

Apr 11th, 9:00 AM - 3:00 PM

2017 Abstract Booklet

Undergraduate Research Center, Minnesota State University, Mankato

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UNDERGRADUATE
RESEARCH
SYMPOSIUM

APRIL 11
2017

Be inspired

Greetings from the President

It is my distinct honor to welcome you to the 19th Annual Undergraduate Research Symposium at Minnesota State University, Mankato. Talented scholars have been assembled for your intellectual and personal enjoyment. What an exciting year of productivity for our students and faculty. On March 2nd, five of our students presented at the 4th annual Posters at St. Paul held at the Minnesota State Capitol. Earlier this month, 27 students traveled to University of Memphis to make 20 presentations at the National Conference of Undergraduate Research. In addition, 14 students traveled to make 15 presentations at Winona State University for the 6th annual Undergraduate Scholars Conference of the Minnesota State Colleges and University system. At the end of the month, senior Biomedical Science student Katie Rubitschung will present her research at Posters on the Hill in Washington DC. Katie's research, under the mentorship of Dr. Michael Bentley is one of 60 projects selected from hundreds of applicants nation-wide for this distinguished undergraduate research event.

Today's symposium is a celebration of intellectual exploration, creativity, hours of labor and collaboration across students, faculty, and staff. Enjoy your time today as you listen to oral presentations, engage in meaningful discussions with students at posters, and view presentations of visual and performing arts. It is, in part, because of these sorts of scholarly showcases that Minnesota State Mankato has come to be known for its Big Ideas and Real-World Thinking.

I want to express my appreciation for the efforts of the Undergraduate Research Center Council under the leadership of Dr. Karla Lassonde. I also want to recognize the many contributions of our faculty and staff that have made this enriching opportunity possible for our students. Your contributions to the intellectual development of these young scholars and their pursuit of excellence will last a lifetime.

Once again, enjoy your day as you are exposed to big ideas and real-world thinking in action.



Richard Davenport
President
Minnesota State University, Mankato

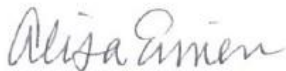
A Message from the Undergraduate Research Center

Welcome to the 19th Annual Undergraduate Research Symposium at Minnesota State University, Mankato. This event features scholarly and creative works from undergraduate students representing majors from five colleges. The symposium allows undergraduates the opportunity to engage in the process of conducting and presenting research in an academic setting. This opportunity fosters collaboration between student presenters and an audience of faculty, administrators, peers, and family. An added goal is to encourage undergraduates to pursue professional development opportunities in the form of research and scholarship, teaching, and professional practice.

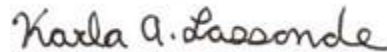
Many students presenting today have received grants from the MSU-Mankato Foundation, the Undergraduate Research Center, the Honors Program, and various academic departments. Additionally, several students have been involved in research that was part of a larger grant from faculty mentors. Other students initiated their own projects and conducted their research independently under faculty supervision.

Student presenters will discuss their research or creative works through oral and poster presentations, and artworks produced through creative research will be on view in the concurrent Creative Works Exhibition. Students gain experience as they are challenged to communicate their findings. It is our hope that this experience will inspire students to become future scholars by continuing their academic journeys to develop research and creative endeavors.

We applaud these student presenters for their accomplishments and hard work throughout the year. We wish them the best of luck on their future academic and professional journeys.



Alisa Eimen, Ph. D.
Coordinator of Undergraduate Research Symposium
Professor, Department of Art



Karla Lassonde, Ph. D.
Director of the Undergraduate Research Center
Associate Professor, Department of Psychology

2016-2017 Undergraduate Research Council Members

Kuldeep Agarwal	Mark McCullough
Jessica Albers	Elizabeth Sandell
Barb Bergman	Kristin Scott
Anne Dahlman	Kristel Seth
James Dimock	Heidi Southworth
Alexandra Hilt-Panahon	Emily Stark
Cindra Kamphoff	Joseph Visker
Jason Kaufman	Heather Von Bank
Allison M. Land	Trent Vorlicek
Karla Lassonde	

2016-2017 Undergraduate Research Student Council Members

Brooke Jones

Eunwon Kim

Ryan Leba

FUNDING SOURCES FOR RESEARCH AND CREATIVE PROJECTS

Several of the research and creative projects presented at this year's Minnesota State University, Mankato Undergraduate Research Symposium were awarded funding through a competitive grant review process. Funding sources included generous contributions from two outside sources as well as the University. Awardees of these grants are noted within their abstract. Specific types of funding awards are outlined below.

Minnesota State University, Mankato Foundation Awards: up to \$2,000

These awards are from the Minnesota State University Foundation Board to support high quality student scholarship at the University. Each student recipient is given \$1,000 as a stipend and up to \$1,000 for supplies necessary for the completion of their project.

Undergraduate Research Center Supply Grant: up to \$500

An Undergraduate Research Center supply grant includes funding for supplies to help aid in the completion of the proposed projects. These grants, like the stipend/supply grants, are funded by the University.

URC MEDALS AND PRESENTATION AWARDS

Medallions - Each student who participates at the Undergraduate Research Symposium is awarded a medallion in recognition of their scholarly achievement to be worn at the student's graduation ceremony. A solid gold ribbon is in recognition of participation at the Symposium.

