



Iowa Center for Research
by Undergraduates

10th Annual

Fall

**Undergraduate
Research
Festival**

Wednesday, November 13, 2019

4:30-6:30 PM

University of Iowa
University Capitol Centre
2nd Floor South Atrium
Iowa City, Iowa

This event is hosted by the Iowa Center for Research by Undergraduates. ICRU promotes undergraduate involvement with faculty and staff in research and creative projects at the University of Iowa.

2019-2020 ICRU Events and Opportunities

| | |
|--|------------------|
| Excellence in Undergraduate Research Award | February 4, 2020 |
| Distinguished Mentor Award | February 4, 2020 |
| Summer ICRU Fellowship Apps Due | March 6, 2020 |
| Academic Year Fellowship Apps Due | March 30, 2020 |
| Research in the Capitol | March 24, 2020 |
| Spring Undergraduate Research Festival | April 15, 2020 |

Director

Bob Kirby

bob-kirby@uiowa.edu

Program Coordinator

Melinda Licht

melinda-smits@uiowa.edu

www.uiowa.edu/icru
6 Gilmore Hall
319.335.8336
icru@uiowa.edu

ICRU's Fall Undergraduate Research Festival (FURF) is proud to showcase visual presentations focusing on the research and creative work performed by undergraduates at the University of Iowa. Presenters work in over **40 different departments** and major in over **35 different disciplines**, representing a broad range of sciences, arts, and humanities.

Odd numbered posters present 4:30-5:30 PM

Even numbered posters present 5:30-6:30 PM

****Please note that at 5:30, all of the boards will be turned around to display even numbered (the second hour presenters') posters****

Many thanks to all of the people who make both ICRU and FURF a possibility:

- All undergraduates presenting their work
- All poster judges
- All mentors of undergraduate researchers
- The Office of the Provost
- The Office of the Vice President for Research
- ICRU Research Ambassadors.

4:30-5:30 Presenters & Poster Numbers

Click presenter name/number to view abstract

[Click here to jump to 5:30-6:30 abstracts](#)

1 - Madison Anae

Understanding Magma Ascension Using Major and Minor Element Diffusion of Olivine, Pupuke Maar, Auckland Field, New Zealand

Major: Geoscience

Mentor: Ingrid Ukstins (Earth and Environmental Sciences)

3 - Angela Benton

Investigating the neural crest gene regulatory network: identification of an enhancer nearby tfap2a

Major: Biochemistry

Mentor: Robert Cornell (Anatomy and Cell Biology)

5 - Maxwell Bernstein

MGF Data and the Angle of Attack of Cassiope-ePOP Against Field Aligned Currents

Major: Journalism

Mentor: David Miles (Physics and Astronomy)

7 - Aimee Butler

Disulfiram induces radio-chemo-sensitization in small cell lung cancer and enhances the toxicity of thioredoxin reductase inhibition and GSH depletion

Major: Microbiology

Mentor: Douglas Spitz (Free Radical and Radiation Biology), Melissa Fath (Free Radical and Radiation Biology)

9 - Kevin Chen

Role of Iron Storage Deficiencies in the Development of Preeclampsia

Major: Human Physiology

Mentor: Mark Santillan (Obstetrics and Gynecology)

11 - Tartil Ali

The Outcome of Surgery in Patients with Traumatic Brain Injuries

Major: Psychology

Mentor: Kenneth Manzel (Neuropsychology), Brinda Shetty (Biology)

13 - Sydney DeBoer

In Our Schools, In Our Stores, and In Our Homes; The Office of Price Administration, 1941-1947

Major: History, Social Studies Education

Mentor: Colin Gordon (History)

15 - Sarah DeLong-Duhon

*Unraveling a taxonomic mystery: Exploring species boundaries within *Stereum fungi**

Major: Environmental Science

Mentor: Andrew Forbes (Biology)

17 - Alex Dobrila

*c-di-GMP: secondary messenger signaling and its importance for surface colonization by *Vibrio parahaemolyticus**

Major: Microbiology

Mentor: Linda McCarter (Microbiology)

19 - Caroline Fantz

Gender Identity and Expression in Individuals with Intellectual Disability

Major: Nursing

Mentor: Melissa Lehan Mackin (Nursing)

21 - Dustin Fykstra

LJA5: A novel population of itch and pain-suppressing brainstem neurons

Major: Biomedical Sciences

Mentors: Alexander Bassuk (Pediatric Neurology) & Lindsay Agostinelli (Pediatric Neurology)

23 - Maria Greufe

Effects of Cerebellar Activity of Cocaine-Seeking Behavior

Major: Neuroscience

Mentor: Ryan Lalumiere (Psychological and Brain Sciences)

25 - Kinsey Gudenkauf

Thermal Changes in Ionic Liquid Solutions Probed by Differential Scanning Calorimetry

Major: Biochemistry

Mentor: Scott Shaw (Chemistry)

27 - Emma Hartke

Examining the Coincidence of Organic and Carbonate Carbon Isotope Perturbations during the Ireviken Extinction Event (Wenlock, Silurian)

Major: Geoscience

Mentor: Bradley Cramer (Earth and Environmental Sciences)

29 - Kaleigh Haus

Quantitative image analysis of cellular structures by fluorescence microscopy

Major: Biomedical Engineering

Mentor: Charles Harata (Molecular Physiology and Biophysics)

31 - Miranda Henry

Ethnomusicology Today

Major: Saxophone Performance

Mentor: Trevor Harvey (Ethnomusicology/Musicology)

33 - Donald Hill

Revisions of the Leveson-Gerk Pterygometopid trilobites

Major: Geoscience, Biology

Mentor: Jonathan Adrain (Earth and Environmental Sciences)

35 - Carly Iacullo

Effects of the timing of infrequent stimuli on motor system suppression

Major: Psychology

Mentor: Jan Wessel (Psychological and Brain Sciences)

37 - Emma Johnson

Anti-Catholicism During the Election of 1960

Majors: History, Criminology

Mentor: Colin Gordon (History)

39 - Korina Justiniani

Identification of genes necessary for Pseudomonas aeruginosa induced motility in response to interspecies signaling

Major: Microbiology

Mentor: Dominique Limoli (Microbiology and Immunology)

41 - Joseph Kettelkamp

Arterial input function and tracer kinetic model driven network for rapid inference of kinetic maps in Dynamic Contrast Enhanced MRI(AIF-TK-net)

Major: Biomedical Engineering

Mentor: Sajan Lingala (Biomedical Engineering)

43 - Virginia Lamas-Meza

*2,2',3,5',6-Pentachlorobiphenyl (Pcb 95) and its hydroxylated metabolites
In adipose tissue*

Major: Chemistry

Mentor: Hans-Joachim Lehmler (Occupational and Environmental Health)

45 - Ricardo Lozano Flores

*Fibronectin-Integrin Signaling Axis is Required for Endoderm
Morphogenesis and Craniofacial Development*

Major: Biology

Mentor: Fang Lin (Anatomy and Cell Biology)

47 - Russell Martin

*The effect of joint angle and contraction velocity on measured muscle
activation at the elbow and knee*

Major: Biomedical Engineering

Mentor: Laura Frey-Law (Physical Therapy and Rehabilitation Sciences)

49 - Molly Matkovich

*Effects of median raphe serotonergic neuron activation on EEG and
seizure-induced death*

Major: Mathematics

Mentor: Gordon Buchanan (Neurology)

51 - Caroline Meek

*Publishing, International Collaboration, and Creative Leadership: Between
the Lines 2019*

Major: English and Creative Writing

Mentor: Katie Prout (International Writing Program), Allison Gnade
(International Writing Program)

53 - Alissia Milani

Lake Michigan Ozone Study: Characterization and Sources of Airborne Particles

Major: Chemistry

Mentor: Betsy Stone (Chemistry)

55 - Jade Miller

Interactions of BG4 with G Quadruplex DNA

Major: Biochemistry

Mentor: Maria Spies (Biochemistry)

57 - Tate Neff

β -klotho in Glutamatergic Cells is Necessary for FGF21-mediated Weight Loss

Major: Biochemistry

Mentor: Matthew Potthoff (Pharmacology)

59 - Sarah Plock

The Role of Cognitive Control in Understanding Speech in Noise

Major: Speech and Hearing Science

Mentor: Bob McMurray (Psychological and Brain Sciences)

61 - Alexander Powers

Robust Automatic Multiple Landmark Detection in 3D MRI

Major: Computer Science and Engineering

Mentor: Hans Johnson (Electrical and Computer Engineering)

63 - Prateek Raikwar

A Novel Population of Pain-Suppressing Brainstem Neurons

Major: Neuroscience

Mentor: Alexander Bassuk (Pediatric Neurology)

65 - Katlyn Rozovics

Passive Imperialists: Imperial Attitudes in Ryse: Son of Rome

Major: History

Mentor: Rosemary Moore (History)

67 - Clayton Saffran-Johnson

Campaign Finance Reform in the 21st Century

Major: History, Philosophy

Mentor: Alyssa Park (History)

69 - Arshaq Saleem

The role of the mitochondrial microprotein Mitoregulin in Parkinson's Disease pathogenesis

Major: Neuroscience

Mentor: Ryan Boudreau (Internal Medicine), Colleen Stein (Internal Medicine)

71 - Kimberly Schroeder

Correlating menstrual cycle-associated pulmonary changes with lung structure measures derived from quantitative CT

Major: Biomedical Engineering

Mentor: Jessica Sieren (Radiology and Biomedical Engineering)

73 - Brian Shanahan

Examples of Smart Cities in the US

Major: Civil Engineering

75 - Hannah Shrader

Dissecting the immunological link between intraoperative bacterial contamination and peritoneal metastasis of pancreatic ductal adenocarcinoma

Majors: Biochemistry, Medical Anthropology

Mentor: Carlos Chan (Surgery)

77 - Zachary Silver

Russian Intervention: An Analysis

Major: International Relations

Mentor: Elizabeth Menninga (Political Science)

79 - Abigail Simon

Sensitivity to fine-grained phonetic variation in children who use cochlear implants

Major: Speech and Hearing Science

Mentor: Bob McMurray (Psychological and Brain Sciences)

81 - Hannah Slowey

Effects of E-Cigarette Exposure on Viability and Proliferation of Placental Cells

Major: Human Physiology

Mentor: Donna Santillan (Obstetrics and Gynecology)

83 - Francesca Spencer

*Probing the nuclear aggregate proteome using *Xenopus* oocytes*

Majors: Biochemistry, Italian

Mentor: Daniel Weeks (Biochemistry)

85 - Michael Steffen

Offensive to the Majority: The Formation, Activism, and Survival of the University of Iowa Gay Liberation Front

Major: History

Mentor: Leslie Schwalm (Gender, Women's, and Sexuality Studies)

87 - Mary Wille

Primary Progressive Apraxia of Speech: A Systematic Review

Major: Speech and Hearing Science

Mentor: Karen Bryant (Communication Sciences and Disorders)

89 - Charlie Wolfe

Khaleesi: Breaking The Advertising & Tracking Redirect Chains

Major: Computer Science and Engineering

Mentor: Zubair Shafiq (Computer Science)

91 - Seunghye Yang

Rule and Exception Learning in Pigeon Categorization

Major: Psychology

Mentor: Leyre Castro Ruiz (Psychological and Brain Sciences)

93 - Jia Zhao

Using Dual-Luciferase Assay to Validate the Targets of a Transcription Factor Regulating Stress Response

Major: Biology

Mentor: Bin He (Biology)

95 - Bennett Zuck

Position Sense and the Control of a Handheld-Tool

Major: Human Physiology

Mentor: Warren Darling (Health and Human Physiology)

97 – Allison Kusik

Geochemistry and Petrology of the Osborne Core (North East Iowa Intrusive Complex)

Major: Geoscience

Mentor: David Peate (Earth and Environmental Sciences)

5:30-6:30 Presenters & Poster Numbers

Click presenter name/number to view abstract

2 - Sameer Ansari

Clinical and Imaging Features of Contrast Induced Neurotoxicity

Major: Human Physiology

Mentor: Santiago Ortega (Neurology), Cynthia Zevallos (Neurology)

4 - Gwen Barnes

A Bayesian Age-Depth Model for the Silurian Altajme Core, Gotland, Sweden

Major: Geoscience

Mentor: Brad Cramer (Earth and Environmental Sciences)

6 - Lakyn Belk; Matthew Culver

Actin capping protein Carmil3 is required for the migration of endodermal cells and KV formation

Majors: Human Physiology; Biomedical Engineering

Mentor: Fang Lin (Anatomy and Cell Biology)

10 - Ethan Bennett

Curve fitting of the decay phase of postsynaptic currents of mammalian neurons

Major: Computer Science

Mentor: Charles Harata (Molecular Physiology and Biophysics), Hiroyuki Kawano (Molecular Physiology and Biophysics)

12 - Bailey Bergman

Phytoplankton Composition of Caloosahatchee River and Estuary and the Gulf of Mexico

Major: Biology

Mentor: Bradley Cramer (Earth and Environmental Sciences)

14 - Ellie Biebesheimer

Paired organic and carbonate carbon isotope chemostratigraphy of the Mulde Excursion from the Altajme Core, Gotland, Sweden

Major: Geoscience

Mentor: Brad Kramer (Earth and Environmental Science)

16 - Daniel Conway

Structural Predictions of Escherichia Coli Outer Membrane Proteins Using Evolutionary Contact Information

Majors: Biochemistry, Computer Science

Mentor: Adrian Elcock (Biochemistry)

18 - Nathan Cremers

Designing a Modular Driver for Use in Optogenetic Studies

Major: Neuroscience

Mentor: John Freeman (Psychological and Brain Sciences)

20 - Megan Crotts

A ketogenic diet increases latency to seizure-induced respiratory arrest in the DBA/1 mouse

Major: Neuroscience

Mentor: George Richerson (Neurology), Frida Teran (Neurology)

22 - Harry Daley-Young

The Fall of Penn Central and the Rise of Conrail: Corporate Failure and the Politics of Deregulation and Nationalization in the 1970s

Major: History, Theatre Arts

Mentor: Tyler Priest (History)

24 - Clarissa Dietz

Investigation of Radiative Transfer Model's Application to VIIRS DNB Images

Major: Physics

Mentor: Daniel Feldman (Lawrence Berkeley National Laboratory)

26 - Lauren Davis

Changes in Vasopressin Receptor Expression in Hypertensive Pregnancies

Major: Human Physiology

Mentor: Eric Devor (Obstetrics and Gynecology)

28 - Alessandra Dutra

Metal Organic Material Comparison: Uranium and Cadmium Based Syntheses

Major: Chemistry

Mentor: Tori Forbes (Chemistry)

30 - Samuel Eck

The Emma Goldman Clinic: From Collectivism to Corporatism

Major: History, English

Mentor: Lina-Maria Murillo (Gender, Women's, and Sexuality Studies, History)

32 - Madysen Gilbert

Nutrient Analyses of the Caloosahatchee River and Estuary of Southwest Florida

Major: Biomedical Engineering

Mentor: Sajan Lingala (Biomedical Engineering)

34 - Jacob Heffelfing

In Vitro Metabolism and Enantioselective Enrichment of the Safener Benoxacor

Major: Public Health

Mentor: Hans-Joachim Lehmler (Occupational and Environmental Health)

36 - Benjamin Howard

A detrital zircon provenance study of the Marnoso-arenacea Formation, Northern Apennines, Italy.

