4-22-2016

Proceedings of the 128th Annual Meeting of the Iowa Academy of Science [Program, 2016]

Iowa Academy of Science.

PROCEEDINGS OF THE 128TH ANNUAL MEETING OF THE IOWA ACADEMY OF SCIENCE

April 22—23, 2016

Grand View University

FRIDAY SCHEDULE

Time	Events	Location	Page
7:30 a.m.	IJAS Registration	SC Lobby	2, 3
7:30 a.m. - 4:30 p.m.	IAS Bookstore Open	SC Lobby	2, 3
8:00 a.m.	Registration Desk Opens	SC Lobby	2, 3
8:00 a.m.	Silent Auction begins	SC Lobby	2, 3
8:00 a.m. -10:30 a.m.	Morning Snack	SC Lounge	2
8:00 a.m. - 3:00 p.m.	IJAS Program Schedule		10
8:00 a.m. -10:45 a.m.	IJAS Poster Presentations	SC Lounge	7-9
8:00 a.m. - 10:45 a.m.	IJAS Oral Presentations	SC—See IJAS Schedule	10
11:00 a.m. - Noon	General Session I	SC Speed Lyceum	12
Noon - 1:15 p.m.	IJAS Award Luncheon	Valhallah Dining	11,12
1:15 p.m. -1:40 p.m.	IAS Business Meeting	SC Plaza View Room	12
1:30 p.m. -2:25 p.m.	Exploring Lunar & Planetary Science with NASA	SC Conference A & B	10
1:30 p.m. - 4:00 p.m.	IJAS Grand View University Event	SC Conference A,B,C	10
1:45 p.m. - 4:30 p.m.	Symposiums A, B, C	See Symposiums Schedule	13, 14
4:30 p.m. - 5:45 p.m .	Senior Poster Session	SC Lounge	14
4:45 p.m. - 6:00 p.m.	Social Hour	SC Lounge	14
6:00 p.m. -7:30 p.m.	President's Banquet	Valhallah Dining	15
7:45 p.m. - 8:45 p.m.	General Session II	SC Speed Lyceum	15

Book Store: Friday 7:30–4:30; Saturday 8:00–3:30; Student Center Lobby
Silent Auction: Friday ; Saturday Morning, Student Center Lobby; Pick up Saturday 1:00–3:00

SC = Student Center RASM = Rasmussen Krumm = Krumm Business Center

SATURDAY SCHEDULE

Time	Events	Location	Page
8:00 a.m.	Registration Desk Opens	SC Lobby	2, 3
8:00 a.m. —3:30 p.m.	IAS Bookstore Open	SC Lobby	2, 3
8:00 a.m. -11:45 p.m.	Silent Auction Pick up items 1:00—3:00	SC Lobby	2, 3
8:00 a.m. -10:30 a.m.	Morning Snack	RASM 1st Floor and 2nd Floor	3
8:20 a.m. -10:45 p.m.	Section Meetings	SC and RASM 1st & 2nd Floor	16, 20 - 23
11:00 a.m. - Noon	General Session III	SC Speed Lyceum	17
11:45 a.m.	IJAS Silent Auction Bidding Closes	SC Lobby	3
Noon -1:15 p.m.	ESTA Award Luncheon	Valhallah Dining	17
1:00 a.m. - 3:00 p.m.	Pick up IJAS Auction Items	Registration Desk, SC Lobby	3
1:15 a.m. - 4:30 p.m.	Section Meetings Continue	SC and RASM 1st & 2nd Floor	20 - 23
4:00 p.m.	Registration Desk Closes	SC Lobby	3

Thank you for attending the 128th Iowa Academy of Science Annual Meeting!

We hope to see you next year at the University of Northern Iowa.

April 21—22, 2017

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.

Iowa Academy of Science
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Iowa Academy of Science
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University of Northern Iowa
Cedar Falls, IA 50614-0508

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)

Special Thanks

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

Grand View University
Kent Henning, President
Nicholas Kavanaugh, Director of Conferencing
Terrence XXXXXX—Director of Catering
General Sessions
Gil Nelson, Ph.D. & Florida State University
Molly Phillips & Florida Museum of Natural History
Jeff Weld, Ph.D., Executive Director, Governor's STEM Advisory Council
Oliver White & NASA Ames Research Center
Symposiums
Daryl Smith, University of Northern Iowa, Emeritus
Joseph Nguyen, Mt. Mercy University
Bob Watson
IJAS Symposium & Other Special Recognition
Iowa Space Grant Consortium/NASA
Oliver White & NASA Ames Research Center
1st National Bank, Cedar Falls
Bank of the West, Des Moines
Eve Halligan, IAS Program Coordinator
Larry Stone, IAS Bookstore, Photography

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.

Corporate Members

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Welcome from IAS President Carol Schutte

Welcome to the 128th annual meeting of the Iowa Academy of Science. We are pleased to be at Grand View University and appreciate your attendance. This gathering is an annual highlight for many of us. It is a time to greet old friends and make new ones. If you are a long-time attendee I am sure you will enjoy catching up with colleagues from across the state and comparing notes on courses, research and families! If you are new to the IAS gathering, we extend you a warm welcome to this organization and hope you will gain from your experience here this week and continue your association with us into the future. We are part of a remarkable and historic organization. May we all enjoy a profound sense of this rich and extraordinary heritage as we continue

Committees and Sections

Committee on Committees and Elections
Chair: Melinda Coogan
Paul Mayes (2016)
Vacant (2016)
Katie Borton (2017)
Tom O'Donnell (2017)
Thad Sheldon (2018)
Nicole Palenski (2018)

Conservation and Preserves
Chair: Neil Bernstein (2016)
Jeremy Allar (2016)
Mike Goudy (2017)
Ron DeArmond (2017)
Katherine Megivern (2018)
Paul Frese (2018)

Finance
Chair: Andrew Brittingham (2018)
Daryl Smith (2016)
Jeff Weld (2016)
Karen Breitbach (2017)
Kacia Cain (2017)
Jeanne Rogis (2018

Iowa Science Foundation
Chair: Kurt Rosentrater (2016)
Corbin Zea (2016)
Kavita Dhanwada (2017)
Paul Bartelt (2017)
Dawn Reding (2018)
Ken DeNault (2018)

Membership
Chair: Eric Hall (2016)
Tammie Atchison (2017)
Lynne Campbell (2017)
Clint Meyer (2017)
Gary Fulton (2018)
Chris O'Connell (2018)

Recognition and Awards
Chair: Carol Boyce (2018)
Karen Wignall (2016)
Traci Maxted (2016)
Tom Ervin (2017)
Heidi Peterson (2017)
Vacant (2018)

Societal Issues
Chair Jim Colbert (2017)
Vacant: (2016)
Mary Skopec (2016)
Birgitta Meade (2017)
Sherman Lundy (2018)
Sara Coleman (2018)

Student Programs Committee
Chair: Kelen Panec (2016)
Mario Affatigato (2016)
Tami Plein (2017)
Gail Kunch (20170
Muhammad Spocter (2018)
Felicitas Avendano (2018)

Excellence in Science Teaching Awards (ESTA)
Chair: Tom Ervin
Members appointed by the Chair:
Ernie Schiller
Mike Zeller
Doug Herman
Gale Vermeulen
Mike Clough
Morgan Masters
Mary Lestina

Section Chairs, Vice Chairs

Anthropology
Mark Anderson, Vacant

Cell, Molecular, & Microbiology

Chemistry

Community College Biologists

Ecology & Conservation

Engineering

Environmental Science & Health

Geology

Iowa Science Teaching

Continued from Page 5

Organismal Biology

Physics, Atmospheric & Space Sciences

Physiology & Health Sciences

IOWA JUNIOR ACADEMY

Promoting the study of and participation in science by elementary, middle, and high school students

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 the IJAS $8,000 in support of the Iowa Junior Academy of Science for

Thank you for participating in the 128th Annual Meeting of the Iowa Academy of Science.

The Iowa Academy of Science is established to further scientific research and its dissemination, education in the sciences, public understanding of science, and recognition of excellence in these endeavors.

2015—2016 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

Sarah Arbuckle	Scott Junck
Grace Arndt	Caleb Kong
Claudia Ballester	Maria Kozakova
Lucas Bleyle	Johanna Krier
Myah Broders	Isabella Laumer
Alexandria Coffman	Juliet Luckey
Sidney Cowles	Gavin Moeller
Amy Cyr	Julie-Michelle Manohar
Natalie Flugrad	Irina Pogorelko
Style Haeffner	Jake Schmit
Frederick Hawkins	Tyler Shives
Serenity Haynes	Chiara Travesset
Helen Hu	Madeline Taylor

Iowa Academy of Science

www.scienceiniowa.org

IJAS RESEARCH PRESENTATIONS

Posters— Student Center 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.

GRADE 7

A. Brianna Gruntmeir
Central Lee Middle School
Gluten Free vs. Gluten: Processed Hype or Sticky Truth?

B. Serenity Haynes
Central Lee Middle School
Bacteria on Menus Phase II

C. Abbi Johnson
Central Lee Middle School
Are Blondes Dumb?

D. Aleaya Klesner
Central Lee Middle School
Chemical Pond Problems

E. Allison Loomis & Arunadee Fernando
Ames Middle School
Optical Illusions and the Brain

F. Gavin Moeller
Central Lee Middle School
Water Filtration

G. Hailey Tweedy
Central Lee Middle School
Cracking up: The Effects of Feed on Egg Production in Backyard Poultry

H. Davis Verhoeven
Ames Middle School
Identification of People Based on their Microbial Clouds

I. Claire Wills
Central Lee Middle School
To Dissolve or Not to Dissolve... That is the Question - Phase II

GRADE 8

J. Andres Cordoba & Steven Frana
Ames Middle School
Seizing the Wave

K. Vanessa Hupp
Central Lee Middle School

GRADE 8 continued

L. Alexander Kovar
Ames Middle School
Speeding Up the Decay Rate of Styrofoam with a Safe Solvent

GRADE 9

M. Sophie Bower
West Central Valley
Is Audio or Visual Information Better Remembered?

N. Emily Box
Holy Trinity Catholic High School
HbA1c and the Potential of Hydrogen

O. Kassidy Bremer & Grace Marks
West Central Valley
Holy Cow!

P. Amy Cyr & Sarah Arbuckle
Ames High School
Take a Look at the Digital Textbook

Q. Helen Hu
Ames High School
Comparing the Heating Value of Different Types of Fuels

R. Jonathan Kalbach
West Central Valley
Salt-Vinegar Battery

S. Caleb Kong
Ames High School
The Efficiency of Passive Solar Heating, Part II

T. Julie-Michelle Manohar
Ames High School
The Effect of Classical Music on Protein Expressionof B. Fragilis, a Component of the Human Gut Microbiota

U. Alec Mehmert
Holy Trinity Catholic High School
Fertilizer vs Flooding III

IJAS RESEARCH PRESENTATIONS

Posters— Student Center 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……....

V. Jake Schmit & Scott Junck
Ames High School
Plant Enhancing Materials

W. Noah Sinclair & Maxwell Westlake
Ames High School
How does Appearance Affect the Perceived Taste of Food?

X. Madeline Taylor
Ames High School
The Effects of the Electromagnetic Spectrum on Tulips and their Growth Patterns

Y**.** Not used.

Z. Anna Van Dorn
West Central Valley
Dawn of the Disinfectants

AA. Jaicee Wathne
West Central Valley
Dirty Water, Healthy Plants!

GRADE 10

AB. Sreelekha Kundu
Central Campus
The Effectiveness of Antibacterial Mouthwash

AC. Merrina Lan
Ames High School
The Efect of Different Concentrations of Several Types of Oils Toward 3T3-L1 cell survival rate and C.elegans' lipid droplets

AD. Cody Mertz
West Central Valley
Does Music Have an Effect on Concentration?

GRADE 11

AE. Rogelio Ivan Apolonio
Central Campus of Des Moines Independent
BACTERIAL ELIMINATION ON DUMBBELLS PERFORMED AT THE GYM

AF. Damien Gero
Central Campus
Is Colloidal silver an antibiotic?

AG. Janelle Hill
Central Campus 11
Wrigley's Winterfresh Gum: Does it get rid of the bacteria that causes bad breath?

AH. Abbagail Hoffman
Central Campus
Baking soda beyond the Cabinet

AI. Pryce Johnson
Central Campus
Comparing the Effectiveness of Antibacterial Soap and Regular Soap

AJ. Ashton Johnson
Central Campus
The Truth Behind Neosporin

AK. Hardik Kalra
Central Campus
Does bottled water or drinking fountain water contain bacteria?

AL. Josh Pieper
Holy Trinity Catholic High School
The Effects of Potato Starch on the Health of Nursing Piglets

AM. Maggie Walker
Holy Trinity Catholic High School
Sodium Polyacrylate and Dioxin Used for Nitrogen Runoff Prevention

AN. Justice Young
Central Campus
Bacteria found after Handwashing

AO. Abbie Youngwirth
Central Campus
Bacteria in a Human's Mouth vs. Bacteria in a Dog's Mouth

AP. Manasa Pagadala
Rivermont Collegiate
An Investigation into the Improvement of Switchgrass Biofuel Production: Phase II

IJAS RESEARCH PRESENTATIONS

Posters— Student Center Lounge ; Oral Presentations—See page 10

Letter identifiers indicate the poster location. Poster presentations are listed by grade of the primary author. If different the grade of second authors are indicated in parenthesis.

GRADE 12

AQ. Regan Ball
Central Lee High School
The Analysis of Different Fertilizer Methods and the Effects of Water Quality on Zea mays

AR. Eric Chambers & Noah Peterson
Hoover High School
STUDY OF THE EFFECT OF URBAN LIFE ON THE WATER QUALITY OF THE RACOON AND DES MOINES RIVER WATERSHED

AS. Kaitlin Crisman
Central Campus
Comparison of the Effects of Benzoyl Peroxide and Lemon Juice on Bacteria

AT. Rylee Freise & Rebecca Gibson, Logan Reed (11)
Central Campus
Teen Mom: Marine Biology Edition

AU. William Golden
Central Campus
The Peculiar Bacteria of the Pac Man Frog

AV. Daniel Gomez
Central Campus
Does Antiseptic or Anticavity mouthwash work better for killing bacteria?

AW. Paige Gwyin
Central Campus
The effectiveness of Germ-X

AX. Chloe Ibsen
Central Campus 12
Does Triclosan Kill Common Bacteria Found on Teeth?

AY. Nia Johnson
Central Campus
Natural Water Purification

AZ. Megan Kress & Jordan Heeren (11), Sarah Hill (11)
Johnston High School
Coral Vibrancy: How Light Affects Corals

BA. Kinzey Lambert
Central Campus
The Effectiveness of Hand Sanitizers versus Anti Bacterial Hand Soap

BB. Rachel Mehmert
Holy Trinity Catholic High School
Rhizobia: The Future Natural Fertilizer of Glycine Max

BC. Fahmo Mohamed
Central Campus
Are Antibacterial Soap More Effective Than Traditional Soap

BD. Brittany Nguyen Central Campus
Comparison of Bacteria Grown on Toothbrushes Based on its Location

BE. Sinh Phan
Central Campus
Bacterial Soft Rot growth on cabbage and the effectiveness of Clorox bleach

BF. Karl Rasmussen & Lillian Nelson (11), Anna Owenson (11)
Central Campus
How to Train your Puffer

BG. Makayla Sanford
Des Moines Central Campus
The effectiveness of Clorox Wipes

BH. Caitlin Walljasper
Central Lee High School

Age and Body Condition's Effect on Weaning Cattle
BI. Kaylie Wilson
Central Lee High School
Tobacco Mosaic Virus vs Milk: Phase IV

IJAS RESEARCH PRESENTATIONS

Oral Presentation Room Assignments

IJAS Oral Presentation Rooms

Poster	Room Assignment	Poster	Room Assignment
A—I	Bud's Place (Nielsen)	**AF—AL**	SC Plaza View Room
J—Q	CETL (RASM 208)	**AM—AS**	SC Conference A
R—X	SC Valhallah Dining	**AT—BA**	SC Conference B
Y—AE	SC Speed Lyceum	**BB—BL**	SC Conference C

SC = Student Center RASM = Rasmussen Center Nielson = Nielsen Hall

IJAS PROGRAM SCHEDULE

Friday, April 22, 2016

Time	Event	Location
7:30 - 8:30 a.m.	IJAS Registration	Student Center Lobby
7:30 — 8:30 a.m.	Poster set up	Lounge
8:00 a.m.	Judges Meeting	Student Center Conference Room A
8:30 —10:00 a.m.	IJAS Poster Presentations/Judging	Student Center Lounge
8:30—10:30 a.m.	IJAS Oral Presentation/Judging	See Room Schedule—Page 10
11:00 — Noon	IAS Welcome—General Session I	Student Center Speed Lyceum
Noon — 1:15 p.m.	IJAS Awards Luncheon	Vahallah Dining Room
1:15—1:30	Remove IJAS Posters	Student Center Lounge
1:30 — 2:30 p.m.	Exploring Lunar and Planetary Science with NASA	Student Center Conference A & B
2:30 — 2:45p.m.	Grand View University Presentation	Student Center Conference A, B, C
IJAS Adjourns	IJAS students attend IAS Symposiums	See IAS Schedule

IJAS AWARDS LUNCHEON

Honoring the Accomplishments of IJAS Students

Luncheon Program, Friday, April 22, 2016

Welcome, Kelen Panec, Chair, Student Programs Committee

Introduction of Iowa's 2016 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

IJAS RECOGNITION

Honoring Iowa delegates representing Iowa nationally

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!

2016 Iowa Delegates to NYSC

Joseph Tibbs
Iowa Falls—Alden High School
Iowa Falls

Chloe Ibsen
Theodore Roosevelt High School
Des Moines

2016 IJAS Delegates to the American Junior Academy of Science Annual Meeting

Rachel Mehmert
Holy Trinity High School
Fort Madison

Tianxin Xu
Ames High School
Ames
Chaperone: Gail Kunch, Holy Trinity Catholic Schools

The Academy with the support of the Iowa Space Grant Consortium sends two Iowa high school students and a chaperone to serve as delegates to the American Junior Academy of Science Annual Meeting. The students are chosen each year at the IJAS Annual Meeting.

IAS PROGRAM SCHEDULE

Friday, Opening Sessions

Welcome from Kent Henning, President, Grand View University

11:00 a.m.

Student Center Speed Lyceum

11:05 a.m. Friday

General Session I: iDigBio

Student Center Speed Lyceum

Gil Nelson, Ph.D. Florida State University

Molly Phillips, Florida Museum of Natural History

Noon Friday

IJAS Awards Luncheon

Ticket Required

Valhallah Dining Room, 2nd Level of the Student Center

See program schedule on page 11

1:15—1:40 p.m.

IAS Business Meeting, Student Center 2nd level, Plaza View Room

Agenda

Call Meeting to Oder

Welcome

Approval of Agenda

Recognition of Deceased Members and Moment of Silence

Introduction of Board Members

Honor Past-President and Outgoing Board Members

Executive Director Annual Report

New Business

Adjourn

IAS PROGRAM SCHEDULE

Friday, Symposiums

1:45—4:00 p.m.

Symposium A

Water Quality in Iowa: Background, Challenges, Solutions

Student Center Speed Lyceum

Jerry Anderson, J.D.
Calkins Distinguished Professor of Law, Drake University Law School
Steven Bruere
Co-Chair of Iowa Soil and Water Future Task Force, President of Peoples Company
Kathleen Delate, Ph.D.
Professor-Organic Agriculture, Depts. of Agronomy and Horticulture, Iowa State University
Lora L. Friest
Executive Director, Resource Conservation & Development, Postville, Iowa
Matthew Liebman, Ph.D.
Professor of Agronomy, H.A. Wallace Chair for Sustainable Agriculture, Iowa State University
Frederick Kirschenmann, Ph.D.
Distinguished Fellow, Leopold Center for Sustainable Agriculture, Iowa State University
Bill Stowe, J.D.
CEO and General Manager, Des Moines Water Works

2:30—4:30 p.m.

Symposium B

Biomedicine Scientists—Educators Network for the Future in Iowa

Location: Krumm 33

Gary Coombs, Ph.D.
Associate Professor of Biology, Waldorf College
Adina Kilpatrick, Ph.D.
Assistant Professor of Biophysics, Drake University
Joseph Nguyen, Ph.D.
Assistant Professor of Chemistry, Mount Mercy University
Madeline Shea, Ph.D.
Professor of Biochemistry, University of Iowa
Stephanie Toering-Peters , Ph.D.
Associate Professor of Biology Wartburg College

IAS PROGRAM SCHEDULE

Friday, Refreshments during the Social Hour in the Lounge

2:30—4:30 p.m.

Symposium C

Iowa Prairie in the 21st Century

Location: Student Center 2nd level, Plaza View Room

Mary Harris, Ph.D.
Adjunct Assistant Professor, Department of Natural Resource Ecology and Management
Iowa State University

Kristine Nemec, Ph.D.
IRVM Program Manager, Tallgrass Prairie Center, University of Northern Iowa

Scott Moats
Director of Stewardship, Iowa Chapter of The Nature Conservancy

Daryl Smith, Ph.D.
Professor Emeritus, Biology and Tallgrass Prairie Center, University of Northern Iowa

4:15—6:00 p.m.

IAS Senior Poster Session & Social Hour

Student Center Lounge

Poster numbers are available in the Abstracts beginning on page 24.

Join your friends and colleagues to learn the latest research, discuss events of the day, and enjoy refreshments. Open to all attendees.

IAS PROGRAM SCHEDULE

Friday Evening, President's Banquet and General Session II

6:00—7:30 p.m.

President's Banquet

Valhallah Dining Room

Ticket required

Program

Dinner

Welcome and Introductions, Craig Johnson, Executive Director

Executive Director Remarks

Introduction of Elected Officers

President's Address by Carol Schutte

Passing of the Gavel

Incoming President's Address, Melinda Coogan

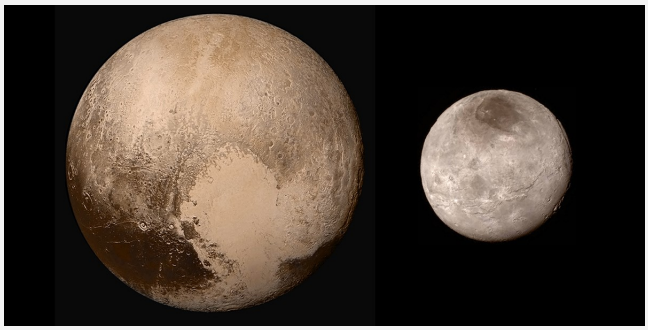
Closing Remarks

7:45 p.m. Friday

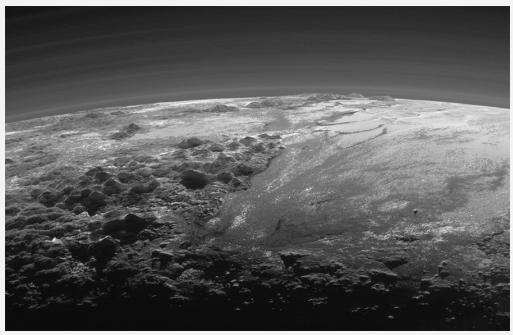
General Session II: New Discoveries from the New Horizons Mission to the Pluto—Charon System

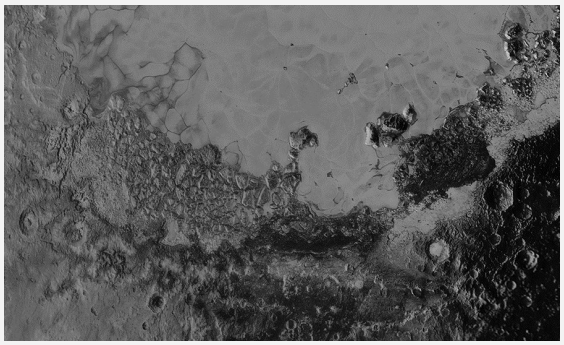
Student Center Speed Lyceum

Oliver White, Ph.D., Ames Research Center
Moffet Field, California



We've had some eye-popping images sent back to us from New Horizons including views of Pluto's mountains, haze layers, complex terrains and much more. In addition to discussing new discoveries from the Pluto - Charon flyby, Dr. White will preview the possible Kuiper Belt Object rendezvous in a few years.





IAS PROGRAM SCHEDULE

Saturday Refreshments in Rasmussen and the Student Center Lounge

IAS Oral Presentations

8:30 a.m.— 4:30 p.m.

Rasmussen and Student Center Conference A, B, C

See the oral presentation schedule on pages 20 - 23.