Presentation Awards - Each poster and oral presentation session is judged by two judges who are graduate students, faculty, or other qualified individuals involved on campus. Exemplary presentations in each session will be recognized with an "Outstanding Presentation" certificate announced at the Celebration Dinner. Winners are also noted on the URC website.

UNDERGRADUATE SCHOLAR RESOURCE FAIR

Explore some resources and activities to enhance your undergraduate research experience. There will be representatives on hand to talk with students about several opportunities. The Resource Fair will be in the CSU Ballroom along with the poster sessions.

1. Publishing: MSU's Journal of Undergraduate Research
2. MSU's Honors Program
3. MSU's Fellowship Office
4. MSU's College of Graduate Studies

**Abstracts were written by the student author(s) and reviewed by faculty mentors. Any opinions expressed do not represent those of the URC or Minnesota State University, Mankato.*

Congratulations to the 2016-2017

Minnesota State Foundation Grant Recipients

Anna Brand	Hyejoo Kang
Brooke Jones	Jenna Macziewski
Josie Mikosch	Natalia Arce
Michael Hedin	Jaden Roddick
Rachel Ascheman	Caitlin Foley
Alec Wright	Elijah Hill
Madison Burandt	Paige Shoutz
John Ruprecht	Patrick Connolly
Michael Ganzer	Mercedez Johnson
Tien Pham	Mariah Adams
Christian Piper	Elizabeth Hall
Madeline Straka	Abbey Linderholm
Ryan Torrell	Ellen Dobbins
Reed Woyda	Correy Steffen
Daniel Crane	Ella Silver
Donald Rudquist	Shannon Helmer
Natalie Moses	Michael Tonsager
Nicole Bean	Lucas Speer
Katherine Kalenberg	Isaac Matzke
Erin Kahnke	Amanda Hinde
Jacob Bukkila	Keely Wardyn
Wyatt Pouliot	Ryan Leba
Curran Couchman	Matthew Netmitz
Nicholas Miller	

CORNERSTONE

 MINNESOTA STATE UNIVERSITY MANKATO

A Collection of Scholarly and Creative Works

Calling all Undergraduate Research Symposium Participants!

Congratulations on presenting at the 19th annual Undergraduate Research Symposium at Minnesota State University, Mankato.

Now that you have finished all your hard work and your poster, creative work or paper is ready for the Undergraduate Research Symposium; did you know that you can also submit a copy of your work to Cornerstone?

Cornerstone highlights the intellectual output of Minnesota State University, Mankato's faculty, staff, and students by preserving their works digitally and presenting them to the world in an easy-to-find format.

After the 2017 Undergraduate Research Symposium, Library Services will be adding the abstract booklet and proceedings to the repository as well. See what last year's submissions look like at <http://cornerstone.lib.mnsu.edu/urs>

The Proceedings are a record of what you presented. You can submit a copy of the poster, written text of your oral presentation, or have photographs or images of your creative work added to Cornerstone. Each item in Cornerstone receives a permanent URL, which you can add to your resume to provide evidence of your hard work to prospective employers or graduate schools. Items for the Proceedings are due by May 31, 2017.

Did your project result in a research paper? Consider submitting it to the *Journal of Undergraduate Research*, which is also archived in Cornerstone at: <http://cornerstone.lib.mnsu.edu/jur>. Submission information will be coming out soon, but the due date for papers is 4 weeks after the Symposium.

When you submit a work to Cornerstone, you will be able to see statistics on the number of times people have downloaded your work. For example, a presentation from 2016 by Alissa Shape, Ellen Hammerschmidt, Jade Anderson, and Stephanie Feldman entitled *Perceptions of Safety within Residence Halls at a Midwestern College Campus* has been downloaded 121 times since it was added to Cornerstone in August 2016.

If you are interested, we encourage you to talk to your faculty mentor or contact Heidi Southworth, Digital Initiatives Librarian at heidi.southworth@mnsu.edu with questions.



UNDERGRADUATE RESEARCH CENTER
MINNESOTA STATE UNIVERSITY, MANKATO



CONNECTING CURRENT AND FUTURE SCHOLARS

Minnesota State University, Mankato's Undergraduate Research Center (URC) is excited to announce a new partnership with ScholarBridge, a powerful resource to promote student and faculty collaboration in academic research. The online network connects faculty, who can post their availability to mentor students, and students, who can begin their search for a mentor and focus their research insights.

Currently, the ScholarBridge network includes 12 universities nationwide, opening up numerous cross-campus opportunities to MSU, Mankato students in addition to on-campus faculty mentors. Partner universities include: Washington University in St. Louis, Purdue University, The University of Alabama at Birmingham, University of Kentucky and The University of Memphis.

Interested students and faculty should visit ScholarBridge to begin the quick and easy process of creating a free account. As part of the MSU, Mankato partnership with ScholarBridge, faculty members have the ability to request their accounts be built on their behalf using the opt-in feature. If a faculty member opts-in to ScholarBridge, the software generates a fully editable profile of academic background and research interests for that individual. At that point, a faculty member can update his or her page and create research opportunities outlining qualifications for ideal applicants. ScholarBridge will provide periodic reminders to maintain up-to-date research opportunities throughout the academic year.