Major: Geoscience

Mentor: Emily Finzel (Earth and Environmental Sciences)

38 - Elizabeth Janey

Swimming in 16p11 mice

Major: Psychology

Mentor: Mark Blumberg (Psychological and Brain Sciences)

40 - Renato Jensen; Joshua Peterson

DRP1 Deficiency in Skeletal Muscle Alters Gene Expression of Mitochondrial-endoplasmic Reticulum Contact- and Misfolded Protein Response-related Proteins

Major: Biochemistry; Biology

Mentor: Marcelo Correia (Internal Medicine), E. Dale Abel (Internal Medicine)

42 - Lillian Jones

Tracking atmospheric pollen during extreme weather events

Major: Chemistry

Mentor: Betsy Stone (Chemistry)

44 - Benjamin Kimball

Severus of Antioch and the Anti-Chalcedonian Movement

Major: History, Anthropology

Mentor: Michael Moore (History)

46 - Dariya Kozlova

Changes in Insulin Clearance in PCOS are Driven by Insulin Sensitivity

Major: Biochemistry

48 - Emily Lefeber

Nothing Comes to Her Who Sits and Waits

Major: History, Political Science

Mentor: Landon Storrs (History)

50 - Tianyi Li

Analysis of Metal in Airborne Particulate Matter in Winter Kathmandu, Nepal

Major: Environmental Science

Mentor: Betsy Stone (Chemistry)

52 - Cole Lotspeich

The Klan in the 1920s: Correlates of Membership in Champaign County, IL

Major: Political Science

Mentor: Douglas Dion (Political Science)

54 - Benjamin Louviere

Beer & Spirit

Major: History

Mentor: Michael Moore (History)

56 - Jack Lynn

Night owl's dilemma: determining the connection between sleep deprivation and seizure-induced death

Major: Chemical Engineering

Mentor: Gordon Buchanan (Neurology), Benton Purnell (Neurology)

58 - Allexis Mahanna

Local and Autonomous Community Migration Responses: Case Study of Barcelona, Spain

Major: Global Health Studies, Ethics and Public Policy

60 - Cameron Moeller

Variably Innate: Inconsistent British Perceptions of Martial Races in the Late-Victorian Indian Army

Major: History, International Relations

Mentor: Paul Greenough (History)

62 - Shaun Morris

Cecina Table Set

Major: 3D Design

Mentor: Monica Correia

64 - Marissa Mueller

Actimetry Analysis Methods Produce Large Differences in Lifestyle Physical Activity Estimates

Major: Biomedical Engineering

Mentor: Laura Frey-Law (Physical Therapy and Rehabilitation Sciences),

Ruth Chimenti (Physical Therapy and Rehabilitation Sciences)

66 - Mayra Narvaez

Biotransformation of dichloroacetamide safeners

Major: Chemical Engineering

Mentor: David Cwiertny (Civil and Environmental Engineering)

68 - Megan Schnobelen

Slipping Away from the "Summer Slide": Reducing Summer Reading Loss in School-Age Students Summer 2019 Honors Internship Project

Majors: Elementary Education, Music Performance

Mentors: Andrew Willard (Honors Program), Sherry Rhineheart (Pomerantz Career Center)

70 - Emily Silich

HaloSat Observations of the Vela and Puppis A Supernova Remnants

Majors: Astronomy, Physics, Mathematics

Mentor: Philip Kaaret (Physics and Astronomy)

72 - Abigail Simon; Mary Wille

Characterizing Primary Progressive Apraxia of Speech: A Case Study of a 76-Year-Old Female

Majors: Speech and Hearing Science

Mentor: Karen Bryant (Communication Sciences and Disorders)

74 - Allison Steger

Fueling the Future of Preston Station: The creation of a collection management policy and action plan

Major: History

Mentor: Heidi Lung (Anthropology)

76 - Hanxi Tang

Genetic Modification of Neurological Phenotypes in a Drosophila Voltage-gated Sodium Channel Mutant

Major: Biology

Mentor: Toshihiro Kitamoto (Anesthesia), Junko Kasuya (Anesthesia)

78 - Jared Termini

Analysis of Chandra Data of the Composite Supernova Remnant G310.6-1.6

Major: Physics and Astronomy

Mentor: Casey Deroo (Physics and Astronomy)

80 - Gabriella Thomsen

Helper-Dependent Adenovirus Transduces the Human and Rat Retina but Elicits an Inflammatory Reaction When Delivered Subretinally in Rats

Major: Spanish, Interdepartmental Health Sciences

Mentor: Luke Wiley (Ophthalmology)

82 - Jacob Tinker

Participant Screening in Dietary Approaches to treat MS Study

Major: Exercise Science

Mentor: Terry Wahls (Internal Medicine)

84 - Haley Vaughn

Longitudinal Time-to-Event Analysis of Time-gated Word Recognition in Children who are Hard of Hearing

Major: Speech and Hearing Sciences

Mentor: Elizabeth Walker (Communication Sciences and Disorders)

86 - Kimberly Vencer

Effects of low brain activity following seizures on immobility in mice

Major: Human Physiology

Mentor: Gordon Buchanan (Neurology)

88 - Olivia Westemeier

Pathway to Prevention: Protective Behavioral Strategies Linked to Sexual Assault on College Campuses

Major: Psychology

Mentor: Teresa Treat (Psychological and Brain Sciences)

90 - Lauren Williams

Does Partisanship Affect Everyday Russians' Engagement in Bribery?

Major: Russian, Environmental Policy and Planning

Mentor: William Reisinger (Political Science)

92 - Ashton Woiwood

Characterizing and Modeling Threat Feeds for Patch Management

Major: Informatics

Mentor: Zubair Shafiq (Computer Science)

94 - Mikayla Wymore

Photoredox Studies with Alkyl and Aryl Radicals

Major: Chemistry, Biochemistry

Mentor: Gregory Friestad (Chemistry)

96 - Joshua Yem

Dynamic and Static Position Sense of Body Targets in Three Dimensions

Major: Human Physiology, Music

Mentor: Warren Darling (Health and Human Physiology), Chris Coffman (Health and Human Physiology)

4:30-5:30 Presenter Abstracts

1 - Madison Anae

Understanding Magma Ascension Using Major and Minor Element Diffusion of Olivine, Pupuke Maar, Auckland Field, New Zealand

The Auckland Volcanic Field (AVF) will potentially erupt and devastate the surrounding area with little to no warning due to the rapid ascension typical to monogenic volcanoes. By analyzing the diffusion of elements along gradients of olivine crystals, we can calculate the time it took for the crystals to ascend from the source.

This study has been replicated on a larger scale in order to determine reproducibility and validity by utilizing the same four techniques: (1) EMP analysis of major element diffusion, (2) Synchrotron analysis for OH diffusion, (3) LA-ICP-MS for minor element diffusion, and (4) grey-scale variation calculations. Focusing on (1), our results support and expand the initial data with ascent at 0.01 m s^{-1} , assuming a minimum depth of derivation of 27 km. If crystals were derived from the maximum depth of 80 km, it yields an ascent rate of 0.03 m s^{-1} . (Brenna, 2018).

We can conclude that the initial study can be duplicated for major trace elements, but the analysis of OH, CO₂ and grey-scale calculations will yield a more well-rounded understanding of these ascension rates.

3 - Angela Benton

Investigating the neural crest gene regulatory network: identification of an enhancer nearby tfap2a

The neural crest is a transient, multipotent population of cells that gives rise to diverse cell fates such as pigment cells, bone of the face, and the peripheral nervous system. The path from neural crest cell to differentiated cell fate is governed by a gene regulatory network (GRN). GRNs are massive, complex networks of transcription factors that regulate each other. Mutations in genes in the neural crest GRN cause breakdown of the neural crest, resulting in cancer of neural crest derivatives, such as melanoma, and birth defects, such as orofacial cleft. Transcription factor activator protein 2 alpha (Tfap2a) is a key player of the neural crest GRN, as double depletion of tfap2a and its redundant

paralog tfap2c results in loss of neural crest and derivatives in zebrafish. However, regulation of tfap2a remains unknown. We have identified a region of non-coding DNA nearby tfap2a that is active in the neural crest, tfap2a+90kb. We have shown that this candidate enhancer is necessary for activation of tfap2a. Transcription factor binding site sequences of various neural plate border modulators are present within the candidate enhancer. Using transient and stable reporter assays, I am investigating the transcriptional inputs into tfap2a+90kb to identify direct upstream regulators of tfap2a.

5 - Maxwell Bernstein

MGF Data and the Angle of Attack of Cassiope-ePOP Against Field Aligned Currents

Cassiope-ePOP is a satellite that was launched by the Canadian Space Agency. The satellite has a multitude of instruments used to understand the Aurora Borealis. The instruments I work with are the Fast Auroral Imager and the Magnetic Field Instrument. Cassiope-ePOP is unique in the fact that it can record videos and magnetic field data. My research focuses on how the angle of attack of the satellite against an aurora changes the magnetic field data that comes off the flowing electrons of the aurora.

7 - Aimee Butler

Disulfiram induces radio-chemo-sensitization in small cell lung cancer and enhances the toxicity of thioredoxin reductase inhibition and GSH depletion

Small cell lung cancer (SCLC) has a five-year survival rate of 6%. Given this poor prognosis, new approaches to enhance radio-chemo-therapies are urgently needed. Disulfiram (DSF) is an FDA approved drug that can selectively target cancer cells versus normal cells, cause toxicity in resistant hypoxic cells, and increase survival rates. Previous work has shown that DSF delivers Cu to cancer cells and reduces Cu(II) to Cu(I). Cu(I) reacts with O₂ and produces superoxide (O₂⁻) and hydrogen peroxide (H₂O₂), which cause toxicity in cancer cells. Clonogenic survival assays using physiologically relevant doses of DSF (50-100 nM) and

CuSO₄ (15 ÅµM) showed that DSF is selectively toxic to SCLC cells, relative to normal human bronchial epithelial cells. DSF/Cu also sensitized SCLC cells to radiation and chemotherapy and caused chemosensitization in resistant hypoxic cells. Additionally, DSF/Cu sensitized SCLC cells to clinically relevant inhibitors of thioredoxin and GSH-mediated hydroperoxide metabolism, auranofin and buthionine sulfoximine (BSO), and DSF/Cu with auranofin sensitized SCLC cells to cisplatin. In vivo, DMS273 xenograft results showed that DSF with cisplatin and radiation significantly increased mouse survival. These results support the hypothesis that DSF is a promising adjuvant to radiochemotherapy in SCLC.

9 - Kevin Chen

Role of Iron Storage Deficiencies in the Development of Preeclampsia

Preeclampsia (PE) is a dangerous cardiovascular disorder of pregnancy that affects 5-7% of pregnant women worldwide. We and others have determined that copeptin (CPP), the C-terminal fragment of arginine vasopressin (AVP) used as a marker for AVP secretion, is increased in the maternal plasma as early as six weeks gestation. How and why AVP secretion is increased is unknown. One possible explanation is that AVP is released in response to anemia, a common condition in pregnancy. We hypothesize that there may be an iron storage deficiency in those women who develop preeclampsia. To test our hypothesis, we collected first-trimester blood samples from 40 PE women and 40 controls from the University of Iowa Maternal-Fetal Tissue Bank. We then quantified the participant's ferritin and transferrin level in their blood. Ferritin and transferrin are iron-storing blood plasma glycoproteins that control the level of free iron in biological fluids. Contrary to our expectations, we did not find a significant difference in either ferritin or transferrin levels in the plasma of women with PE compared to non-preeclamptic women. Therefore, there is an alternate cause of the elevation in AVP in preeclampsia.

11 - Tartil Ali

Major: Psychology

Mentor: Kenneth Manzel (Neurology)

The Outcome of Epilepsy Surgery in Patients with History of Traumatic Brain Injuries

A traumatic brain injury (TBI) is a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head. Injury can range from mild (such as concussions) to severe, life-threatening injuries. TBIs can cause a seizure months or years after the injury also known as Epilepsy. Temporal lobe epilepsy (TLE) is the most common type of epilepsy and is commonly treated with a Temporal lobectomy (TLOB). TLOB removes a part of the anterior temporal lobe along with the amygdala and hippocampus. We are testing whether those with a history of TBI will have greater cognitive impairment post-surgically, most notably in executive functioning and memory, than those without a history of TBI. A more complete understanding of the potentially combined effects of TBI and TLE could help inform surgical decisions, provide more sophisticated prognostic, and assist in informing the patients and families about potential surgical outcomes.

13 - Sydney DeBoer

In Our Schools, In Our Stores, and In Our Homes; The Office of Price Administration, 1941-1947

As American involvement into war escalated into the 1940s, the US government required a strong, organized domestic economy. The Roosevelt administration created an agency called the Office of Price Administration (OPA), 1941-47, to address the growing demands on the US economy. The OPA turned out to be one of the most active government war programs, directly affecting the private lives of millions of Americans. The agency aimed to ward-off inflation, distribute scarce goods equitably, and foster production through the "Three Rs": Regulation, Rationing, and Rent-Control. In order to achieve these goals, the OPA implemented a series of education programs that encouraged popular participation within the state fostered economy. Standing in the context of the war and the legacy of Roosevelt's New Deal, the OPA attempted to extend farther than a temporary, economic mobilization office that served winning the war. The agency used community volunteers to implement government policy and empower consumers to

dictate the private economy. By these means, the OPA chose to educate, protect, and empower American consumers. At the end of the war, these empowered consumers, along with dissidents from Congress, businesses and other interest groups, dismantled the OPA. As a result, the OPA stood as an example for the failure of an American regulatory government model in the private economy.

15 - Sarah DeLong-Duhon

Unraveling a taxonomic mystery: Exploring species boundaries within Stereum fungi

Stereum are wood decay fungi common throughout the world, including the North American Midwest, but its species are similar and chronically misidentified. Past efforts to explain Stereum taxonomy under the morphological species concept have resulted in wide-scale "lumping" of multiple similar species into one, often not considerate of geographic distance. The most common Stereum in North America is *S. ostrea*, but through phylogenetic and morphological analysis of North American *S. ostrea*, it is now apparent that it comprises two species - *S. fasciatum* and *lobatum*. How many other Stereum species are hiding in synonymy, and what does this discovery mean for past studies on biomedical uses for "*S. ostrea*"?