Section Meeting Room Assignments

Section	Time*	Location
Anthropology	9:00 a.m. - 10:40 a.m.	SC Conference A (Room 137)
Cellular, Molecular, and Microbiology	8:40 a.m. - 3:15 p.m.	RASM 217
Chemistry	8:20 a.m. - 3:35 p.m.	RASM 219
Community College Biologists	TBD	RASM 213
Ecology & Conservation	8:20 a.m. - 2:25 p.m.	RASM 103
Engineering	8:20 a.m. - 2:05 p.m.	SC Conference B (Room 136)
Environmental Science & Health	10:20 a.m - 10:40 a.m.	RASM 119
Geology	10:00 a.m.- 10:40. a.m.	RASM 212
Iowa Science Teaching	8:40 a.m. -10:40 a.m.	SC Conference C (Room 135)
Organismal Biology	10:00 a.m. -10:20 a.m.	RASM 120
Physics, Atmospheric and Space	10:00 a.m. - 10:40 a.m.	RASM 216
Physiology & Health Sciences	8:40 a.m. - 10:40 a.m.	RASM 220

SC = Student Center RASM = Rasmussen Center

* The time listed is the total time the section meetings are scheduled to run. The meetings will break at 11:00 for General Session III through the ESTA Awards Luncheon which ends at 1:00 p.m. Sections scheduled to meet in the

Section Meeting schedules begin on Page 20

GENERAL SESSION III

Saturday Events

11:00 a.m. Saturday

General Session III: Iowa Scientists + Iowa STEM = Sustainable Talent Future for Iowa

Student Center Speed Lyceum

Panel Discussion

Moderated by Jeff Weld, PhD., Executive Director of the Governor's STEM Advisory Council

Scientists will share their motivations for engaging in STEM education partnerships of various sorts with the Governor's STEM Advisory Council. Regional STEM Manager panelists will share their views as to the mutual benefits of connecting Iowa's science community with Iowa's statewide STEM network. An array of connection opportunities will be shared as well.

Panelists:
Paul Bartelt, PhD., Professor of Biology, Waldorf College
Melinda Coogan, PhD., Professor of Biology, Buena Vista University
Sarah Derry, PhD., South Central Regional STEM Manager, Drake University
Paul Gibbins, MLA, North Central Regional STEM Manager, Iowa State University
John Gitua, PhD., Associate Professor and Director, Drake University Undergraduate Science Collaborative Institute
Steven Siek, PhD., Associate Professor of Chemistry, Grinnell College

Noon Saturday

ESTA Luncheon

Valhallah Dining Room

Ticket required

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	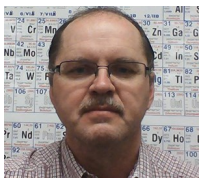				
Arie Schiller	Marc Benedict	Robert Campbell	Gail Kunch	Yvette McCulley	Glen Unwin
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SATURDAY—SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Anthropology Section

Room

9:00 **O3.** THE PRESENTATION OF SELF IN INTENTIONAL COMMUNITIES

9:20 **O4.** THE CONFUSING CONUNDRUM OF WAPSIPINICON, SCOTCH GROVE, PALISADES-KEPLER, AND GRAND MEADOW CHERT:EXPLORATION OF THE SILURIAN/DEVONIAN SYSTEM UNCONFORMITY

9:40 Discussion of Posters from Friday Evening

10:00 BREAK

10:20 Section Business Meeting: **Election of New Officers New Business**

Cellular, Molecular & Microbiology Section

Room

8:40 **O28.** EVALUATING THE ABILITY OF A RECLAIMED WETLAND TO REMEDIATE ANTIBIOTIC RESISTANT BACTERIA IN SOIL

9:00 **O29.** MODELING MUSCULAR DYSTROPHY IN *DROSOPHILA MELANOGASTER*

9:20 BREAK

9:40 **O30.** SPICE UP YOUR LIFE: *STREPTOCOCCUS* BIOFILM INHIBITION BY COMMON HOUSEHOLD SPICES

10:00 **O31.** ROLE OF A NEW TCP GENE IN FLOWER DEVELOPMENT AND PLANT ARCHITECTURE OF THE ORCHID FAMILY

10:20 Section Business Meeting: **Election of New Officers New Business**

10:40 Travel to General Session III

11:00 General Session III

12:00 LUNCH

1:15 **O32.** INFLUENCE OF BORIC ACID ON HISTONE H3 ACETYLATION IN YEAST

1:35 **O33.** CHARACTERIZATION OF THE ROLE OF YEDR IN *ESCHERICHIA COLI* CELL DIVISION

1:55 **O34.** A CYTOLOGICAL INVESTIGATION OF A MALE-STERILE, FEMALE-STERILE LINE IN *GLYCINE MAX*

2:15 **O35.** MANIPULATING METABOLIC PATHWAYS TO SUPPRESS MUSCULAR DYSTROPHY

2:35 BREAK

2:55 **O36.** EPIGALLOCATECHIN GALLATE AND RELATED COMPOUND INHIBIT REPLICATION OF HERPES SIMPLEX VIRUS IN VERO CELLS

Chemistry Section

Room

8:20 **O53.** AN ANALYSIS OF THE PRACTICALITY AND EFFECTIVENESS OF UV IRRADIATION AS A TREATMENT METHOD FORM17-B ESTRADIOL USING DANIO RERIO IN VIVO AND HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

8:40 **O54.** A SURVEY FOR THE PRESENCE OF ANTIBIOTICS IN THE WATERS AND SOILS OF STREAMS SURROUNDING GUTTENBERG, DUBUQUE, AND DAVENPORT, IOWA

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

9:00 **O55.** SYNTHESIS AND APPLICATIONS OF IONIC LIQUID MONOMERS IN FREE-RADICAL POLYMERIZATIONS

9:20 BREAK

9:40 **O56.** EVALUATING THE EFFECTIVENESS OF COMPUTATIONAL DESIGN SOFTWARE FOR DETERMINING THE CONSEQUENCES OF POINT MUTATIONS

10:00 **O57.** A COMPARISON OF THE TEMPERATURE DEPENDENT ACTIVITY AND KINETIC PROPERTIES OF POTATO, MUSHROOM, AND APPLE TYROSINASE

10:20 Section Business Meeting: **Election of New Officers**

10:40 Travel to General Session III

11:00 General Session III

12:00 LUNCH

1:15 **O58.** SYSTEMATIC COMPARISON OF TRANSITION METAL OXIDE SURFACE PROPERTIES USING DENSITY FUNCTIONAL THEORY

1:35 **O59.** OPTIMIZING PREPARATION CONDITIONS OF LIVE MDV INFECTED SAMPLES FOR TRANSMISSION ELECTRON MICROSCOPY

1:55 **O60.** AB INITIO APPROACH FOR THE STUDY OF INCONGRUENT NMC METAL DISSOLUTION IN AN AQUEOUS ENVIRONMENT

2:15 **O61**. ADAPTING NMR FOR THE STUDY OF ENZYMATIC REACTIONS

2:35 BREAK

2:55 **O62.** ALUMINUM NANOPARTICLE STUDIES THROUGH DENSITY FUNCTIONAL THEORY[ISF]

3:15 **O63.** THE EFFECTS OF DISTAL AMINO ACID MUTATIONS WITHIN THE POLYSACCHARIDE BINDING SITE OF BETA GLUCOSIDASE B

Ecology and Conservation Section

Room

8:20 **O73.** CONSERVATION ASSESSMENTS FOR SIX NORTHEAST AND NORTH CENTRAL IOWA STATE PRESERVES

8:40 **O74.** FROM STORAGE CABINETS TO THE WORLD: PROGRESS ON SPECIMEN DIGITIZATION AT IOWA STATE UNIVERSITY'S ADA HAYDEN HERBARIUM

9:00 **O75.** STUDIES OF LICHEN DISTRIBUTION ON A LINN COUNTY HILL PRAIRIE

9:20 BREAK

9:40 **O76.** AGE- RELATED CHANGES IN HOME RANGE AND DISTANCE MOVED IN ORNATE BOX TURTLES

10:00 **O77.** HOW MATERNAL STRESS LEVELS MIGHT AFFECT NEONATAL PAINTED TURTLES, *CHRYSEMYS PICTA*[ISF]

10:20 Section Business Meeting: **Election of New Officers New Business**

11:00 General Session III

12:00 LUNCH

1:15 **O78.** WHEN SNAKES GET HOT: HORMONAL RESPONSES TO UPPER TEMPERATURE EXTREMES IN GARTER SNAKES

1:35 **O79.** IMPACTS OF A SINGLE-TURBINE WIND FACILITY ON BAT ACTIVITY AND FATALITY IN NORTHEASTERN IOWA[ISF]

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Ecology and Conservation continued

1:55 **O80.** EMODIN IN *RHAMNUS CATHARTICA* (EUROPEAN BUCKTHORN) AS A POTENTIAL NOVEL WEAPON: EFFECTS ON NATIVE *AGERATINA ALTISSIMA* (WHITE SNAKEROOT)

2:15 **O81**. GARLIC MUSTARD AS A POTENTIAL DRIVER OF CHANGE IN SOIL MICROBIAL COMMUNITIES AND INHIBITOR OF NATIVE SPECIES GROWTH

Engineering Section

Room

8:20 **O87.** AUGER PYROLYZERS: A VIABLE TECHNOLOGY IN BIOMASS CONVERSION

8:40 **O88.** ELASTIC PROPERTY MEASUREMENTS OF MIXED-GLASS-FORMER GLASSES USING ULTRASONIC WAVE VELOCITY

9:00 **O89.** STRUCTURE-ACTIVITY CORRELATIONS FOR CATALYTIC FAST PYROLYSIS OF BIOMASS

9:20 BREAK

9:40 **O90.** CONSIDERATIONS FOR ALUMINUM-RICH ZSM-5 IN MODERATE TO HIGH TEMPERATURE PROCESSING

10:00 **O91.** COLONIC STEM CELLS MEDIATED CO-DELIVERY OF R-SPONDIN-1 AND INFLIXIMAB TO TREAT ULCERATIVE COLITIS

10:20 Section Business Meeting: **Election of New Officers New Business**

10:40 Travel to General Session III

11:00 General Session III

12:00 LUNCH

1:15 **O92.** TOWARDS LOW-COST SENSORS FOR REAL-TIME MONITORING OF NITRATE CONCENTRATION IN IOWA SOIL WATER

1:35 **O93.** CARBON SUPPORT EFFECTS ON THE SELECTIVITY OF PD/C CATALYSTS FOR THE LIQUID-PHASE HYDROGENATION OF MULTIFUNCTIONAL CHEMICALS

1:45 **O94.** COMBUSTION CHARACTERISTICS OF COLLOIDAL DROPLETS OF TRANSPORTATION FUEL AND CARBON BASED NANOPARTIC

Environmental Health and Science

Room

10:20 Section Business Meeting: **Election of New Officers New Business**

10:40 Travel to General Session III

11:00 General Session III

Geology Section

Room

10:00 **O97.** GEOPHYSICAL INVESTIGATION OF THE NORTHEAST IOWA INTRUSIVE COMPLEX

10:20 Section Business Meeting: Election of New Officers New Business

SECTION MEETINGS

Saturday, See individual sections for room and schedule.

Iowa Science Teaching Section

Room

8:40 **O101.** PROFESSIONAL DEVELOPMENT OF IOWA SCIENCE TEACHERS: PRACTICES, PRIORITIES, AND BARRIERS

9:00 **O102.** SAVING STUDENT LABORATORY DATA FOR EVALUATION AT MULTIPLE LEVELS: A FOOD ON THE FLOOR SIMULATION

9:20 BREAK

9:40 **O103.** TEACHING SCIENCE, TEACHING ENGINEERING

10:00 **O104.** HOW DO WE BRING ENGINEERING DESIGN TO OUR COLLEGE COURSES (AND WHY IS THAT IMPORTANT)?

10:20 Section Business Meeting: **Election of New Officers New Busines**

10:40 Travel to General Session III

Organismal Biology Section

Room

10:00 Section Business Meeting: **Election of New Officers New Business**

Physics, Atmospheric and Space Sciences

Room

10:00 **O114.** TOTAL SOLAR ECLIPSE IN THE CLASSROOM AND BEYOND

10:20 Section Business Meeting: **Election of New Officers New Business**

10:40 Travel to General Session III

Physiology & Health Sciences

Room

8:40 **O124.** THE EFFECTS OF CROCIN ON AGE-RELATED SPATIAL LEARNING AND MEMORY DEFICITS OF FEMALE SWISS WEBSTER MICE ASSESSED IN THE RADIAL ARM MAZE

9:00 **O125.** CALCINEURIN HOMOLOGOUS PROTEIN GENETIC VARIANTS ASSOCIATED WITH AN INCREASE IN BLOOD PRESSURE

9:20 BREAK

9:40 **O126.** FROM THE BRAIN TO THE GUT: CHRONIC STRESS ALTERS THE GUT MICROBIOME

10:00 **O127.** THE EFFECT OF ORAL L-TYROSINE SUPPLEMENTATION ON THERMAL AND EXERCISE STRESS IN OLDER ADULTS

10:20 Section Business Meeting: **Election of New Officers New Business**

ABSTRACTS BY SECTION

Poster locations are labeled by the poster number as indicated below. Example: P1

Anthropology
Poster Presentations

P1. A NEW METHOD APPLIED TO AN OLD TECHNOLOGY: HIGH RESOLUTION SCANNING OF USDA AERIAL PHOTOGRAPHS FOR IOWA ARCHAEOLOGICAL RESEARCH

Mark L. Anderson
University of Iowa Office of the State Archeologist

Archaeologists are frequently searching for better ways to gain the most information and provide the greatest interpretative value from the resources available during the process of Cultural Resource Management. Aerial photographs from the United States Department of Agriculture, Natural Resource Conservation Service (USDA, NRCS) have been utilized in assessing cultural resources encountered during Iowa archaeological surveys for several decades. The collection of USDA, NRCS aerial photography is housed in the Map Collection, University of Iowa Main Library, and spans roughly 65 years between 1934 and 1999. The photographs comprise a mosaic that covers the entire area of each county in the state of Iowa. They were originally used for documentation of various agricultural and other land use attributes pertinent to the programs of the USDA. Beyond agricultural applications, this photographic series has yielded valuable information regarding historic impacts to archaeological resources as well as in identifying archaeological sites themselves. These images have been scanned at high resolutions, opened in Photoshop® where preset filters are applied to alter the image and show features otherwise not visible. Several examples of this technique are presented in this poster with particular attention to locating Mill Creek Culture sites located in Northwest Iowa.

P2. HUNT SCENES AND ATLATLS: THE MEANING OF SPEAR-THROWERS IN PREHISTORIC ROCK ART OF THE AMERICAN SOUTHWEST

Merlin Grant
Grinnell College

Recognizable images of atlatls and atlatl darts occur repeatedly in Basketmaker petroglyphs in the American Southwest. These atlatls frequently appear in conjunction with other images, ranging from representational to abstract. Evidence suggests that these other images were deliberately associated with the atlatls. By recording and analyzing these associated images, we can make conjectures about the use of atlatl imagery in petroglyphs.

Anthropology
Oral Presentations

O3. THE PRESENTATION OF SELF IN INTENTIONAL COMMUNITIES

Andrea Semlow
Grinnell College

My research focuses on applying Erving Goffman's "presentation of self" theory to Elderly intentional communities and Children-oriented intentional communities. In the summer of 2015, I conducted ethnographic fieldwork at the Living Well Community, an Elderly Intentional Community (EIC) in Franklinville, North Carolina, and at the Cold Pond Community Land Trust, a children-oriented community in Acworth, New Hampshire. Using my findings from this research, I critically analyzed their websites to find how accurately a community represents themselves online compared to everyday lived experiences. After this analysis, I applied my working theories to a wider range of communities similar to the demographics and mission statements of the communities I visited. This process involved analyzing the websites of ten other intentional communities and interviewing members from each community. In the United States, intentional communities generally advertise through websites and other online media sources. Intentional communities are unique in terms of recruitment because they are often a small population of individuals focused on very specific lifestyles. In my research, I provide an evaluation of how accurate online representations of self correspond to the reality of community life and expectations.

O4. THE CONFUSING CONUNDRUM OF WAPSIPINICON, SCOTCH GROVE, PALISADES-KEPLER, AND GRAND MEADOW CHERT:EXPLORATION OF THE SILURIAN/ DEVONIAN SYSTEM UNCONFORMITY

Mark L. Anderson[1] & Muriel Grubb[2]
University of Iowa Office of the State Archeologist[1] & Cornell College[2]

Wapsipinicon chert has been in the University of Iowa Office of the State Archaeologist Lithic Raw Material Assemblage since the 1980s. It represents knappable lithic material found in the central Wapsipinicon River valley and immediately surrounding vicinities. Additional varieties that have similar macroscopic and microscopic appearance include Scotch Grove chert, Palisade-Kepler chert, and Grand Meadow chert. The origins of these chert types are somewhat uncertain because of a lack of clear primary bedrock provenience. This presentation examines

these lithic types with a focus on the Silurian/Devonian unconformity as a potential key for unlocking their geologic associations.

Cellular, Molecular & Microbiology Poster Presentations

P5. MTOR SIGNALING PATHWAY REGULATES THE PROTEIN EXPRESSION OF LEUCINE DEGRADING ENZYMES IN LYMPHOMA CELLS

Torres Ashley & Elitsa Ananieva
Des Moines University

An enzyme, involved in the degradation of the amino acid leucine, known as cytosolic branched chain aminotransferase (BCATc), is a prognostic cancer marker. Leucine is known to activate the mammalian target of rapamycin (mTOR) pathway; the latter is activated during cancer formation. An immunosuppressive drug, called rapamycin inhibits mTOR pathway. We tested the effect of rapamycin on the protein expression of BCATc and other leucine degrading enzymes (E1a, E2, and mitochondrial BCATm) in comparison to other compounds such as cyclosporine A (CsA) and 10058-F4. CsA inhibits the Nuclear Factor of Activated T cells (NFAT), while 10058-F4 inhibits the oncogene c-Myc. c-Myc and NFAT up-regulate the expression of BCATc in cancer and immune cells, respectively. We used mouse lymphoma cells treated with rapamycin, CsA, and 10058-F4 and measured the expression of leucine degrading enzymes. Rapamycin inhibited BCATc protein expression but increased the expression of E1α. CsA showed no effect, while 10058-F4 inhibited both BCATc and E1α. The effect of rapamycin on BCATc and E1α proteins demonstrates that mTOR pathway plays a role in the regulation of leucine degrading enzymes. Understanding the regulation of these enzymes in cancer cells will help define their function in cancer and potentially find new treatment options.

P6. EPIGALLOCATECHIN GALLATE AND MST-312 INDUCE LEVELS OF CYTOTOXICITY SIMILAR TO VEHICLE CONTROLS

Evan Beacom, Jesse Wilson, Phonphanh Dedthanou, Prajakta Pradhan & Marie Nguyen
Des Moines University

Herpesviridae is a large and diverse family of DNA viruses with many members that are infectious to humans. HSV-1 is a ubiquitous and virulent member species that causes recurrent and painful ulcers. Though antivirals are used clinically for severe infection, increasing resistance calls for development of novel strategies to interrupt virus-host interaction or inactivate the virus directly. Both the green tea derivative epigallocatechin gallate (EGCG) and its synthetic analog, MST -312, show potential as inhibitors of HSV infection. To have a potential use in human medicine, these compounds must inhibit virus without markedly destroying host cells. In this study, MST-312 and EGCG were incubated at concentrations between 2 and 100 μM with human cell lines HEp-2 and hTERT-HME1 as well as the primate Vero cell line. Toxicity was measured by trypan blue exclusion. Cell death levels were less than 6% for HEp-2 cells and less than 23% for Vero and hTERT-HME-1 cells. In all cell lines, the toxicity levels of MST-312 and EGCG tested were similar to the vehicle control. Therefore, MST-312 and EGCG, while being investigated as inhibitors of HSV infection, do not have an appreciable cytotoxic effect on these primate and human cell lines at concentrations up to 100μM.

P7. OXIDATIVE STRESS RELIEVING CATALASE GENE IDENTIFICATION AND CHARACTERIZATION IN DEINOCOCCUS MARICOPENSIS

Brittany Bowman & Michael LaGier
Grand View University

Deinococcus maricopensis is a Gram-positive bacterium known for living in extreme conditions due to its ability to withstand unusually high ionizing radiation and oxidative stress. Characteristics of *Deinococci* are appealing to research for their potential in bioremediation applications. The focus of this study was to identify and characterize potential catalase genes from the genome of *D. maricopensis*. A preliminary bioinformatics survey of the genome identified two genes potentially encoding catalases. One of the two, which appears to be closely related to well-described KatA catalases, was chosen for additional characterization. Typically, KatA is responsible for converting the usually lethal doses of hydrogen peroxide into soluble levels of water and oxygen. The putative KatA from *D. maricopensis*, termed DM-KatA, encodes for a protein of 515 amino acids and shares features commonly found in KatA enzymes from related organisms, including *D. radiodurans*. This study will summarize the characterization of DM-KatA using bioinformatic resources as well as in vitro approaches. The identification of catalases in the genome of *D. maricopensis* allows for a better understanding of how this species can thrive under stressful conditions, including those that are often encountered during the bioremediation of wastes.

P8. WITHDRAWN

P9. PROTEIN PURIFICATION METHOD OF LACTATE DEHYDROGENASE FROM STREPTOCOCCUS MUTANS

Sydney Cyzon, Jeffrey Butikofer & Rebecca Schmidt
Upper Iowa University

Lactate dehydrogenase (LDH) is a key enzyme in the metabolic pathways of homofermentative bacteria such as *Streptococcus*

mutans. LDH is instrumental in the final conversion of pyruvate to lactate in fermentation pathways, and the regeneration of NAD^+ from NADH. Previous research done on this topic has provided methods for purification and identification of LDH from *S. mutans*. We have formulated a method for purification that can be used to identify activity of isolated LDH. Preliminary research has provided information regarding growth conditions optimal for increased bacteria density throughout a variety of mediums. Further experimentation will examine assay techniques that will quantify protein amount and LDH activity in *S. mutans* cultures. We are interested in a method of protein purification that is feasible for this type of student research project.

P10. MICROTUBULE-ASSOCIATED PROTEIN TAU ENHANCES OXIDATIVE STRESS-INDUCED CELL DEATH IN NEURONAL CELLS

Isaac Hartman, Jessica Cole, Natasha Hongsermeier & Chad Leugers
Morningside College

The neuronal microtubule-associated protein tau has recently been shown to enhance growth factor-induced MAPK signaling through the ERK pathway. Over-activation of ERK and other MAPK pathways such as JNK and p38 in response to chronic inflammation and oxidative stress can lead to significant neuronal atrophy and cell death in neurodegenerative diseases such as Alzheimer's disease. Since the role of tau in JNK and p38 activation due to cellular stressors remains unclear, we aimed to further investigate tau's impact on these pathways downstream of various cellular stressors such as oxidative stress. Neuronal PC6-3 cells, D5-20 cells overexpressing human tau, and rTau4 cells with depleted endogenous tau were treated with either hydrogen peroxide (H_2O_2) or exposed to UV light to investigate the effects of oxidative stress. Tau overexpression increased cell death in cells exposed to UV light. No notable neurite outgrowth resulted from UV or H_2O_2 stressors, in control cells or tau overexpressed cells. These findings suggest tau is able to enhance oxidative stress-related cell signaling as it has been previously reported for growth factor-induced signaling, and increase understanding of the mechanisms of neurodegenerative disease. Subsequent experiments will address the nature of tau's interactions with stress-related signaling pathways.

P11. ANTIBACTERIAL ACTIVITY OF PRAIRIE TURNIP (*PSORALEA ESCULENTA*)

Chad Heying, Daniel Jung & Paul Weber
Briar Cliff University

Psoralea esculenta, found in the prairies of Iowa, contains the flavonoids genistein and daidzein. These compounds are known to be beneficial to human health, exhibiting high antioxidant activity. Recently flavonoids are the subject of anti-infective research, and many researchers have shown them to possess antifungal, antiviral, and antibacterial activity. Previous research by colleagues at this institution have shown that extracts from the various parts of this plant showed antioxidant activity. A previously un-reported component, M-11', was isolated from this plant and also exhibited potent antioxidant activity (see adjoining poster at this poster session).

Research in this lab revealed anti-bacterial activity of the extracts from *P. esculenta.* Bacterial survival test (percent survival of bacteria) showed the inhibition of bacterial growth on following pathogenic and non-pathogenic bacteria: *Mycobacterium bovis*, *Mycobacterium smegmatis*, *Psuedomonas aeruginosa*, and *Staphylococcus aureus*. Percent survival levels of tested bacteria were dose dependent. Percent survival of *S. aureus* ranged from 0% survival (highest dose) to 20% (lowest dose) and expressed lower survivability than that of *P. aeruginosa* or *Mycobacterium species*, which ranged from 0% (highest dose) to 68% (lowest dose) and from 2% (highest dose) to 64% (highest dose), respectively. Further-more, the potent antioxidant M-11 possessed partial antibacterial-activity against all bacterial species.