For more information, visit www.scholarbridge.com.

Thank you to the



for providing 47 student research awards
totaling \$53,323.37

A Special Thank you to...

President Richard Davenport
Provost & Senior VP of Academic Affairs Dr. Marilyn Wells
Associate VP of Research & Dean of Graduate Studies Dr. Barry Ries
Dean of Library Services Dr. Joan Roca
Vice President for University Advancement Kent Stanley
Cover Design by Daniel Peluso

...and the Minnesota State University, Mankato Moderators and Judges.

9:00 a.m. – 3:00 p.m.	Presenter, Moderator, Judge Check-in (9-3) Coffee and Snacks Available (9-3)	CSU Ballroom
10:00 – 11:30 a.m.	Poster Session A Biological Sciences, Chemistry, Construction Management, Electrical, Mechanical, & Automotive Engineering, Geology, Environmental Sciences, and Physics	CSU Ballroom
10:00 – 11:00 a.m.	Oral Session 1 Dance	CSU 201
10:00 – 11:00 a.m.	Oral Session 2 Anthropology	CSU 202
10:00 – 11:00 a.m.	Oral Session 3 History	CSU 203
11:05 – 12:05 p.m.	Oral Session 4 Psychology and Sociology	CSU 204
11:05 – 12:05 p.m.	Oral Session 5 Dance	CSU 201
11:05 – 12:05 p.m.	Oral Session 6 Educational Studies	CSU 255
11:05 – 12:05 p.m.	Oral Session 7 Anthropology, American Indian Studies, and Biological Sciences	CSU 202
12:05 – 1:05 p.m.	BREAK	

Sessions resume at 1:05 p.m.

1:05 – 2:05 p.m.	Oral Session 8 Art	CSU 201
1:05 – 2:05 p.m.	Oral Session 9 Automotive Engineering	CSU 203
1:05 – 2:05 p.m.	Oral Session 10 Integrated Engineering, Environmental Science, and Computer Science	CSU 202
2:00 – 3:30 p.m.	Poster Session B Speech, Hearing, and Rehabilitation Studies, Health Science, Human Performance, Nursing, Economics, Family Consumer Science, Geography, Honors, Psychology, and Dance	CSU Ballroom
2:10-3:20	Oral Session 11 Automotive and Mechanical Engineering	CSU 203
3:00 – 4:45 p.m.	Creative Works Exhibit Coffee and Snacks Available	CSU Gallery (lower level)
5:00 p.m.	Undergraduate Research Symposium Celebration Dinner	CSU Ballroom

Biological Sciences, Chemistry, Construction Management, Electrical, Mechanical, & Automotive Engineering, Geology, Environmental Sciences, and Physics

- 1. Seasonal Variations in the Dorsolateral and Medial Cortex, the Reptilian Hippocampus Homologue**
Abdiasis Abdilahi, Caitlyn Foley, and Jaden Roddick
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)
- 2. Volume of Parasite Tissue Relative to the Volume of Host Tissue in Infected Snails**
Ashley Adam and Emily Jones
Robert Sorensen, Faculty Mentor (Department of Biological Sciences)
Scott Malotka, Graduate Student Mentor (Department of Biological Sciences)
- 3. Examining the Aqueous Outflow in c57BL6 Mouse Eyes Using Scanning Electron Microscopy**
Prathibha Bamunu Achchi
Michael Bentley, Faculty Mentor (Department of Biological Sciences)
- 4. Protective Effect of Beta-Sitosterol Against Ethanol Toxemia**
Dakota Cooper and April Boucher-Zamzo
Steven Mercurio, Faculty Mentor (Department Biological Sciences)
- 5. Survival of Methicillin-Resistant Staphylococcus Aureus on Fomites**
Rudy Correa and Mutma Inna
Lois Anderson, Faculty Mentor (Department of Biological Sciences)
- 6. Characterization of Brewer's Yeast Strains by Carbon Source Utilization and Flow Cytometry**
Megan Ford
Timothy Secott, Faculty Mentor (Department of Biological Sciences)
- 7. Survey of Gastrointestinal Parasites Found in Muskrats (*Ondatra zibethicus*) Collected from Lakes in Southern Minnesota**
Bree Friedman and Kayla VanBeck
Robert Sorensen, Faculty Mentor (Department of Biological Sciences)
Scott Malotka, Graduate Student Mentor (Department of Biological Sciences)
- 8. miRNA regulation of A3A and A3B**
Katlyn Gieseke and Alyssa Lange
Allison Land, Faculty Mentor (Department of Biological Sciences)
- 9. Connective Tissue Infiltration into Three-Dimensional Printed Stainless Steel Alloy**
Mehedi Hasan, Clenten Ndonwie, and Bethany Haus
Michael Bentley, Faculty Mentors (Department of Biological Sciences)
Kuldeep Agarwal, Faculty Mentor (Department of Automotive Engineering Technology)
- 10. Helminth Parasites Protect from Intestinal Damage in Mice Model of IBD**
Shannon Helmer
Allison Land, Faculty Mentor (Department of Biological Sciences)
Natalie Gooder, Graduate Student Mentor (Department of Biological Sciences)