17 - Alex Dobrila

c-di-GMP: secondary messenger signaling and its importance for surface colonization by Vibrio parahaemolyticus

Gram-negative marine bacteria *Vibrio parahaemolyticus* has two lifestyles that lead to diverse surface adaptation and colonization. When in a liquid environment, the bacteria swim. When grown on a surface, they either swarm across that surface or cease moving and form a biofilm community. The decision to move or stick is mediated by the secondary messenger c-di-GMP, found in nearly all bacteria. High c-di-GMP favors biofilm formation and inhibits swarming. There are four known c-di-GMP

binding transcription factors that determine biofilm development; however, deletion of all four transcription factors fails to restore the swarming phenotype. We hypothesize there are other factors causing the c-di-GMP-mediated repression of swarming. A transposon mutant library constructed in strains lacking the four c-di-GMP binding transcription factors was screened for mutants able to swarm under high c-di-GMP conditions. The transposon insertions in 20 mutants were identified through arbitrary PCR and cloning out of the transposon along with adjacent chromosomal DNA. Several mutations mapped in genes encoding potential regulators and c-di-GMP enzymes. These genes may represent new factors participating in the decision to swarm or stick. Fusions of the genes of interest with a green fluorescent protein were created to study localization of these proteins during surface colonization.

19 - Caroline Fantz

Gender Identity and Expression in Individuals with Intellectual Disability

Prior research has not examined gender identity in persons with intellectual disability (ID). The aim of this study was to describe how individuals with ID understood gender expression and what factors contributed to their own gender identity. This qualitative, descriptive study used interviews to encourage individuals to talk about their own gender identity and expression. Data collection is currently in progress, with five individuals interviewed to date. Preliminary findings suggest that like non-disabled persons, social messages play an important role in individual gender identities. Gender expression was understood to be defined by outward appearance such as what kind of clothing a person wore or defined by gender roles such as "I'm a man, I take care of things, I'm a man and it's what I do". Only one interview participant did not identify as cis-gender despite outward appearance, describing barriers such as requiring personal care and a dependence that made free gender expression difficult. The implications of this study represent an attempt to contribute to the gap in knowledge about gender identity in persons with ID, but also honors the rights of persons with ID to have the same support and opportunities as persons without disability.

21 - Dustin Fykstra

LJA5: A novel population of itch and pain-suppressing brainstem neurons

Sensory information (itch, pain, and temperature) from the skin is transmitted by dorsal root ganglion (DRG) fibers to lamina I of the spinal cord and up to the brain (afferent or “bottom-up” pathway). Some of this information is modulated by “top-down” projections from the brain to the spinal cord, so discovering the endogenous mechanisms for reducing pain and itch sensations holds enormous potential for developing new treatments. Neurons mediating the top-down inhibition of pain are not well understood, and no pathway has been identified for itch sensation. Here we identify a novel population of GABAergic neurons in the ventral brainstem, distinguished by prodynorphin expression, which we named LJA5. LJA5 neurons send inhibitory projections to all levels of the spinal cord. These projections selectively target lamina I of the dorsal horn, which transmits afferent pain, temperature, and itch information up to the brain. Therefore, we hypothesized that LJA5 neurons mediate top-down inhibition of one or more of these sensory modalities.

23 - Maria Greufe

Effects of Cerebellar Activity of Cocaine-Seeking Behavior

The infralimbic (IL) cortex in rats is a crucial structure in the inhibition of drug-seeking behavior. Recent work has suggested that the cerebellum works in conjunction with the IL to inhibit cocaine-seeking behaviors. Because of this finding, our goal was to replicate this experiment in a way that focuses on this mechanism by temporarily compromising all outputs of the cerebellum instead of just one region.

Drug-seeking behavior was measured by the number of active lever presses during a reinstatement test following cocaine self-administration and extinction training. Prior to self-administration, rats underwent surgery and had an intravenous cannula inserted in the dentate nucleus in the cerebellum. This site was used to inject either artificial cerebral spinal fluid (ACSF) or Muscimol (MUSC) into the dentate nucleus of the cerebellum during reinstatement to observe the changes in lever pressing activity. The ACSF acted as a control injection, while MUSC acted

as a GABA A agonist which deactivated cerebellar outputs. Reinstatement consisted of three phases: cued, cocaine primed, and cocaine with cue. Our results indicate no significant effect of manipulation of the dentate nucleus. This doesn't suggest a lack of connectivity between the two regions, but the possible use of compensation of one area when the other is silenced. The more specific role of the cerebellum in drug-seeking inhibition is yet to be narrowed down, but still very relevant in studying addiction.

25 - Kinsey Gudenkauf

Thermal Changes in Ionic Liquid Solutions Probed by Differential Scanning Calorimetry

Ionic liquids are room temperature molten salts that show interesting thermal behavior, including low freezing temperatures and multiple melting transitions. This is partially due to an asymmetric organic cation and anion pair that create unfavorable crystalline packing geometries and a wide range of intermolecular interactions. Here we have probed the thermal transitions of 1-butyl-3-methylimidazolium trifluoromethanesulfonate ([BMIM][OTf]) in mixtures with a known hydrogen bond donor and polar solvent, water. To study the physical behavior over a series of aqueous dilutions, we employed differential scanning calorimetry (DSC). Different dilutions were tested and the melting and crystallization peaks were analyzed for shifting temperature and enthalpy. Our data show general increases in enthalpy with higher concentrations of water. We also observe a subtle decrease in crystallization peak temperature with increasing water concentration, likely because water crystallizes at a cooler temperature than the IL. An increase in the melting peak temperature is seen at the higher water dilution rates as well. More thermal transitions are present in the mixture of the IL and water than in either neat liquid. We suggest that these additional features are indicative of ionic liquid and water mixtures creating complex solvate or crystal structures which we plan to investigate using vibrational or x-ray spectroscopies in the future.

27 - Emma Hartke

Examining the Coincidence of Organic and Carbonate Carbon Isotope Perturbations during the Ireviken Extinction Event (Wenlock, Silurian)

The Silurian Period (443-416 Ma) was defined by extensive changes to the biogeochemistry of the Earth and marked by a series of extinction events and global carbon cycle perturbations. The Ireviken Event (Llandovery-Wenlock boundary, ~430 Ma) was one of these Silurian biogeochemical events and is marked by the Ireviken positive carbon isotope excursion. This global carbon cycle perturbation produced a positive carbon isotope excursion in both the organic and carbonate carbon records and this study is the first high-resolution investigation of the paired carbon isotope record through this interval.

Upon examining the synchronicity between the organic and carbonate carbon records from this study, the data demonstrate a +2% increase in $\Delta^{13}\text{C}$, the difference between carbonate and organic carbon values, as well as a slight variation in the timing of the onset of events in each isotopic record. If taken as a proxy for atmospheric pCO_2 concentrations, the data suggest an increase in CO_2 , and thus global temperatures. However, this is in opposition to previously published data using the oxygen isotope temperature proxy, which shows a roughly 4 degree Celsius cooling during this interval. If the oxygen isotope temperature proxy is considered to be valid, an alternative explanation for $\Delta^{13}\text{C}$ record is required.

29 - Kaleigh Haus

Quantitative image analysis of cellular structures by fluorescence microscopy

In biological imaging experiments, it is often necessary to identify positive signals within individual cells, measure their sizes and intensities, and measure their locations from a reference such as a center of cell body. The measured values will be used for comparing groups, for example, a group of cells under a disease condition vs. that of healthy cells. Such quantitative image-analysis of spatial information becomes difficult when the target signals are irregular in size, shape and intensity.

In order to address this problem, we have developed a novel "continuous distribution" analysis, which enables feasible comparisons of two groups of cells, without complicated measurements in individual cells. Here we describe its principle, and demonstrate two applications: analyses of 1) subcellular localizations of the Golgi apparatus, and 2) shape of cellular nucleus and expression level of neuronal cytoskeletal protein in the context of a movement disorder, dystonia. This image-analysis tool is quantitative, sensitive and powerful. It is widely applicable to any cell type, and to the analyses of physiological and pathological processes. Given that the spatial localization and amount of intracellular proteins and organelles will determine the cellular functional states, this tool is expected to contribute to the improvement of biomedical research.

31 - Miranda Henry

Ethnomusicology Today

I read and annotate academic articles from the Society for Ethnomusicology journals. I then discuss the articles and create interview question with Dr. Harvey to ask the author(s). I am responsible for recording the interview. Afterwards, I edit the interview to create a podcast that will be uploaded to the university's radio station, iTunes, and the Society for Ethnomusicology Today website. By working on this project, I can gain crucial research skills and learn the processes of recording which I can apply to my education now and even in my graduate education.

33 - Donald Hill

Revisions of the Levenson-Gerk Pterygometopid trilobites

The Levenson-Gerk trilobites were collected by two amateurs, Calvin Levenson and Arthur Gerk, given species names, and seemingly promptly forgotten about after that. No papers have been written regarding the trilobites and any photography of the specimens is indistinct at best. Many taxa of trilobites were collected by Levenson and Gerk, but the current focus of this project revolves around one family of them, the Pterygometopids. While technical issues have slowed the project, our

current goal is the photography and redefining of the Pterygometopid species of the Levenson-Gerk collection. Of special interest is that at least one of the species described in the collection, *Calyptaulax isrrabei*, has not been found anywhere in the literature so far. Whether this is a failure in the search engines used or a legitimate lack of papers published remains to be seen.

35 - Carly Iacullo

Effects of the timing of infrequent stimuli on motor system suppression

It is important to adapt behavior appropriately following surprising events. Previous research suggests that the fronto-basal ganglia (FBg) network, responsible for our ability to stop actions voluntarily, induces inhibition in motor systems following surprising events, and potentially following infrequent but expected events also. We used transcranial magnetic stimulation (TMS) to produce a motor-evoked potential (MEP) to investigate if such infrequent stimuli produced MEP suppression, a measure of inhibition of the body's corticospinal motor system. In a previous study, the infrequent stimuli were presented before the instruction to make a response, which yielded a null outcome. Here, the stimuli were presented immediately after the response cue to investigate if the FBg will be recruited when there is an active motor system to interrupt. So far, we have data from seventeen participants. Previously, we found that surprising events cause significant MEP suppression compared to standard events 150ms following the events. This finding was replicated in the current experiment. Infrequent but expected events did not cause MEP suppression at 150ms, but do cause MEP suppression at 175ms. While preliminary, we believe these results provide evidence that infrequent events recruit the same circuit as unexpected events - but only when a motor program is active.

37 - Emma Johnson

Anti-Catholicism During the Election of 1960

The Anti-Catholicism sentiment during the mid-1900's influenced many aspects of United States' history. The campaign and election of the first

Catholic President, John F. Kennedy is one example. This essay examines anti-Catholic sentiment and its impact on the campaign and the election of John F. Kennedy. During the campaign of Kennedy and Richard Nixon leading up to the 1960 presidential election, anti-Catholic groups voiced their anxiety over the issues of the separation of Church and State, including the influence of the Vatican in US domestic affairs and the funding of parochial schools. His original tactic of avoidance of such an influential proved ineffective that caused his approaches to escalate. Anti-Catholics feared Kennedy would pass specific religious based policies if he were elected. Such public discussion of anti-Catholic groups led to the re-emergence of old fears amongst the Protestant population and forced Kennedy's campaign to address them by emphasizing Kennedy's loyalty to the public office rather than to his faith. Kennedy's campaign team utilized different strategies and Kennedy's skill of public speaking turned the religion from a large challenge to an advantage. Kennedy's arguments countering the "Catholic Question" indeed influenced his victory in the 1960 election.

39 - Korina Justiniani

Identification of genes necessary for Pseudomonas aeruginosa induced motility in response to interspecies signaling

Pseudomonas aeruginosa is an opportunistic pathogen that plays a critical role in the dynamics of chronic airway infections, particularly in cystic fibrosis patients. Increasing evidence suggests that how different bacterial species interact during infection can influence patient outcomes. *P. aeruginosa* has been observed to have an increased type IV pili-mediated motility (referred to as twitching motility) in the presence of secreted factors from other bacterial species. We hypothesized that *P. aeruginosa* encodes genes necessary to facilitate this observed behavior. We utilized forward genetics with transposon mutagenesis to elucidate *P. aeruginosa* genes necessary to sense interspecies signals. Specifically, we sought to identify *P. aeruginosa* mutants that retain WT levels of twitching motility, but do not respond to other

bacterial species (here *Staphylococcus aureus*). To achieve this, *Escherichia coli* carrying a plasmid encoding the transposon was conjugated into *P. aeruginosa*. Transconjugant colonies were selected by plating onto antibiotic plates. To date, 850 colonies have been screened and three independent candidates identified (reduced twitching motility in the presence of *S. aureus*). However, current candidates failed to maintain this phenotype upon more rigorous secondary screening. In the future, additional mutants will be screened to identify potential candidates.

41 - Joseph Kettelkamp

Arterial input function and tracer kinetic model driven network for rapid inference of kinetic maps in Dynamic Contrast Enhanced MRI(AIF-TK-net)

We propose a patient-specific arterial input function (AIF) and tracer kinetic (TK) model-driven network to rapidly estimate the extended Tofts-Kety kinetic model parameters in DCE-MRI. We term our network as AIF-TK-net, which maps an input comprising of an image patch of the DCE-time series and the patient specific AIF to the output image patch of the TK parameters. We leverage the open-source NEURORIDER database of brain tumor DCE-MRI scans to train our network. Once trained, our model rapidly infers the TK maps of unseen DCE-MRI images at the order of a 0.34 sec/slice for a 256x256x65 time series data on a NVIDIA GeForce GTX 1080 Ti GPU. We show its utility on high time resolution DCE-MRI data sets where significant variability in AIFs across patients exists. We demonstrate the proposed AIF-TK net considerably improves the TK parameter estimation accuracy in comparison to a network which does not utilize the patient AIF.

43 - Virginia Lamas-Meza

2,2',3,5',6'-Pentachlorobiphenyl (Pcb 95) and its hydroxylated metabolites In adipose tissue

Polychlorinated biphenyls (PCBs) are persistent organic pollutants. They are stable in the environment and bioaccumulate and bio magnify in

aquatic and terrestrial food chains. Some PCB congeners, such as PCB 95, and its metabolites are toxic to the developing brain. Based on in vitro studies, the metabolism of PCB 95 by human cytochrome P450 enzymes, such as CYP2A6 enzyme, is distinctively different from the metabolism observed in mice. We hypothesize that, unlike wild-type mice, CYP2A6-humanized mice approximate the disposition of this PCB congener in humans and, thus, are a translational animal model to study the developmental neurotoxicity of PCB 95. To test our hypothesis, we exposed wild-type mice, Cyp2abgf null mice, and CYP2A6-humanized mice, by oral gavage to a single dose of PCB 95 (1 mg/kg in corn oil) and collected tissues 24 h after PCB 95 exposure. We developed an extraction method with acceptable recoveries of the target analytes (87 % for PCB 95; 45 % to 85 % for hydroxylated PCB 95 metabolites) from adipose tissue. Subsequently, we quantified PCB 95 and its hydroxylated metabolites in adipose tissue from PCB 95-exposed mice. We detected PCB 95, but not the corresponding hydroxylated metabolites in all samples, irrespective of the genotype. These data suggest that the genotype does not alter the distribution of PCB 95 into the adipose tissue of PCB exposed mice, but additional analysis is necessary to confirm these findings.