P12. MICROTUBULE-ASSOCIATED PROTEIN TAU ENHANCES HYPOXIA-INDUCED NEURITE OUTGROWTH AND CELL DEATH IN NEURONAL CELLS

Natasha Hongsermeier, Samie DuVall, Christian Kent & Dr. Chad Leugers
Morningside College

The neuronal microtubule-associated protein tau has recently been shown to enhance growth factor- induced MAPK signaling through the ERK pathway. Over-activation of ERK and other MAPK pathways such as JNK and p38 in response to chronic inflammation and oxidative stress can lead to significant neuronal atrophy and cell death in neurodegenerative diseases such as Alzheimer's Disease. Since the role of tau in JNK and p38 activation due to cellular stressors remains unclear, we aimed to further investigate tau's impact on these pathways downstream of cellular stressors such as hypoxia. In this study, neuronal PC6-3 cells, D5-20 cells overexpressing human tau, and rTau4 cells with depleted endogenous tau were treated with $CoCl_2$ to simulate hypoxia. Our results demonstrated that tau overexpression increases the likelihood of cell death in response to hypoxia, whereas tau depletion had a protective effect on hypoxia-induced cell death. Hypoxia-induced neurite outgrowth was also increased in D5-20 cells and reduced in rTau4 cells. Together, these findings suggest tau is able to enhance stress-related cell signaling as it has been previously reported for growth factor-induced signaling, and shed new light on the mechanisms of neurodegenerative disease. Subsequent experiments will address the nature of tau's interactions with stress-related signaling pathways.

P13. DISCOVERING CANDIDATE GENES CAUSING GLAUCOMA BY USING A YEAST TWO-HYBRID SCREEN TO IDENTIFYING PROTEINS THAT INTERACT WITH SH3PXD2B

Alesia Hruska[1], James Estipona[2], Amanda Dolley[1], Katerina

Kubanova[1], Kacey Meyer[3] & Michael Anderson[3]
Mount Mercy University[1], Lake Erie College of Osteopathic Medicine[2] & University of Iowa Carver College of Medicine[3]

Glaucoma is one of the leading causes of blindness affecting approximately 60 million people worldwide. Nee mice with a mutation in the SH3PXD2B gene, develop an early onset form of glaucoma. This gene is linked to Frank-Ter Haar syndrome in humans, a rare disease resulting in congenital glaucoma, cardiac, skeletal, and craniofacial abnormalities. SH3PXD2B is composed of: an N-terminal PX domain, four SH3 domains, multiple PXXP motifs and several tyrosine phosphorylation sites. Many of these domains are possible binding sites for protein-protein interaction. SH3PXD2B is a podosomal adaptor protein interacting with membrane spanning metalloproteinases that aid in adhesion, degradation and remodeling of the extracellular matrix. The mutant SH3PXD2B gene in nee mice contains a 1bp deletion truncating the protein in the middle of the third SH3 domain. Understanding what proteins bind to this domain of SH3PXD2B may identify other proteins involved in molecular mechanisms causing glaucoma, and help to better understand the function and regulation of SH3PXD2B in podosomes. To identify these proteins, a yeast-two hybrid screen was performed using the third SH3 domain as bait. Prey plasmids encoding 50 distinct proteins from a normalized mouse library were identified. Results of tests determining specificity of the prey proteins for the SH3 domain of the bait protein will be reported.

P14. IDENTIFICATION OF NEW SOURCES OF RESISTANCE TO SOYBEAN APHIDS (APHIS GLYCINES MATSUMURA)

Martha Ibore, Jessica Hohenstein, Asheesh Singh & Gustavo MacIntosh
Iowa State University

Soybean aphids are phloem feeding insect pests of soybean. Aphids diverge plant assimilates for their nutrition causing yield losses of up to 50% in susceptible soybean varieties. One management option for aphids is cultivation of resistant soybean varieties. Aphid resistance in soybean is conferred by resistance to Aphis glycines (Rag) genes and in the USA five Rag genes have been identified. Although host plant resistance is an effective management strategy against aphids, aphid biotypes that colonize resistant soybean have been discovered. The presence of biotypes that survive on aphid-resistant soybean indicates the need to identify new sources of resistance. To identify new sources of resistance, 145 soybean accessions in maturity group I were obtained from a diverse USDA gene bank collection and screened for resistance to aphids (biotype 1) using choice tests. Aphid numbers and damage symptoms were used to assign respective scores (scale of 1-6) to each plant and the means used to group lines as resistant, moderately resistant or susceptible. From this panel, 4 soybean lines were resistant and 4 had moderate resistance to aphids. Future studies will utilize the phenotypic data to identify candidate genes for aphid resistance in the resistant soybean lines using genome-wide association studies.

P15. FUNCTIONAL CHARACTERIZATION OF ANTHURIUM DFR GENE IN TT3 MUTANTS OF ARABIDOPSIS

Olivia Larson[1], Sharif Rahim[1], Teresita Amore[2] & Rasika Mudalige-Jayawickrama[1]
University of Dubuque[1] & University of Hawaii[2]

Anthocyanins are colored flavonoid glycosides which accumulate in vacuoles giving characteristic colors to flowers, fruits and other specialized plant organs. Although anthocyanin biosynthesis has been extensively studied in crops such as petunia, snapdragon, and roses, it is lagging behind in non-grass monocots. The main objective of this study is to characterize the dihydroflavonol 4-reductase (DFR) gene from *Anthurium andraeanum*. The DFR is one of the key enzymes that determine the type of color produced due to its substrate specificity. We isolated a cDNA of the DFR gene by PCR and cloned it into an expression vector, pORE-E4, under the EntCUP2 promoter (tobacco cryptic constitutive promoter) and nopalene synthase (nos) terminator. Arabidopsis thaliana transparent testa-3 (tt-3) mutants lacking DFR activity was transformed with the pORE-E4-DFR plasmid via floral dip method of Agrobacterium mediated transformation. We are currently selecting the transformed kanamycin resistant seeds. Selected seeds and seedlings will be tested for anthocyanin production, and the type of anthocyanin produced, via thin layer chromatography. These results will help us to understand the substrate specificity of the Anthurium DFR enzyme and its potential value as a genetic tool in manipulating flower color in other floricultural commodities such as orchids, which lack dark red flowers.

P16. N-ACETYL-LEUCINE-AMIDE (NALA), A LEUCINE ANTAGONIST, IMPACTS THE ENERGY STATUS AND GROWTH OF OSTEOSARCOMA CELLS

Shailer Martin & Elitsa Ananieva
Des Moines University

Bone sarcomas have proven themselves a challenge to physicians and researchers with their unresponsiveness to traditional treatments. One novel solution to bone sarcoma resistance is to explore the metabolism of the amino acid leucine. Leucine is a nutrient signal that regulates protein synthesis, and we hypothesized that the leucine antagonist, N-acetyl-leucine-amide (NALA), would produce an inhibitory effect on cell growth and protein synthesis in bone sarcoma cells. For that purpose, we treated a human osteosarcoma cell line (143B) with NALA (25 mM and 50 mM) for a 24 h. The impact of NALA on major signaling pathways (mammalian target of rapamycin [mTOR] and AMP-activated protein kinase [AMPK]) in these cells was examined by Western Blotting. The lower concentration of NALA [25 mM] caused cell growth inhibition along with increased phosphorylation of AMPK. The higher concentration of NALA [50 mM] had a severe inhibitory effect on cell growth and protein expression of all proteins examined. The activation of AMPK in leucine-compromised cells indicates that leucine and/or leucine metabolism may impact the energy status of osteosarcoma cells, and cause a

reduction in growth. Thus, limited leucine availability may be one novel solution to treat bone cancer patients.

P17. IDENTIFICATION AND CHARACTERIZATION OF SUPEROXIDE DISMUTASES IN DEINOCOCCUS MARICOPENSIS

Mark McDaniel & Michael LaGier
Grand View University

The Deinococcus group of bacteria are extremophiles characterized by their resistance to cellular damage from large amounts of ionizing radiation and oxidative stress. These properties have generated interest in their manipulation for bioremediation and for further studying *D. maricopensis* genes that may contribute to their resiliency. One objective of the current study is to survey the genome of *D. maricopensis* for the presence of superoxide dismutase genes, which are conserved enzymes used to minimize cellular oxidative stress. Using a bioinformatics scanning approach, two potential superoxide dismutases (Sod) were identified. One of the two, a potential homolog of SodA (termed DM-SodA), was further characterized. SodA counteracts oxidative stress via the dismutation of superoxide radicals into oxygen and hydrogen peroxide. Gene annotation experiments including BLAST, STRING, and I-TASSER support the identification of SodA in *D. maricopensis*. This study will summarize the identification and characterization of SodA using in silico and in vitro methodologies. The identification of catalases in the genome of *D. maricopensis* allows for a better understanding of how this species can thrive under stressful environmental conditions.

P18. DETERMINATION OF PROTEIN INTERACTIONS THAT ARE IMPORTANT FOR STRUCTURAL MAINTENANCE OF SMALL BIOLOGICAL TUBES

Luke Meadows & Kelly Grussendorf
University of Dubuque

Tubular structures in animals are incredibly diverse and important, the human body is full of tubular structures, such as the digestive system, urinary system and the vascular system. Tubes, along with other biological structures, tend to wear down and the body must regenerate and repair these structures. Often when there are problems in the regeneration process, due to mutations, diseases such as different forms of Muscular Dystrophy or Polycystic Kidney Disease (PKD) can develop. The genetic model, *Caenorhabditis elegans* is an ideal organism to study tubular structure and formation, as the organism is transparent, allowing for easy studies and manipulations in a living organism. The formation and regulation of the excretory (osmoregulation) canal, a small single-celled tube, has been studied extensively and a number of proteins have been found to be important for this tubular formation. Two of these proteins, EXC-4 and CFT-1 have been suggested to work together to maintain proper structure, and have been found to localize in regions where there is substantial tube maintenance. Studies are being carried out to determine if these two proteins interact and bind to each other directly, allowing for us to further understand the molecular and cellular mechanisms of tubular formation and structural maintenance.

P19. LOSS OF FUNCTION OF RNS2, A HOUSEKEEPING RNASE T2 ENZYME, CAUSES ALTERATIONS IN CELLULAR HOMEOSTASIS AND GROWTH IN ARABIDOPSIS

Stephanie Morriss, Xiaoyi Liu, Brice Floyd, Diane Bassham & Gustavo MacIntosh
Iowa State University

The T2 family of Ribonucleases is a family of ribonucleases conserved across Eukaryotes. This family of ribonucleases has been shown to degrade ribosomal RNA in numerous organisms including Arabidopsis, humans, zebrafish and yeast. While the plant Arabidopsis has five RNase T2 enzymes, only one, RNS2, has been shown to degrade ribosomal RNA. Plants without RNS2 activity display cellular homeostasis disruption manifested by constitutive autophagy and vacuolar accumulation of ribosomal RNA. Here, we use metabolite and transcriptome (microarray and RNAseq) analyses to determine the metabolic changes that may be responsible for the cellular phenotype. We show that mutation of RNS2 results in energy pathway disruption, indicated by differential expression of energy-related enzymes including an aldolase, transketolase and glyceraldehyde-3-phosphate dehydrogenase, and by differential accumulation of pentose-phosphate pathway metabolites. We observed induction of expansins and glycosyltransferases in RNS2 mutants concurrent with higher water content and larger plant and cell size. Additionally, measurements of cell wall monosaccharides reveal differences between wild type and mutant cell wall. These results suggest that RNS2 mutants modify carbon flux in order to compensate for lack of ribosomal RNA degradation which has an impact on cellular and morphological phenotypes. Our results illustrate the relevance of RNS2 function in Arabidopsis.

P20. DIESEL EXHAUST PARTICLE INDUCED OBSTRUCTION OF ROTIFER DIGESTION AS A BIOSENSOR FOR CHARACTERIZING POLLUTANT IMPACT ON HUMAN HEALTH

Lizeth Ornelas Salazar & Adriana LaGier
Grand View University

Human exposure to air pollutants is associated with elevated respiratory and cardiovascular hospital admissions. Due to a recent surge of alternative motor vehicle fuel usage, novel air pollutants are emerging, but their impact on human health is unknown. Unfortunately, the use of animal models to characterize the biological impact of novel pollutants is labor and cost-prohibitive and in vitro models have not been standardized. This project sought to determine the feasibility of developing a whole cell-based biosensor for characterizing the biological impact of pollutants. In this study, *Philodina rotifers*, an organism capable of cryptobiosis (long-term survival) were subjected at different temperature to different concentrations of diesel exhaust particulate, which are well known pollutants

emitted from combustion of diesel fuel. Exposure to diesel exhaust particles led to a dose-dependent change in corona movement and in alimentary patterns (digestive obstruction) that was exacerbated by increasing temperature. This preliminary cell-based biosensor study indicates that in vitro living system models could be used as biosensors to assess air pollutant-induced cellular changes.

P21. ALVEOLAR EPITHELIAL MICROFILAMENT ASSEMBLY DISRUPTED BY 1,4-BENZOQUINONE, A BYPRODUCT OF DIESEL COMBUSTION

Anai Perez & Adriana LaGier
Grand View University

When lung tissue is damaged, pulmonary epithelial cells migrate across the provisional matrix to restore the epithelial integrity. This occurs more frequently in patients with respiratory diseases, who have been exposed to diesel. 1,4-benzoquinone (BQ) is a known product of diesel and was utilized to show if there were any alterations in cell migration in a wound scratch model. Anti-Golgi staining and ezrin (a membrane-microfilament linker) immunoblots were utilized to show polarity and cytoskeletal configuration, respectively. At a concentration of 25 μM, it was shown that BQ led to alterations in the time of directed cell migration, polarity and cytoskeletal structure of the cells. Data presented here provide insights into the mechanisms by which exposure to traffic emissions may result in detrimental episodes in susceptible individuals.

P22. VIRUCIDAL EFFECTS OF EGCG AND MST-312 ON HSV-1 LIFE CYCLE[ISF]

Prajakta Pradhan & Marie L. Nguyen
Des Moines University

Herpes Simplex Virus (HSV) is the cause of cold sores, blindness and brain damage and often leads to recurrent infections. Decreases in the success rate of the current anti-viral therapies occur as drug resistant mutants arise. Thus, novel drugs for treatment of HSV are needed. Our lab has been studying the natural compound, Epigallocatechin gallate (EGCG) and its chemical analogue, MST-312, for anti-HSV properties. Preliminary results indicated that these compounds may have direct virucidal properties. To further investigate this, HSV-1 was directly exposed to various concentrations of the compounds for time periods between 5 and 60 minutes and then tested for its ability to form plaques on Vero cells. When treated for 30-60 minutes, 40 μM MST and 0.5-1.0 μM EGCG reduced the number of HSV-1 plaque forming units significantly. The temperature at which treatment occurred impacted the ability of the compounds to limit viral replication. Both compounds were effective when treatment occurred at 37^{o}C and room temperature (RT). However, no inhibition was seen at 4^{o}C. Five minutes of treatment with 2 μM EGCG at RT was sufficient to significantly reduce HSV titers. These data indicate that both EGCG and MST-312 have direct virucidal properties.

P23. DNA SEQUENCING AND GENETIC POLYMORPHISM DISCOVERY IN THE CANINE MONOAMINE OXIDASE A (MAOA) GENE

Andrew Ruplin, Paul Skonieczny, Michael Ohman & James Sacco
Drake University

Monoamine oxidase type A (MAOA) is an enzyme that degrades neurotransmitters. In humans, reduced enzyme activity due to MAOA genetic polymorphisms is associated with aggressive behavior. Our overall hypothesis is that, in dogs, aggression, a common behavioral problem, is influenced by variation within the canine MAOA gene. Therefore, the aim of this preliminary study was to sequence functionally important regions of the canine MAOA gene in order to identify novel alleles. Genomic DNA was collected via cheek swabs from 50 pure-bred dogs. Following DNA purification, target regions of the canine MAOA gene were amplified, sequenced, and screened for polymorphisms. Several novel genetic polymorphisms were found. Five were single nucleotide polymorphisms (SNPs) and four were repeat variations. Two synonymous coding SNPs were discovered in exons 12 and 15. Two highly polymorphic microsatellites (ATTT and TTTA repeats), were found in introns 1 and 10 respectively. The microsatellite region in intron 10 was represented by three alleles, representing variable numbers of TTTA repeats (10, 11, or 12). The polymorphism in intron 1 was an ATTT sequence inserted within a short interspersed nuclear element (SINE) that is unique to canids.

P24. ANTIBIOTIC RESISTANCE IN AN IOWA HOG CONCENTRATION FACILITY

Ewalt Shelby & Kate Mathes
Morningside College

Antibiotic resistant bacteria are a growing cause for concern in many concentrated animal feeding operations. To investigate the incidence of resistance to common antibiotics used on-site in a northwest Iowa hog confinement facility, stool samples were collected from three different ages of hogs (<12 days of age, 6 weeks of age, and mature sows). Minimal inhibitory concentration method was used to identify the extent of antibiotic resistance to ampicillin among culturable gut bacteria. Our presentation will report rates of antibiotic resistance and discuss possible strategies to minimize further development of antibiotic resistance in these facilities. Our presentation will report rates of antibiotic resistance and discuss possible strategies to minimize further development of antibiotic resistance in these facilities.

P25. USING *CAENORHABDITIS ELEGANS* AS A MODEL TO STUDY THE MOLECULAR AND CELLULAR ROLE OF THE MUSCLE PROTEIN FER-1 AND ITS IMPLICATIONS IN MUSCULAR DYSTROPHY

Kathryn Silberstein & Kelly Grussendorf
University of Dubuque

Limb Girdle Muscular Dystrophy (LGMD) is a genetic disease characterized by the degradation of muscle tissue. Research suggests a mutated cellular protein called dysferlin is implicated in the mechanism responsible for the inadequate muscle repair that occurs in people with LGMD. Dysferlin belongs to a large family of proteins called Ferlins. These proteins have been discovered to exhibit similar function across species, which allows for the comparison studies within different organisms. The FER-1 protein in *Caenorhabditis elegans* is the homologous protein to dysferlin in humans. *C. elegans* is a well-studied genetic model that provides many tools to study cellular and molecular mechanisms of different biological disorders. Early evidence suggests FER-1 plays an important role in plasma membrane structure and maintenance, by regulating steps of membranous vesicle fusion during spermatogenesis, however studies determining the function of FER-1 within the muscular system of *C. elegans* hasn't been determined. Work is being carried out to determine the morphological and functional role FER-1 might play within the muscular system of *C. elegans* as this could prove to be a powerful tool for the study of LGMD.

P26. CHARACTERIZATION OF ARABIDOPSIS DEAD/DEAH-BOX HELICASES WITH A PUTATIVE ROLE IN RRNA DEGRADATION

Benjamin Wherry, Gustavo MacIntosh, Victoria Ridout & Stephanie Morriss
Iowa State University

Ribosomal RNA (rRNA) is the most abundant type of RNA in all eukaryotic cells, making up almost 80% of the RNA in *Arabidopsis thaliana*. To maintain cellular homeostasis, it is important that the subsequent degradation of those RNAs is maintained. Degradation of rRNA is carried out in the vacuole primarily by the action of the ribonuclease RNS2. We hypothesize that accessory proteins, including RNA helicases, will facilitate this process. We identified two putative membrane-bound DEAD/DEVH-box helicase proteins that are candidates to have a functional role in the degradation of rRNA. The expression profile of the two helicases was characterized. A homozygous mutant for one of the helicases (AT3G46960) was identified. The mutant plants show a growth phenotype, with larger rosettes and longer roots, as previously shown for rns2 mutants.A T-DNA insertion mutant for the second helicase (AT1G72730) was obtained and screening for homozygotes is under way. Upcoming experiments will be done on tissue samples of the mutant genotypes to determine if rRNA accumulation is altered due to the lack of helicase expression.

P27. EFFECT OF P60 ENZYME EXPRESSION IN LISTERIA MONOCYTOGENES DURING MICROBIAL COMPETITION ASSAYS

Erik Zorrilla & Rebecca Schmidt
Upper Iowa University

Due to the health risks associated with the food-borne pathogen *Listeria monocytogenes* (Lm), there is interest in the food industry to determine whether harmless bacterial strains may act as ecological competitors against Lm and reduce *Listeriosis* incidence. Lm secretes the p60 enzyme, which might be used as a defensive mechanism to break down the peptidoglycan present in the cell wall of competitor microbes. Lactic acid-producing bacterial species (LABs) like *Lactococcus lactis* are found in fermented foods such as cheese, yogurt, and pickled vegetables, and there is interest in assessing LAB competition against Lm in ready to eat foods such as deli meats, soft cheeses and seafood. Bacillus subtilis is not a LAB, but like Lm is a soil microbe a potential natural Lm competitor. We hypothesize that expression of Lm p60 enzyme increases the ability of Lm to compete against *Bacillus subtilis* and *L. lactis*. Two Lm strains, wild type and p60 deletion (Δp60) mutant, have been tested in competition against *B. subtilis* and *L. lactis* to acquire a better understanding of the p60 enzyme mechanism and its effect on other bacterial strains. These studies will improve understanding of nontoxic microorganisms as potential competitors to inhibit Listeria growth and ultimately reduce food-borne illnesses.

CELLULAR, MOLECULAR & MICROBIOLOGY ORAL PRESENTATIONS

O28. EVALUATING THE ABILITY OF A RECLAIMED WETLAND TO REMEDIATE ANTIBIOTIC RESISTANT BACTERIA IN SOIL

Karli Mockenhaupt & Mike Vitalini
St. Ambrose University

Increasing amounts of antibiotic resistant (AR) bacteria have been found in clinical settings, reducing the effectiveness of antibiotics to fight infection. Soil has been demonstrated to be a reservoir that holds AR genes that can be transferred to pathogenic bacteria. Human land-use activities such as fertilization with manure or industrial pollution with heavy metals have been shown to increase the abundance of AR genes present in the environment. However, wetlands can potentially remediate the increase in AR genes that result from these activities. Nahant Marsh, a reclaimed wetland in Davenport, Iowa where water from farmland flows sequentially through three marshes before reaching the Mississippi river will be examined for its ability to reduce levels of AR bacteria. It is hypothesized that soil sampled after the farm run-off has progressed through the marsh will have reduced microbial diversity and lower numbers of AR bacteria than soil near the marsh in-flow. Soil samples will be taken at the marsh in-flow and out-flow. The relative number of culturable AR- and antibiotic-sensitive colony forming units will be determined, the presence of specific AR genes will be detected via

polymerase chain reaction, and microbial diversity present will be assessed using EcoPlates. The results and implications of these experiments will be presented.

O29. MODELING MUSCULAR DYSTROPHY IN *DROSOPHILA MELANOGASTER*

Gulnara Novbatova[1], Gary Coombs[1], Lori Wallrath[2] & Diane Cryderman[2]
Waldorf College[1] & The University of Iowa[2]

We have used *D. melanogaster* to investigate the cytological and physiological effects of A type lamin mutations known to cause muscular dystrophy in human patients. The use of *Drosophila* as a model for human laminopathic muscular dystrophy is well established and studies in *Drosophila* have identified cytological defects that may contribute to the pathology of muscular dystrophy. These defects begin with misfolding and cytosolic aggregation of lamin proteins. These aggregates activate an antioxidant stress response mediated by the transcription factor Nrf2. This stress response produces reductive stress which may in turn aggravate protein misfolding. We hypothesize that these cytological defects underlie pathologies of the disease including impaired larval motility, and failure to survive through metamorphosis. Many different lamin A mutations are associated with the disease and their effects may vary in informative ways. We measured the effect of two unstudied mutations (R308P, and R493W) on larval locomotion, survival through metamorphosis, and cytoplasmic lamin aggregation. We found these mutations to cause very little mislocalization or aggregation of lamin, and to have very little effect on survival through metamorphosis. Surprisingly however, they still strongly reduce larval motility. We also report the development of a small scale drug screen to test drugs on Drosophila that target protein misfolding, Nrf2 activation, or reductive stress.

O30. SPICE UP YOUR LIFE: *STREPTOCOCCUS* BIOFILM INHIBITION BY COMMON HOUSEHOLD SPICES

Sydney Oppelt & Shannon Mackey
St. Ambrose University

Almost fifty percent of Americans over the age of thirty are affected by periodontitis. Periodontitis is a gum disease that is caused by a build-up of oral bacteria that, over time, form a biofilm. Oral bacteria have the ability to lead to adverse systemic infections. These systemic infections occur with poor oral hygiene. Without proper oral health care, bacteria grow uncontrolled and eventually migrate out of the biofilm and into the bloodstream. For example, *Streptococcus salivarius* is one of the many bacterial species that resides in dental biofilms and has been linked to systemic infections, such as bacterial endocarditis. One way to treat *Streptococcus* biofilms could be with household spices. Spices are known to have antimicrobial effects against bacteria; however, their effect on biofilms has not yet been fully studied. If spices are found to inhibit *Streptococcus* biofilms, this evidence could suggest that spices have the potential to be alternative treatments that are more accessible, especially in under-resourced countries where toothpaste, clean water, and/or dentists are hard to come by. This research study hypothesizes that spices, such as clove, will have the ability to inhibit biofilm formation and retention.