- 11. Seasonal Control of Reproduction in Green Anole Lizards Through Neural Peptides Involved in the Hypothalamic-Pituitary-Gonadal (HPG) Axis**
Uyi Imasuen, Megan Sandeberg, and Nicholas Booker
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)
- 12. Ultrastructure of Larval Trematodes from Snails Collected from Lake Winnibigoshish, Minnesota**
Jacob Iverson and Ross Buttleman
Robert Sorensen, Faculty Mentor (Department of Biological Sciences)
Scott Malotka, Graduate Student Mentor (Department of Biological Sciences)
- 13. FAM171B mRNA Expression in the Brain**
Brooke Jones
Geoffrey Goellner, Faculty Mentor (Department of Biological Sciences)
Ashani Sudasinghe, Graduate Student Mentor (Department of Biological Sciences)
- 14. The Effects of DIO2 and DIO3 Expression on Seasonal Reproduction in a Seasonally Breeding Animal**
Hyejoo Kang
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)
- 15. Induced Natriuresis on Spontaneously Hypertensive Female Rats**
Okhumhekho Kassim and Jill Knepprath
Penny Knoblich, Faculty Mentor (Department Biological Sciences)
- 16. Counteraction of APOBEC3A by SIV Sooty Mangabey Proteins**
Ryan Leba
Allison Land, Faculty Mentor (Department of Biological Sciences)
- 17. Methicillin Resistance in Staphylococci Isolated From Healthy College Students**
Kelsey Linnell
Timothy Secott, Faculty Mentor (Department of Biological Sciences)
- 18. Quantifying Cochlear Nerve Myelination in Mice Lacking Thyroid Hormone Transporters**
Natalie Moses
David Sharlin, Faculty Mentor (Department of Biological Sciences)
- 19. Investigation of Metacognitive, Motivational and Self-Efficacy Influences on the Performance of Undergraduate Introductory Non- Major Biological Sciences Students**
Rachel Newinski
Brittany Smith, Faculty Mentor (Department Biological Sciences)
- 20. Analysis of Amygdala Morphology and Neurogenesis in Green Anole Lizard in Breeding Versus Non-Breeding Season**
Jaden Roddick and Abodalrahman Algamdy
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)
- 21. Mineralization and Structural Anatomy of Bone from Male C57/BL6 Mice with Reduced Testosterone Levels**

Katie Rubitschung
Michael Bentley, Faculty Mentor (Department of Biological Sciences)

22. Transcriptome Analysis of Staph. Aureus in Response to Specific IgY through RNA-Sequencing

Reed Woyda
Allison Land, Faculty Mentor (Department of Biological Sciences)

23. Are Hypothyroidism-Induced Reductions in Brain Derived Igf1 Due to Reductions in Serum Growth Hormone?

Alec Wright
David Sharlin, Faculty Mentor (Department of Biological Sciences)

24. The Effect of Culture Medium Surfactants on Cytometric Analysis of Mycobacterium Avium Subsp. Paratuberculosis

Rachel Ascheman
Timothy Secott, Faculty Mentor (Department of Biological Sciences)

25. Effects of Cardiac Arrhythmic Mutant D95V on Calmodulin Structure and Stability

Jacob Rachuy
Allison Land, Faculty Mentor (Department of Chemistry)

26. Using Total Protein Stain as a Loading Control for Western Blot Analysis of SOD2

Nicole Bean
Theresa Salerno, Faculty Mentor (Department of Chemistry)

27. Isomorphous Replacements and Crystal Structure of $\text{Pb}(8-x)\text{Ca}x\text{Na}_2(\text{VO}_4)_6$ Solid Solutions

Aynura Berdyeva
Lyudmyla Stackpool, Faculty Mentor (Department of Chemistry)

28. Effects of Abiotic Stress on miR393 in Soy Bean Plants

Derick Che
James Rife, Faculty Mentor (Department of Chemistry)

29. Developing Hops Extraction Method for Brewing

Anh Cong
Brian Groh, Faculty Mentor (Department of Chemistry)

30. miR160 and 167 and their Target mRNAs

Patrick Connolly
James Rife, Faculty Mentor (Department of Chemistry)

31. Exploring Reactions Between Substituted-Aromatic Aldehydes and Guanosine

Dahye Kim
Danae Quirk Dorr, Faculty Mentor (Department of Chemistry)

32. Oxidation Effects the Myosin Motor Domain Function and Structure

Rachel Ott
Rebecca Moen, Faculty Mentor (Department of Chemistry)

