATR, 3 ppb ATR, or 30 ppb ATR in drinking water.

At Day Postnatal 1, (DPN), the dams were removed from ATR. At DPN 56, the serum of 10 male and 10 female pups, randomly selected from each treatment group, was collected. At DPN 77, the inguinal fat pad and liver of each pup were isolated, along with a second serum sample. All collected samples were analyzed for Leptin using a Leptin ELISA kit (R&D systems). A significant decrease in Leptin levels was seen in serum as exposure to ATR increased and a significant decrease was seen between 0 ppb and 30 ppb in fat pads.

155. SERUM CORTICOSTERONE LEVELS AND THE METHYLATION OF THE GLUCOCORTICOID RECEPTOR GENE IN THE HIPPOCAMPUS OF *MUS MUSCULUS* EXPOSED IN UTERO TO ATRAZINE^{BBB}

Katherine Stolz
Saint Mary's University of Minnesota

Atrazine is the most commonly used herbicide in the USA, with more than 76 million pounds applied to crops per year. Because of atrazine's inability to degrade when dissolved in water, the herbicide can build up in water sheds. The EPA has set the maximum contaminant level for atrazine at 3 ppb. Many studies have documented the adverse effects of this herbicide but none (that are known of) have looked at the effects of atrazine on the methylation of certain genes, specifically the glucocorticoid receptor gene. Previous studies show that compounds similar to atrazine, such as the endocrine disruptor vinclozolin, can methylate genes. The glucocorticoid receptor gene has shown higher methylation in poorly mothered and these offspring grew up to be skittish or stressed. In this study, the hippocampi of three generations of mice were dissected out and serum was collected. The serum was analyzed for cortisol levels using the Cortisol Assay (R&D systems) while the methylation in the hippocampi was quantified using a methylation detection kit (NEB). No significant difference in cortisol levels was detected between the three generations of mice or between treatment groups within each generation. Methylation studies were inconclusive.

156. LOW SERUM CONDITIONS CHANGE CALCINEURIN B HOMOLOGOUS PROTEIN ISOFORMS 2 EXPRESSION AND FUNCTION IN NON-SMALL CELL LUNG CANCER CELLS^{BBB}

Clarice Wallert and Mark Wallert
Minnesota State University Moorhead

The Na⁺-H⁺ exchanger isoform 1 (NHE1) is a key regulator of proliferation, migration and invasion in tumors including non-small cell lung cancer (NSCLC). The calcineurin B homologous proteins (CHP1 and CHP2) appear to be essential cofactors to support NHE1 function. To evaluate the role of CHP2 and NHE1 we used three cell lines. H1299 are a human NSCLC

carcinoma cell line. H1299CHP2KD is a cell line that lacks CHP2 expression and H1299NHE1KD lacks NHE1 expression. We assessed the expression of CHP1, CHP2 and NHE1 in normal (10%) and low (0.5%) serum conditions. While CHP1 and NHE1 expression does not change over 48 hours of low serum exposure, CHP2 expression increased in H1299 cells. We also evaluated in vitro tumor formation using a soft agar assay. H1299 cells formed a significant number of large tumors (> 500 μ m diameter) in both serum conditions. NHE1KD cells formed a very low number of tumors in 10% serum and no tumors in 0.5% serum. CHP2KD cells formed no large tumors under either condition. These data suggest a critical role for CHP2 expression in cell migration and tumor formation which allows NSCLC cells to maintain a more aggressive phenotype even in low serum conditions.

157. THE IMPACT OF SUCRALOSE CONSUMPTION ON SPATIAL MEMORY IN MUS MUSCULUS^{BBB}

Daniel Carroll

Saint Mary's University of Minnesota

Many food and beverage products launched in the U.S. today contain an artificial sweetener, most frequently sucralose. Each artificial sweetener approved for use by the FDA has been given an acceptable daily intake value (ADI) deemed as a safe amount for daily consumption by the general population. The ADI for sucralose, however, is substantially lower than that of other artificial sweeteners on the market; equivalent to six 12 ounce cans of soda per day. The intent of this study was to test the validity of the ADI for sucralose, focusing on possible detrimental effects of the sweetener on cognitive function. To investigate these possible effects, mice were administered the artificial sweetener in their drinking water for 14 weeks, receiving one of the following: high dose, low dose, sucrose, or only water. Spatial memory of the mice was then measured using a Morris water maze. The results indicated mice that consumed a high concentration of sucralose (10 times the ADI value) exhibited a significant decrease in spatial memory function compared to mice that consumed a low concentration of sucralose (the ADI value), sucrose, or only water. Thus, ingestion of sucralose levels only 10 fold greater than the ADI demonstrated a decrease in spatial memory function.

abundant graptolites in its lower part. Toward the top, the sequence includes increasing amounts of detrital sand and mica-rich siltstone, and mostly sandstone in the upper part, which is called the Sharawra Member. The Sharawra Member is conformable throughout Saudi Arabia. It consists of alternating silty micaceous shale and fine grained sandstone, it is enriched in sand content toward the top, and is generally highly burrowed and bioturbated. The basal "hot shale" of the Qusaiba member is the principal source rock for Paleozoic hydrocarbons along the Arabian region.



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