O31. ROLE OF A NEW TCP GENE IN FLOWER DEVELOPMENT AND PLANT ARCHITECTURE OF THE ORCHID FAMILY

Anna Runge, Amanda Harrop & Rasika Mudalige-Jayawickrama
University of Dubuque

The TCP family (teosinte branched-1(tb-1); CYCLOIDEA; PCF-1 and 2) is responsible for shaping the plant architecture, control of floral symmetry and cell division in plants. The orchid family has two main branching patterns: monopodial where the main axis is continuously growing; and sympodial where the main axis finish its growth by producing an inflorescence. In corn, expression of tb-1 in axillary buds leads to suppression of side branches and development of female inflorescence (ear primordia) in its place. If tb-1 has a similar effect in orchids, its expression will be limited to axillary buds that produce inflorescence primordia. Our main objective is to isolate and characterize the tb-1 like gene(s) from orchids. We isolated a tb-1-like gene from *Phalaenopsis aphrodite* genomic DNA using a genome walker method. Nucleotide sequence show orchid tb-1 does not contain any introns within the open reading frame. The deduced amino acid sequence show TCP domain and the arginine rich domain (R domain) is conserved. The expression profile show tb-1 is strongly expressed in the young terminal buds of the inflorescence while weaker expression is seen on the axillary buds of the inflorescence axis. These results suggest tb-1 may play a major role in floral development and the inflorescence branching pattern in orchids.

O32. INFLUENCE OF BORIC ACID ON HISTONE H3 ACETYLATION IN YEAST

Martin Schmidt & Benjamin Pointer
Des Moines University

Candida albicans is a dimorphic yeast commonly found on human mucosal membranes that switches from yeast to hyphal morphology in response to environmental factors. The switch to hyphal growth requires histone H3 modifications by the yeast-specific histone acetyltransferase Rtt109. In addition to its role in morphogenesis, Rtt109-dependent acetylation of histone H3 lysine residues 9 and 56 has regulatory functions during DNA replication and repair. Boric acid (BA) is a broad-spectrum poison that specifically inhibits *C. albicans* hyphal growth, locking the fungus in its harmless commensal yeast state. The present study characterizes the effect of BA on *C. albicans* histone acetylation in respect to specificity, time-course and significance. We demonstrate that sub-lethal concentrations of BA reduce H3K9/H3K56 acetylation, both on a basal level and in response to genotoxic stress. Acetylation at other selected histone sites were not affected by BA. qRT-PCR expression analysis of the DNA repair gene Rad51 indicated no elevated level of genotoxic stress during BA exposure. A forward-

mutation analysis demonstrated the BA does not increase spontaneous or induced mutations. The findings suggest that DNA repair remains effective even when histone H3 acetylation decreases and dispels the notion that BA treatment impairs genome integrity in yeast.

O33. CHARACTERIZATION OF THE ROLE OF YEDR IN *ESCHERICHIA COLI* CELL DIVISION

Monica Steffen[1], Ryan Bezy[1] & David Weiss[2]
Mount Mercy University[1] & The University of Iowa[2]

Cell division in *Escherichia coli* is a highly regulated process that involves over 30 different proteins. About 10 of the 30 proteins involved are essential for cell division while the play a more minor role. Deletions of essential cell division proteins are typically lethal, while deletion of nonessential proteins can produce filamentous phenotypes or more subtle variations. Previously, a multi-copy suppressor screen identified yedR as a putative gene involved in cell division. Follow-up work showed that yedR:GFP fusions localized to the septal ring during cell division. However, comparison of cell lengths between wild type *E. coli* and ΔyedR mutants failed to show a filamentous phenotype relative to wild type *E. coli*. The yedR gene was deleted from various cell division mutant backgrounds, creating a series of double mutants in which one, ΔyedR/ftsI(Ts) double mutant, showed reduced growth and significantly longer filaments compared to the ftsI(Ts) single mutant. Here overexpression of yedR in various mutant backgrounds has been done to further characterize the participation of yedR in *E. coli* cell division. Wild type and mutant lines were transformed with pBAD33-yedR vector that results in yedR overexpression. Mutant phenotypes were then assayed under a range of conditions with or without yedR overexpression via growth assays and cell length assays.

O34. A CYTOLOGICAL INVESTIGATION OF A MALE-STERILE, FEMALE-STERILE LINE IN *GLYCINE MAX*

Katherine Thilges[1,2], Mark Chamberlin[2], Marc Albertsen[2] & Harry Horner[1]
Iowa State University[1] & DuPont Pioneer[2]

A completely male-sterile, female-sterile mutant was discovered in a transformation study for sterility in soybean (*G. max* L.). This double-sterile mutant was studied for abnormalities in both the male and female organs during micro- and mega-sporogenesis, and gametogenesis. Vegetatively, the mutant line showed no differences from the wild-type line. Analysis via squashes and fluorescent dye staining of the chromosome behavior during male meiosis was done to better understand any issues that could occur that would cause sterility. Clearings of aldehyde-fixed wild-type and mutant anthers and ovules were done throughout their development, followed by confocal laser scanning microscopy and optical sectioning to compare their development and to determine the timing of mutant abortion in both the male and female organs. Preliminary results indicate there are chromosomal abnormalities during male mutant meiosis. Mutant megasporogenesis proceeds through meiosis and the early formation of a megagametophyte when development ceases. Mutant anther development proceeds through the released microspore stage after which the resulting male cells become irregular and eventually abort. These first-time results will be compared with an already published molecular study of this mutant and will provide insight as to the specific mechanism causing this dual sterility.

O35. MANIPULATING METABOLIC PATHWAYS TO SUPPRESS MUSCULAR DYSTROPHY

Maria Valdes[1], Gary Coombs[1], Lori Wallrath[2], Diane Cryderman[2], Dylan Thiemann[2] & Grant Young[2]
Waldorf College[1] & The University of Iowa[2]

Human lamin A gene carrying the point mutation G449V has been found in a muscular dystrophy patient. Drosophila Lamin C carrying the homologous mutation, G489V produces locomotion and survival defects when expressed in larval body wall muscle. This mutation produces four characterized cytological defects in affected muscle cells:

- Cytosolic aggregation of Lamins and associated nuclear proteins
- Activation of the NRF2-mediated redox stress response
- Reductive stress
- DNA damage

We here test the hypothesis that the observed cytological defects contribute to physiological symptoms of muscular dystrophy by A) testing for the same cytological defects in flies expressing muscular dystrophy associated mutations in other domains of lamin C, and B) crossing flies expressing Lamin C G489V with flies expressing proteins or RNAis that could alleviate one or more of the cytological defects

O36. EPIGALLOCATECHIN GALLATE AND RELATED COMPOUND INHIBIT REPLICATION OF HERPES SIMPLEX VIRUS IN VERO CELLS

Jesse Wilson, Evan Beacom, Imran Abassi, Prajakta Pradhan & Marie Nguyen
Des Moines University

Herpes simplex virus (HSV) is ubiquitous worldwide and often results in painful ulcerative lesions, with lifelong recurrent outbreaks. Antivirals for HSV exist, but drug resistance is an increasing concern, prompting the search for novel antivirals. Epigallocatechin gallate (EGCG) is a natural compound derived from green tea that has been shown to possess anti-infectious and anti-tumor properties. MST-312 is its synthetic analogue. Previous studies have indicated that treatment with these compounds inhibited HSV production in human HEp-2 and hTERT-HME1 cells. In this study, we expanded the analysis of the antiviral properties of these compounds to include infection in cells classically used to propagate HSV, nonhuman primate Vero cells. The presence of MST-312 during HSV infection caused a reduction in both viral cytopathic effect (CPE) and the accumulation of late viral proteins. Although EGCG treatment

did not dramatically alter CPE, treatment with 70 and 100μM EGCG inhibited the accumulation of the immediate-early viral protein ICP4, and all late proteins tested. Furthermore, MST-312 addition after viral attachment also decreased viral protein levels, albeit to a lesser extent. Together, these data indicate that both compounds impede HSV infection and offer further insight into the mechanism whereby EGCG and its analogue MST-312 confer antiviral activities.

Chemistry
Poster Presentations

P37. EVALUATION OF THE CYTOTOXICITY OF LIPID-BASED CARRIER FOR MAGNETICALLY INDUCED THERMO-RESPONSIVE DRUG DELIVERY SYSTEM[ISGC]

Jason Babcock & Abebe Mengesha
Drake University

This study investigates the cytotoxicity of a lipid carrier containing glyceryl monooleate (GMO) - glyceryl monostearate (GMS) loaded with oleic acid-modified iron oxide (OA-Fe_3O_4) nanoparticles. Lipid matrices containing mixtures of GMO-GMS (75:25 wt%) have been evaluated for their application in magnetically induced thermo-responsive local drug delivery systems. Additionally, we have recently shown that the OA-Fe_3O_4 oxide nanoparticles (10 nm, at concentration of 0.125 – 0.5 mg/mL) were not significantly cytotoxic on human mammary (HTB19) carcinoma cell lines when tested without the lipid matrix. However, the lipid matrix has the potential to modify the toxicity of the OA-Fe_3O_4 nanoparticles. Therefore, it must be shown that a combined formulation does not induce cytotoxicity. By utilizing the CytoTox-Glo® Cytotoxic Assay over time, we will evaluate the in vitro cytotoxicity of the OA-Fe_3O_4-loaded GMO-GMS formulation carrier and its effects on the continued proliferation of the HTB19 carcinoma cells. The results of this study will provide necessary information on the safety and potential application of lipid-based nanotechnology for designing and developing triggerable drug delivery systems for smart medicine.

P38. IDENTIFICATION OF THE MEDICALLY IMPORTANT COMPOUNDS IN LEBEDAI, A FOLK MEDICINE PLANT FROM GAMBIA, AFRICA

Kebba Bojang & Mark Sinton
University of Dubuque

Lebedai, or Moringa oleifera, is a common plant used in the folk medicine in Gambia, Africa.
Traditional uses of lebedai involve making a tea from the dried leaves of the plant, and drinking the brew to cure a variety of ailments such as malaria, fever, headache, and joint pains. We wished to identify any compounds in the tea made from the dried leaves of the plant that have known medicinal properties, and if present, to correlate those compounds with the plant's folk medicine uses. As one might expect, when analyzed via gas chromatography/mass spectrometry (GCMS), the tea contains a wide variety of compounds, some of which have known biological activities. Cyclopentadecane, 10-heneicosene, N-(4-bromobutyl)-2-piperidinone and 1-hexacosene, are just four examples of the compounds found in the tea with biological activity: cyclopentadecane and heneicosene have antimalarial properties, while N-(4-bromobutyl)-2-piperidinone and 1-hexacosene have antimicrobial and anti-inflammatory activities, respectively. Each of these compounds match quite well with the folk medicine uses of lebedai.

P39. WITHDRAWN

P40. GC/MS/MS ANALYSIS OF ASTROBIOLOGICALLY SIGNIFICANT AEROSOLS: THE HUNT FOR PREBIOTIC MOLECULES[ISGC]

Tate Christensen, Jose Lopez, Jessica Wayson & Joshua Sebree
University of Northern Iowa

A large number of laboratory experiments have been carried out in attempts to recreate the atmospheric chemistry of both the early Earth and Titan. The earliest experiments, carried out by Miller and Urey, attempted to show how biomolecules could form in the primitive Earth's atmosphere. While their results were groundbreaking at the time, further work has since determined their atmosphere was more reducing then that of the Earth. Since then, many groups have attempted to create biological compounds from prebiological atmospheres. The largest obstacles to overcome in working with and characterizing lab-generated aerosols are those of the large number of species formed and the limited sample amounts. To that end, we have worked to develop a new method for aerosol analysis. Taking advantage of the chemical nature of many prebiotic molecules which contain acid hydrogens, the aerosols are derivatized with MTBSTFA allowing for selective solvation of only the derivatized compounds. The dissolved compounds are then injected into a GC-MS/MS triple-quad operating in trapping mode on the first quadrupole. The combination of derivatization and triple-quad analysis has allowed for the development of a method that is both selective for prebiotic molecules and sensitive enough to detect species that would not show up using a more traditional GC/MS technique.

P41. ANALYSIS OF SOLVENT STORAGE PROPERTIES OF POLYUREA-SHELL MICROCAPSULES CONTAINING A FREE-RADICAL INITIATOR CORE

Tyler Halligan & Brian McFarland
Morningside College

In this study, microcapsules were synthesized with an initiator core consisting of a free-radical initiator and their leakage/storage properties within different storage media were analyzed. The initiators chosen for this study were cumene hydroperoxide (CHP) and t-butyl-peroxybenzoate (t-BPB). The leakage properties were analyzed by storing the capsules in various solvents of differing polarity, and periodically

testing the solvent media using gas chromatography to analyze the percentage of leaked initiator present. 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. Results have indicated that a larger percentage of the core initiator leaks from the microcapsules within the first several days of storage when stored in polar solvents, supporting our hypothesis.

P42. PREPARATION OF CRUDE EXTRACTS AND ISOLATED COMPONENTS WITH HIGH ANTIOXIDANT ACTIVITY FROM THE PRAIRIE TURNIP (PSORALEA ESCULENTA)

Jacob Hindman & Paul Weber
Briar Cliff University

Native Americans of the prairie regions have employed the prairie turnip (Psoralea esculenta) as both a dietary staple and a medical remedy for generations. Research in this laboratory has uncovered the presence of the flavonoids genistein and daidzein in relatively large amounts in the prairie turnip. Flavonoids, in general, exert a variety of activities beneficial to human health, including the ability to act as antioxidants. Thus, the antioxidant activity of extracts of various parts of the plant, including stems and leaves, seeds, bulb, woody rind and rind skin, were investigated. Extracts of rind skin, in particular, exhibited high antioxidant activity, and further fractionation of the extract by preparative chromatography lead to the isolation of a potent antioxidant, designated M-11'. Partial chemical characterization of M-11' was achieved. Multiple samples of rind-skin extract and M-11' were prepared and provided to co-investigators at this institution for determination of relative anti-bacterial activity (see adjoining poster at this poster session).

P43. EXPLORING THE WILDTYPE AND MUTANT BETA GLUCOSIDASE B SPECIFICITY TOWARDS GLUCO- AND GALACTO- PYRANOSIDE

Jonathan Le[1], W. Brett Norris[1], Bonnie Hall[2] & Laura A. Rusch -Salazar[2]
Hoover High School[1] & Grand View University[2]

This study assesses the effects of different substrates on the enzyme β-glucosidase B (BglB) from Paenibacillus polymyxa. The effectiveness of the substrates ρ-nitrophenyl-β-D-glucopyranoside and o-nitrophenyl-β-D-galactopyranoside on both wildtype and mutant enzyme will be compared. To collect data we used a protocol that would express and purify wildtype and modified BglB, then test enzymes with the different substrates, monitoring ρ-nitrophenol production to assess protein activity. The results concluded that BglB was more had a higher affinity for substrate ρ-nitrophenyl-β-D-glucopyranoside (KM = 1.67x10-3M) over the galactopyranoside (KM = 0.107M). The reaction was significantly more efficient (kcat) and produced more product when reacting with substrate ρ-nitrophenyl-β-D-glucopyranoside; however, it is suggested to continue research on the effects of the substrates using mutant β-glucosidase B enzymes.

P44. IONIC CONDUCTIVITY STUDIES OF ORGANIC ETHER, CARBONATE AND SILYL SOLVENT BLENDS FOR APPLICATIONS IN LITHIUM-ION BATTERIES

Fangda Li & Leslie Lyons
Grinnell College

Low toxicity, high conductivity and a wide temperature performance range are commonly used criteria for electrolytes in modern lithium-ion batteries. Triglyme, diethyl carbonate (DEC) and ethylene carbonate (EC) are commonly utilized solvents for lithium-ion batteries. We have explored the use of novel silyl solvents as components of electrolytes due to their improved lithium ion transference numbers and safety in comparison to the conventional carbonate solvents used in lithium-ion electronic devices. In a search for optimum solvent blends for commercial use, blended cyclic and linear carbonates as well as silyl solvents containing the salt lithium hexafluorophosphate at different concentrations were tested in variable temperature ionic conductivity measurements. Ionic conductivities were measured by impedance spectroscopy over a fifty degree temperature range and analyzed using Arrhenius or VTF regression fits. All electrolytes demonstrated that the conductivity increases as the temperature increases. At ambient temperature, EC/DEC blends have higher conductivity than organic ether electrolytes. Moreover, conductivity was also found to be dependent on salt concentration with a positive correlation such that conductivity increases as the concentration of salt increases.

P45. DEVELOPING A COMPUTATIONAL RNA SEQUENCING PIPELINE FOR THE ANALYSIS OF GLUCOCORTICOID-INDUCED GENE REGULATION IN BCP-ALL CELLS

Alec McIntosh
Simpson College

RNA sequencing is a modern analytical technique that allows precise quantification of all RNAs simultaneously and how their levels change in response to stimuli at any moment in time. Although many tools are available, principles for interpreting the data are still evolving, and there are no gold standard protocols for computational analysis once data is generated. Every year new versions of these tools are being developed that employ better trimming, counting, mapping, and normalizing techniques. Using these modern advancements and improvements of RNA sequencing, I was able to synthesize a computational pipeline in order to answer our question pertaining to glucocorticoid-induced gene regulation in B-cell Precursor Acute Lymphoblastic Leukemia (BCP-ALL) cells. Glucocorticoids remain the standard treatment for such lymphatic cancers. Although we know that a "stronger" glucocorticoid, dexamethasone, works better than a "weaker" one, prednisone, in a clinical setting, the reason behind this difference is unknown. Using RNA sequencing and my

computational pipeline, we will be able to compare differential gene regulation between these two drugs, as well as an assortment of downstream analysis techniques, to shed light on this question.

P46. STUDY OF THE EFFECT OF URBAN LIFE ON THE WATER QUALITY OF THE RACOON AND DES MOINES RIVER WATERSHED

Nejla Memic[1], Leilla Memisevic[1], Eric Chambers[1], Noah Peterson[1], Corbin Zea[2], Emma Hodges[1] & Jill Tang[1]
Hoover High School[1] & Grand View University[2]

The topic of water quality is a hot button issue that strikes very close to home in Iowa. Many people are quick to blame the farmer for the amount of fertilizer runoff that is found creeping into Iowa's waterways. In this study, we look at the effect that the urban area of Des Moines has on the Des Moines River watershed over the course of the August 2015 to April 2016. We will monitor various water quality factors such as dissolved oxygen, pH, presence of heavy metal ions, and nitrate concentrations. We hope that this information will give us a clearer picture about the impact that urban areas have on water quality.

P47. DEVELOPMENT OF A CHEMICAL-BASED MULTI-POTENTIAL ION GUIDE ELECTRODE FOR REFLECTRON TIME OF FLIGHT MASS SPECTROMETRY

Jonathan Nederhoff, Madison Flesch, Dmytro Kravchuk & Curtiss Hanson
University of Northern Iowa

Laboratory use of mass spectrometry (MS) is becoming the most prevalent analytical technique for molecular identification included in many industries such as biotechnology and forensics. The instruments require precise electric fields to provide maximum resolution and transmission efficiency. The basis for our proposed method of analysis is the creation of an electric field generated by a multi-potential ion guide (MPIG) electrode. By varying the conductivity of the surface of the electrode, it is possible to use the single electrode as a voltage dividing device which alters the potential field generated by the ion guide at different locations.
We are developing a technique in which a single MPIG electrode can create a reflectron region in a TOF mass spectrometer. In our instrument, two separate reflecting fields will be created at each end of the drift region to permit the ions to oscillate between the reflectrons. The electrode will create electric fields that constantly redirect the ions back towards the flight axis, eliminating the divergence and subsequent ion loss. The motion of the ions in the resulting fields will increase the resolution of the mass spectra by reducing the effect of the energy variance of ions.

P48. DEVELOPMENT OF A SEMICONDUCTOR BASED QUADRUPOLE ION TRAP MASS ANALYZER

Madison Flesch, Dmytro Kravchuk, Johnathan Nederhoff & Curtiss Hanson
University of Northern Iowa

Today, the majority of mass spectrometers on the market rely on instruments with quadrupole mass filters that separate ions based on their m/z charges using a combination of radio frequency (RF) and direct (DC) voltage fields. To achieve these fields, one type of quadrupole analyzer uses a hyperbolic ring electrode sandwiched between two end cap electrodes to create a stable ion trap. Sequentially ejecting ions from the trap into the charge detector accomplishes mass analysis, and the RF field created by the hyperbolic ring electrode controls this process.
We have simplified this process by developing a novel method mass analysis based on chemically produced hyperbolic fields of a quadrupole ion trap. The basis for this new method of analysis is achieved by replacing the hyperbolic ring electrode with a multi-potential ion guide (MPIG) electrode. The MPIG electrode created by coating the surface of an insulator with a semi-conductive polymer. In this manner, a simple chemically treated electrode can project the same potential energy field as the field generated by a more complex physical electrode. This would not only reduce costs of production of the electrodes, but also offers a simpler route to miniaturization of the quadrupole since it does not have the same limitations as machined electrodes.

P49. DEVELOPMENT OF THE CHEMICAL BASED SEMI-CONDUCTIVE ELECTRODES AS MULTI-POTENTIAL ION GUIDE FOR THE QUADRUPOLE ION MASS SPECTROMETER AND TIME-OF-FLIGHT ION MASS SPECTROMETER

Dmytro Kravchuk, Madison Flesch, Johnathan Nederhoff & Curtiss Hanson
University of Northern Iowa

Mass spectroscopy is the progressive field of chemistry that helps with accurate measurements because of high sensitivity and specific molecule identification. In order to achieve such properties, various mass spectrometers were developed, such as Time-Of-Flight and quadrupole mass analyzers. Most of these ion trap mass spectrometers use shaped metallic electrodes to generate the fields used for analysis. These metal electrodes have a uniform voltage across a precision machined surface that lets them generate the parabolic electron fields as ion traps. However, there is an alternative approach to creating a multi-potential electrode based on the chemical, semi-conductive polymer applied on the electrode surface that would replace typically machined versions. The previously used type of electrodes was projecting a parabolic well permitting mass analysis of the samples trapped in the mass spectrometer. The same concept would be applied for the new semi-conductive electrode that can be adapted and used for both ion trap

spectrometers. Once the semi-conductive polymer was chemically synthesized, it was possible to vary the thickness or composition of a semiconductor on the surface of either the electrode or a non-conductive support. Therefore, a semi-conductive electrode or a glass coated with semi-conductive paint would create a range of voltages that mimics an electric field projected by the mechanically shaped electrode.

P50. PHOTOCHEMICAL CHARACTERIZATION OF AN L11798 HIGH-BRIGHTNESS DEUTERIUM LAMP AS A LIGHT SOURCE FOR ATMOSPHERIC STUDIES[ISGC]

Joshua Sebree, Steven Gomez, Carissa Herkelman, Jose Lopez, Jessica Wayson, Brittnie N. Dotson, Bobbi Minard, Kathryn Patrick, Alexa Sedlacek & Xinhua Shen
University of Northern Iowa

In order to simulate the interaction of sunlight with planetary atmospheres, laboratory scientists have used a variety of light sources. While some light sources, such as lasers, exhibit a constant photon flux across a lifetime of usage, other sources show a drop in photon density over time. Exceedingly bright light sources can lead to the rapid build up of films over the optical surfaces when used to initiate high-yield photochemistry that then require the disassembly and cleaning of the reaction vessel more often. Older/dimmer sources may result in a significant drop in reactions calling for longer experiments, which then leads to further aging of what can be an expensive piece of equipment. In order to maximize the usefulness of the L11798 deuterium lamp from Hamamatsu, we have carried out N_2O actinometry studies of multiple lamps at different points in their lifetime. With the knowledge of how photon flux varies with lamp life, it is possible to maximize photochemical product yields while minimizing downtime do to cleaning needs. In addition, it is possible to better compare our reaction conditions with those experienced by planetary atmospheres.

P51. AN INVESTIGATION OF DIMETHYL CARBONATE AS A GREEN SOLVENT FOR THE SUZUKI REACTION

Mark Sinton, Jason Davidson, Carlos Montero, Jacob Hesselman & Zachary Pickel
University of Dubuque

The Suzuki reaction, a widely used method for synthesizing biphenyl compounds, traditionally involves the use of environmentally toxic solvents such as benzene and benzotrifluoride. Here, we have endeavored to replicate the work of Satterlee, in which she found that dimethyl carbonate could be used in place of the traditional Suzuki solvents as a way to make the Suzuki reaction more "green" (Satterlee, 2012). This work demonstrates that dimethyl carbonate is indeed an effective solvent for the Suzuki reaction.