45 - Ricardo Lozano Flores

Fibronectin-Integrin Signaling Axis is Required for Endoderm Morphogenesis and Craniofacial Development

Craniofacial development of vertebrates relies crucially on the proper growth and maintenance of the pharyngeal pouch. Pharyngeal pouches are endodermal pockets formed between the arches of the pharynx in the developing embryo, and contribute greatly to the formation of the epithelial lining of different tissues within various internal systems. Previous studies have shown that integrin alpha 5 (Itga5) is involved in the formation of the pharyngeal endoderm pouch and craniofacial development. Our lab has also learned that Fibronectin (Fn) plays similar roles in the formation of the endoderm pouch and craniofacial development, but the phenotype in Fn mutants are much stronger than those in itga5 mutants. The current goal of the study is to determine the functional interaction of ItgaV and Itga5 during embryonic development,

and analyze the anatomical and physiological outcomes that arise from their interactions. Because integrin alpha V (ItgaV) is shown to function together with Itga5, we hypothesize that ItgaV and Itga5 function synergistically during pharyngeal pouch development. We generated genetic itgaV mutants using Crispr technology, and found that although the itgaV mutants do not display defects in pharyngeal pouch or craniofacial development, itgaV/5 double mutants exhibit much stronger defects. Thus, our data suggests that both ItgaV and Itga5 are required for proper pharyngeal pouch development during embryogenesis.

47 - Russell Martin

The effect of joint angle and contraction velocity on measured muscle activation at the elbow and knee

Electromyography (EMG) is a technique used to quantify tiny physiological electrical signals that are used to cause muscle contractions (similar to the technology used in a heart ECG). In general, the more effort a subject puts into a contraction, the greater the EMG signal from the contracting muscles will be. This project investigates changes in EMG of contracting muscles during a maximum-effort contraction at different joint angles and angular velocities. Despite the fact that subjects are putting forth maximal effort throughout all tasks, we observe that EMG varies (i.e. is not maximal) depending on the joint angle and angular velocity. This has implications in many biomechanics research that uses EMG technique, since a common premise in using EMG is that the peak EMG indicates peak effort. However, our work shows that the subject may be outputting peak effort even when EMG is not maximal. This work profiles these differences, as well as propose some potential reasons for this phenomenon.

49 - Molly Matkovich

Effects of median raphe serotonergic neuron activation on EEG and seizure-induced death

Epilepsy is a condition in which patients experience recurrent seizures, some of which can lead to death. Seizures occur in a sleep-state

dependent manner with almost no seizures happening during rapid eye movement (REM) sleep which is characterized by theta brain activity. The neurotransmitter serotonin (5-HT) modulates seizure occurrence and seizure-induced death. Median raphe 5-HT neurons remain active during REM sleep while others reduce their activity. Therefore, we hypothesized that 5-HT neurons in the median raphe nucleus (MRN) control theta activity and affect seizure-induced death. Optogenetics and maximal electroshock (MES) induced seizures were utilized to examine this hypothesis. Preliminary analyses revealed that manipulation of 5-HT neurons in the MRN alters brain theta activity detected through EEG and more mice survived MES seizures when these neurons were activated as opposed to inhibited. This research is expected to advance our understanding of seizure-induced death and theta activity, potentially encouraging new therapeutic developments for controlling seizures.

51 - Caroline Meek

Publishing, International Collaboration, and Creative Leadership: Between the Lines 2019

Each summer, the International Writing Program (IWP) hosts Between the Lines (BTL), a two-week creative writing and cultural exchange program for students age 15-18 from the U.S. and around the world. Via conversation, creative writing, and global literature, BTL guides participants as they question, explore, and ultimately take charge of the stories they tell about themselves – and about others. BTL ushers young people toward intercultural interactions that are nuanced, compassionate, and informed by cultural understanding.

Many of the students who participate in the summer program leave with an interest in creating collaborative projects of their own. As a research fellow for the IWP, I compiled an anthology of students' work, taught a master class on collaborative work, and served as a mentor and photographer for the duration of the program. Through my research, I examined the following questions: How do educators and writers create community both locally and globally among youth? How can we empower students to find themselves in their writing and use their ideas to connect with others? I explored these questions with IWP staff and

students, examining what it takes to produce a successful collaborative project and organize a community towards a common goal.

53 - Alissia Milani

Lake Michigan Ozone Study: Characterization and Sources of Airborne Particles

Air pollution in coastal regions affects nearly one-third of all Americans. Along the Lake Michigan coastline, elevated levels of ground-level ozone (a harmful gas) are consistently observed in spring and summer. Sources of ozone in this region are not well understood but can be inferred through the study of airborne particles. On one poor air quality day, elevated levels of elemental carbon - a type of particle tied to fuel combustion, were observed. Concurrently, cobalt and lead - metals tied to industrial sources - were elevated. Other poor air quality days had elevated levels of wind-blown dust and secondary particles, which come from the Earth's crust and reactive gases in the atmosphere, respectively. Wind-blown dust contributes 0.5% to 16% of airborne particles collected over the study. Other sources of particles include biomass burning, fertilizer use, and oxidation of SO₂ and NO_x. Sources influencing particle composition vary, such that particle and ozone formation is influenced by a variety of sources. The next step in this project is source apportionment modeling that will be used to quantify major sources of air pollutants and can inform strategies to reduce air pollution.

55 - Jade Miller

Interactions of BG4 with G Quadruplex DNA

Certain Guanine-rich sequences in DNA are capable of founding structures known as G-Quadruplexes, which control Gene expression by hindering the transcription of that sequence. BG4 is a protein that binds these G-quadruplexes, but the binding of BG4 is not well characterized. The goal of this project is to understand the binding patterns of BG4, with the larger goal of understanding how G-quadruplexes can be stabilized or destabilized.

57 - Tate Neff

β -klotho in Glutamatergic Cells is Necessary for FGF21-mediated Weight Loss

Fibroblast growth factor 21 (FGF21) is an endocrine hormone that controls energy homeostasis. Critically, the metabolic effects of FGF21 on energy expenditure occur via action in the central nervous system. In silico reanalysis of data obtained from single cell RNA sequencing demonstrated that FGF21 co-receptors, FGFR1 and β -klotho (KLB), are both expressed on glutamatergic (Vglut2+) cells within the hypothalamus. Thus, we hypothesize that FGF21 signals to glutamatergic cells within the hypothalamus to control energy expenditure and body weight. To determine whether β -klotho is required in Vglut2+ expressing cells to mediate FGF21 action, we generated a mouse model lacking β -klotho in Vglut2-expressing cells (KLBVglut2-KO mice). Intriguingly, diet-induced obese (DIO) KLBVglut2-KO mice do not respond to FGF21 administration with an increase in energy expenditure or decrease in body weight suggesting that FGF21 signaling to glutamatergic cells is required for FGF21's effects. To determine whether overexpression of β -klotho can protect mice from DIO, we generated a mouse model which overexpresses β -klotho specifically in Vglut2-expressing cells (KLBVglut2-TG mice). Despite significant overexpression of β -klotho within the hypothalamus, KLBVglut2-TG mice exhibit significant increases in body weight after high fat diet consumption. These data suggest that signaling to glutamatergic cells is required for pharmacological, but not physiological, regulation of body weight by FGF21.

59 - Sarah Plock

The Role of Cognitive Control in Understanding Speech in Noise

Individuals with hearing impairment struggle to understand speech in noise. This is more than a matter of auditory ability; cognitive mechanisms are also crucial. When people hear a word, they implicitly consider multiple words that partially match the auditory input, creating competition. For example, when hearing "sandal", listeners consider "sandwich" and "candle". These words compete until the best matching

word remains. The ability to suppress competitors (e.g., “sandwich”) rapidly is crucial for speech in noise perception. However, it is unknown whether this suppression process is specific to speech or if it involves general-purpose processes for decision-making and inhibition (cognitive control). Work on the neuroscience of speech perception suggests that in noise, listeners engage a system involving frontal areas – the likely seat of cognitive control – but the function of this is unknown. We investigate the role of cognitive control when speech is heard in noise. We use a unique eye-tracking paradigm to measure how people suppress competitors over the course of milliseconds while they recognize words in quiet or noise. This is correlated with performance on nonlinguistic cognitive-control tasks. Results could lead to cognitive training to improve the ability to process speech in noise for individuals with hearing loss.

61 - Alexander Powers

Robust Automatic Multiple Landmark Detection in 3D MRI

Reliable detection of anatomical landmarks is an essential preprocessing step in many medical image analysis algorithms. Existing solutions for multiple landmark detection are generally slow, heuristic-based, algorithms that are susceptible to failure in the presence of missing data, like defacing and partial fields of view. Reinforcement learning (RL) offers a potential solution by modeling the landmark detection task as an iterative process, where a software agent moves through the image to locate a landmark, which allows the agent to learn both the trajectory and representation of the landmark of interest. We have expanded upon existing work in RL based single landmark detection to detect multiple landmarks simultaneously in a way that allows all agents to share what they learn with one another.

63 - Prateek Raikwar

A Novel Population of Pain-Suppressing Brainstem Neurons

Afferent pathways from the spinal cord to the brain for pain, itch, and temperature sensations have been the subject of substantial prior

investigation. Some afferent information, however, might be modulated by neural substrates in the brain through efferent pathways. We discovered a novel brain nucleus in the caudal ventrolateral pons named LJA5, identifying it as a potential substrate involved in the modulation of afferent sensory information. The LJA5 nucleus contains GABAergic, dynorphin-expressing neurons which project to the parabrachial nucleus, lamina I of the dorsal horn in the spinal cord, and the periaqueductal grey. These findings suggest LJA5 neurons suppress pain, itch, and thermal sensations. Thus, capsaicin-induced pain was assessed in mice upon exclusively stimulating LJA5 neurons. Compared to control groups, experimental mice experienced a significant decrease in capsaicin-induced pain sensation.

65 - Katlyn Rozovics

Passive Imperialists: Imperial Attitudes in Ryse: Son of Rome

This paper will evaluate the game, Ryse: Son of Rome and the various historical inaccuracies within the game by comparing it to historical accounts and examining common tropes and stereotypes.

Ryse follows the story of Marius, a Roman soldier who is on a quest for revenge. He takes part in subduing a revolt in Britannia and kills Britons and Picts in brutal fashion. The issue with Ryse is that it integrates players into a world full of falsehoods mixed with enough history to make it feel believable and never pauses to state that this is a world of fiction.

History needs to be treated with integrity no matter the medium. In the case of Ryse, this need to preserve historical integrity is even more important because the game deals with a conflict between colonized natives and the imperial Roman army.

Translations of primary sources like Caesar, Strabo, Tacitus and Dio have been used to build a sense of the Roman attitudes towards non-Romans. These Roman sources show true Roman attitudes towards the native people the empire clashed with, offering an insight to how the game in the modern era still managed to reflect these imperial biases.

67 - Clayton Saffran-Johnson

Campaign Finance Reform in the 21st Century

The Bipartisan Campaign Reform Act (BCRA) of 2002 was a landmark moment in campaign finance legislation for the United States. This act followed the Federal Election Campaign Act amendments of the late 1970's, and preceded the Citizens United case in 2010. The BCRA shaped changes in the way campaigns are funded, and shapes law and precedent regarding campaign financing to this day. An analysis of the causes and outcome of the BCRA is one that explains why campaign finance looks the way it does, and explains the current relationship between money and politics.

69 - Arshaq Saleem

The role of the mitochondrial microprotein Mitoregulin in Parkinson's Disease pathogenesis

Earlier last year, the Boudreau lab discovered the novel mitochondrial microprotein Mitoregulin. Mitoregulin seems to boost mitochondrial function by decreasing mitochondrial ROS and boosting its calcium buffering capacity. Since mitochondrial dysregulation is implicated in Parkinson's Disease, we set out to determine if Mitoregulin may be protective against Parkinson's disease, using a mouse alpha-synuclein disease model. Although the project is ongoing, initial results have indicated that Mitoregulin is not protective to striatum/substantia nigra dopaminergic neurons (that die in Parkinson's Disease), but rather destructive. We are still trying to figure out why and how this result occurred.

71 - Kimberly Schroeder

Correlating menstrual cycle-associated pulmonary changes with lung structure measures derived from quantitative CT

In inflammatory lung diseases, such as asthma, computed tomography (CT) imaging is valuable for quantitative disease evaluation. CT derived measures of lung density and airway structure are being used to sub-phenotype these complex diseases, and for longitudinal evaluation of disease progression or intervention response. Changes in lung function and lung disease symptoms can occur throughout a female's menstrual

cycle. It is vital we understand the variation in lung CT measures over this cyclic period to ensure women are studied with the same precision as men (without cyclic variations). To measure the potential airway bias within the cycle, 14 healthy women with no history of lung disease and regular menstrual cycles completed a CT scan and a pulmonary function test during two visits on days corresponding to menses and the early luteal phase. The CT lung segmentation and histogram analysis was performed using the Pulmonary Analysis Software Suite and the VIDA APOLLO program to quantify the airway features. Statistically significant biases include airway diameter and area of the lower left lung segmental airway, diameter of a sub-subsegmental upper left airway and the trachea's wall area. Based on the results, there are measurable changes in CT metrics during the female menstrual cycle.

73 - Brian Shanahan

Examples of Smart Cities in the US

The current urban sprawl of large cities across the world has led to poorer air quality and decreased environmental standards. It is essential to find a solution that improves air quality and life for all citizens. Specifically, the use of a two-mile diameter filtering dome over large cities serves as a proposition that could make our cities of the future smarter. For example, stadium developments in the United States have shown how to implement cutting edge construction. A popular commonality among stadiums today is the use of ethylene tetrafluoroethylene (ETFE), a fluorine-based plastic with high corrosion resistance, strength over a wide temperature range, and translucent light properties. The performance of ETFE has been tested and evaluated in many different climatic environments, proving its success as a roofing solution. A comprehensive analysis of air quality has proved to be the most influential issue in improving cities. Concepts have been designed to include air filtering towers in cities, but none of which are effective enough to cover an entire city. The future will depend on developing a centralized scrubber tower underneath an ETFE geodesic dome that safeguards the cities.

75 - Hannah Shrader

Dissecting the immunological link between intraoperative bacterial contamination and peritoneal metastasis of pancreatic ductal adenocarcinoma

Background: Pancreatic ductal adenocarcinoma (PDA) is one of the deadliest cancers. Currently, surgery is the only curative treatment option. However, spillage of bile contaminated with normal gut flora into the peritoneal cavity is often unavoidable during surgery. Conflicting data exists in the literature regarding the impact of infection on cancer recurrence. We aim to evaluate the effect of the bacterial content derived from PDA patients' bile samples on pancreatic cancer cell growth.