- 33. The Effect of Sweeteners on the Expression of Superoxide Dismutase Isoforms**
Natalie Prak
Theresa Salerno, Faculty Mentor (Department of Chemistry)
- 34. MicroRNA Expression in Maize Roots Under Nitrate Starvation Conditions**
Derek Anderson
James Rife, Faculty Mentor (Department of Chemistry)
- 35. Cardiac Activator Drug Effects on Myosin Structure and Function**
Madeline Straka
Rebecca Moen, Faculty Mentor (Department of Chemistry)
- 36. Investigating the Reactivity of Cuminaldehyde and Isovaleraldehyde toward DNA**
Ekaterina Voytsekhovskaya
Danae Quirk Dorr, Faculty Mentor (Department of Chemistry)
- 37. Modular Construction Utilization in the Healthcare Industry**
Andrew Bortolotti
Brian Wasserman, Faculty Mentor (Department of Construction Management)
- 38. Construction Waste Management**
Connor Campbell
Brian Wasserman, Faculty Mentor (Department of Construction Management)
- 39. MS4 on Minnesota State University, Mankato**
Juan Lopez
Brian Wasserman, Faculty Mentor (Department of Construction Management)
- 40. Modular Construction Innovation**
Chase Olson
Brian Wasserman, Faculty Mentor (Department of Construction Management)
- 41. Dual Polarized Substrate Integrated Waveguide**
Michael Hedin
Xuanhui Wu, Faculty Mentor (Department of Electrical Engineering)
- 42. Footstep Power Generation**
Nibrasul Karim Nibras, Sampath Senanayakalage, and Justin Shaffer
Puteri Megat Hamari, Faculty Mentor (Department of Electrical Engineering)
- 43. Ball-Wheeled RC Car**
Isaac Matzke, Lucas Speer, and Michael Tonsager
Puteri Megat Hamari, Faculty Mentor (Department of Electrical Engineering)
- 44. E-Plane Substrate Integrated Waveguide Reflector Antenna**
Adam Schultz
Xuanhui Wu, Faculty Mentor (Department of Electrical Engineering)
- 45. Additive Manufacturing: Parametric Analysis of Building Parameters to Maximize Strength of Material**

Preston Torres
Shaobiao Cai, Faculty Mentor (Department of Mechanical Engineering)

46. Effect of Binder Saturation and Sintering on Stainless Steel – Hydroxyapatite Biocomposite Manufactured by 3D Printing

John Ruprecht
Kuldeep Agarwal, Faculty Mentor (Department of Automotive Engineering)

47. Escherichia coli (E. coli) Impairment in Minneopa Creek

Caitlin Flynn and Melissa Jones
Beth Proctor, Faculty Mentors (Department of Environmental Science)

48. Are Escherichia coli (E. coli) Isolated from Minneopa Creek Developing Resistance to 10 Antibiotics?

Melissa Jones and Caitlin Flynn
Beth Proctor, Faculty Mentor (Department of Environmental Science)

49. Genesis of the Magenta Zone, NorthMet Copper-Nickel-PGE Deposit, Minnesota

Daniel Crane and Cole Huggins
Steven Losh, Faculty Mentor (Department of Geology)

50. Gamma Radiation Effects on the Mortality and Fertility Rates of Drosophila Melanogaster

Wyatt Pouliot and Curran Couchman, Jacob Bukkila, and Nicholas Miller
Andrew Roberts, Faculty Mentor (Department of Physics)

51. Structural Characterization of Carbonaceous Meteorites by Micro-Raman Spectroscopy

Donald Rudquist
Analia Dallasen, Faculty Mentor (Department of Physics)

1. Seasonal Variations in the Dorsolateral and Medial Cortex, the Reptilian Hippocampus Homologue

Abdiasis Abdilahi, Caitlyn Foley, and Jaden Roddick

Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

The hippocampus is a region of the brain involved in spatial learning and memory and is a site of neural plasticity in the adult brain. In the seasonally breeding green anole lizard, *Anolis carolinensis*, steroid hormones, specifically testosterone (T) and its metabolites, estradiol (E2) and dihydrotestosterone (DHT), have been shown to play a role in seasonal changes to brain morphology. To investigate potential seasonal effects in the lizard homologue of the hippocampus, the dorsolateral cortex (DC) and medial cortex (MC), we examined 1) morphology in breeding (BS) and non-breeding (NBS) males and 2) neuron addition in BS males treated with various hormones. In experiment 1, we obtained males during the BS and NBS, collected brains, and examined volume in Nissl stained sections. In experiment 2, we gonadectomized BS males and implanted subcutaneous capsules containing T, E2, DHT, or left empty (blank). After hormone implantation, animals were injected with bromodeoxyuridine (BrdU; 50mg/kg) once per day for three days and brains collected after 25 days. Immunohistochemistry for BrdU and HuC/D (a neuronal marker) was performed to determine the number of new neurons (neurogenesis) present in the DC after treatment. Preliminary results for experiment 1 have shown there was no effect of season on the volume of either region, or the total volume (n=4; t0.502). Additionally, experiment 2 preliminary results suggest that DC, MC and total volume did not differ between T or Bl treated breeding males (n=2; t 0.258). More animals are currently being analyzed.