P52. THE QUANTITATIVE AND QUALITATIVE ANALYSIS OF ENDOCRINE-DISRUPTING COMPOUNDS IN THE MISSOURI RIVER[ISF]

Cristhian Trujillo & Theodore Bryan
Briar Cliff University

The goal of this ongoing project is to carry out a qualitative and quantitative analysis of endocrine-disrupting compounds (ECDs) in the Missouri River near Sioux City, IA. Quantitative standardization was performed for p-cresol, DDT, caffeine, atrazine, vinclozoline, 17α-ethinylestradiol, endosulfan, and bisphenol A. Samples were collected approximately every two weeks between March 15, 2015 and Aug 15, 2015 from a location upriver from Sioux City and one downriver from Sioux City. These samples were quantitatively analyzed for the EDCs listed. Additional qualitative analyses were conducted on the samples using the MassHunter software package from Agilent. The results of these analyses are reported.

Chemistry
Oral Presentations

O53. AN ANALYSIS OF THE PRACTICALITY AND EFFECTIVENESS OF UV IRRADIATION AS A TREATMENT METHOD FORM17-B ESTRADIOL USING DANIO RERIO IN VIVO AND HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Issac Schwantes, Joshua Stratton & Neil Aschliman
St. Ambrose University

Since their advent in the 1960's, endocrine disrupting compounds (EDCs) such as 17-β estradiol have steadily increased in concentration to the point of their ubiquity today through anthropogenic and agricultural sources. Several studies have indicated that even at ng L-1 concentrations, these EDCs elicit negative effects such as the feminization of males in fish populations. With the increasing awareness of EDCs, many wastewater treatment facilities are looking for cost-effective treatment methods to remove EDCs from wastewater effluent without the overwhelming investment to upgrade the facility to an advanced oxidation processes facility. We hypothesize that UV irradiation (λ=254nm) will reduce the endocrine-disrupting effects of 17- β -estradiol on male zebrafish (*Danio rerio*). Two identical tank setups housed 12 zebrafish each in water containing 10 ppb untreated estradiol (positive control) or UV-irradiated estradiol. To analyze the endocrine disrupting effects, histological analysis of gonad morphology will be performed using standard hematoxylin & eosin stain. Using High Performance Liquid Chromatography, estradiol levels of the tank conditions and wastewater samples were determined, and the effectiveness of UV irradiation was analyzed using a two-means t-test.

O54. A SURVEY FOR THE PRESENCE OF ANTIBIOTICS IN THE WATERS AND SOILS OF STREAMS SURROUNDING GUTTENBERG, DUBUQUE, AND DAVENPORT, IOWA

Kayla Neff, Michael Kennedy & Mark Sinton
University of Dubuque

Water and soil samples from twelve streams encompassing an area from the north of Guttenberg, Iowa, to Davenport, Iowa,

and that empty into the Mississippi River, were surveyed for the presence of five antibiotics commonly used in agriculture: ampicillin, ciprofloxacin, sulfadiazine, sulfamethazine, and tetracycline. Only three out of twenty-four water samples had a detectable amount of antibiotic, while all of the soil samples (forty-eight, in total) contained one or more of these compounds. These data suggest that, while there may be little antibiotic content in water in this area of the country, stream soils are an antibiotic sink.

O55. SYNTHESIS AND APPLICATIONS OF IONIC LIQUID MONOMERS IN FREE-RADICAL POLYMERIZATIONS

Mallory Sea & 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. Initial results suggest adhesive properties similar to common commercial adhesives, with lower toxicity to environmental bacteria.

O56. EVALUATING THE EFFECTIVENESS OF COMPUTATIONAL DESIGN SOFTWARE FOR DETERMINING THE CONSEQUENCES OF POINT MUTATIONS

Ryan Starkman, Mohammed Al Hussein, Miles Hackett, Kennedy Kiprop, Jerad Snyder, Corbin Zea & Bonnie Hall
Grand View University

Mutagenesis is an accepted method of changing the structure and function of a protein, allowing it to be engineered to have a novel function. The goal of this study is to evaluate how effective computational design programs are at determining the consequences of amino acid substitutions in protein engineering. βglB was selected, as it is an easily expressed protein with a simple spectrophotometric assay and an available crystal structure. We used FoldIt, a computational software program, to model amino acid substitutions in the βglB protein in silico and score the predicted effects on both the folding of the protein and interactions with the substrate. A series of βglB point mutations were selected using FoldIt, and included F418Y, W328S, Q22A, W410H, and W402C. These mutations should affect the polarity, charge, and pI of the binding pocket, and all were predicted to generate a functional protein. These mutant proteins were expressed, purified and tested in vitro. Data will be presented addressing whether the predicted effects of each mutation correlates with the experimental results.

O57. A COMPARISON OF THE TEMPERATURE DEPENDENT ACTIVITY AND KINETIC PROPERTIES OF POTATO, MUSHROOM, AND APPLE TYROSINASE

Andrew Kendell, Mitchell Goff & Mark Sinton
University of Dubuque

Tyrosinase is a copper-containing enzyme found in most higher plants and animals, and plays an essential role in synthesizing melanin. Previous activity and kinetic studies in this laboratory have shown that tyrosinase isolated from Russet potatoes has an unexpected activity temperature dependence, and retains high catalytic activity at temperatures up to 80°C (Fraticelli and Sinton, 2003, Englert and Sinton, 2013, Englert, et. al., 2014). At 25°C, for example, tyrosinase has a V_{max} of 41 μM/min and a K_M of 4.3 μM. In contrast, at 80°C, the enzyme's V_{max} and K_M are 55 μM/min and 0.34 μM, respectively. These observations suggest that tyrosinase binds substrate more tightly at higher temperatures than it does at lower temperatures, and as a result has a higher catalytic efficiency at 80°C than at 25°C. Based on these unusual results, we wondered whether this phenomenon was isolated to the Russet potato variety of the enzyme, or was a common feature of all tyrosinase enzymes. Thus, to explore this issue, we ran similar temperature dependent activity and kinetic experiments with tyrosinase isolated from mushrooms and apples, the results of which suggests that only the potato form of the enzyme has this extraordinary temperature behavior.

O58. SYSTEMATIC COMPARISON OF TRANSITION METAL OXIDE SURFACE PROPERTIES USING DENSITY FUNCTIONAL THEORY

Michael Welford, Katharine Corum, Xu Huang & Sara Mason
The University of Iowa

There have been many well-known computational surface studies on α-Al_2O_3 (001), TiO_2 (110), and α-Fe_2O_3 (001). Many past studies do not fully relax the surfaces but fix certain layers in order to reduce computational cost and believe that this does not affect the electronic structure of the surface. However, when the surface is fully relaxed there are significant vertical relaxations that occur due to the displacements of the metal atoms, these surface relaxations cannot fully occur in a partially frozen structure. In order to determine how the electronic structure is affected by fixing certain layers**,** the relaxed and two partially fixed structures are optimized for the α- Al_2O_3 (001), TiO_2 (110), and α-Fe_2O_3 (001) surfaces. We test surfaces with a variety of layer thicknesses (2, 3, 4, 5, and 6 layers) and determine that the electronic density of states differs depending on how many atomic layers have been fixed. We also calculate the absorption energy differences for a single Al, Ti, Fe, and Pt atom on a fully relaxed and partially fixed surface at different thicknesses and two different reactive sites.

O59. OPTIMIZING PREPARATION CONDITIONS OF LIVE MDV INFECTED SAMPLES FOR TRANSMISSION ELECTRON MICROSCOPY

Amanda Dolley, Zachary Fritz, Hanna Stenzel, Keith Jarosinski & Joseph Nguyen
Mount Mercy University

Marek's disease virus (MDV) is a highly contagious herpesvirus, which induces T-cell lymphoma in chickens. Despite forty years of vaccination, the virus can still infect vaccinated chickens and has become increasingly virulent. Thus, it is important to better understand the replication and pathogenicity of MDV. New mutant viruses have been developed to help study the infection process better; however, infections by these mutant viruses can only be characterized using transmission electron microscopy (TEM). Unlike the standard procedures for the preparation of tissue culture samples for TEM, standardized procedures for live samples, such as feather follicles, are less common, not standardized, and much more difficult. The presentation will discuss the efforts made towards effectively optimizing the preparation conditions of MDV-infected feather follicles and consequently the identification of infected cells.

O60. AB INITIO APPROACH FOR THE STUDY OF INCONGRUENT NMC METAL DISSOLUTION IN AN AQUEOUS ENVIRONMENT

Chi-Ta Yang & Xu Huang
The University of Iowa

Lithium based transition metal oxides such as nickel manganese cobalt oxide (NMC) are widely adopted as cathode materials in various electronic products. The rapid and large-scale commercialization of such materials is increasingly bringing detrimental impacts on our environment during the manufacture, usage, and disposal of materials. Experimental work has shown that the mechanisms affecting biologic systems varies among materials. For example, the dissolution of NMC in aqueous media has turned NMC into a toxic object. However, the experimental techniques are limited to gain molecular understandings of the mechanism. Here we use density functional theory and thermodynamics to investigate the fundamentals of NMC metal dissolution and use free energy (ΔG) to reveal the incongruent dissolution tendency among nickel, manganese, and cobalt. We found that the Ab Initio ΔG better explain the Ni+ dominated dissolution of NMC as compared to the metal vacancy formation energy. Besides, the computational results corresponds well with the experimental counterpart, which indicates ΔG a suitable predictor for metal dissolutions of the cathode materials. By calculating the ΔG of NMC with different ratios, promising candidates for environmental benign cathode materials can be found and to suggest future experiment work. Our work helps the redesign of potential cathode materials that meets both battery performance and environmental friendly purposes.

O61. ADAPTING NMR FOR THE STUDY OF ENZYMATIC REACTIONS

Kennedy Kiprop & Corbin Zea
Grand View University

Enzyme kinetics is a tool that provides a good understanding of how enzymes work by integrating the functions of turnover rate and substrate concentration. Traditional standard protocols rely on known substrates that produce a colored product. These substrates may not give true kinetic data due to the interference from attached chromophores. Nuclear Magnetic Resonance Spectroscopy (NMR), however, is a good alternative tool in complimenting a standard protocol in enzyme kinetics. NMR allows for real-time data collection that can be used to gain an insight in enzyme kinetics without the use of a chromophore. Here we use β-glucosidase B, (Bglb) to demonstrate its interaction with its substrate and compare the standard protocol to the NMR analysis.

O62. ALUMINUM NANOPARTICLE STUDIES THROUGH DENSITY FUNCTIONAL THEORY[ISF]

Jennifer Bjorklund, Katie Corum & Sara E. Mason
The University of Iowa

Aluminum (III) is known to hydrolyze in water and form a variety of hydroxide species with unique properties. Aluminum nanoparticles have been used for water purification due to their ability to form complexes with harmful metal contaminants, such as arsenic and lead. The aluminum nanoparticles studied include the Keggin-type structures of Al_{13} ($Al_{13}O_4(OH)_{24}(H_2O)_{12}^{+7}$) and Al_{30} ($Al_{30}O_8(OH)_{56}(H_2O)_{26}^{18+}$), as well as the flat structure of $Al_{13}(m_3\text{-}OH)_6(m\text{-}OH)_{18}(H_2O)_{24}^{15+}$. To study these molecules, density functional theory (DFT) was used; the energetics and electrostatic potentials were determined and compared to experimental results. Combined computational and experimental studies on the reactivity of these polyaluminum cations have shown trends that relate to shape, counter ion, and composition.

O63. THE EFFECTS OF DISTAL AMINO ACID MUTATIONS WITHIN THE POLYSACCHARIDE BINDING SITE OF BETA GLUCOSIDASE B

Elizabeth A. Kras, Kennedy Kiprop, Corbin Zea, Bonnie Hall
Grand View University

Beta-Glucosidase B (βgl-B) is able to break down disaccharides, oligosaccharides, and conjugated saccharides. Glutamic acid (E) 180 is found in the substrate binding pocket and participates in hydrogen bonding to the sugar unit in subsites +2 and +3. We examined whether mutating this distal amino acid would affect the catalytic efficiency of βgl-B. Computational design using FoldIt was used to select perspective mutants. E180 was mutated to aspartic acid (D), glutamine (Q), and tryptophan (W) to modify changes in side chain size, shape, polarity, and acidity. Oligonucleotides were created and outsourced to Transcriptic for mutant synthesis using Kunkel mutagenesis. Mutant proteins were then over expressed, affinity purified, and enzymatic activity assayed.

E180D exhibits an increased catalytic efficiency, E180W exhibits values comparable to wildtype and E180Q demonstrates exceptionally low catalytic efficiency. Although the crystal structure reports critical hydrogen bonding at this site, these data do not support that conclusion. Additional mutants will need to be analyzed to explain this discrepancy.

Ecology & Conservation Poster Presentations

P64. GROWTH OF ORNATE BOX TURTLES

Meleah Baloch[1], Grace Leppink[2], Nikita Martinson[2], Virginia Brust[1], Andrew McCollum[2], Neil P. Bernstein[1], Robert Todd[1] & Tyler Skorczewski[2]
Mount Mercy University[1] & Cornell College[2]

Morphological measurements were taken on ornate box turtles of different ages during the summers of 2011-2015. Measurements of carapace length, carapace width, front plastron length, rear plastron length, plastron width, and height will be examined through mathematical models relative to estimated age of the turtles. Predictive models will be explored in this preliminary analysis.

P65. IMPACTS OF INTRA- AND INTERSPECIFIC COMPETITION ON TWO PRAIRIE FORBS: *RUDBECKIA HIRTA* AND *DESMANTHUS ILLINOENSIS*

Tianna Berard, Ben Lewis & Amethyst Merchant
Grand View University

Responses of an aster and a legume species native to the tallgrass prairie were measured when individuals were grown in pots alone, with another individual of their species, and with an individual of the other species under non-limiting conditions within a greenhouse. Plant growth and morphology parameters were collected. Differences in total biomass and allocation patterns under intra- and interspecific competition were greater for *Rudbeckia hirta* (Asteraceae). Interspecific competition lead to a significant decrease ($P = 0.05$) in total plant biomass and a trend of increase in the root:shoot ratio in comparison to responses without competition. Comparisons between *R. hirta* under intraspecific versus interspecific competition again found a trend of greater increase ($P = 0.06$) in root:shoot ratio under interspecific competition. Extensive soil exploration by roots was found for *R. hirta*, but not *Desmanthus illinoensis* (Fabaceae). Parameters of *D. illinoensis* were not significantly impacted by intra- or interspecific competition. Significantly less growth occurred for *D. illinoensis* when compared to *R. hirta* under all conditions. When roots were harvested, no nodule formation was found in *D. illinoensis*. *Desmanthus illinoensis* did not exhibit acclimation responses to competition in our study.

P66. COMPARISONS OF POPULATION DENSITIES OF FOX SQUIRRELS (*SCIURUS NIGER*) IN URBAN LANDSCAPES

Tim Bergin, Daniel Enabnit, Justin Langford & Andrew Smith
Des Moines Area Community College

Fox Squirrels (*Sciurus niger*) inhabit urban landscapes throughout much of the American midwest. We estimated squirrel population densities in residential and parkland areas within urban landscapes in Ames and Boone, IA. Fox squirrels were counted while walking 1-mile transects in 4 different study sites over 10 different sampling periods in the fall of 2015. There were no differences in population density between Ames and Boone, so we pooled our data. We did find significant differences in population density between residential and park areas. In addition, our study sites had apparent differences in tree density, so we counted and measured trees along each 1 mile transect. We found a significant, positive correlation between tree and squirrel density. Squirrels use trees for roosting, nesting and foraging on acorns and other tree nuts.

P67. AGE VS. LENGTH: A COMPARISON OF NATIVE AND INTRODUCED YELLOW BASS POPULATIONS

Dustin Bulten & Jeffrey Butikofer
Upper Iowa University

Yellow bass are native to Iowa's natural lakes and larger rivers, but they are not native in artificial lakes throughout the state. When released in small lakes, yellow bass populations can quickly become stunted. Age and length data can be examined to determine if a fish population shows signs of stunting. This study focuses on age and length of yellow bass from Otter Creek Lake compared to fish from the Mississippi River to look for evidence of stunting. Otter Creek Lake is a 74-acre impoundment that is located in Tama County, Iowa. Yellow bass were introduced in the 1990s and quickly overran the lake. Age of fish was determined by examination of annual age rings in otoliths, which were stained with either methyl violet or Semichon's acetocarmine.

P68. BUTTERFLY COMMUNITY DYNAMICS AT A HETEROGENEOUS TALLGRASS PRAIRIE BIOENERGY PRODUCTION SITE IN BLACK HAWK COUNTY, IOWA

Sara Judickas, Ben Hoksch & Mark Myers
University of Northern Iowa

Current biofuel production in the Midwestern United States is dependent on annual monoculture crops which have little value for biodiversity conservation. We conducted a field experiment assessing the potential biomass yields and wildlife habitat value of four candidate tallgrass prairie agroenergy crops. In 2009, 48 research plots were established on three soil types in fields previously managed for annual row crops in Black Hawk County, Iowa. Each plot was seeded with one of four native prairie agrofuel crops: (1) Switchgrass1 (a *Panicum virgatum* monoculture), (2) Grasses5 (five warm-season grass species), (3) Prairie16 (16 species of grasses and forbs), and (4) Prairie32 (32 species of graminoids and forbs). From 2010-2014, we surveyed plant community characteristics and butterfly community dynamics in the plots. We sought to address the

following research questions: How do butterfly abundance, diversity, and community composition differ among the prairie crops over time? Does butterfly behavior differ among crop types? Do seasonal changes in butterfly abundance within years relate to plant flowering phenology? Does soil type affect vegetation characteristics and, consequently, butterfly habitat use over time? We discuss the implications of our findings in the context of the potential expansion of perennial biomass energy cropping systems in the Midwest.

P69. OVERWINTERING BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*) USE OF AGRICULTURAL FIELDS IN NORTHEAST IOWA

Kristy Miller & Paul Skrade
Upper Iowa University

Bald Eagle (*Haliaeetus leucocephalus*) numbers have greatly increased in recent decades with overwintering eagles along the Mississippi River in Iowa numbering in the thousands. However, this phenomenon is not limited to areas of open water, with many accounts of eagles away away from typical foraging habitat. We performed roadside surveys for eagles in Fayette County, Iowa over eight weeks during the winter of 2015-2016. Over the course of 30 survey periods we documented eagles with counts ranging from zero to 19 individuals. Locations of individuals were mapped in ArcGIS and distance to the nearest road, roosting site, utility line, and confined animal feeding operation were examined along with weather conditions. The majority of the sightings consisted of eagles feeding on discarded swine carcasses, generally in close proximity to feeding operations. Iowa is the leading pork producing state in the nation and animals that are lost due to mortality prior to slaughter must be disposed of. These composting sites have unintentionally provided a food source for eagles that may allow birds to occupy habitat that was previously unavailable, and may impact overwintering survival.

P70. EFFECTS OF *RHAMNUS CATHARTICA* ON BIODIVERSITY OF HERBACEOUS SPECIES IN AN OAK-HICKORY FOREST IN NORTHEAST IOWA

Brennen Reysack, Marissa Wales & Molly McNicoll
Luther College

European buckthorn (*Rhamnus cathartica*), a common invasive species in forests in Iowa, has been associated with a loss of native diversity through several mechanisms, including shading, high growth rate, and allelopathy. Native understory plants can be particularly susceptible to these effects. As part of a larger study to document baseline conditions in an oak and hickory forest, we examined the relationship of *R. cathartica* and the native herbaceous and woody species understory. We collected understory species abundance and buckthorn density in 80 plots (0.5x1.0-meter), divided evenly among buckthorn invaded and un-invaded areas of the forest. Our results showed a negative correlation between density of *R. cathartica* and understory species richness. The same negative relationship was present between density of *R. cathartica* and understory abundance. This information provides observational data, at the individual plot level, that greater *R. cathartica* density may inhibit the understory community. Future studies in this forest will use thesethis data to assess reduced buckthorn abundance and response of the understory plant community.

P71. BAT SPECIES RICHNESS AND ABUNDANCE AND HIBERNACULA CHARACTERISTICS AT MAQUOKETA CAVES STATE PARK

Ryland Richards & Paul Skrade
Upper Iowa University

Bats are a vital component of Iowa ecosystems and their consumption of insects reduces the need for agricultural pesticides. However, bat populations across the United States are in decline because of an introduced fungus, *Pseudogymnoascus destructans*. This fungus causes the disease white-nose syndrome (WNS), which lowers over-wintering survival rates in hibernating bats. The Iowa Department of Natural Resources has monitored the caves at Maquoketa Caves State Park, Jackson County, IA annually for WNS since 2010 as part of a collaboration with other organizations. Four species of bats were found in the three caves that were sampled: big brown bat (*Eptesicus fuscus*), little brown myotis (*Myotis lucifugus*), northern long-eared *(Myotis septentrionalis*), and the tricolored bat (*Perimyotis subflavus*). Big brown bats were the most numerous in Dancehall Cave, but counts varied from year to year (mean 299, SE 73). Other documented species of bats were found in very low numbers in much smaller and shorter caves, which raises the question: Do cave characteristics affect bat abundance and species distribution? In 2016 we participated in the survey and in addition to counting bats we also measured cave characteristics such as width, height, distance from the cave opening, and temperature at the count sites .

P72. MICROBIAL COMMUNITY ANALYSIS OF SOIL AFTER STUMP-CUT TREATMENTS TO BLACK WILLOWS

Jennifer Stoffel, Rebecca Schmidt & James Mount
Upper Iowa University

Microbial soil communities are instrumental in nutrient cycling, and given the influence and interplay of soil microbes on ecosystem balance, it is important to consider how conservation management approaches may effect these microbes and the underlying health of the ecosystem. Microbial communities of Pleggenkuhle Prairie (Fayette Country, Iowa) were compared pre- and post-treatment following a Stump-cut treatment of Black Willow using Gordan's Stump Killer (32.3% glyphosate), or Tordon (5.4% picloram, 20.9% 2-4D). Biolog Eco plates with representative carbon substrates were used to assess the diversity and degree of microbial community metabolism before willow removal versus two post-treatment time points. Metabolism was analyzed after various times post-culture in the Biolog plates. General linear model analysis of 96hr culture data indicated that field collection time, treatment, and carbon substrate were significant factors differentiating the

community samples. Tukey's pairwise comparison of means of field treatments indicated that Tordon treatment differentiated community metabolism from the control to a greater degree than Gordan's Stump Killer treatment. However, the glyphosate and picloram/2-4D-treated samples were not significantly different from each other. The microbes contributing to these differences and the mechanism by which the chemical treatments disparately effect the microbial communities will be avenues of future study.

Ecology & Conservation Oral Presentations

O73. CONSERVATION ASSESSMENTS FOR SIX NORTHEAST AND NORTH CENTRAL IOWA STATE PRESERVES

Wayne Schennum & John Pearson
Iowa State Preserves Board & Iowa Department of Natural Resources

The Iowa State Preserves Advisory Board and IDNR periodically conduct conservation assessments of their ecological preserves. Six were selected in 2015: Cedar Hills Sand Prairie (36 ac), Clay Prairie (3 ac), A. F. Miller (10 ac.), Fossil & Prairie Park (292 ac), Hoffman Prairie (36 ac), Pilot Knob (238 ac). Information collected: GPS community boundaries; plant species presence and relative abundance; community quality; disturbance evidence; EN/TH/SC species documentation; wildlife habitat; management needs. All 6 preserves have high quality communities. Cedar Hills upland sand prairie is recovering well from livestock grazing, but its sedge meadow/fen has lost considerable diversity. Clay Prairie has 74 prairie plants, including several conservatives, but shrubs have become too common. A. F. Miller still has 72 wetland plants, but only a few purple fringed orchids, as it is overrun by invasive shrubs. Once heavily grazed, Fossil & Prairie Park is now a large complex of high quality remnant and restored prairies supporting Henslow's Sparrow and Regal Fritillaries. Hoffman Prairie is a very high quality high diversity prairie-pothole ecosystem with many intergrading communities. At Pilot Knob three EN/TH plants were rediscovered, including endangered round-leaved sundew, in Iowa's only bog.