Methods: Pancreatic cancer cells were cultured at 37°C for 24 hours with 3 sets of culture media spiked in with 1) different patient-derived bile samples, 2) sterile bile contaminated with different bacteria isolated from patient-derived bile samples, or 3) media contaminated with different bacterial isolates. Cell viability was determined using carboxyfluorescein succinimidyl ester (CFSE) and CellTiter-Blue stains.

Results: We found that all patient-derived bile samples significantly decreased cancer cell viability, but the bacterial content alone did not have any effect. Interestingly, bacterial content could modify the ability of sterile bile to kill cancer cells.

Conclusions: Spillage of bile during surgery may not have negative impact on cancer recurrence. The underlying mechanisms as to how bile kills cancer cells and how bacteria modify bile content are under investigation.

77 - Zachary Silver

Russian Intervention: An Analysis

This project will be an analysis of why Russia involves itself militarily in other countries' internal affairs, and how this information can be used to predict future intervention by Russia. The key focuses will be Russian minority populations in other states and states suffering from internal conflict. Each focus will be analyzed by looking at a pair of cases that match the criteria but only in one of which did Russia choose to militarily

intervene. The hypothesis of this paper is that Russia chooses to intervene in other countries only when it can maintain international legitimacy.

79 - Abigail Simon

Sensitivity to fine-grained phonetic variation in children who use cochlear implants

A critical issue in speech perception is how listeners identify sound categories from a variable acoustic signal. Classic work used speech continua in which sounds are morphed in small increments between two categories (e.g., a /b/ gradually morphing into a /p/). This work has generally assumed that listeners' goal is a sharp boundary or transition between categories. More recent work in our lab suggests that adults with normal hearing encode fine-grained acoustic differences. Intriguingly, post-lingually deafened adult CI users also preserve gradiency to deal with acoustic uncertainty. In the current study, we wanted to learn how congenitally deaf children who use CIs identify speech categories. We tested 17 adolescents who use CIs and 31 age-matched NH controls between the ages of 11-18. Participants were presented with a spoken word from a speech continuum (e.g., /b/ to /p/) and selected its pictured referent. We analyzed responses to differences using eye movements to implicitly measure how strongly each interpretation was considered. The aims of this project were to gain a better understanding of how children with CIs process speech signals and how patterns of speech perception development differ for NH and CI listeners.

81 - Hannah Slowey

Effects of E-Cigarette Exposure on Viability and Proliferation of Placental Cells

Background: Electronic cigarettes (e-cigarettes) are used by millions of US people, including pregnant women. However, health effects of e-cigarettes use during pregnancy on the mothers and fetuses are unclear. E-cigarettes containing nicotine and flavoring chemicals are potentially

harmful to the fetal lung and cardiovascular system. Their effect on the placenta has not been well studied. We sought to design a method to produce e-cigarette cell culture media and to test the effects on this media on the HTR8Sv/neo placental cell line.

Methods: To generate the e-cigarette media, a vacuum was applied to a flask containing complete cell culture media connected to an e-cigarette device. The vapor from the e-cigarette was bubbled through the cell culture media that was being stirred. Cells were plated (1 x 10⁶ cells/10cm dish) in duplicate. Cells were treated with either 0%, 0.5% or 4.5% of the e-cigarette media for 24 hours and 48 hours. Cells were counted at each time point. Duplicates were averaged at each time point (N=3). Cell pellets and media were harvested to use for protein analysis.

83 - Francesca Spencer

Probing the nuclear aggregate proteome using Xenopus oocytes

There are devastating diseases, like Alzheimer's, Huntington's and Parkinson's disease whose pathology relates to proteins forming insoluble aggregates. However, it is increasingly clear that protein aggregation is an essential feature of many cellular activities. For example, the different non-membrane-bound organelles within the nucleus that are responsible for RNA synthesis and processing are formed by aggregations of specific proteins. Unlike the toxic disease aggregates, normal cells are constantly building and dissolving these protein aggregates. Aggregates can assume the properties of liquid droplets, gels or fibers. We've generated a list of the proteins present in Xenopus oocyte nuclei that are candidates for aggregate formation. To initiate studies on aggregation of specific proteins, we have generated fusions with fluorescent proteins in plasmids that enable production of mRNA that can be injected into oocytes to examine the protein behavior in vivo. Here we present studies concentrating on proteins involved in ribosome biogenesis. Our hypothesis is that these proteins will selectively co-aggregate to as part of the regulatory control assisted by dynamic non-toxic protein aggregation.

85 - Michael Steffen

Offensive to the Majority: The Formation, Activism, and Survival of the University of Iowa Gay Liberation Front

The formation of the Gay Liberation Front in Iowa City in 1970 was a watershed moment for the gay liberation movement, both nationally - as the first gay organization to be officially recognized as a student group by a state university - and locally, as a militant force within the Iowa City community. Using local newspaper articles, correspondence between the GLF, the UI, and the Iowa City community, oral histories, photographs, and promotional material created by the GLF, this thesis explores how the GLF navigated its relationships with the University of Iowa, outside community members, and other LGBT+ and minority groups. Using sources that have never before been systemically analyzed, this thesis not only argues that the GLF successfully reinvented itself and created its own safe spaces and programs for queer people, but that this continual reinvention was necessary for the organization to survive in a community that actively discriminated against it.

87 - Mary Wille

Primary Progressive Apraxia of Speech: A Systematic Review

Primary progressive apraxia of speech (PPAOS) is an isolated, progressive motor speech disorder that affects an individual's spoken communication. This rare disease is relatively new to the research literature and is unfamiliar to many speech-language pathologists. Therefore, a systematic review of this topic will gather important information in an organized, summarized manner and make diagnosing the disorder more approachable to practicing clinicians. We searched six databases including PubMed, CINAHL, PsycINFO, Scopus, Web of Science and Proquest to allow for a thorough account of diagnostic criteria of PPAOS in the literature. This summary of current diagnostic practices will assist speech-language pathologists in working with individuals with PPAOS. This project will affect speech language pathologists clinical work as well as individuals diagnosed with PPAOS, and their loved ones, gaining an overall understanding of the disorder.

89 - Charlie Wolfe

Major: Computer Science and Engineering

Mentor: Zubair Shafiq (Computer Science)

Khaleesi: Breaking The Advertising & Tracking Redirect Chains

Software used to block online advertisements is implemented using manually curated regular expression lists which in turn causes it to be easily evaded and have many unused filters. Previously, researchers have proposed using machine learning in place of these lists to solve these issues. Our proposed approach focuses on blocking chains of HTTP redirects by leveraging the sequential data gained from redirection as opposed to web requests that are not involved in redirection.

91 - Seunghye Yang

Rule and Exception Learning in Pigeon Categorization

Pigeons can categorize information just as humans do - they create a simple rule to categorize regular items and memorize exceptional items. But not all exceptions are created equal. It seems that, in humans, different types of exceptions (oddball exceptions, totally different from the category members, and crossover exceptions, that share most features with members of an opposite category) may be learned and remembered differently (Savic & Sloutsky, 2019). But it is not known if this is true for pigeons as well. Here, pigeons were trained to discriminate two categories. Categories consisted of regular items and one exception item, that could be an oddball item or a crossover item. Results showed that there was a learning advantage for the categories containing the oddball item. It seems that confusability of the crossover items, rather than distinctiveness of the oddball items, may be the reason for that advantage.

93 - Jia Zhao

Using Dual-Luciferase Assay to Validate the Targets of a Transcription Factor Regulating Stress Response

RNA-seq comparing a wildtype and a transcription factor (TF) deletion strain is widely used to identify the targets of that TF. Combining it with Chromatin IP (ChIP) allows one to further distinguish between direct and indirect targets of the TF. However, even combining these two methods is still insufficient to rule out false positives, because TF binding to a promoter may not be causally linked to the associated gene being induced. Promoter bashing, where one mutationally removes the known motif(s) of the TF and assess the induction of the gene adds further evidence for the TF-target relationship. In the commensal yeast *C. glabrata*, we have previously identified an expansion of the putative targets of the Phosphate Starvation (PHO) response TF, CgPho4, compared with its ortholog in the baker's yeast *S. cerevisiae*. We also predicted that the additional targets of CgPho4 extend the function of the PHO response beyond phosphate homeostasis and may play a role in the commensal yeast adapting to the host stresses. Identifying direct targets is necessary to investigate the interactions of the PHO response and other biological processes. We adapted a dual-luciferase reporter assay to accomplish this goal and explored various factors affecting the performance of the assay

95 - Bennett Zuck

Position Sense and the Control of a Handheld-Tool

To use a tool, such as hitting an oncoming ball with a tennis racquet, the central nervous system must know the exact location and morphology of the tool. However, during tool use, visual attention is frequently directed elsewhere (e.g. watching the ball, not the racquet whilst playing tennis). Without vision, this information must be derived from somatosensation. We investigated the role of proprioception under active and passive conditions in the control of a hand-held rod-shaped tool. Participants held the rod in their left hand and reached to touch the end and the middle of the rod using their right index-tip in separate conditions. Participants made reaches to a stationary or moving rod with and without vision, with the experimenter inducing movement of the target limb, with the subject controlling target limb movement. Subject-induced movement of the target limb resulted in lower errors than experimenter induced movement ($\sim 1\text{cm}$) in all 3 subjects ($P_{\text{max}} < 0.001$). Reaches to the

middle of the rod were more accurate than reaches to the end in all subjects ($P_{max}=0.01$). Two of three subjects had smaller errors when reaching to rod while moving than to a stationary rod (~1cm smaller). These results provide support for the embodiment hypothesis and suggests localization errors are lower when the subject actively moves the tool, perhaps due to higher sensitivity of muscle spindles during active movement.

97 – Allison Kusik

Major: Geoscience

Mentor: David Peate (Earth and Environmental Sciences)

Geochemistry and Petrology of the Osborne Core (North East Iowa Intrusive Complex)

The Northeast Iowa Intrusive Complex (NEIIC) is a 16,000 km² mafic complex buried about one kilometer beneath the surface of northeast Iowa that has been revealed through aeromagnetic surveys. The age of the complex is of key interest due to its potential relationship to the Keweenawan (~1.1 Ga) Midcontinent Rift System (MRS). Many MRS-related intrusions host economically significant copper-nickel sulfide and platinum group element (PGE) deposits. The only samples available are from the Osborne core, drilled in 1963 into a dike extending northeast from the complex. Petrographic study of this 225 m core has revealed a layered structure with a ~110 m thick olivine-rich outer margin and an abrupt transition into a troctolite (plagioclase-olivine) unit. Both units contain abundant FeTi-oxides. Several coarser-grained feldspar+apatite-rich layers were found in the lower part of the core. Importantly for geochronology, it also contains trace baddeleyite and zirconolite and work is ongoing to date these phases. Our preliminary observations suggest that the Osborne core material represents the in-situ crystallization of a single magma batch within a dike-like structure. This model will be evaluated using whole-rock elemental analysis by ICP-MS and mineral composition data (olivine, plagioclase, FeTi-oxides, apatite) by electron microprobe on a representative sample suite.

5:30-6:30 Presenter Abstracts

2 - Sameer Ansari

Clinical and Imaging Features of Contrast Induced Neurotoxicity

Contrast Induced Neurotoxicity (CIN) is an uncommon complication from iodinated contrast exposure. CIN diagnosis is challenging due to its varied clinical manifestations. We describe the clinical and imaging characteristics of patients diagnosed with CIN in order to help identify and manage similar patients.

4 - Gwen Barnes

A Bayesian Age-Depth Model for the Silurian Altajme Core, Gotland, Sweden

Age-depth models play a pivotal role in investigating environmental changes throughout Earth history as a way to provide rates of change in stratigraphic data. There are two approaches in creating an age-depth model: "classical" and Bayesian approaches. Classical models often result in constant sedimentation rates between dated levels. Furthermore, classical methods often erroneously assume extremely small age uncertainties between dated levels. Over the past decade, a Bayesian-Markov Chain Monte Carlo (Bayesian-MCMC) modeling approach has become prevalent. Taking a Bayesian-MCMC approach to age-depth modeling addresses these issues. Bayesian-MCMC models help capture the variations in sedimentation rates and provide more realistic uncertainty estimates in accumulation rates between dated levels in a given stratigraphic section.

Here, we apply these methods to the Silurian succession preserved in the recently drilled Altajme Core from Gotland, Sweden. The presence of more than 20 bentonites preserved in the core, including three of which have been previously dated using high-precision CA-ID-TIMS U-Pb from zircons from Gotland outcrops, provide an ideal opportunity to develop a Bayesian-MCMC age-depth model for this core. Such a refined age-depth model will allow for the first statistically supported demonstration

of the duration of two major biogeochemical events that took place during the Wenlock Epoch.

6 - Lakyn Belk; Matthew Culver

Actin capping protein Carmil3 is required for the migration of endodermal cells and KV formation

CARMILs are large multidomain proteins that regulate the actin-binding activity of capping protein, which is critical for actin assembly necessary for cell shape and movement during development. To investigate the functions of vertebrate CARMILs, three genes (carmil1, 2, 3) are identified in zebrafish. They display distinct spatial and temporal expression patterns during development. Particularly, carmil3 is expressed ubiquitously, with higher levels in nascent CNS, intestine and heart. Zebrafish lines carrying mutations of carmil3 that produce early stop codons are generated. We found maternal-zygotic zebrafish carmil3 mutants display multiple defects: the migration of endodermal cells and dorsal forerunner cells (DFCs) is impaired, and DFCs fail to form a tight cluster, instead of splitting into multiple small cluster. As DFCs generate the KV, the laterality organ in zebrafish, consistently, we also found that in the mutants, KV is small and disorganized, and the number of cilia within the KV is reduced, which might contribute to the observed defects of cardiac left/right asymmetry. These data indicate that Carmil3 is required for proper migration of endodermal and dorsal forerunner cells (probably by regulating the actin dynamics). Thus, our findings provide more evidence for the important role of actin regulation in morphogenesis during vertebrate development.

10 - Ethan Bennett

Curve fitting of the decay phase of postsynaptic currents of mammalian neurons

Communication between neurons occurs at synapses. When an information-sending neuron is stimulated, the communication is detected as the electric current flowing through an information-receiving neuron (evoked postsynaptic current, evPSC). The decay phase of evPSC

is important, because it determines overall signal durations, and reveals molecular properties that give rise to evPSC. For characterizing the decay phase, it is customary to fit a function and extract the fitting parameters. However, multiple functions have been reported, and their advantages and disadvantages have not been compared systematically. Here, we evaluated three commonly used functions, and applied them to both excitatory and inhibitory evPSC types. Alpha and polynomial functions have the advantage that they can fit the entire evPSC timecourse, whereas an exponential function can only fit the decay phase. For fitting the decay phase, a double-exponential function performed better than alpha or polynomial functions, and could be extrapolated beyond the fitting duration more accurately. Fitting error among exponential functions were in the order of single > double > triple. Although functions with more parameters generally lead to better fitting, they suffer more from being trapped in local minima, especially with inappropriate initial values of fitting parameters. Optimal and practical fitting methods are discussed.