2. Volume of Parasite Tissue Relative to the Volume of Host Tissue in Infected Snails

Ashley Adam and Emily Jones

Robert Sorensen, Faculty Mentor (Department of Biological Sciences)

Scott Malotka, Graduate Student Mentor (Department of Biological Sciences)

When trematode parasites infect snails they consume host tissue for asexual reproduction. For this study, snails were collected from Lake Winnibigoshish and checked for trematode infection. Infected snails were frozen for later use. These snails were then used to determine the volume of parasite tissue relative to the volume of host tissue in infected snails. This was accomplished by analyzing serial cross sections through the snails using light microscopy. First, the snails were washed in formalin overnight to fix the tissue and prevent degradation. The snails were then washed with distilled water and several baths of ethanol of increasing concentration. The ethanol washes gradually dehydrate the specimens to better preserve the tissue. Then the snails were washed with xylene. The snails were embedded in paraffin wax to allow for slicing in the microtome. Once the snails were cut into cross sections, the tissue was mounted on slides and stained using hematoxylin and eosin. The Moticam 10 digital camera was used to capture images of the slides under light microscopy. Moticam Images Plus software was used to calculate the volume of parasite tissue relative to the volume of host tissue in infected snails.

3. Examining the Aqueous Outflow in c57BL6 Mouse Eyes Using Scanning Electron Microscopy

Prathibha Bamunu Achchi

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

In the human eye, the aqueous fluid, which is a complex mixture of electrolytes, growth factors, and other proteins that nourish the non-vascularized tissue of the anterior chamber, is secreted by the ciliary body into the posterior chamber of the eye and then flows into the anterior chamber. The aqueous fluid flows out from the anterior chamber, through a trabecular meshwork into the

Schlemm's canal at the junction of the iris and cornea, and then into the venous system of the eye. Obstruction of the outflow causes a pressure increase in the anterior chamber, which then exerts pressure on the posterior chamber, retina and the optic nerve. The resultant damage to the retina and optic nerve tissue from elevated intraocular pressure is called glaucoma. In this study, the aqueous outflow pathway in mice is examined using scanning electron microscopy. This allows us to examine the anatomy of the structures such as Schlemm's canal, collector channels and aqueous veins. C57BL6 mice, weighing around 30g were used. Mice were euthanized by CO₂ inhalation. Both eyes from each mouse were removed, fixed and stored by immersion in 3% glutaraldehyde. The eye tissue were dehydrated, dried and examined. Schlemm's canal in the mouse eye will be much smaller in scale in comparison to the human eye. Examining the anatomy of the Schlemm's canal allows us to get a better understanding of the aqueous outflow and glaucoma.

4. Protective Effect of Beta-Sitosterol Against Ethanol Toxemia

Dakota Cooper and April Boucher-Zamzo

Steven Mercurio, Faculty Mentor (Department Biological Sciences)

Herbal medications have no indications of interactions with alcohol on their labels. There has been at least one clinical finding that saw palmetto with active ingredient beta-sitosterol used for enlarged male prostates caused pancreatic damage. This study with 20 male mice hypothesized that ethanol would increase the toxicity of beta-sitosterol. It was found that mice dosed by gavage with 0.1 ml of 95 proof ethanol died starting at the second dose and increased to 100% by the sixth dose (unexpected based on literature). 60-microgram injections of beta-sitosterol prevented deaths in 80% of the mice past the sixth dose opposite to what was expected. We will present urine and organ data at the conclusion of the study to try to understand this novel protective action against a well known societal consumed toxicant (ethanol).

5. Survival of Methicillin-Resistant Staphylococcus Aureus on Fomites

Rudy Correa and Mutma Inna

Lois Anderson, Faculty Mentor (Department of Biological Sciences)

Methicillin-resistant Staphylococcus aureus (MRSA) has emerged as a growing concern for major healthcare facilities. The introduction of MRSA through contact with blood specimens, body fluids, and microbiological cultures on fomites is considered a high risk. Varying concentrations of a MRSA organism were suspended in three different media (blood, urine, and saline) and then inoculated to four common hospital surfaces or materials: tile flooring, vinyl flooring, laboratory coat, and pillowcase material. MRSA survival was assessed by swabbing the fomite surface and then inoculating to CHROMagar, which allows rapid identification of MRSA organisms. Longer survival times were seen with higher microbial inoculum. The survival of MRSA suspended in saline was, in some cases, greater than 92 days. MRSA was also detected in some blood specimens up to 57 days. Lengthy MRSA survival times on hospital fomites reinforce the importance of control and disinfection in monitoring the transmission of these microorganisms.

6. Characterization of Brewer's Yeast Strains by Carbon Source Utilization and Flow Cytometry

Megan Ford

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

Different types of beers are brewed not only due to variations in the malts and the hops but also as a result of the yeast strains that are involved. With brewers handling so many strains of yeast, there is the possibility of cross contamination, which would interfere with the consistency of the product. The purpose of this study was to see if we could establish/distinguish among the strains what

biochemical profiles they have with respect to carbon source utilization and what physical properties such as size and surface texture they have so that these may be employed as baseline tools to be used later to see if strains remains pure or if they have become contaminated. Data was measured using BIOLOG plates, which contain 95 unique carbon sources, coupled with flow cytometry to get indirect measurement of size and surface properties or aggregations. Analysis of preliminary BIOLOG and flow cytometry data indicate that while the English ale and Irish ale yeasts could not be distinguished from one another, California common yeast revealed BIOLOG and flow cytometry profiles distinct from the other two strains. Additional work will be needed in order to identify traits that will differentiate between the English ale and Irish ale yeasts.