O74. FROM STORAGE CABINETS TO THE WORLD: PROGRESS ON SPECIMEN DIGITIZATION AT IOWA STATE UNIVERSITY'S ADA HAYDEN HERBARIUM

Deborah Lewis
Iowa State University

Digitization of biological collections is the process of converting specimen or field-recorded information into digital formats, including text and images. The Ada Hayden Herbarium (ISC/IA) has received several grants since 2006 to make digitized information from ~160,000 specimens widely available. Early projects included text-only records from bryophyte and Iowa vascular plant specimens. Jim Colbert and his students have also digitized the lichen collection label data. Recent projects have included entire specimen or label-only images: vascular plant specimens from the Parry Historical Collection and the general collection, and currently, imaging labels and notes along with databasing the fungal collection. These records have been or are in the process of being added to online taxonomic or geographic portals, making data from ~25% of ISC/IA's holdings available worldwide. The National Science Foundation, USDA and Iowa State University have provided funds for equipment, supplies and student wages. Collaboration in data hosting, training and other support by iDigBio and SEINet make sharing these data feasible. Equipment- and expertise-sharing with other Iowa collections staff may make digitization activities possible elsewhere. Such projects are leading to a democratization in biological studies, in which the public has opportunities for a direct role in supporting and doing research.

O75. STUDIES OF LICHEN DISTRIBUTION ON A LINN COUNTY HILL PRAIRIE

Berns Alysia , Jessica Hiney & Neil Bernstein
Mount Mercy University

Lichens growing on trees in a Linn County hill prairie were quantified for distribution and species present. Species richness was greater on the east and west sides of trees than north and south face. Lichen coverage increased from the cliff face to approximately 21 m from the cliff, and then the coverage declined. Species richness peaked at approximately 8 m from the cliff face and again increased after 21 m. Species encountered and explanations based upon local microclimate will be discussed.

O76. AGE- RELATED CHANGES IN HOME RANGE AND DISTANCE MOVED IN ORNATE BOX TURTLES

Virginia Brust[1], Jessica Hiney[1], Grace Leppink[2], Emma Narotsky[2], Nikita Martinson[2], Andrew McCollum[2] & Neil P. Bernstein[1]
Mount Mercy University[1] & Cornell College[2]

Analysis of data collected in a wild population of ornate box turtles from 2011-2015 will be presented. Turtles of different ages from newly hatched to adult were followed daily or every other day by radio-telemetry. Data were analyzed for minimum convex polygons on weekly, monthly, and annual bases and compared to size of the turtle. Average distance moved between samples was also analyzed .

O77. HOW MATERNAL STRESS LEVELS MIGHT AFFECT NEONATAL PAINTED TURTLES, *CHRYSEMYS PICTA*[ISF]

Rebecca Polich, Brooke Bodensteiner, Clare Adams & Fredric Janzen
Iowa State University

Exposure to the stress hormone corticosterone (CORT) during embryonic development has the potential to influence

developmental, morphological, and behavioral traits in offspring. We collected 20 clutches of painted turtle (Chrysemys picta) eggs and subjected them to five treatment groups: (1) frozen to assay baseline CORT levels, (2) control group that is not manipulated, (3) low CORT treatment group ((0.05ng/0.5µL), (4) medium CORT treatment group (0.25ng/0.5µL), and (5) high CORT treatment group (0.50ng/0.5µL). CORT treated eggs were incubated in the field in a randomized block design. Prior to hatching, eggs were retrieved from the field and hatched in the lab. For each individual, we recorded hatching date, mass, and body size. We also subjected hatchlings to righting trials. Preliminary analyses indicate that treatment by CORT seems to affect embryos and hatchlings in several ways. Embryos in eggs treated with high levels of CORT tended to incubate for a shorter period of time ($P = 0.077$), produce hatchlings with shorter plastrons ($P = 0.069$), or die prior to hatching ($P = 0.062$). All these traits can critically affect offspring fitness.

O78. WHEN SNAKES GET HOT: HORMONAL RESPONSES TO UPPER TEMPERATURE EXTREMES IN GARTER SNAKES

Eric Gangloff, Kaitlyn Holden, Rory Telemeco, Lance Baumgard & Anne Bronikowski
Iowa State University

Extreme temperatures fundamentally constrain organismal physiology and have both acute and chronic effects. Additionally, temperature-induced hormone-modulated stress response pathways and energetic trade-offs are important drivers of life-history variation. This study employs an integrative approach to quantify physiological responses to high temperatures in divergent life-history ecotypes of the western terrestrial garter snake (Thamnophis elegans). Using wild-caught animals, we measured oxygen consumption rate and physiological markers in blood plasma across five ecologically relevant temperatures (24, 28, 32, 35, and 38º C; 3-hour exposure). Corticosterone, insulin, and glucose all increased with temperature, but with different patterns of thermal response curves. This suggests that high temperatures may alter the homeostatic role of insulin in glucose regulation in garter snakes, similar to some mammals. Finally, the life-history ecotypes had similar physiological thermal responses to high-temperature exposure, suggesting that neither local adaptation nor developmental plasticity alter response pathways at near-lethal temperatures. Together, these results identify some of the mechanisms by which higher temperatures alter hormonal-mediated energy balance in reptiles and potential limits to the flexibility of this response.

O79. IMPACTS OF A SINGLE-TURBINE WIND FACILITY ON BAT ACTIVITY AND FATALITY IN NORTHEASTERN IOWA[ISF]

Dawn Reding, Marcella Meza, Kieran Okerstrom, Nathaniel Hemming & Mariah Crotty
Luther College

Wind energy provides many environmental benefits, yet bats may be highly susceptible to turbine-associated fatalities. Learning more about these fatalities can help with developing strategies to minimize wind facility impacts on bats. Most studies have been conducted at large, multi-turbine wind farms, but few studies have examined the impacts of single-turbine facilities. Our goal was to investigate bat activity (via acoustic surveys) and mortality at the Luther College wind turbine, Decorah, Iowa. We conducted daily carcass searches and nightly acoustic monitoring from 15 June – 1 Oct 2015. We used molecular techniques to verify species of carcasses found. We also deployed two different types of acoustic detectors and analyzed the recorded bat calls in order to identify species present. We found a total of 34 carcasses representing 6 species. Number of recorded nightly bat calls was high, with Little Brown bats being one of the most common species acoustically identified. Collectively, the data indicate a high activity of resident, cave-dwelling bats in the vicinity, but also show evidence of migratory bat occurrence and fatality. Our data provides a current record of bat presence in northeastern Iowa, and will inform potential mitigation strategies to reduce bat fatality at this single-turbine site.

O80. EMODIN IN *RHAMNUS CATHARTICA* (EUROPEAN BUCKTHORN) AS A POTENTIAL NOVEL WEAPON: EFFECTS ON NATIVE *AGERATINA ALTISSIMA* (WHITE SNAKEROOT)

Zoe Bachman
Luther College

Rhamnus cathartica (European buckthorn) is an invasive woody species in the upper Midwest that creates high-density infestations, impacting native communities through multiple physical and chemical mechanisms. Previous research has shown that *R. cathartica* produces emodin, which influences soil chemistry, deters predation, inhibits amphibian growth, and indirectly impacts plant germination and growth. This study tested the effect of emodin on germination and growth of the common native herbaceous species *Ageratina altissima* (White snakeroot). Seeds and seedlings of *A. altissima* were exposed to varying concentrations of emodin and evaluated for germination, cotyledon development, true leaf development, photosynthetic area, and senescence. Emodin did not affect germination of *A. altissima* in lab conditions. However, emodin variably influenced emergence, senescence, and photosynthetic area of seedlings in early growth stages in a greenhouse setting. Results were complicated through the use of a solubilizing agent used to keep the emodin in solution, but trends emerged at high concentrations of emodin. Preliminary evidence shows that emodin may possess some traits as a novel weapon, at the stage of seed establishment, but not at the germination stage. Further studies are necessary to confirm the trends observed in this pilot study.

O81. GARLIC MUSTARD AS A POTENTIAL DRIVER OF CHANGE IN SOIL MICROBIAL COMMUNITIES AND INHIBITOR OF NATIVE SPECIES GROWTH

Gabe Price & Amy Blair
St. Ambrose University

Garlic Mustard (*Alliaria petiolata*) is a biennial plant that is invasive in woodland areas in the Midwestern and Northeastern United States. Garlic Mustard has been shown in previous studies to inhibit fungal and microbial growth with its allelopathic chemicals. However, relatively little is known about how Garlic Mustard influences the soil microbial community as a whole, nor during what stage of its biennial life -cycle Garlic Mustard releases its allelopathic chemicals. To address these questions, Garlic Mustard was grown from seed in soil collected from a forested area lacking Garlic Mustard. After 3 months of growth, the soil was analyzed with Eco Plates to determine if first year Garlic Mustard alters the soil microbial community. Furthermore, the extent to which Garlic Mustard alters soil and potentially inhibits native plant growth is not well understood for many native plant species. Therefore, the common native plant species, White Snakeroot (*Ageratina altissima*), was grown from seed in soil collected from a woodland Garlic Mustard infestation, and growth was compared to plants grown in the aforementioned collected soil lacking Garlic Mustard. Results indicate that the early stages of Garlic Mustard and White Snakeroot growth aren't significantly impacted by soil history ($p= 0.63$; $p=0.09$, respectively). Results from the soil analysis will also be presented and discussed.

Engineering Poster Presentations

P82. ECONOMIC COMPARISON OF HIGH MOISTURE FEEDSTOCK BIOFUEL PRODUCTION

Mitch Amundson & Mark Wright
Iowa State University

The purpose of this study is to develop a high level economic comparison model for the utilization of high moisture feedstock in biofuel production. Four feedstocks are compared: corn stover, corn silage, giant miscanthus and sweet sorghum. A myriad of logistical pathways are considered for each feedstock including multi/single pass harvesting, wet/dry storage and the omission of a drying step. Drying the biomass is an energy intensive and costly process, that if omitted may benefit the economics of producing biofuel. Hydrothermal liquefaction and anaerobic digestion were strategically chosen for this analysis based on their ability to process high moisture feedstock. Upgrading the conversion products is an important step to provide a marketable product. Hydroprocessing is employed as the upgrading step following HTL and Fischer-Tropsch synthesis and methanol-to-gasoline are used following the AD conversion process.

Through this approach, capital and operating costs are calculated to estimate the economic viability of specific biofuel production pathways. A comparison in plant capacity, harvesting and storage techniques, conversion methods and upgrading technologies are analyzed and reported. This comparison yields fuel prices in the range of $2.00 - $3.50 for the entire spectrum of production scenarios. After preliminary studies following this approach, high moisture feedstock can be an economic option for biofuel production.

P83. SOIL REMEDIATION THROUGH BIOCHAR: CENTRAL UGANDA

Nataliya Apanovich & Mark Mba Wright
Iowa State University

Uganda is one of the fastest growing populations in the world. Its annual population growth of 3% puts additional stress on already highly weathered tropical soils. Land fragmentation, agricultural intensification, deforestation contribute to soil loss and consequently diminished food security. The central region of Uganda, Buganda Kingdom, is especially vulnerable in terms of food security as its high population density coupled with mismanagement of natural resources led to gradual loss of its soil and even changes in microclimate. Biochar offers an opportunity to remediate these soils. If produced on a small-scale with locally available materials, smallholder farmers can in a cost-effective way improve their livelihoods. This will help a country like Uganda, where approximately 80% of its population is agriculture-dependent, to move from subsistence farming to commercial production.

This research assesses biomass produced on a small-scale and farmers willingness and attitudes towards a new soil management practice. While, much of the biomass produced on individual farms is reused for either fuel, livestock feed, or mulch, some agricultural residues as groundnut shells are burned or discarded without extracting its energy content. The willingness of farmers to adopt a novel practice is hindered by their negative experiences with agricultural chemicals, costs, accessibility, and availability associated with a new agricultural practice.

P84. DIRECT FAST PYROLYSIS BIO-OIL FUEL CELL

Neeva Benipal, Ji Qi, Patrick A Johnston, Jacob Gentile, Robert C. Brown & Wenzhen Li
Iowa State University

Bio-oil derived from the pyrolysis of lignocellulosic biomass shows a great promise, however, needs further upgrading to potentially serve as an alternative to fossil fuels. Herein, we demonstrate that crude fast pyrolysis bio-oil can be directly used as a fuel for anion exchange membrane fuel cells (AEMFCs) to generate high power density electrical energy at low temperature (≤ 80oC). A simple aqueous-phase reduction method was used to prepare carbon nanotube (CNT) supported noble metal (Pt, Pd, Au, and Ag) nanoparticles with average particle sizes: 1.4 nm, 2.0 nm, 3.8 nm, and 12.9 nm for Pt/CNT, Pd/CNT, Au/CNT, and Ag/CNT, respectively. Direct fast pyrolysis bio-oil AEMFCs with the Pd/CNT anode catalyst and a commercial Fe-based cathode catalyst exhibit a remarkable

peak power density of 42.7 mW cm-2 at 80oC using 30 wt% bio-oil + 6 M KOH electrolyte. Levoglucosan was identified as the major sugar compound with 11.1 wt% of the bio-oil composition, along with disaccharides, pyrolytic lignin, and oligomer of lignin-derived phenolic compounds. Cyclic voltammetry (CV) studies investigated the electrocatalytic oxidation of high purity levoglucosan over the four noble metal catalysts in half cell, as levoglucosan is the dominant sugar component in bio-oil. Pd/CNT, compared to other catalysts, displayed the highest activity and lowest onset potential of electrocatalytic oxidation of levoglucosan. AEMFC with high purity sugars shows ~ 1.2 to 3 times higher power density than that with fast pyrolysis bio-oil fuel.

P85. TECHNO-ECONOMIC ANALYSIS AND LIFE CYCLE ANALYSIS OF THE PYROLYSIS-BIOENERGY-BIOCHAR PATHWAY TO CARBON-NEGATIVE ENERGY

Wenqin Li, Mark Mba Wright & Robert Brown
Iowa State University

The objective of this project is to evaluate the economic and environment impacts of the pyrolysis-bioenergy-biochar pathway to carbon-negative energy. The condensed carbon-rich solid pyrolysis coproduct biochar, has the potential to improve soil quality by sequestering carbon, achieving the carbon-negative energy goal. Different biochar types might have different impacts on soil properties depending on the specific soil type. This project will first quantify the interactions among biochar type, soil types, soil property change and crop yields by using the Agricultural Production Systems SIMulator (APSIM). Based on the ASPSIM result, three specific land areas of US are investigated depending on the selection of pyrolysis facility locations: Upper Mississippi River Basin (UMRB), California, and U.S. Southeast. The pyrolysis facility locations might affect various factors, such as feedstock cost, feedstock type, capital cost, operating cost. Biochar type and the demand for biochar will also vary with the plant locations. The capital cost, operating cost and minimum fuel selling price will be estimated to indicate the economic benefits of employing integrated Pyrolysis-Bioenergy-Biochar pathway in various regions. Life cycle analysis will also be conducted using GREET to evaluate the GHG emissions of the integrated Pyrolysis-Bioenergy-Biochar production facility in different regions.

P86. MULTI-SCALE DISCRETE ELEMENT METHOD-BASED MODELING OF BIOMASS FAST PYROLYSIS IN DUAL AUGER REACTORS

Fenglei Qi & Mark Wright
Iowa State University

Conversion of biomass into bio-oil via fast pyrolysis is a potential way to produce renewable fuels and chemicals. Auger reactors are often employed as pyrolyzers because of their ability to yield up to 65 wt. % bio-oil. The underlying particulate flow, heat transfer and reactions in the reactor is hard to measure in experiments due to the geometric complexity of reactors and the intrinsic non-transparent property of solid particles. Numerical simulation is employed to investigate the important transport processes in the reactor. In this research, a DEM-based method is employed for modeling granular flow and heat transfer in auger reactors, and a 1-D single particle model is coupled to simulate biomass intra-particle transport phenomena. Simulations of cold granular flow and heat transfer in auger reactors are validated by comparing to experiment measurements. By extracting heat flux data from reactor modeling, single particle simulations were conducted. The effects of various operating conditions on the product yields are well predicted. Particle scale simulation also shows that the effects of intra-particle transport phenomena on the pyrolysis process become significant when the particle size is larger than 2 mm. This simulation framework shows potential in the reactor design and scale-up.

Engineering Oral Presentations

O87. AUGER PYROLYZERS: A VIABLE TECHNOLOGY IN BIOMASS CONVERSION

Tannon Daugaard & Mark Mba-Wright
Iowa State University

The continual development in the production of fuels and chemicals from biorenewable resources remains a top national priority to help provide economic, environmental and national security. One pathway in the conversion of biorenewable resources is a thermochemical route called fast pyrolysis. Fast pyrolysis uses moderate temperatures, short residence times and an inert environment to convert biomass into liquids, solids and gases. One reactor type for fast pyrolysis is an auger pyrolyzer which is considered to be an alternative reactor to the widely used fluidized bed pyrolyzer. Auger pyrolyzers have advantages such as their minimal dependence on inert gas and their low complexity while maintaining similar yields to that of the traditional fluidized bed reactors. Additionally, auger pyrolyzers can employ different modes of heat transfer such as direct heating using a heat carrier material to provide high heat transfer rates. The objective of this research was to test heat carriers with different thermophysical properties and determine their effects on the yield and characteristics of pyrolysis products using an auger pyrolyzer. Additionally, some heat carriers' regenerability and recyclability was also studied. Heat carriers tested included stainless steel, silicon carbide and sand. Red oak was pyrolyzed up to 1 kg/hr using a twin-screw, lab-scale auger reactor to produce bio-oil, char and gas.

O88. ELASTIC PROPERTY MEASUREMENTS OF MIXED-GLASS-FORMER GLASSES USING ULTRASONIC WAVE VELOCITY

Brian Fuchs, Steve Martin, Kate Hakanson, Carter Francis & Steven Kmiec
Iowa State University

The increased use of renewable energies has resulted in a

growing demand for better grid-scale energy storage technologies. Solid-state electrolyte batteries show promise as an alternative to the traditional liquid-electrolyte because of their relative higher safety, lower cost, and longer lifetime. Adding sodium to common borosilicate glass creates a sodium-ion-conducting ternary composition system with mechanical and electrical properties pertinent to battery applications. The particular system studied exhibits the phenomenon known as the Mixed-Glass-Former
Effect (MGFE), a non-linear change in the ionic conductivity of the glass with an increase in ion concentration.
Due to the inherent difficulties of synthesizing these glasses, as well as their brittle nature, it is difficult to measure their elastic properties using traditional mechanical testing techniques. However, these properties can be determined in a nondestructive manner utilizing ultrasonic sound waves. The Young's modulus, shear modulus, and Poisson's ratio of the sodium borosilicate glass system, 0.33 Na_2O + [(x) $BO_{3/2}$ + (1 -x) SiO_2], were determined via ultrasonic inspection.

O89. STRUCTURE-ACTIVITY CORRELATIONS FOR CATALYTIC FAST PYROLYSIS OF BIOMASS

David Gardner, JP Tessonnier, Tom Hoff, Rajeeva Thilakartne, Kaige Wang & Robert Brown
Iowa State University

The production of aromatic hydrocarbons from cellulose by zeolite-catalyzed fast pyrolysis involves a complex reaction network sensitive to the zeolite structure, particle size, crystallinity, and Lewis to Brønsted acid site ratio. The interplay of these parameters under reaction conditions and the difficulty to decouple them by rational catalyst design represents a major roadblock that has hampered any significant improvement for almost a decade. Here, we studied a series of ZSM-5 catalysts with very different catalytic performance. Data from six complementary characterization techniques was combined in an attempt to identify parameters common to high-performance catalysts. The chemical environment of framework aluminum atoms was found to be critical to achieve high aromatic yields. In contrast, crystal size and mesoporosity, which control intra-crystalline diffusion of substituted aromatics, were found to comparatively only play a minor role. These findings allowed us to synthesize a ZSM-5 catalyst with enhanced catalytic properties, offering the highest aromatic hydrocarbon yield reported to date.

O90. CONSIDERATIONS FOR ALUMINUM-RICH ZSM-5 IN MODERATE TO HIGH TEMPERATURE PROCESSING

David Gardner, Jean-Philippe Tessonnier, Tom Hoff, Rajeeva Thalikartne & Robert Brown
Iowa State University

The thermal stability and unique shape selectivity of the ZSM-5 structure has made this zeolite a popular choice for gas phase petrochemical and biorenewable applications. However, with processes such as catalytic fast pyrolysis and methane aromatization being studied at temperatures exceeding 700 ºC, it is imperative to understand how the catalyst structure is affected by the reaction conditions. Here, we address the chemistry of high aluminum content commercial zeolites at temperatures between 500 and 900 ºC and the implications for future work. Our results suggest that although the MFI structure is retained following a thermal treatment, aluminum coordination within the zeolite is significantly changed and a corresponding decrease in acid site strength and concentration is observed proportional to the atomic percent of aluminum. The changes to the zeolite structure enable us to study the role of strong Brønsted acid sites in the catalytic fast pyrolysis of cellulose.

O91. COMBUSTION CHARACTERISTICS OF COLLOIDAL DROPLETS OF TRANSPORTATION FUEL AND CARBON BASED NANOPARTICLES

Mohsen Ghamari & Albert Ratner
University of Iowa

Addition of micro and nano-sized particles to liquid fuels has proven to be a successful mechanism to improve some of the combustion characteristics such as burning rate and ignition delay. However, the focus has been mainly on metallic particles that come with undesirable metallic oxide emissions. Carbon based materials are new generation of nanoparticles that typically have better radiative properties and do not result in harmful emissions. However, these nanoparticles come in wide range of sizes and morphologies that result in different combustion behavior. In this study, droplets of colloidal suspensions of diesel and jet fuel with several different carbon based nanoparticles were burned in room condition. In general, higher burning rate was achieved but it was also found that the size and morphology of nanoparticles play an important role on the extent of burning rate increase.

O92. TOWARDS LOW-COST SENSORS FOR REAL-TIME MONITORING OF NITRATE CONCENTRATION IN IOWA SOIL WATER

Amin Gorji, Amy Kaleita & Nicola Bowler
Iowa State University

The flow of nitrate ions into the Gulf of Mexico is a major environmental concern in the United States. Presence of excess of these ions causes explosive plant growth which uses up available oxygen in the water, leaving areas unable to support aquatic life. Furthermore, the excessive concentration of such ions in drinking water poses a threat to human health. The efflux of ions from agricultural lands in Iowa has been estimated to be about one quarter of the nitrate that the Mississippi river delivers to the Gulf of Mexico which has been a topic of recent controversy between the Des Moines Water Works and three Iowa counties. Assessing the effectiveness of management strategies to control the ions' efflux is hampered by the lack of affordable, effective, and in-field nitrate monitoring systems. Thus the need for low-cost and real-time sensing becomes critical for complete monitoring. By

measuring the dielectric properties of liquid, we can infer properties that can influence the molecular structure, such as ion concentration. In this work, environmentally-relevant electrolyte solutions of nitrate, chloride, and sulphate ions are characterized in terms of their conductivity and high frequency dielectric properties. The ion-specific responses are presented and the planned development of real-time sensors, based on these results, is discussed.

O93. CARBON SUPPORT EFFECTS ON THE SELECTIVITY OF PD/C CATALYSTS FOR THE LIQUID-PHASE HYDROGENATION OF MULTIFUNCTIONAL CHEMICALS

Radhika Rao[1], Thomas Hansen[2], Raoul Blume[3], Simona Moldovan[4], Ovidiu Ersen[4] & Jean-Philippe Tessonnier[1]
Iowa State University[1], Technical University of Denmark[2], Max Planck Institute for Chemical Energy Conversion, Germany[3] & University of Strasbourg[4]

Carbon is a widely used support material for the catalytic production of specialty and fine chemicals from both petroleum and biomass. Although carbon is considered to be an inert carrier, differences in catalytic performance have been observed for supported noble metals depending on the nature and surface properties of the carbon scaffold. These differences were attributed to metal-support interactions (MSI); however, the exact nature of these interactions remains elusive. This study seeks to develop a fundamental understanding of these MSI by using a bottom-up approach for the synthesis of the support materials. Stacked cup carbon nanotubes, with properties controlled at the nanoscale, were prepared and Pd nanoparticles of 3-5 nm size were successfully deposited on these supports. Strong correlations were observed between the selectivity of Pd/C catalysts with the graphitic character and surface functionalities of the support. Since the effects due to varying particle size, metal loading, and transport limitations were carefully eliminated, the differences in the catalytic selectivity could be safely attributed to the MSI. Detailed characterization using X-ray photoelectron spectroscopy (XPS), hydrogen chemisorption, aberration corrected transmission electron microscopy (TEM) further strengthened our understanding of the nature of the MSI.