12 - Bailey Bergman

Phytoplankton Composition of Caloosahatchee River and Estuary and the Gulf of Mexico

The purpose of this project is to explore the phytoplankton community composition differences along the Caloosahatchee River and Estuary and in the Gulf of Mexico over several dates before, during, and after discharge from Lake O. We collected water samples from thirteen sites that include seven in the river/estuary itself and six in the nearshore environment adjacent to the estuary. Salinity, temperature, DO, depth, and chlorophyll-a were also be collected at each site. Discrete water samples were collected for analyses of nutrient concentrations. Phytoplankton composition and abundance were measured using (Flowcam 10-100um) and epifluorescence microscopy was used for picoplankton (<10 um). We expect the dominant phytoplankton identified in Flowcam to change in response to changes in salinity and other environmental factors. Positive correlations between chlorophyll a, total particles and the dominant phytoplankton are expected in the samples. As a result of this study, we hope to see if there is a link

between discharge from Lake O and harmful algae bloom in the estuary and gulf. Understanding phytoplankton populations before, during and after harmful algal blooms will improve the prediction of bloom events in the future.

14 - Ellie Biebesheimer

Paired organic and carbonate carbon isotope chemostratigraphy of the Mulde Excursion from the Altajme Core, Gotland, Sweden

The Mulde Event is an extinction event that occurred during the Wenlock Epoch of the Silurian Period. It is also coincident with a perturbation in the global carbon cycle known as the Mulde positive carbon isotope excursion, which is recorded in the rock record by a two-peaked positive isotope excursion. Previous low-resolution studies have indicated that the onset and end of the Mulde Excursion are not precisely synchronous between carbonate and organic carbon. The purpose of this study is to evaluate the synchronicity between carbonate and organic carbon records of the Mulde Excursion at extremely high resolution.

To test this synchronicity, a core (Altajme) was drilled from the Swedish island of Gotland that contains more than 180 meters of Homerian strata. Over 300 samples were taken for organic carbon isotope analysis for this project and compared with greater than 500 carbonate carbon samples from the same core. This provided the ability to demonstrate small scale variations in the onset and end of the Mulde positive carbon isotope excursion at the highest resolution ever produced for this interval. What was demonstrated is that there is indeed a small offset in the onset of the excursion in the carbonate versus organic carbon isotope records, indicating they are not precisely synchronous. The $\Delta^{13}\text{C}$ record also demonstrates a series of transitions during the first peak of the Mulde Excursion.

16 - Daniel Conway

Structural Predictions of Escherichia Coli Outer Membrane Proteins Using Evolutionary Contact Information

As the cost of high-throughput sequencing has declined, the number of organisms with completely sequenced genomes has risen. The

information contained in these genomes affords a remarkable opportunity to extend our knowledge of protein structure and function. Unfortunately, the number of experimentally-solved structures lags far behind available sequencing data. By avoiding the technical challenges inherent in experimental methods, computational 3D structure prediction may help to close this gap. While large numbers of structures can be predicted rapidly, their accuracy depends on their ability to model interactions within a protein. Not only must accurate predictions respect general rules governing interactions between residues, they must also reflect information known about a protein's environment and function. This information is especially important in the case of B-barrel proteins, membrane-spanning proteins whose geometric organization is crucial to their function. Here, I describe attempts to build plausible models of β -barrel proteins whose structures have not been determined experimentally. I detail strategies using ROSETTA, a leading structural prediction package, and MapPred, a contact prediction tool using evolutionary information and machine learning. I also explore predictions prioritizing geometric organization using another software package, 3D-BMPP. Preliminary results suggest that supplementing ROSETTA with evolutionary information may be a viable strategy.

18 - Nathan Cremers

Designing a Modular Driver for Use in Optogenetic Studies

Learning a new category involves differentiating between stimulus features that are typical of a category (i.e., category-relevant dimensions; snout of a dog or webbed toes of a frog) and features that are not exclusive to one category (i.e., category-irrelevant dimensions; both cats and dogs have four legs). Then, attention should be shifted towards the category-relevant dimensions. Many models of human category learning posit that prefrontal cortex (PFC) is important in shifting attention towards category-relevant dimensions. Previous research from our lab found that lesioning PFC impaired accuracy and reaction time during a category learning task; this impairment in reaction time was specific to a single phase of the trial sequence. To further examine this effect, we plan to inactivate PFC activity during specific phases of each training trial using an optogenetic approach. Therefore, the purpose of this project

was to design an adaptable, modular driver that could be used in a variety of optogenetic experiments. Using Autodesk Inventor software, we designed a 3D-printable driver capable of holding up to four FLED (fiber-mounted LEDs) optic fibers and 8 recording tetrodes. This driver offers a lightweight, customizable design applicable to a variety of experimental designs.

20 - Megan Crotts

A ketogenic diet increases latency to seizure-induced respiratory arrest in the DBA/1 mouse

A ketogenic diet (KD) is a high-fat, low carbohydrate dietary therapy that was recently shown to decrease the incidence of seizure-induced death without reducing seizures in a Dravet Syndrome mouse model. This suggests that treatment with a KD may stabilize factors contributing to mortality such as S-IRA. Here we use DBA/1 mice, which have audiogenic seizures, to study the effect of a KD on S-IRA. DBA/1 mice were primed to seize in response to a sound and rescued with a mini-ventilator if S-IRA occurred. Successfully primed mice were randomly placed on a control diet or KD for one week, after which the latency to seizure was determined by exposure to a loud sound for 60 seconds. Mice were then crossed over to the other diet for another week, and the latency to seize was tested again. DBA/1 mice fed a KD ($n=25$) had a significant delay in onset of S-IRA compared to mice on a control diet ($n=26$; $p=.0001$). Three mice in the KD group had no S-IRA throughout 60 seconds of sound exposure. The KD was protective with exposure in either order, with the latency to S-IRA increased in the KD group for the Control to KD crossover ($n=6$) and the KD to Control crossover ($n=6$), ($p=.0313$, $p=.0313$). There was no significant difference in seizure latency between sexes on either diet ($p=0.61$). Treatment with a KD delayed the onset of S-IRA in DBA/1 mice. Further studies looking at the effects of the KD on respiratory physiology will be necessary to understand the protective mechanisms.

22 - Harry Daley-Young

The Fall of Penn Central and the Rise of Conrail: Corporate Failure and the Politics of Deregulation and Nationalization in the 1970s

This essay argues that the Penn Central merger was an ill-conceived idea that was doomed by larger economic factors, poor management, and outdated practices and regulations. Penn Central's failure forced the government to step in to preserve the vital pieces of infrastructure contained within Penn Central. The government decided that nationalization, in the form of Conrail, was the best route to take because Penn Central could not be reorganized under bankruptcy protection. Conrail's management, helped by railroad deregulation in the form of the Railroad Revitalization and Regulatory Reform Act and the Staggers Act, led the company to profitability and enabled its privatization. It ultimately helped to preserve railroads in the northeast United States. The story of Penn Central and Conrail serves as a case study in the process of American industrial decline, the transition from New Deal Keynesianism to Reaganite neoliberalism, deregulation and the changed relationship between government and business that accompanied it.

24 - Clarissa Dietz

Investigation of Radiative Transfer Model's Application to VIIRS DNB Images

Much more is known about daytime cloud patterns than nighttime ones. I examined Weinman et al's radiative transfer model for visible light through liquid water clouds, in order to determine the feasibility of using the model and images from the VIIRS DNB to determine nighttime cloud properties such as height, thickness, and average droplet size. Underdetermination of these properties within the model yielded a null result.

26 - Lauren Davis

Changes in Vasopressin Receptor Expression in Hypertensive Pregnancies

Arginine vasopressin (AVP) is a hormone that functions to regulate blood pressure and bodily fluid homeostasis. Vasopressin has three main

receptors AVPR1a, AVPR1b, and AVPR2 which were investigated in this project as well as with OXTR, LNPEP, and CUL5. We have investigated whether the expression of vasopressin receptors in maternal blood is different within groups (control, preeclamptic and hypertensive mothers) between trimesters and within trimesters between groups. The expression of vasopressin receptors in whole placenta tissue was also investigated in mothers with chronic hypertension and preeclampsia. The maternal blood (N=50) and the whole placenta tissue (N=48) were obtained from the Maternal Fetal Tissue Bank (IRB# 200910784). RNA was purified from the cells and used for real-time quantitative PCR to assess variation in receptor expression. Significant differences were measured when comparing receptor expression in preeclamptic and hypertensive mothers to normotensive mothers in the 2nd and 3rd trimesters. Significant changes in receptor expression also occurred between trimesters. However, no significant differences in receptor expression were observed in whole placenta tissue. The differences in gene expression in cord blood may be related to the future risk of hypertension later in life for children born to women with hypertensive diseases in pregnancy.

28 - Alessandra Dutra

Metal Organic Material Comparison: Uranium and Cadmium Based Syntheses

Following the synthesis of a water-selective uranium nanotube, our group has attempted to elucidate further information regarding the selectivity through comparison of structures formed using different metals. The current study focuses on determining suitable alternatives of the uranyl cation (UO_2^{2+}) for nanotube formation. The common oxidation state of +2 in both uranium and cadmium led to the hypothesis that cadmium could be substituted as the metal center in the nanotube. To synthesize the crystal, cadmium nitrate tetrahydrate ($Cd(NO_3)_2 \cdot 4H_2O$), piperazine ($C_4H_{10}N_2$), and iminodiacetic acid ($C_4H_7NO_4$) were pipetted into a 20 mL scintillation vial and layered with methanol (CH_3OH). After about 3 weeks, a solid had formed at the bottom and a single crystal was separated to run single crystal X-Ray Diffraction (scXRD) to determine the

unit cell, space group, and crystal system. The structure was then visualized using Crystal Maker.

30 - Samuel Eck

The Emma Goldman Clinic: From Collectivism to Corporatism

In 1973 after the passing of Roe V Wade, The Emma Goldman Clinic opened its doors to the community of Iowa City. The clinic offered a variety of reproductive health services to women of all races, classes, and sexualities. Through its organizational structure, the clinic identified as a feminist collective. This meant that the clinic was controlled and operated entirely by women and that all decisions were made by consensus. This structure reflected the radical politics of Iowa City during the 1970s. During which socialist, anarchist, queer, and feminist movements all attempted to achieve social justice through direct actions. Multiple restructurings of the clinic occurred down the road. With each restructuring, the clinic became more hierarchical and specialized. These restructurings illustrate a move away from the radical beliefs of which the clinic was birthed in. They also indicate a change in the support for radical ideas in Iowa City which over time has seen less direct actions.

32 - Madysen Gilbert

Nutrient Analyses of the Caloosahatchee River and Estuary of Southwest Florida

Red tide is an algal bloom of the dinoflagellate *Karenia brevis* which produces a paralyzing neurotoxin that prevents respiration in marine life leaving an overwhelming amount of dead wildlife on the shores, threatens already impaired waters, and causes negative human health effects. It is hypothesized that red tide is exacerbated by a supply of excess nutrients in coastal water and Lake Okeechobee is thought to drive blooms with nutrients from freshwater discharges. In order to investigate the cause of red tide, we examined the relationship between nutrient concentrations and freshwater flows from Lake Okeechobee by comparing nutrient concentrations in the Caloosahatchee River and Gulf of Mexico before, during, and after freshwater releases to determine

specific indicators in water conditions. Samples were filtered onsite and analyzed using a continuous segmented flow analyzer to determine the nutrient concentrations for nitrite, nitrate, ammonium, phosphate, and silicate. The amount of dissolved nutrients will be compared to physical and biological factors including temperature, salinity, flow, and chlorophyll in order to determine specific relationships between nutrient levels and other existing features of the water. These data will provide insight into the changes in nutrient concentrations during red tide and allow for an understanding of harmful algal blooms and why there has been an increase in frequency and severity.

34 - Jacob Heffelfing

In Vitro Metabolism and Enantioselective Enrichment of the Safener Benoxacor

Safeners have become important agricultural crop protection products since the 1940's. Safeners are chemicals listed as inert compounds but still have bioactivity. Due to the widespread use and limited knowledge, this study aims to understand the metabolism of the safener benoxacor as it inevitably enters our water sources. Benoxacor has been shown to be metabolized by microsomal cytochrome p450 enzymes. This metabolization is enantioselectively done by enzymes within liver microsomes. Continued research will help to determine the metabolites of benoxacor and discover the toxicity effects of benoxacor and its metabolites.

36 - Benjamin Howard

A detrital zircon provenance study of the Marnoso-arenacea Formation, Northern Apennines, Italy.

In Italy, there are many important geologic features that have been the basis for geology fundamentals. The most studied geologic feature in the world, the place where turbidity flows were first described and defined. This is where our story begins. There have been countless studies done on the Apennines in Northern Italy. But no major provenance work on the Marnoso-arenacea Formation (MAF). Our current work will be the

forefront of major provenance data produced from the major Mediterranean country. The mass transport complexes that will be presented are the first steps in a complete provenance study of the major Italian Formation. Furthermore, with future work including heavy mineral analysis sand stone petrography, the data already collected and the data that will be collected, will tell a more detailed story about the rocks in the cradle of western civilization.

38 - Elizabeth Janey

Swimming in 16p11 mice

This study addresses the swimming behavior of 16p11.2 del (16p11) mice during early postnatal ages to determine whether there is a deficit in their swimming ability during development when compared to normal wild-type (WT) mice. These mice have a deletion within chromosome 7, which models the deletions on chromosome 16 found in 1% of humans with autism spectrum disorder (ASD). Previous studies have described sensorimotor abnormalities in people with ASD. We have established this comparison using a computer learning program which allows us to quantify the limb movement patterns from recorded videos of swim behavior. Our current data shows that the development of synchronized swimming movements in 16p11 mice lags behind that of WT mice. This points to 16p11 mice swimming less effectively and with less synchronized or normal swimming limb movements at early ages than WT mice.