7. Survey of Gastrointestinal Parasites Found in Muskrats (*Ondatra zibethicus*) Collected from Lakes in Southern Minnesota

Bree Friedman and Kayla VanBeck

Robert Sorensen, Faculty Mentor (Department of Biological Sciences)

Scott Malotka, Graduate Student Mentor (Department of Biological Sciences)

Knowledge of the parasites that reside in wildlife provides basic information about the risk those parasites may pose to humans. The muskrat (*Ondatra zibethicus*) is a mammal commonly found in wetlands over a wide range of climates and habitats. By describing the diversity and abundance of parasites that typically reside within muskrats, we gain a better understanding of ecology of muskrats and the extent to which they possess parasites that could infect people. *O. Zibethicus* residing around Minnesota lakes typically contract parasites from intermediate hosts, like snails or arthropods, that live within those lakes. Humans that come into contact with these intermediate hosts could be at some risk given these parasite could potentially infect humans. By conducting a survey of the typical parasite species found within the intestines of muskrats in southern Minnesota, we provide information on the possible risk to diversity and abundance of these parasites. In the fall of 2016, we obtained 52 muskrats from Minnesota Lake and German Lake in southern Minnesota that were harvested by local fur trappers. Intestines were extracted from the muskrats and placed in plastic bags and stored at -20°C until they were thawed and examined to collect any parasites they contained. Parasite species were identified using phylogenetic keys and primary literature. Commonly found parasites include *Quinqueserialis quinqueserialis*, *Echinostoma trivolvis*, and *Notocotylus filamentis*. These efforts to describe baseline parasite community structure are deemed necessary to future studies given the numerous environmental changes being forecast, including introduced species, habitat loss, and climate change.

8. miRNA regulation of A3A and A3B

Katlyn Gieseke and Alyssa Lange

Allison Land, Faculty Mentor (Department of Biological Sciences)

APOBEC3A (A3A) and APOBEC3B (A3B) are enzymes that deaminate DNA Cytosine to Uracil, leading to 5'TC to 5'TT mutations. A3B overexpression has been found in many different cancers and is associated with increased mutation. Some individuals have a deletion that removes the A3B coding region and fuses the A3B 3'regulatory region to A3A. If A3B is the sole source of these mutations, these individuals shouldn't have these APOBEC3 mutations, but they do. I hypothesize that the A3B deletion affects A3A expression through miRNA transcriptional regulation. To test this hypothesis, we amplified the A3A and A3B 3'regulatory regions from HCC1569 cancer cells, expressing high levels of A3B, and HeLa cells, expressing low levels of A3B. These regions of DNA from each cell will be cloned into psiCHECK-2 vector downstream of firefly luciferase. We then identified miRNA-'s that are predicted to bind the 3'regulatory region of A3A and A3B. We will clone the identified miRNA-'s into a separate expression vector. The luciferase vector with the

A3A or A3B 3'regulatory region will be transfected into cells, along with a miRNA expression vector. The luciferase gene will cause the cells to glow. The light will be quantified to tell how the miRNA affects A3A and A3B expression. MiRNA that binds the regulatory region are expected to cause a decrease in luciferase. We expect to identify miRNAs that are capable of regulating A3A and A3B expression. This research could help identify how A3B expression is controlled and how cancer was caused in people with the A3B deletion. This research could also help to further understand how tumors and APOBEC enzymes are related.

9. Connective Tissue Infiltration into Three-Dimensional Printed Stainless Steel Alloy

Mehedi Hasan, Clenten Ndonwie, and Bethany Haus

Michael Bentley, Faculty Mentors (Department of Biological Sciences)

Kuldeep Agarwal, Faculty Mentor (Department of Automotive Engineering Technology)

The biomaterial used in medical implantable devices must sufficiently integrate within the biological system and be compatible with surrounding tissue. Hydroxyapatite (HA), a bioactive material that is a major and essential component of normal bone and teeth, is often used for coating metal implants to initiate implantation. However, its bioactivity leads to high biodegradation when implanted alone, which can result in clinical implant failure. In the present study, our focus is on the biocompatibility of a mixture alloy of stainless steel and hydroxyapatite, fabricated by using a three-dimensional printer. To test the biocompatibility of the fabricated metal implant in vivo, one millimeter-sized lattice structure metal pieces of high and low HA ratio mixture alloys were inserted on rat skulls through a small incision on the back made using a sterilized implantation surgery. After five months, the metal pieces were removed and observed under scanning electron microscopy to determine the degree of infiltrated bone and connective tissue. The surrounding connective tissues were also examined for inflammation and other tissue damages. The result showed that, the metal alloys that were fixed on the bone were encapsulated by dense connective tissue continuous with the periosteum without having any signs of inflammation or rejection. Furthermore, connective tissue infiltrated into spaces within alloy, between and around the spheres of stainless steel, to form a dense matrix of cellular and fibrous material throughout the implant. Our findings will help improve medical device alloys for hip, femur, dental, and other implants.