O94. COLONIC STEM CELLS MEDIATED CO-DELIVERY OF R-SPONDIN-1 AND INFLIXIMAB TO TREAT ULCERATIVE COLITIS

Qun Wang, Zahra Davoudi & Yijun Qi
Iowa State University

Healing of the epithelium and restitution of the mucosal epithelial barrier is regarded as an important goal in the treatment of Ulcerative Colitis (UC). Conventional strategies using general anti-inflammatory drugs to treat UC show only limited efficacy which is far from satisfactory. Colonic stem cells (CSCs) have the ability to efficiently generate all the cell types of colon epithelium. For intestinal renewal and regeneration, Wnt signaling is a pivotal requirement for intestinal crypt proliferation. The Wnt agonist R-spondin-1 can significantly promote the expansion of CSCs. As the major TNF inhibitor, Infliximab is monoclonal antibody which can target TNF-α to suppress the intestinal inflammation. A topical delivery system of CSCs to the damaged intestines through a non-invasive route can minimize potential systemic adverse effects of traditional (steroid) therapies. The application of nanotechnology in treating GI tract diseases remains challenging due to the harsh physiological conditions in the GI tract. The new strategy to use Trojan horse system for drug delivery can achieve improved biodistribution of payload, increased local drug concentration, extended retention time, prolonged dosing intervals, and enhanced therapeutic efficacy. The co-delivery of R-Spondin-1 and Infliximab with a novel colorectal Trojan horse to the inflamed murine colon will achieve rapid regeneration of the epithelial barrier and reduce chronic intestinal inflammation.

Environmental Science & Health
Poster Presentations

P95. HISTORICAL CONTAMINANTS IN THE MIXED AGRICULTURE AND URBAN USE CATFISH CREEK WATERSHED, IOWA, USA

Wade Gibson & Adam Hoffman
University of Dubuque

Water quality sustains ecological processes that support native fish populations, vegetation, wetlands and birdlife. Water quality is closely linked to the surrounding environment and land use. Human activities impact watersheds and waterways on a scale that varies both temporally and spatially. Previous studies have examined the prevalence of metals in surface freshwater around the country. However, temporal and spatial studies of heavy metals in systems of varying land use patterns are lacking.

Sites in the Catfish Creek Watershed in Iowa with varying land use (urban and agricultural) were sampled for select metals and physical chemical properties. High chloride concentrations were noted in the watershed study sites classified as urban. Spatial analysis determined no initial significant threshold exceedance, according to EPA standards. Nitrate analysis showed differences in concentrations between urban and rural landscapes. One site was at the EPA's maximum containment level for drinking water, 10 mg/l. Regression analysis was used to compare the spatial variation in metal concentrations. In high concentrations metals can impact aquatic organisms, thus affecting the entire ecosystem. Implications regarding the impacts of nutrient and metals on the plant, animal, and human communities will be discussed.

P96. DIESEL EXHAUST PARTICLE INDUCED OBSTRUCTION OF ROTIFER DIGESTION AS A

BIOSENSOR FOR CHARACTERIZING POLLUTANT IMPACT ON HUMAN HEALTH

Lizeth Ornelas Salazar & Adriana J. LaGier
Grand View University

Human exposure to air pollutants is associated with elevated respiratory and cardiovascular hospital admissions. Due to a recent surge of alternative motor vehicle fuel usage, novel air pollutants are emerging, but their impact on human health is unknown. Unfortunately, the use of animal models to characterize the biological impact of novel pollutants is labor and cost-prohibitive and in vitro models have not been standardized. This project sought to determine the feasibility of developing a whole cell-based biosensor for characterizing the biological impact of pollutants. In this study, Philodina rotifers, an organism capable of cryptobiosis (long-term survival) were subjected at different temperature to different concentrations of diesel exhaust particulate, which are well known pollutants emitted from combustion of diesel fuel. Exposure to diesel exhaust particles led to a dose-dependent change in corona movement and in alimentary patterns (digestive obstruction) that was exacerbated by increasing temperature. This preliminary cell-based biosensor study indicates that in vitro living system models could be used as biosensors to assess air pollutant-induced cellular changes.

Environmental Science & Health
Oral Presentations

NONE

Geology
Poster Presentations

NONE

Geology
Oral Presentations

O97. GEOPHYSICAL INVESTIGATION OF THE NORTHEAST IOWA INTRUSIVE COMPLEX

Raymond Anderson[1], Benjamin Drenth[2] & Ryan Clark[3]
The University of Iowa[1], U.S. Geological Survey[2] & Iowa Geological Survey[3]

In 2012 the U.S. Geological Survey, working with the geological surveys of Iowa and Minnesota, initiated a program to study a series of large amplitude regional aeromagnetic and gravity anomalies in northeast Iowa and adjacent Minnesota. The source of these anomalies has been interpreted as mafic Keweenawan age (~ 1 billion years) intrusive bodies in a granite/gneiss-dominated basement terrane. These intrusives, called the Northeast Iowa Intrusive Complex (NEIIC), lie 2000-3000 feet below the land surface. Their geophysical signature is similar to that of the Duluth Complex in northern Minnesota that contains rich concentrations of platinum group elements and related metallic resources. A high-resolution, multi-method geophysical mapping program, including the acquisition of 3,333 line kms of airborne magnetic, gravity gradient, and time-domain electromagnetic data, was initiated in 2012 in the Decorah area. Distinctive magnetic and gravity anomalies were identified, including a horseshoe-shaped feature called the Decorah Complex, with geophysical similarities to known alkaline ring complexes, (e.g. Coldwell and Killala Lake) and gabbro-anorthosite-rapakivi granite intrusions (e.g. Wolf River Batholith). In 2015 the study moved south, with 22,712 line kms of aeromagnetic data obtained over multiple NEIIC anomalies in all or parts of 10 counties in east central Iowa.

Iowa Science Teaching
Poster Presentations

P98. UNDERGRADUATE STUDENTS' ACADEMIC, SOCIAL, AND PERSONAL GAINS THROUGH SCIENCE OUTREACH ACTIVITIES

Emily Jacobson, Lindsey Simmons & Joseph Nguyen
Mount Mercy University

Service learning is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities. Service learning generally occurs in the classroom of many secondary and higher education institutions. It is less common to have service learning opportunities through student activities. Undergraduate students at Mount Mercy University (MMU) have an opportunity to participate in service learning through the Science Club by hosting Science Fun Night events at elementary schools to help increase young students' interest and excitement for science, technology, engineering, and mathematics (STEM) fields. The evening allows elementary students to participate in hands-on STEM activities run by MMU students. The evening ends with a CheMMUsical Show, which is a fun way to end the evening for the families because it is a different way for them to experience science. The CheMMUsical Show is a performance of various science demonstrations set to popular music. The presentation will discuss the academic, social, and personal gains made by undergraduate students through this service learning opportunity.

P99. COLLABORATIVE EXPERIENTIAL EDUCATION: A PARTNERSHIP BETWEEN WAUKEE HIGH SCHOOL'S APEX PROGRAM AND DRAKE UNIVERSITY'S COLLEGE OF PHARMACY TO ENHANCE STUDENT LEARNING

Michael Lyons[1], Ryan Allen[1], Michael Greifzu[1], Faith Kiplagat[1] & Ronald Torry[2]
Waukee High School[1] & Drake University[2]

A growing trend in Iowa high school education is to develop experiential learning programs to promote STEM career interest through collaborations with businesses and higher educational institutions. These experiences provide explorations into STEM fields and allow students to improve higher order thinking skills by completing projects with community partners. Students from Waukee High School's APEX (Aspiring Professional Experiences) Exploration in Health Sciences and Medicine class collaborated with Drake's College of Pharmacy and Health Sciences to improve first year pharmacy student skills in interpreting clinical data. Published data often do not reflect the variability that requires integration with other information for accurate interpretation. APEX students were asked to develop laboratory protocols to mimic obstructive or restrictive pulmonary diseases and perform functional testing to generate results consistent with asthma, chronic bronchitis or asbestosis. Students designed protocols and performed FEV and MVV testing at Grand View University's physiology lab using BIOPAC Data Acquisition Systems. The APEX data were included in case studies given to students in Phar 132: Pathophysiology. Students were asked to utilize the data to determine the disease and its functional lung changes in order to better understand current management strategies for the diseases. Student and instructor surveys were used to determine the effects on pharmacy and APEX student learning.

P100. DEVELOPMENT OF A CELL AND MOLECULAR BIOLOGY TEACHING LAB AT UPPER IOWA UNIVERSITY

Rebecca Schmidt & William Jones
Upper Iowa University

Using a grant from the Roy J. Carver Trust, the Department of Biology and Chemistry of Upper Iowa University is developing a state-of-the-art Cell and Molecular Biology Teaching Laboratory to better serve our growing population of students interested in pursuing careers in the biological and health sciences. The learning goals for the lab include: enrichment of current class offerings, development of laboratory offerings, and expanding undergraduate research investigations in cell and molecular biology. The development of the lab has involved the purchase of key pieces of equipment necessary for research using eukaryotic cells, allowing students to practice sterile manipulation of cell culture and analyze cell structure and behavior using fluorescent microscopy. With the laboratory students may now put theory and practice into contexts such as they would encounter in a working laboratory science environment. The Cell and Molecular Biology Teaching Lab will benefit both UIU students and regional employers. Students have begun to practice in-demand, hands-on skills, preparing them to contribute to the region's growing economy and bioscience-based industries upon graduation. The lab is also promoting student readiness for employment, graduate and professional programs in health sciences, research, and clinical lab work, biotechnology industries and agribusiness research and development.

Iowa Science Teaching Oral Presentations

O101. PROFESSIONAL DEVELOPMENT OF IOWA SCIENCE TEACHERS: PRACTICES, PRIORITIES, AND BARRIERS

DeEtta Andersen
Center Point Urbana High School, Walden University

Engagement in professional development (PD) opportunities is critical for science teachers to stay current in their field, yet little is known about the PD participation of Iowa's science educators. One hundred thirty-five Iowa secondary science teachers of all levels of experience responded to an online survey that asked what PD practices they engaged in and which practices they considered most important to their work. Teachers were also asked to list barriers to engagement. Both novice and experienced teachers reported that they keep current in their field by reading and collaborating with other science teachers and consider these the most important PD activities. While most teachers engage in general education PD sessions required by school systems, many consider these only slightly important to their work. Fewer report participating in science courses, engaging with researchers, or having knowledge of online options for PD. Barriers to engaging in desired PD included cost, time, geographic isolation, and inflexible school schedules. While Iowa teachers engage in a variety of practices, barriers to engagement need to be addressed. These data are important for organizations aiming to improve both the content knowledge and pedagogical practices of science educators.

O102. SAVING STUDENT LABORATORY DATA FOR EVALUATION AT MULTIPLE LEVELS: A FOOD ON THE FLOOR SIMULATION

Gary Fulton
Marshalltown Community College

Data collected from an experiment can be evaluated at three levels: individual student, whole class, multiple classes and years. Eight coffee filters (size #4) simulated food dropped on the floor in student homes. The experiment was a nested design: hard surface floors and carpeted floors, dry filters and wet filters, three second contact and nine second contact. Filters were pressed onto the floor then pressed onto Petri dish

agar surfaces for five seconds. The eight Petri dishes were incubated in the lab. Bacterial colonies were counted. Different species were estimated by colony color and morphology.

Each student observed her/his own Petri dishes recording the results of the floor, moisture, and time categories, describing factors contributing to the differences. Students listed their individual results on the white-board. Factors contributing to differences among student homes were discussed (number of people, pets, cleaning). Averages were calculated for each category column. Class data were entered in an Excel spreadsheet. In a homework assignment data saved from previous years fall and spring classes were compared. Factors contributing to seasonal differences were discussed (bare ground, snow cover, temperature).

O103. WITHDRAWN

O104. HOW DO WE BRING ENGINEERING DESIGN TO OUR COLLEGE COURSES (AND WHY IS THAT IMPORTANT)?

Ken Turner
University of Dubuque

The Next Generation Science Standards, NGSS, have been published and accepted in Iowa (2015). This is the most important and exciting science curricular re-focusing since the post-Sputnik era. Viewing this event as inconsequential would be a disservice to our students. However, most college science professors have not heard of NGSS nor have any plans to change our courses in response. We may have to overcome some institutional inertia. The way we have done things in the past may not be enough for what our students need. Engineering Design is the most difficult part of the NGSS to implement, nonetheless let's discuss the importance of implementing Engineering Design in all of our college science courses. Engineering Design may be just the perspective you are looking for to engage your students in authentic problem-solving.

Organismal Biology Poster Presentations

P105. PRELIMINARY FIELD AND GENETIC STUDY OF NATIVE BEES OF IOWA

Casey Link, Paulina Mena & Abby Fyfe
Central College

Pollinators are vital for both natural ecosystems and agriculture. Currently, the honey bee is the main source of insect pollination of crops. However, as honey bee populations show dramatic declines, it has become critical to study other species that fulfill this role. Native/wild bees are excellent pollinators of both native species and crops. This is a preliminary study of the bee species richness found at the Carlson-Kuyper field station in Pella, IA. Furthermore, we are developing the techniques to assess genetic diversity found in several species of bumblebees: Bombus bimaculatus, B. griseocolis, B. impatiens using microsatellite markers. Genetic diversity is an important indicator of a species' ability to cope with a changing environment. Two microsatellite loci have been amplified and are effective to assess genetic variation. Preliminary results show very low heterozygosity and significant deviations from Hardy-Weinberg equilibrium in all samples.

P106. GENOME SIZE ESTIMATES FOR PERENNIAL SUNFLOWERS

Abigail Mark, Isabel De Ayala, David Carius & Eric Baack
Luther College

Across flowering plants, genome sizes vary by three orders of magnitude. Significant genome size variation has been reported within many species, although some of this variation appears to be an artifact of experimental technique. We examined nuclear DNA content in several species of sunflowers (Helianthus) using flow cytometry, estimating genome size for several individuals within each population and several populations for each species. We found limited evidence of significant genome size variation between populations of a given species, but evidence for previously undiscovered chromosome numbers within one species. Studies on a few species have found that differences in repetitive DNA (transposon) copy number explain some of the differences in genome size, but the evolutionary factors responsible for differences in transposon activity are unknown.

P107. ASSESSMENT OF GENETIC DIVERSITY AMONG AEGLA CRABS FROM PARAGUAY

Josue Melendez, Brianna Caldwell, Andrew Satterlee, Rasika Mudalige-Jayawickrama & Gerald Zuercher
University of Dubuque

The freshwater anomuran crab family Aeglidae is composed of a single extant genus, Aegla, which are endemic to the inland rivers and streams of temperate and subtropical South America. In Paraguay, only a single Aegla species, A. platensis, has been documented and was suggested to be extinct in 1999 (Kochalka et al. 1999). The rediscovery of A. platensis at several sites in the Mbaracayú Forest Biosphere Reserve by Satterlee et al (2009) has given an exciting opportunity to study the diversity of Aegla previously thought to be extinct. Previous studies of collected specimens of Aegla using Random Amplified Polymorphic DNA indicated that they may represent different species or different ecotypes of A. platensis. Our objective is to further our understanding of Aegla genetic diversity by sequence analysis of the mitochondrial DNA of 16S rRNA and cytochrome oxidase II genes from Aegla specimens previously collected. We successfully isolated good quality DNA from the preserved specimens. Resultant DNA was amplified using Polymerase Chain Reaction. The 16SrRNA gene from several specimens are being sequenced currently. Sequences will be compared to those of other 17 documented Aegla species to see

whether multiple species are represented among the Paraguayan specimens. The genetic diversity and Phylogenetic tree of Paraguayan Aegla specimens will be presented.

P108. THE EFFECT OF EYELESS AND WINGLESS MUTATIONS ON THE REPRODUCTIVE FITNESS OF FRUIT FLIES

Alison Schutt, Skyler Hill-Norby, Austin Blankespoor, Joseph Tolsma, Calvin Van Surksum & Todd Tracy
Northwestern College

Fruit flies (Drosophila melanogaster) can possess many different genetic mutations. These mutations clearly affect the phenotype of the fruit flies, but the full extent of their effects on reproductive fitness is not known. By performing crosses of specific sex and phenotype combinations, we were able to collect data on the effect of the Eyeless and Wingless mutations on reproductive fitness. To determine whether mutant offspring are as viable as Wild Type (WT) offspring, we crossed homozygous WT males with mutant females and allowed the F1 offspring to interbreed freely. We found no significant difference between the observed phenotypic ratio in the F2 generation and the expected 3 WT:1 mutant phenotypic ratio. To determine whether mutant males are as fecund as WT males, we crossed mutant females with a combined set of mutant and WT males. We found significantly fewer mutant flies in the offspring generation than would be expected if the mutations had no effect on reproductive fitness. We conclude that the mutations do not affect the viability of the offspring but do negatively affect the reproductive success of male fruit flies, with male Eyeless fruit flies being only 36% as fit and male Wingless fruit flies being only 32% as fit as male WT flies.

P109. MORPHOLOGIC AND GENETIC VARIATIONS IN TWO SPECIES OF REITHRODONTOMYS

James Stroh
Morningside College

The purpose of this study was to compare morphological and genetic characteristics of two species of Reithrodontomys from eastern Nebraska and western Iowa to help facilitate accurate field identification. Plains harvest mice (R. montanus) were captured with Sherman live traps on the Wood Duck Wildlife Management Area in Stanton County, Nebraska in May of 2014. Western harvest mice (R. megalotis) were captured in the several locations in the Loess Hills of western Iowa in Woodbury County in November of 2014. Tail length, hind foot length, ear length and weight were recorded for each capture. In addition, a small portion of tissue was collected and preserved for genetic analysis. Plains harvest mice were significantly smaller ($P < 0.01$) than western harvest mice for all morphological measurements except weight. DNA bar-coding was inconclusive for both species, but shows promise as a way to distinguish species with a modified collection protocol

Organismal Biology
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P110. THE EFFECT OF IMPROVED INTER-NIGHT DATA NORMALIZATION ON A STUDY OF LONG PERIOD VARIABLE STARS.

Erik Floden, Kevin Honz & Jeffrey Wilkerson
Luther College

Since 2003, more than 500,000 unfiltered images have been acquired of a half-degree square field containing the open star cluster M23. More than 1600 stars are detectable in this field. Prior to 2015 we had observed unambiguous variability in about 58 long period pulsating variables (LPVs) in this field. These stars were identified using a color-independent inter-night normalization for the data. Here we report the results of normalizing by using functional fits to each data night. The improvement in photometric resolution was strongly color-dependent with a median improvement factor of 1.21 for the 2014 data season. This improved photometric resolution led directly to the discovery of 13 additional LPVs with periods shorter and amplitudes (~0.1 magnitude) smaller than typical for our other variables. We will describe the color-dependent normalization, present a detailed analysis of the results and discuss where this effort fits within our long-term study of secular evolution in LPVs.

P111. CHARACTERISTICS OF RECENTLY DISCOVERED ECLIPSING BINARY STAR SYSTEMS

Elizabeth Larget, Jonathon Goldstein & Jeffrey Wilkerson
Luther College

Since 2003, more than 500,000 unfiltered images have been acquired of a half-degree square field containing the open star cluster M23. More than 1600 stars are detectable in this field. We have clear evidence of 5 eclipsing binary systems and one additional potential binary system. The periods of these systems range from 0.2 days to 10 days. We will present light curves and O-C diagrams that allow us to search for evidence of long-term period changes and cycle-to-cycle variation that might be inconsistent with the expected mechanical stability of a binary orbit. In addition we put upper limits on the orbital eccentricities of some of the systems as well as upper limits on temperature differences between the stellar components of a given binary and upper limits on any variations in the eclipse depths.

P112. BUILDING A CRYOGENIC AEROSOL CHAMBER FOR THE STUDY OF PLUTO'S ATMOSPHERE[ISGC]

Clare Laubenthal, Carissa Herkelman & Joshua Sebree
University of Northern Iowa

Titan, the largest moon of Saturn, and Pluto provide unique environments in the solar system for studying dynamic planetary processes similar to those on Earth. With atmospheres composed of ~95% nitrogen and several percent methane with trace other species, they are the only other terrestrial bodies in the solar system with nitrogen rich atmospheres aside from the Earth. In order to better understand these atmospheres, NASA sent two spacecraft into the outer solar system: the Cassini spacecraft, currently in orbit around Saturn, and the New Horizons spacecraft, which is still sending back data from its July 2015 flyby of Pluto. In order to aid in the interpretation of the returned data, we have constructed a cryogenic aerosol chamber. Ultraviolet photolysis of trace organics in a nitrogen buffer gas can take place in a chamber cooled below 200 K. The length of the chamber allows for the formation of aerosols ~100 nm in diameter. Aerosols can then be removed via an in-line filter for ex situ analysis or directed on a window on a cold head for in situ FTIR analysis for direct comparison to planetary data. We will present the first results from this setup along with a comparison to currently available spacecraft data.

P113. BIOGEOCHEMICAL EVOLUTION OF THE ATMOSPHERE: THE BETA PROJECT [ISGC]

Jessica Wayson, Brittnie Dotson, Steven Gomez, Carissa Herkelman, Jose Lopez, Bobbi Minard, Kathryn Patrick, Joshua Sebree, Alexa Sedlacek & Xinhua Shen
University of Northern Iowa

The interactions between the atmosphere and biosphere throughout Earth's history play an important role in the dynamic climate system. The BETA Project involves undergraduate students in a multidisciplinary study of the biogeochemical evolution of Earth's atmosphere at three key intervals of Earth's history. (1) The anoxic atmosphere that supported Earth's first life, (2) the Devonian, a period when forest ecosystems radiated onto the land surface and caused major CO_2 drawdown from the atmosphere and (3) the modern agricultural sources of atmospheric NH_3. Our interdisciplinary team includes undergraduate Earth Science, Environmental Science, Biology, Biochemistry, and All Science Teaching majors from the University of Northern Iowa. The team is led by faculty from the Earth Science Department and Chemistry and Biochemistry Department at UNI in collaboration with scientists from NASA Goddard Space Flight Center. The team will use a combination of laboratory simulations, field work and analysis, and weather and climate modeling to study atmospheric changes at these intervals of Earth's history.

Physics
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O114. TOTAL SOLAR ECLIPSE IN THE CLASSROOM AND BEYOND

Larry Stevens
Initiative for Solar Eclipse Education

The first Total Solar Eclipse in the contiguous U.S. in over 38 years crosses the entire country. Essentially for all of Iowa, the eclipse will be a very deep partial, but because of the scarcity of such events, there are a number of educational opportunities available, and education about how to safely view the event is important, for both students and parents (here the students can be educators). There are scientific, mathematical and historical parameters that can be covered, and with careful planning for a "Once in a Lifetime" event, you might consider an "Away Mission" to view the total phase of the eclipse from northern or central Missouri.
Planning and scheduling will be important as the eclipse is on August 21, 2017 as it will be close to, if not directly on, the first day of school for the 2017-2018 school season. These will all be touched upon briefly along with illustrations, images and perhaps a video of a past eclipse.
The presenter has been to 17 central eclipses and can be considered a "Master" Eclipse Chaser, and is setting up a viewing site in Lathrop, Missouri. Eclipse glasses will be given out, and telescope observing during lunchtime.

Physiology & Health Sciences
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P115. THE INFLUENCE OF RHYTHMIC AUDITORY-CUEING TECHNIQUES ON GAIT FUNCTION OF PEOPLE WITH PARKINSON'S DISEASE

Alison Brinkman, Mollie Hammer, Jennifer Uzochukwu & Dr. Elizabeth Stegemoller
Iowa State University

Gait impairment is among the major symptoms of Parkinson's Disease (PD). However, current pharmacological and surgical treatments do not address this symptom. There remains a need to find alternative treatment strategies for gait impairment in persons with PD. Walking in time with an auditory cue is a training intervention shown to improve gait function in persons with PD. However, research examining different techniques of optimal training parameters is lacking. The purpose of this study was to examine gait in people with PD using two different strategies: 1) auditory cues for each step, and 2) auditory cues on only dominant-side steps. Auditory cues were provides at a rate of 140 bpm for both steps, and 70 bpm for the dominant-side only steps, such that the same walking rate was maintained for all trials. Twenty participants with PD were

asked to complete four trials of each task. Gait parameter data was collected, analyzed, and compared between conditions using paired t-tests. Preliminary results revealed that stride length and velocity were decreased during the dominant-side cued walking compared to auditory cues for each step. These results suggest cueing both steps may be a more beneficial strategy to improving gait impairments in people with PD.

P116. MALES VERSUS FEMALES AND THEIR PHYSIOLOGICAL RESPONSES TO VIOLENT VIDEOGAME PLAY

Jacqueline Carlson[1], Amanda O'Kief[1], Aaron Bunker[1], Brian McFarland[1], Dean Stevens[1] & Susan Burns[2]
Morningside College[1] & Clarke University[2]

The purpose of this study was to compare the physiological responses between males and females during violent and non-violent videogame (VG) play. It was hypothesized that the physiological responses during VG play between the sexes would not differ, independent of VG type. The two groups (male n=13-17; female n=4-5) were randomly selected to play a violent or non-violent VG for 45 minutes. Pupil diameter, blood pressure, heart rate, and other physiological variables were measured during VG play. Sex, independent of VG type, had no effect on measured physiological variables. These results suggest that the different VGs have similar effects on both males and females. More surprisingly, the VG type (violent versus non-violent), independent of sex, also had no effect on the measured physiological variables. It is concluded that while males self-report more VG play per week than females, acute VG play in females is not enough to alter physiological variables.