40 - Renato Jensen; Joshua Peterson

DRP1 Deficiency in Skeletal Muscle Alters Gene Expression of Mitochondrial-endoplasmic Reticulum Contact- and Misfolded Protein Response-related Proteins

Mitochondria, the powerhouses of cells, undergo a dynamic process of fusion and fragmentation depending on cellular metabolic demands. Notably, the skeletal muscle of type 2 diabetic patients exhibits mitochondrial dysfunction associated with increased mitochondrial fragmentation. Dynamin-related protein 1 (DRP1) is responsible for

mitochondrial membrane constriction during mitochondrial division, whereas mitochondrial-endoplasmic reticulum contacts (MERCs) mark mitochondrial sites where this division process occurs. Here, we have shown that mice with skeletal muscle-specific DRP1 deficiency are in part protected from obesity and diabetes induced by a high fat diet. We also found that skeletal muscle-specific DRP1 deficiency in mice fed normal chow is associated with altered expression of genes associated with MERCs and increased expression of genes linked to the misfolded or unfolded protein response (UPR), including greatly augmented FGF21 expression. In conclusion, our study suggests that molecules secreted by skeletal muscle during the UPR, such as FGF21, might help explain the metabolic benefit of DRP1 deficiency. Additionally, altered MERCs could potentially change calcium signaling between mitochondria and the endoplasmic reticulum, which could in turn modify insulin sensitivity in skeletal muscle DRP1 deficient mice. As such, reduction of mitochondrial fragmentation in diabetics could potentially be of therapeutic value.

42 - Lillian Jones

Tracking atmospheric pollen during extreme weather events

Exposure to atmospheric pollen causes seasonal health disorders in more than 24 million Americans. While whole pollen grains ranging 15-100 microns affect the upper respiratory system, sub-micron pollen fragments released during thunderstorms can penetrate deeper into the lung. Two field campaigns were conducted during spring and summer pollen seasons in Iowa in 2019 to determine the meteorological conditions that correlate with tree pollen concentrations in ambient aerosols, infer which conditions cause pollen bursting events, and identify pollen species present during these events. Ambient levels of intact pollen declined sharply with any amount of precipitation, with the decrease proportional to the volume of precipitation. These observations suggest that pollen bursting events follow the onset of rain and that the reduction in intact pollen concentration is correlated with an increase in fragments. The most prevalent pollen genera were found to be mulberry, birch, walnut, and oak. Mulberry and birch pollen concentrations declined the most under precipitation, which suggests that these genera are more susceptible to rupturing than others. Future work will include two

additional field campaigns. With a better understanding of the conditions that cause elevated levels of pollen fragments in the atmosphere, the negative health impacts associated with pollen fragments can be reduced.

44 - Benjamin Kimball

Severus of Antioch and the Anti-Chalcedonian Movement

This paper examines the life and ideas of Severus of Antioch, who redefined the Anti-Chalcedonian movement in theology and its role in politics. The Anti-Chalcedonians emerged in the midst of the Council of Chalcedon (451), considered a watershed moment in the history of the late Roman Church. The Council declared Christ to be one person with two natures, after which supporters and opponents struggled over of the Council on "Orthodoxy." Anti-Chalcedonians believed that the Council had rejected not only heretical ideas, but important aspects of Orthodoxy. Severus of Antioch, eventually became the leading theologian of the Anti-Chalcedonian movement, by influencing the Emperor Anastasius, and through his prodigious body of work. His works helped to redefine the Anti-Chalcedonian movement, providing it with a new and stronger theological base. Through his concept of the hypostatic union. Which held that even though Christ was of one Nature, that nature was a result of the blending of Christ's humanity and divinity into one. The Influence of Severus's theology was such that even long after his death, his work still had committed opponents. This paper places Severus in the context of the late Roman world by using Severus's own writings, and various other contemporary sources.

46 - Dariya Kozlova

Changes in Insulin Clearance in PCOS are Driven by Insulin Sensitivity

Polycystic ovary syndrome (PCOS) affects 6-15% of US women and is characterized by insulin resistance, hyperinsulinemia and increased type 2 diabetes risk. The metabolic clearance rate of insulin (MCRI) impacts insulin concentrations and varies with race/ethnicity and obesity, yet is understudied in PCOS. We compared MCRI in girls with PCOS vs. controls and determined significant predictors of insulin clearance. Fasting insulin,

c-peptide, glucose, sex hormone binding globulin (SHBG) and total testosterone were collected fasting and during an oral glucose tolerance test (OGTT) in obese/overweight (OB/OV) PCOS, non-obese PCOS, OB/OV control, and non-obese control girls 12-19 years of age. MCRI was calculated by: (i) fasting c-peptide/insulin, (ii) c-peptide iAUC/insulin iAUC (first 30 minutes of an OGTT). Insulin sensitivity was calculated by HOMA-IR and the Matsuda index, and insulin secretion via HOMA-%B. Linear regression and stepwise selection were used to assess correlates of MCRI. OB/OV participants had significantly lower insulin clearance than lean participants, regardless of PCOS status. In the fasting state, higher insulin secretion was a significant predictor of lower insulin clearance. During an OGTT, higher insulin sensitivity was a significant predictor of increased insulin clearance. MCRI should be considered in future studies that utilize insulin concentrations as an outcome.

48 - Emily Lefeber

Nothing Comes to Her Who Sits and Waits

Rather than viewing the Nineteenth Amendment as an endpoint of the woman suffrage movement, this amendment should instead be viewed as a stop along the way. No one piece of legislation guaranteed all women the right to vote, nor did the Nineteenth Amendment grant women equal citizenship status with men. Founded in 1919, the League of Women Voters of Iowa became the successor of the Iowa Equal Suffrage Association, carrying on a legacy of activism and resistance to gender-based discrimination. While woman suffrage had been conquered for white women, other limitations for women continued to exist. The League of Women Voters of Iowa continued to fight for gender equality, capitalizing on the existing organization structures left behind by the Iowa Equal Suffrage Association. During their first two decades, the League of Women Voters of Iowa focused primarily on women-specific legislation and reform in addition to citizen education initiatives. This paper utilizes archival sources to argue that the League of Women Voters of Iowa's activity demonstrates the continuation of the women's movement post-Nineteenth Amendment when women continued to define and redefine citizenship during a period thought of as silent for the women's movement.

50 - Tianyi Li

Analysis of Metal in Airborne Particulate Matter in Winter Kathmandu, Nepal

Particulate matter (PM) is a major component of air pollution that can lead to various health problems when inhaled, especially respiratory and cardiovascular diseases. Metals in airborne PM can be hazardous, causing brain damage (Pb, Hg), or increasing the risk of cancer (As, Cr). Air pollution can be reduced by investigating and regulating its sources. The objectives of our research are to identify and quantify sources of PM during winter in Kathmandu, Nepal in January 2018 by measurement of metals. Although PM mass exceeded the World Health Organization guidelines on every day of this study, toxic metals such as lead, vanadium, manganese, and arsenic were below these guidelines. Sources of metals were identified as resuspended dust, fossil fuel combustions, industrial emissions and garbage burning. On average, metal oxides accounted for 34% of PM mass in particles less than 10 micrometers and 11% for particles less than 2.5 micrometers. For the first time, two tracers of garbage burning, 1,3,5-triphenylbenzene and antimony, were measured in the same ambient PM samples, and their moderate correlation supports that they were from the same source. This research will further identify the major sources of PM and can contribute to developing strategies to reduce air pollution.

52 - Cole Lotspeich

The Klan in the 1920s: Correlates of Membership in Champaign County, IL

Political observers have drawn comparisons between recent events and the second rise of the Ku Klux Klan during the 1920s. Using a rare surviving list from the Champaign County klavern, we are able to identify members in the Klan. Using census data, we statistically evaluate the importance of various social and economic factors on the likelihood of Klan membership.

54 - Benjamin Louviere

Beer & Spirit

My research argues that the famed beer brewed by the Trappist order of Catholic monks today is a reflection of two abundantly rich traditions: brewing and monasticism. Initial examination of these two traditions finds their linkage a conceptual paradox, and my essay proposes that their reconciliation lies in the uniquely spiritual ambition underlying the labor practices of these brewing monks. Benedictine thought, and the elaboration of monastic theology, is the force which has historically imbued practical meaning in the lives of a sizable demographic – that is, the men and women of prayer who have taken the monastic vocation; and, within the tradition of brewing, such monastic thought has advanced brewing and even allowed for the early and unprecedented flourishing of beer in Europe at an industrial scale. The confluence of monastic organization with brewing practice reveals a distinguished understanding of work and life characterized by, on one hand, the perennial pursuit of holiness and, on the other, the evolving social role of monastic institutions in European society over time. The most significant components of this understanding, I argue, form over the course of the Middle Ages and have endured since. My essay unites scholarly sources of modern historical literature on brewing and on monasticism, along with several primary medieval sources. With what is common amongst them, I have built a story of how and why monks came to brew.

56 - Jack Lynn

Night owl's dilemma: determining the connection between sleep deprivation and seizure-induced death

Sudden unexpected death in epilepsy (SUDEP) is the leading cause of epilepsy-related death in refractory epilepsy patients, but SUDEP is not functionally well-understood. It is known that SUDEP is more likely to occur at night, indicating a potential connection between sleep and SUDEP. Moreover, previous studies have shown that a lack of sleep compromises a number of physiological processes, in particular respiration. Sleep deprivation increases breathing irregularity, which could potentially increase the amount of carbon dioxide in the blood and contribute to hypercapnia. Depriving mice of rapid-eye movement sleep

causes increased tonic phases and decreased seizure thresholds, both of which are potentially relevant to SUDEP. This experiment examines how sleep deprivation could increase the length and severity of seizures using the mouse model, potentially contributing to an increased SUDEP risk. Four mice were subjected to 24 hours of sleep deprivation or 24 hours of normal sleep/wake patterns before an amygdala-kindled seizure was induced. Seizure duration, postictal EEG generalized suppression (PEGS) duration, and breathing were assessed and compared between conditions. Understanding the possible connection between seizures and sleep deprivation is important as a lack of sleep is becoming an inherent part of many peoples' lives, so epileptic patients could take proper precautions in relations to their sleep habits.

58 - Allexis Mahanna

Local and Autonomous Community Migration Responses: Case Study of Barcelona, Spain

This research provides context to the current migration policies in Spain, specifically in the urban city of Barcelona, located in the autonomous community of Catalonia. This research was funded over Summer 2019 from the Stanley Award for International Research, the ICRU Fellowship, and Honors Travel Funding. This research questions how migration policies differ between autonomous communities, and the cities within them. Additionally, it focuses on possible implications from the different regions' responses, impacted by the increasing influx of migrants into Spain. This ethnographic research project evaluated the local migration policies of Barcelona through a case study framework. This research subsists of two forms of data, first including a literary analysis of local and country wide migration policies, population density changes, and the historical perceptions of migrants in Spain, spanning from 1985 to 2018. The second form of data includes evaluations of local and community wide migrant policies through thematically coded qualitative interviews of individuals working at migrant agencies in Barcelona. The interviews were recorded, transcribed, and categorically coded utilizing a process coding methodology in order to identify key themes and patterns. This research explains the implications of current migrant policy spanning the local, autonomous community, and state levels of Spain.

60 - Cameron Moeller

Variably Innate: Inconsistent British Perceptions of Martial Races in the Late-Victorian Indian Army

This thesis examines the malleability of the concept of “martial races,” the classification system by which British imperial officers recruited soldiers for the Indian Army, the mainstay of British military power in India. Though led by British officers, the army was composed of Indian soldiers known as sepoys. Seeking to ensure the loyalty and effectiveness of sepoys, British officers only recruited groups they considered to be martial races. This imposed classification was based on traits, like physique and bravery, which were considered innate to certain Indian ethnic groups, referred to as “races” by the British. The concept of martial races was central to army organization, and the British did not question its validity. Using India Office Military Department documents, this thesis argues that just who was considered a martial race was the subject of much more debate than has previously been appreciated. A martial race could be lauded by one British officer but scorned by another. Different martial races came and went, recruited and discharged following the conflicting opinions of different officers. Sepoys were caught at the center of this back and forth, but they were not helpless, as the value the British attached to martial status, combined with the threat of mutiny, gave sepoys indirect influence over their compensation and treatment.

62 - Shaun Morris

Cecina Table Set

The goal of the Cecina Table Set was to create a collection of nesting tables that could provide support for low seating activities. The tables were inspired by crochet patterns and were designed to be exhibited at the London Art fair that took place this past September. The final set included four tables and one candle holder that were collectively made out of soft maple, epoxy resin, and mica powder. Part of the project involved research to discover what the limitations of the CNC router were, along with which materials and processes would work best. A large

portion of our time was spent experimenting with an array of patterns on various wood types while trying to figure out the specific adjustments required that were dependent on the type of material we were working with, such as foam, maple, and walnut. In addition, we tested different methods of applying resin to amplify the design and formulated a specific design for the pieces that would allow for them to be easily disassembled and shipped internationally. Our research was supportive in discovering how to achieve successful processes for designing and we will use our findings to proceed with future projects this coming year.

64 - Marissa Mueller

Actimetry Analysis Methods Produce Large Differences in Lifestyle Physical Activity Estimates

Physical activity (PA) can be objectively and conveniently measured using accelerometers, which are increasing in recreational and clinical applications. However, there are numerous algorithm and filter choices used to analyze data whose effects are not always clear. This study investigates how lifestyle PA estimates are impacted by several analysis methods within a commercial software platform - ActiLife. Wrist-worn accelerations were collected for one week (N=132, ActiGraph GT3X+ accelerometers) and used to evaluate four PA outcome domains: daily energy expenditure (EE), active EE, time in moderate-to-vigorous PA and steps. Data were analyzed using multiple ActiLife algorithms - with/without the low-frequency-extension (LFE) and wrist correction - and compared to self-report (International Physical Activity Questionnaire (IPAQ) long-form). Variable, but typically large, effect sizes resulted due to the wrist correction ($p < 0.05$ and $d = 0.26-3.04$ for all outcomes save steps and one EE algorithm) and algorithm choice ($p < 0.05$, $d = 0.00-10.17$, median=1.04). Contrastingly, the LFE only notably increased step estimates ($p < 0.05$, $d = 1.44$) while correlations between objective and self-reported outcomes varied irregularly by method. Thus, while scoring methods are previously validated, they are not interchangeable. These results emphasize the importance of clearly documenting scoring methods and taking caution when comparing objective estimates between studies or with normative PA guidelines.

66 - Mayra Narvaez

Biotransformation of dichloroacetamide safeners

Dichloroacetamide safeners are a class of agrochemicals co-applied in large scale with chloroacetamide herbicides to protect crops from herbicide toxicity. Although all four dichloroacetamide species have been detected in Midwestern surface waters, safeners are currently regulated as "inert" constituents under the U.S Federal Insecticide, Fungicide, and Rodenticide Act, and as such, have received meager attention in the peer-reviewed literature. Recent studies suggest that some dichloroacetamide safeners are reactive in aquatic systems and can yield products with increased bioactivity which may pose risks to human and environmental health. To evaluate the fate and transformation of dichloroacetamide safeners, we measured timescales (i.e. half-lives, sorption rates) for predicting safener persistence, determined the effects of water chemistry (i.e. pH, DOC) on the rate and extent of hydrolysis and sorption processes, and quantified sorption parameters for active herbicide co-formulants and mixtures. We found that most dichloroacetamide safeners undergo both acid-catalyzed and base-catalyzed hydrolysis, and we identified two hydrolysis products for benoxacor, the most widely-used dichloroacetamide safener. Sorption studies revealed limited uptake of safeners and herbicide co-formulants, with more sorption to soil with a high organic carbon content. In general, dichloroacetamide safeners demonstrated reduced uptake onto soil compared to their chloroacetamide herbicide co-formula

68 - Megan Schnoebelen

Slipping Away from the "Summer Slide": Reducing Summer Reading Loss in School-Age Students Summer 2019 Honors Internship Project

Many will agree that the "Summer Slide" is a common problem facing teachers, students and families once students return to school from summer vacation. The "Summer Slide" occurs when students fail to read over the summer as much as they did during the school year which causes both their reading level and abilities to significantly drop. This loss of learning causes problems for both teachers and students. As a part of

this project, I considered research as well as interviews from librarians to look at effects of "Summer Slide" as well as to generate solutions. My research reflects the responses of nine area librarians from and their individual strategies to combat "Summer Slide". The topics discussed included how to combat "Summer Slide", the best way to foster a love of reading in students, how library programming can help prevent or reduce "Summer Slide" and the importance of following a curriculum to reduce the problem of the "Summer Slide". It is clear that the reduction of summer reading time can cause rocky starts to new academic years, yet the solutions are plentiful: collaboration between school and public libraries as well as someone taking an interest in fostering a love of reading.

70 - Emily Silich

HaloSat Observations of the Vela and Puppis A Supernova Remnants

The Vela and Puppis A supernova remnants (SNRs) comprise a large emission region of approximately 8 degrees in diameter in the soft X-ray sky. The HaloSat CubeSat mission provides the first soft X-ray (0.4-7 keV) observation of the entire Vela SNR and Puppis A SNR region with a single pointing and moderate spectral resolution. HaloSat observations of the Vela SNR are best fit with a two-temperature thermal plasma model consisting of a cooler component with $kT = 0.19$ keV in collisional ionization equilibrium and a hotter component with $kT = 1.06$ keV in non-equilibrium ionization. Observations of the Puppis A SNR are best fit with a single-component plane-parallel shocked plasma model with $kT = 0.86$ keV in non-equilibrium ionization. For the first time, we find the total X-ray luminosities of both components of the Vela SNR spectrum in the 0.5-7 keV energy band, as well as the total X-ray luminosities of the Vela and Puppis A SNRs.

72 - Abigail Simon; Mary Wille

Characterizing Primary Progressive Apraxia of Speech: A Case Study of a 76-Year-Old Female

Primary progressive apraxia of speech (PPAOS) is a progressive neurodegenerative speech disorder in which apraxia of speech presents as the sole or dominant symptom. Individuals with PPAOS demonstrate impaired planning or programming of motor speech movements, which manifest as a combination of distorted sound substitutions, abnormal prosody, and slowed speaking rate. We conducted a case study on a 76-year-old woman, Anne (pseudonym), who was referred to the Wendell Johnson Speech and Hearing Clinic (WJSHC) with a diagnosis of primary progressive aphasia. However, diagnostic testing at WJSHC found symptoms of PPAOS instead. This poster describes the diagnostic process and therapy techniques we utilized with Anne.

74 - Allison Steger

Fueling the Future of Preston Station: The creation of a collection management policy and action plan

The Preston Historic District has been an important gathering place in Belle Plaine, Iowa since George Preston took ownership of it in 1923. No longer in operation, Preston's Station has become a landmark that tells the story of its community and the Lincoln Highway. The current caretakers of the Station are fourth generation Prestons dedicated to preserving the site, its collections, and connected history. This student research project considered both preservation and public access in its development of a tiered collections management policy and procedures for cataloging and protecting the Preston Historic District collection including its buildings and contents.

76 - Hanxi Tang

Genetic Modification of Neurological Phenotypes in a Drosophila Voltage-gated Sodium Channel Mutant

Voltage gated sodium (Nav) channels are responsible for generation and propagation of action potentials in excitable cells such as neurons and muscles. While mutations in Nav channel genes can cause an array of human disorders, disease symptoms in patients with the same Nav channel mutation could be drastically different. Previous studies took

advantage of paraShu, a gain-of-function Nav channel mutant of *Drosophila melanogaster*, and found that a loss-of-function mutations in the glutathione S-transferase S1 (GstS1) gene significantly suppress the neurological phenotypes of adult paraShu mutants. GstS1 is a putative fly ortholog of a mammalian enzyme responsible for the synthesis of immunomodulatory lipid signaling molecules. To further investigate mechanisms underlying GstS1 suppression, we used parabss1, another gain-of-function *Drosophila* Nav mutant allele that confers seizure-like phenotypes including semi-dominant, bang-sensitive paralysis. Our study revealed that GstS1 loss-of-function significantly suppresses the neurological phenotypes of adult parabss1 mutants as well. These findings set the foundation for further exploring GstS1's role in suppressing neurological hyperexcitability using a variety of genetic tools available in *Drosophila*.

78 - Jared Termini

Analysis of Chandra Data of the Composite Supernova Remnant G310.6-1.6

We have analyzed Chandra observations of G310.6-1.6, a composite supernova remnant (SNR) containing a pulsar and associated pulsar wind nebula (PWN). A previous study (Renaud et al. 2010) used Rossi X-ray Timing Explorer (RXTE) data to identify the pulsar and determine that it is one of the most energetic rotation-powered pulsars known in the galaxy. We utilize additional Chandra observations made since this study to characterize the X-ray spectra of the pulsar, the PWN, and the surrounding SNR. We find that the SNR spectrum is well-described with by a thermal plasma model and find strong evidence for synchrotron "burn-off" within the PWN.

80 - Gabriella Thomsen

Helper-Dependent Adenovirus Transduces the Human and Rat Retina but Elicits an Inflammatory Reaction When Delivered Subretinally in Rats

Despite success using adeno-associated viruses, many retinal disease-causing genes, like ABCA4 or USH2A, are too large to fit into these vectors. One option for large gene delivery is the family of integration-

deficient helper-dependent adenoviruses (HDAd5). However, HDAd5 have been shown in other organs to elicit an immune response, and the immunogenicity of HDAd5 in the retina has not been characterized. HDAd5 was found to successfully transduce photoreceptors in human retinal organ cultures. The ocular inflammatory response to subretinal injection of the HDAd5 serotype 5 (HDAd5) was evaluated in rats. Subretinal injection of HDAd5-CMVp-eGFP elicited an inflammatory response by 3-days post-injection which included vitreous infiltration of Iba1-positive monocytes and increased expression of the pro-inflammatory protein, ICAM-1. By 14-days, Iba1-positive cells persisted in the retinas of HDAd5-injected eyes, and there was thinning of the outer nuclear layer. Injection of an empty HDAd5 virus was used to confirm that the inflammatory response was in response to the HDAd5 vector and not due to eGFP-induced cytotoxicity. Injection of lower doses of HDAd5 dampened the inflammatory response, but also eGFP expression. Further work is needed to identify an immunomodulation paradigm sufficient for safe and effective transfer of large genes to the retina using HDAd5.

82 - Jacob Tinker

Participant Screening in Dietary Approaches to treat MS Study

Relapsing remitting multiple sclerosis (RRMS) is a form of MS in which an individual experiences consistent symptom flare-ups or relapses. The Dietary Approaches to Treating MS Related Fatigue study aims to treat symptoms of RRMS through dietary intervention. Potential participants are first exposed to the study through an online screening survey. The survey contains numerous exclusion criteria that must all be met in order to qualify. When the participant completes the survey in correspondence with the screening criteria, they are presented with another survey consisting of seven questions called the Fatigue Severity Scale (FSS). Participants must again score above the appropriate threshold to qualify for the study. When a participant has qualified, they must then gather a consent to obtain (CTO) medical information form and a neurology verification form (NVF) from their neurologist. When the participant has provided these documents to the study team, they will then schedule

their first of four visits. This project aims to identify common issues as to why qualified study subjects are unable to participate in the study.

84 - Haley Vaughn

Longitudinal Time-to-Event Analysis of Time-gated Word Recognition in Children who are Hard of Hearing

Speech perception in degraded listening situations is a complicated task, one in which children with hearing loss often struggle. Listeners must first decode the acoustic-phonetic stimulus characteristics using lower-level processes (i.e., auditory access). These stimulus characteristics are then linked with mental representations stored in long-term memory in order to recognize its meaning, through higher-level processes (i.e. contextual cues; syntactic and semantic constraints). Therefore, accurate speech recognition requires coordination of multiple cognitive and linguistic processes, including working memory and semantic/syntactic knowledge. This study investigates word recognition in degraded listening contexts for children who are hard of hearing and children with normal hearing, tested at first and third grade. Participants completed a time-gated word recognition task with sentences that varied in predictability. A longitudinal time-to-event model is used to evaluate the effects of test visit, hearing status, and predictability on word recognition.

86 - Kimberly Vencer

Effects of low brain activity following seizures on immobility in mice

Sudden unexpected death in epilepsy (SUDEP) is the leading cause of death in epilepsy patients with uncontrolled seizures. Following many seizures, there is a period of low brain activity termed post-ictal electroencephalographic (EEG) suppression (PGES). PGES duration has been proposed as a risk marker for SUDEP. During PGES, patients display reduced mobility and responsiveness. Following seizures, there is a rise in serum CO₂ concentration. CO₂ is a usually potent arousal stimulus. We hypothesized that seizures reduce sensitivity to CO₂-induced arousal and this reduced sensitivity correlates with the PGES period. Seizures were induced via amygdala stimulation in amygdala kindled mice during wake

or sleep. Following seizures animals were subjected to room air or CO₂ gas challenges. Seizure severity, PGES duration, breathing, and latency to mobility were assessed from EEG, EMG, breathing, and video recordings. Mice did not resume mobility until PGES ended, PGES length was independent of seizure duration, and animals remained immobile to CO₂, implicating PGES as a crucial time for medical intervention. Future experiments can study responsiveness to other salient stimuli such as touch/sound.

88 - Olivia Westemeier

Pathway to Prevention: Protective Behavioral Strategies Linked to Sexual Assault on College Campuses

Male-initiated sexual aggression towards female acquaintances is a serious problem on college campuses, and existing prevention programs are inadequate. The current work further develops and evaluates two measures of protective behavioral strategies (PBSes) that people might use to reduce sexually aggressive behavior and risky sexual behavior. Undergraduates indicated how often they had used each PBS in the last year on each of the measures, and they also completed outcome variable measures related to behaviors and attitudes of sexually aggressive behavior and risky sexual behavior. Participants then gave feedback on item appropriateness and the suggestion of new items. Both PBS measures were moderately correlated with their respective outcome variables; feedback was overall positive, but suggested eliminating avoidance language and encouraged more peer-related items. These findings suggest that incorporating review of PBSes for sexual aggression and risky sexual behavior might prove helpful for prevention purposes. Future work will begin to evaluate test-retest reliability and perceived peer's utilization of PBS items.

90 - Lauren Williams

Does Partisanship Affect Everyday Russians' Engagement in Bribery?

In a comparatively high-corruption society, citizens need to figure out when and how to provide cash, gifts, or favors to officials who work for state agencies or other large bureaucracies. But does one's political outlook

affect this decision to engage in bribery? And if so, how and why? In the summer of 2015, Professor William Reisinger of the University of Iowa's Political Science Department, together with professor Marina Zaloznaya of Sociology, commissioned 2000 face-to-face surveys in Russia which asked a representative sample of citizens about their interactions with bureaucrats as well as their life experiences and outlooks on a variety of issues. In this study, ICRU recipient Lauren Williams analyzes these survey responses to reveal that those who voted for the ruling party in Russia (United Russia) are significantly less likely to engage in bribery when compared with voters of any other party. Even when controlling for age, financial situation, and other demographic factors, United Russia partisans abstain much more often from petty corruption. These results indicate that voting for a ruling party may create a feeling of investment in the political system which leads individuals to be less willing to sabotage the system via bribery than other voters -- an implication which points to the need for further research, and potential modifications to anti- corruption programs worldwide.

92 - Ashton Woiwood

Characterizing and Modeling Threat Feeds for Patch Management

In consumer-grade systems if a new security patch is available most users have very little reason not to install a new patch. However, for mission critical systems, new security patches can put a significant strain of resources and safety due to potential downtime. Thus, it is important to know which patches need to be deployed immediately and which can wait. To decide this, one must quantify the usefulness of various threat indicators from a multitude of threat feeds. Organizations spend millions of dollars to purchase threat information. These "threat feeds" may contain valuable information pertaining to future exploits, however processing the data to find this valuable information is costly and time consuming. We aim to use this rich data to model and predict future threat events to inform stakeholders in deciding to patch mission critical systems or not.

94 - Mikayla Wymore

Photoredox Studies with Alkyl and Aryl Radicals

In previous research, imines have demonstrated reactivity with alkyl radicals. These reactions were carried out using organometallic reagents, such as Sn or $\text{Mn}_2(\text{CO})_{10}$. These reactions led to the addition of the alkyl radical to the carbon-nitrogen bond of the imine. Likewise, recent research demonstrates that alkylsilicates can be utilized to generate similar products via a carbon-centered radical. We hypothesize that these conditions can be extended to include chiral Lewis acids such that the stereochemistry can be controlled. Initial studies in the Friestad group have been conducted with both alkylsilicates and arylsilicates as precursors for adding alkyl and aryl radicals to the carbon-nitrogen double bond of N-acylhydrazones. Under our conditions, products only resulted from the reactions conducted with alkylsilicates. We have screened some chiral Lewis acids to test their ability to promote the reaction. After we identify promising chiral Lewis acids, we will analyze the optical rotation of the resulting products to determine enantioselectivity. In the future, the resulting products may be used as important building blocks for drug discovery and would be useful in the synthesis of new drug therapies.

96 - Joshua Yem

Dynamic and Static Position Sense of Body Targets in Three Dimensions

Much research on proprioception has focused on the ability to match angles at joints such as the elbow, ankle, or knee in perceptual tasks (e.g., Goble et al 2012, *Phys Ther* 90:1176), or has been constrained to two dimensional tasks. We investigated proprioceptive acuity for various locations on the body. We hypothesized that reaching to touch hand and head targets would be more accurate than for trunk and lower limb targets because of hand use in bimanual coordination and in bringing the hand toward the head (e.g. eating food). We recruited 10 young adults, and placed motion sensors on 13 sites on the trunk, lower limb, and upper limb to mark proprioceptive targets. Participants reached to touch the instructed target with the right index-tip in a single smooth movement both with and without vision, and to both moving and static targets. Mean errors without vision were very low for head and hand targets (average of 1.64 cm) but higher ($p < 0.001$) for lower limb targets (average of 2.98 cm). Variable distance errors were lower for hand and axial targets ($p < 0.01$). Accuracy was similar for moving and static targets. Notably, errors were much

smaller than expectations from joint angle matching studies. Imposing movement did not cause larger errors in locating targets. Differences in target localization for different regions of the body may reflect differences in available sensory input or differences in experience with the targets.