P117. A TEST OF SOCCER CLEATS COMPARED TO FOOTBALL CLEATS DURING FOOTBALL SPEED AND AGILITY DRILLS: DO SOCCER CLEATS MAKE YOU FASTER OR MORE AGILE?

Caanan Gassmann, Ben Mardis & David Senchina
Drake University

Football players have many options in cleat styles and designs today. Skill position players especially may opt for soccer cleats over football cleats in the belief that the soccer cleats will help them run faster. The purpose of this study was to compare soccer cleats to football cleats during common American football field drills. Sixteen young adult males performed a circuit of four American football speed and agility drills (forty yd-dash, ladder drill, 5-10-5-drill, and six-route route tree) in both soccer and football cleats. Performance measures (such as time or steps) were recorded for each drill. Subjects were asked to score the shoes in terms of comfort, heaviness, stability, and traction at various times. Two significant differences were found as a result of this study. Out route times (seconds) were significantly different between football cleats and soccer cleats. The other significant difference occurred in the perceived heaviness of each cleat. This study found minimal difference between football and soccer cleats in performance and perception. Participants in this study showed split preferences as to which cleat was better for performance. Of four studied perceptual outcomes, only the heaviness perception was significantly different. This was further backed by performance data that had only one significant difference among seventeen performance-associated measurements.

P118. THE INFLUENCE OF RHYTHMIC AUDITORY-CUEING FOR MOST AND LESS AFFECTED SIDE ON GAIT IN PERSONS WITH PARKINSON'S DISEASE

Mollie Hammer, Alison Brinkman, Jennifer Uzochukwu & Elizabeth Stegemoller
Iowa State University

Most symptoms of Parkinson's disease (PD) present asymmetrically with the asymmetric loss of dopaminergic neurons in the basal ganglia. Among these symptoms, impairments in gait have a tremendous impact on functional mobility and falls. However current pharmacological and surgical treatments do not address this impairment, and there is a need to find alternative treatments. Walking in time with an auditory cue is an intervention shown to improve the gait impairment seen in persons with PD. However, it remains unknown if the more or less affected side should be cued. The purpose of this study was to compare gait in persons with PD when cueing the most affected side and less affected side. Twenty participants with PD were asked to complete three trials of each task while walking over the GaitRite, a specially designed mat to record foot pressure. Data was collected, analyzed, and compared between conditions using paired t-tests. Preliminary results revealed increased step time when cueing the less affected side, and increased step length when cueing the more affected side. The results of this study will help supply further understanding of the use of auditory cueing to improve gait functioning in persons with PD.

P119. SOMATOSENSORY PERCEPTION OF RUNNING SHOE MASS BY WOMEN PART 1[ISF]

Mary Hausler, Taylor Conroy, Philip DeGraffenreid, Stacey Lester, Christopher Kliethermes & David Senchina
Drake University

Running shoe marketing often touts the virtues of lightweight running shoes. Perception of running shoe mass has not previously been studied in females. This study determined how accurately women perceived running shoe mass using feet compared to hands. Twenty-five adult females participated in three experiments (one foot and two hand portions). For the foot portion, subjects experimenters placed one pair on the subjects' feet and subjects had sixty seconds to move freely. Subjective comfort and heaviness were assessed after each pair, and overall heaviness after all five. For hand portion part 1, subjects performed an analogous task using their hands instead and assessed heaviness. For hand portion part 2, subjects interacted with all five shoes simultaneously and again assessed only heaviness. Overall mass perception accuracy was 34% in the foot portion, 64% in hand portion part 1, and 95% in hand

portion part 2. Verbal ranking scores and subjective heaviness scores strongly correlated, and subjects were able to differentiate the heaviest and lightest pairs. For the hand portion, similar and stronger results were found. Altogether, the results were similar for those obtained previously for males, suggesting no sex differences in running shoe mass perception, and underscoring that the feet perceive relative running shoe mass much more poorly than the hands.

P120. SOMATOSENSORY PERCEPTION OF RUNNING SHOE MASS BY WOMEN PART 2[ISF]

Taylor Conroy, Mary Hausler, Christopher Kliethermes & David Senchina
Drake University

Running shoe marketing often touts the virtues of lightweight running shoes. Typical women's shoe masses are different from men's shoe masses, and it's presently unclear if unfamiliar mass ranges may lead to differences in someone's mass perception accuracy. This study determined how accurately women perceived the mass of typical men's running shoes (which are generally more massive than women's), and how accurately men perceived the mass of typical women's running shoes (which are generally less massive than men's). Subjects manipulated five pairs of test shoes with their hands two ways—serially (one-at-a-time) and simultaneously (all-at-once). Afterwards, they were asked to verbally or physically rank them from lightest to heaviest. Subjects also ranked the test shoes in relation to an idealized shoe using visual analogue scales (VAS) during the serial portion only. Both sexes had similar accuracy in both the serial portion (74% accuracy by women, 71% accuracy by men) and the simultaneous portion (95% accuracy by women, 93% accuracy by men). Complementing that, VAS results indicated subjects were able to accurately differentiate the masses of most shoe comparisons. Mass perception accuracy was not different between the sexes, despite each sex testing shoes outside the mass range they would typically encounter

P121. A STUDY OF ORAL HEALTH PRACTICES IN CONJUNCTION WITH SCREENING FOR TRICHOMONAS TENAX IN A U.S. COLLEGE STUDENT POPULATION

Sam Reichenbacker, Ashly McLaughlin & Jacqueline Brittingham
Simpson College

According to the Global Burden of Disease Study (1990-2010), oral diseases impact 3.9 billion people worldwide and account for 2.4 million days of work lost in the United States. Identifying cost effective measures to screen for microorganisms that contribute to oral diseases can have significant health and productivity impacts. The commensal protozoan Trichomonas tenax has been associated with periodontal disease, but has also been reported in the mouths of healthy individuals. This study was designed to investigate methods to screen for the presence of T. tenax in oral samples. An oral health and dental knowledge survey was administered to characterize dental practices and provide a link between demographics and presence of T. tenax. Laboratory strains of T. tenax were established using a novel culture system, and the protozoan's distinct cellular morphology was characterized. Cultures obtained from peri-gingival samples of college students did not contain T. tenax. In contrast to documented studies from the previous century, in geographically and culturally distinct regions of the globe, our findings suggest that T. tenax is not commonly found in the oral flora of our study population. Additionally, this work provides insights into the oral health habits and dental knowledge of U.S. college students.

P122. LOWER LIMB PERCEPTION OF RUNNING SHOE MASS AFTER BRIEF BOUTS OF TREADMILL RUNNING

James Saxton, Joel Greenya, Christopher Kliethermes & David Senchina
Drake University

The purpose of this experiment was to determine the effects of five minutes of running on lower limb perception of unfamiliar running shoe mass. Seventy-three young adult males were divided into two experimental groups: high-experience runners (n=25) in a five-shoe experimental model (Experiment 1); and low-experience (n=24) or high-experience runners (n=24) in a three-shoe experimental model (Experiment 2). Subjects ran in their own personal running shoes or test shoes for five minutes and stated whether the test shoes were heavier or lighter than their own shoes, and also rated each shoes' comfort, heaviness, shoe climate, and stability to an idealized running shoe using visual analogue scales. A subset of subjects also rank-ordered all shoes at the conclusion of testing. Mileage run peer week did not influence outcomes in Experiment 2. Mass perception accuracy ranged from 61-75% depending on the subpopulation and accuracy metric, similar to previous studies where subjects exercised in test shoes for less than one minute. More massive shoes tended to be perceived less favorably by subjects. Comfort perception consistently and negatively correlated with heaviness and shoe climate, but positively with stability; heaviness and foot climate also positively correlated. Five-minute running bouts may not improve lower limb perception of running shoe mass.

P123. HUMAN MALE RELEASER PHEROMONES AS SIGNALS OF UNDERLYING TESTOSTERONE LEVELS

Katherine Shindelar & Brianne Sharff
Wartburg College

Although women believe they bear complete jurisdiction regarding mate choice, there may be subtler physiological predilections that aide in this decision. The objective of this study was to determine a correlation between male testosterone levels and their odor rankings determined by female participants. We hypothesized that human male releaser pheromones are signals of underlying testosterone levels. We predicted that heterosexual women would detect, through odor alone, differences in male testosterone levels.

We also predicted that women would prefer men with higher testosterone levels. Male subjects slept in one t-shirt for three consecutive nights. Cheek swabs were collected for each male and testosterone levels were evaluated using an ELISA salivary immunoassay kit. Finally, female participants smelled each shirt and ranked the odor for both pleasantness and sexiness. Results from the immunoassays and rankings were analyzed by Spearman-Rank Correlation. The rS values indicate negative correlations between male testosterone levels and female rankings for both pleasantness and sexiness. The most significant negative correlation was between testosterone levels and rankings from females on contraception for pleasantness ($rS = -0.8850$, $p \leq 0.01$) and sexiness ($rS = -0.8495$, $p \leq 0.01$). A significant negative correlation illustrates that men with higher testosterone levels received lower rankings for pleasantness and sexiness.
We also predicted that women would prefer men with higher testosterone levels. Male subjects slept in one t-shirt for three consecutive nights. Cheek swabs were collected for each male and testosterone levels were evaluated using an ELISA salivary immunoassay kit. Finally, female participants smelled each shirt and ranked the odor for both pleasantness and sexiness. Results from the immunoassays and rankings were analyzed by Spearman-Rank Correlation. The rS values indicate negative correlations between male testosterone levels and female rankings for both pleasantness and sexiness. The most significant negative correlation was between testosterone levels and rankings from females on contraception for pleasantness ($rS = -0.8850$, $p \leq 0.01$) and sexiness ($rS = -0.8495$, $p \leq 0.01$). A significant negative correlation illustrates that men with higher testosterone levels received lower rankings for pleasantness and sexiness.

Physiology & Health Sciences
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O124. THE EFFECTS OF CROCIN ON AGE-RELATED SPATIAL LEARNING AND MEMORY DEFICITS OF FEMALE SWISS WEBSTER MICE ASSESSED IN THE RADIAL ARM MAZE

Aubrey Graham & Brenda Peters
St. Ambrose University

Oxidative stress is believed to affect neuronal cell death that is associated with Alzheimer's disease and Parkinson's disease via apoptosis of cells. This accumulation of oxidative damage and stress, which may affect spatial memory, has been found in both rodents and humans as they age. Crocin is a carotenoid (fat-soluble pigment) found in the herb saffron that scavenges free radicals in order to protect cells from oxidative stress. The hypothesis of this study is that the independent variables of saffron and the age of mice will significantly impact the dependent variable of spatial learning and memory of mice through assessment in a modified radial arm maze. Four groups of mice (young with or without crocin injection, and older with or without crocin injection) will be trained to visit each baited arm of the modified maze. Once learned, mice will then receive crocin injections prior to entering the maze where one arm will be blocked. A delay will be inserted, and the mice will then be tested to remember which arm had not previously been available by counting the number of reentries and time needed to complete the maze. The data will be analyzed using a Kruskal-Wallis one-way analysis of variants.

O125. CALCINEURIN HOMOLOGOUS PROTEIN GENETIC VARIANTS ASSOCIATED WITH AN INCREASE IN BLOOD PRESSURE

Liran BenDor[1], Samuel L. Lampe[1], John E. Norgaard[1], Arshin Parsa[2], Francesca Di Sole[1] & Victor Babich[1,2]
Des Moines University[1] & University of Maryland School of Medicine[2]

Hypertension affects ~80 million adults in the United States and is a major burden for the health care system. Although genetic factors play a role in individuals' risk for hypertension, specific genetic determinants of hypertension are poorly understood. The Calcineurin Homologous Protein (CHP) is a calcium-binding protein and binding partner of the Na+/H+ exchanger-3 (NHE3), a major regulator of body salt, fluid homeostasis, and blood pressure (BP). In a genome-wide association study (International Consortium for BP, 200,000 individuals), single nucleotide polymorphisms (SNPs) in non-coding regions of CHP gene were located within putative transcription factor binding sites and associated with a BP increase. Since CHP regulates NHE3 protein expression and activity, we hypothesized that these SNPs affect CHP gene transcription, which could then change BP via altering NHE3 transcription/activity. Five SNPs were investigated for their influence on the binding of transcription factors: SNPs were cloned in a luciferase reporter system, constructs were expressed in human renal cells and luciferase activity was tested. A major to minor allele replacements of four of the five SNPs revealed significant effects on promoter activity. Functional analysis of CHP genetic variants might aid the discovery of novel susceptibility loci responsible for genetic predisposition to develop hypertension.

O126. FROM THE BRAIN TO THE GUT: CHRONIC STRESS ALTERS THE GUT MICROBIOME

Aaron Shoskes[1], Allie Proctor[2], Kathyrn Battani[1], Misty Carder[1], Lori Semke[1], Vanja Duric[1], Greg Phillips[2] & LiLian Yuan[1]
Des Moines University[1] & Iowa State University[2]

Emerging evidence supports a bidirectional communication axis between the brain, the gastrointestinal tract, and the microbiota colonizing the gut. Various stressors have been shown to influence the function of the GI tract and its resident

microbiota. Dysbiosis of GI tract colonization has been associated with different diseases, including depression. We investigated the relationship between chronic stress and the gut microbiota by comparing the taxonomic composition before and after chronic stress. Mice were subjected to chronic unpredictable stress
(CUS) for six weeks. Fecal samples were collected before and after CUS. Bacterial DNA was extracted and the V4 region of 16s rRNA genes were sequenced. We observed phylum level differences: mean abundance of Bacteroidetes increased and Firmicutes decreased over the chronic stress period. Decreases in Bacilli and Lactobacillus appeared to contribute to the abundance decrease at the phylum level. No difference in alpha diversity was noted, indicating abundance changes are unlikely due to differences in the amount of diversity. Our results suggest that genera within Bacilli may be targets of therapies to restore a microbiota associated with well-being. Further studies are underway to address whether other stressors, such as chronic pain, result in similar taxonomic changes in GI resident microbiota.

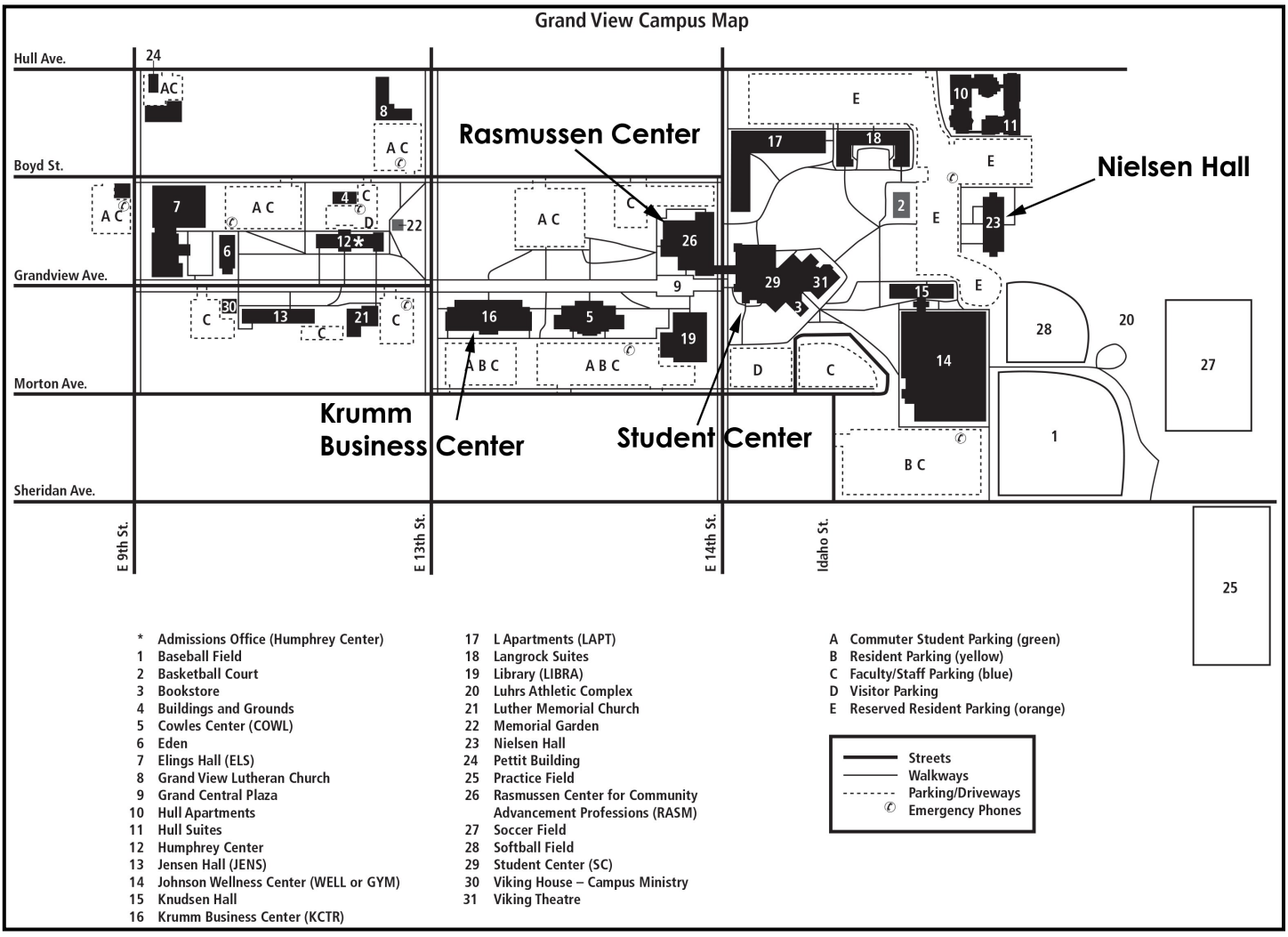
O127. THE EFFECT OF ORAL L-TYROSINE SUPPLEMENTATION ON THERMAL AND EXERCISE STRESS IN OLDER ADULTS

Raquel Relph[1], Kevin Smaller[2] & James Lang[3]
Grand View University[1], Drake University[2] & Des Moines University[3]

Sympathetic function in healthy older individuals is impaired. We hypothesized that oral supplementation of L-tyrosine, the primary substrate for catecholamine biosynthesis, would augment sympathetic function in response to gradual whole-body cooling (Tsk = 30.5ºC) and handgrip exercise in older adults. Eleven young (Y = 24±1 years) and eleven older (O = 68±4 years) participants completed two experimental visits where each ingested either 150 mg/kg L-tyrosine or placebo. An hour post-consumption, a 30 min whole-body cooling period commenced. Laser Doppler flux (LDF) was measured and cutaneous vascular conductance (CVC) was calculated as CVC = LDF / mean arterial pressure and expressed as a percent change from baseline (%ΔCVC). Two minutes of static handgrip exercise (35% MVC) followed by 3 minutes of post-exercise ischemia was implemented before and toward the end of cooling. L-tyrosine supplementation did not affect the blood pressure or heart rate response to exercise; however, L-tyrosine did augment the VC response to whole body cooling (Y = 37±5; O = 31±4 %ΔCVC; $p<0.05$) compared to placebo (Y = 29±3; O = 21±5 %ΔCVC). These results indicate that L-tyrosine may be a limiting factor in the full expression of the cutaneous vasoconstriction response, particularly in older adults.

CAMPUS MAP

Saturday, See individual sections for room and schedule.



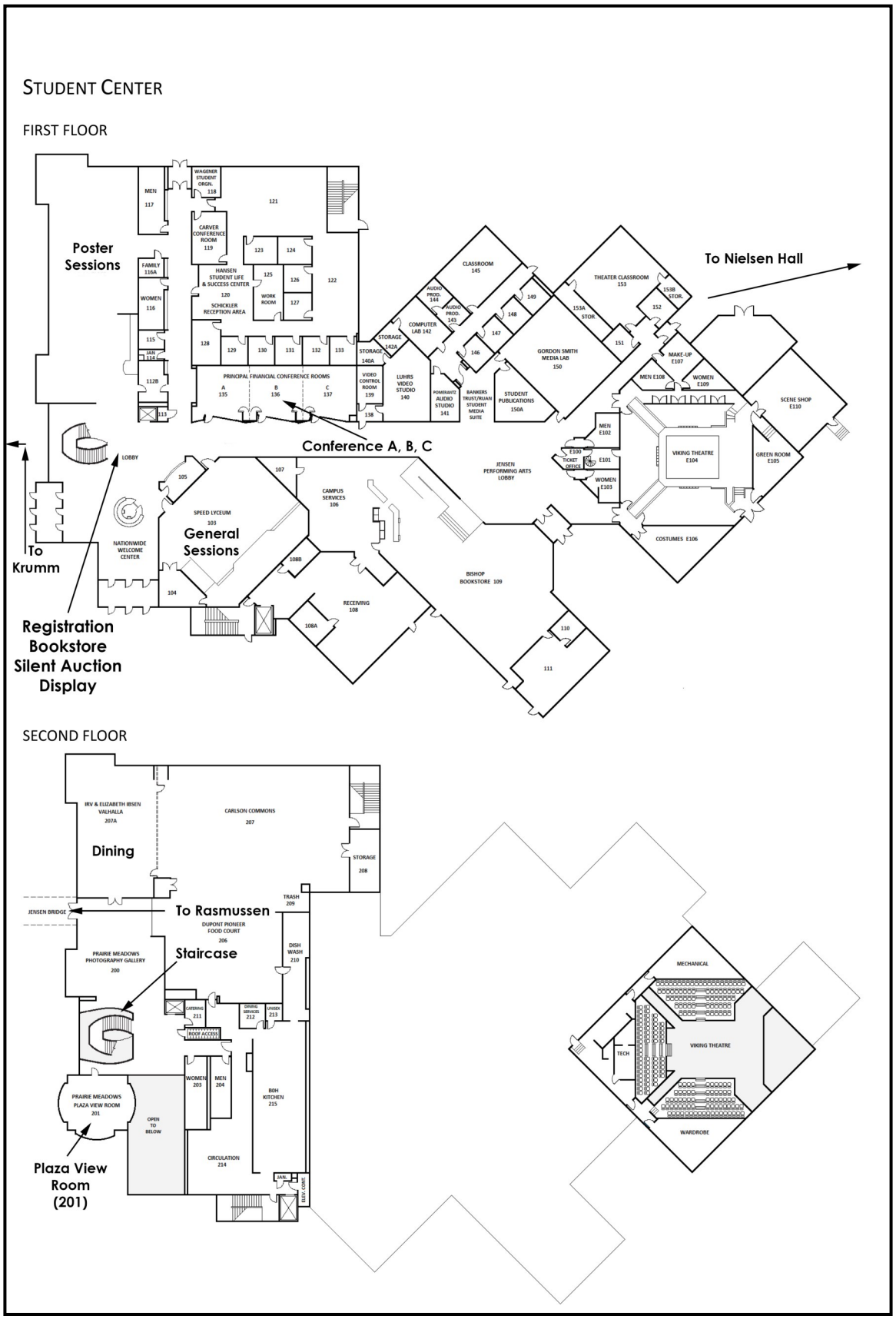
* Admissions Office (Humphrey Center)
1 Baseball Field
2 Basketball Court
3 Bookstore
4 Buildings and Grounds
5 Cowles Center (COWL)
6 Eden
7 Elings Hall (ELS)
8 Grand View Lutheran Church
9 Grand Central Plaza
10 Hull Apartments
11 Hull Suites
12 Humphrey Center
13 Jensen Hall (JENS)
14 Johnson Wellness Center (WELL or GYM)
15 Knudsen Hall
16 Krumm Business Center (KCTR)
17 L Apartments (LAPT)
18 Langrock Suites
19 Library (LIBRA)
20 Luhrs Athletic Complex
21 Luther Memorial Church
22 Memorial Garden
23 Nielsen Hall
24 Pettit Building
25 Practice Field
26 Rasmussen Center for Community Advancement Professions (RASM)
27 Soccer Field
28 Softball Field
29 Student Center (SC)
30 Viking House – Campus Ministry
31 Viking Theatre

A Commuter Student Parking (green)
B Resident Parking (yellow)
C Faculty/Staff Parking (blue)
D Visitor Parking
E Reserved Resident Parking (orange)

Streets
Walkways
Parking/Driveways
Emergency Phones

STUDENT CENTER

Saturday, See individual sections for room and schedule.



NOTES

THANK YOU!

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Join us next year!

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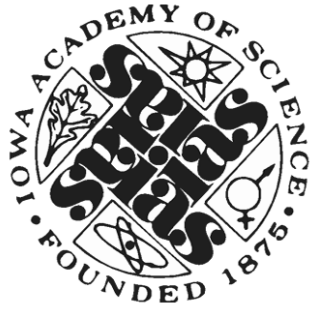

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