10. Helminth Parasites Protect from Intestinal Damage in Mice Model of IBD

Shannon Helmer

Allison Land, Faculty Mentor (Department of Biological Sciences)

Natalie Gooder, Graduate Student Mentor (Department of Biological Sciences)

Developed countries have seen a noticeable rise in allergic and autoimmune disease, but interestingly, less developed countries, which have low incidences of allergic and autoimmune disease, have high incidences of parasitic infections. A major part of an immune response is the balance between an inflammatory response and a regulatory response. Once the inflammatory response is triggered, the body induces phagocytes to migrate to the site of the foreign invader. Once at the site, phagocytes are activated and produce cytokines, which activate other cells in the immune system. Once an infection is detected and cytokines are activated, Tregs (regulatory T cells) control which cytokines are used and how. Inflammatory Bowel Disease (IBD) is an example of an autoimmune disease where we see a damaging inflammatory response. I hypothesize that parasites may be used to trick the immune system into shutting off inflammation in IBD. Using a well-established IBD mouse model, heat-killed parasites (or a control) will be fed to the mice. The ability of the parasites to modulate the immune response in IBD will be assessed by measuring IL-10 (anti-inflammatory) and IFN γ (pro-inflammatory) cytokines using an ELISA. I anticipate that the ability to protect mice from intestinal damage will be shown by an increase in IL-10 (anti-

inflammatory) and a decrease in IFN γ (pro-inflammatory). These findings will demonstrate the ability of heat-killed parasites to stimulate an anti-inflammatory immune response, protecting against chronic inflammation. This would provide novel insight into lessening symptoms of IBD and other autoimmune diseases.

11. Seasonal Control of Reproduction in Green Anole Lizards Through Neural Peptides Involved in the Hypothalamic-Pituitary-Gonadal (HPG) Axis

Uyi Imasuen, Megan Sandeberg, and Nicholas Booker

Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

While reproduction is a key component in an organism's life, reproductive behaviors vary across species. Seasonal breeders' reproductive behavior changes depending on the season due to fluctuations in steroid hormone levels. Steroid hormone levels increase during the breeding season, causing increased reproductive behaviors, and decrease in the non-breeding season, resulting in a decrease in these behaviors. These hormone levels are controlled by the hypothalamus-pituitary-gonadal (HPG) axis; the hypothalamus releases gonadotropin releasing hormone (GnRH) which acts on the pituitary gland. The pituitary gland then releases hormones that act on the reproductive organs, which ultimately release steroid hormones. Regulation of this process occurs via neural peptides, including kisspeptin, a positive regulator of GnRH, and gonadotropin inhibitory hormone (GnIH), a negative regulator. Green anole lizards (*Anolis carolinensis*) are seasonal breeders who display increased territorial behaviors and ritualized courtship displays while experiencing increased steroid hormone levels during the breeding season. In the current experiment, the gene expression of kisspeptin 1 receptor (Kiss1R), kisspeptin 2 (Kiss2) and GnIH are going to be examined in the green anole brain to assess seasonal changes. We are working to clone the sequences of these genes into a vector, which will be used to construct RNA probes for an in situ hybridization study, allowing for the localization of these genes in the anole brain.

12. Ultrastructure of Larval Trematodes from Snails Collected from Lake Winnibigoshish, Minnesota

Jacob Iverson and Ross Buttleman

Robert Sorensen, Faculty Mentor (Department of Biological Sciences)

Scott Malotka, Graduate Student Mentor (Department of Biological Sciences)

Trematodes are a class of parasitic flatworm that are internal parasites of both mollusks and vertebrate hosts. Most trematodes have a complex life cycle that includes at least two hosts: one where sexual reproduction occurs (definitive host) and one where asexual reproduction occurs (intermediate host). Identification of both larval and adult stages is critical for determining the species of trematode in question as well as the mechanisms that allow that parasites to reside within their intermediate host. The current investigation was started to elucidate the mechanisms that allow for parasite attachment within intermediate hosts. Snails were collected from Lake Winnibigoshish in northern Minnesota, an area known for harboring trematode diversity within both definitive and intermediate hosts. During this study, two different larval forms (rediae and tetracotyle) were dissected from snail hosts and prepared for scanning electron microscopy (SEM). Examination of the presence or absence of structures used for the attachment to host tissues will be performed. These findings will help better understand the interaction that occurs between the intermediate snail host and the parasitic worm.

13. FAM171B mRNA Expression in the Brain

Brooke Jones

Geoffrey Goellner, Faculty Mentor (Department of Biological Sciences)

Ashani Sudasinghe, Graduate Student Mentor (Department of Biological Sciences)

Huntington's disease (HD) is a disorder characterized by its progressive and ultimately fatal neurodegeneration for which no cure exists. HD is defined by its repeats of CAG (CAG codes for the amino acid glutamine) within its DNA sequence, also referred to as polyglutamine (polyQ) sequences. In HD-afflicted individuals, polyQ sequences expand beyond normal range, causing brain cell death. The absence of polyQ sequences in healthy populations has led to the inference that polyQ stretches are the primary cause of the pathological effects of HD. This is of particular significance in our lab because an uncharacterized protein named FAM171B also contains a polyQ sequence and is hypothesized to function in the brain. The purpose of this research project is to determine if FAM171B is expressed within the brain. If it is, FAM171B could be considered a candidate gene for a currently unidentified neurodegenerative disease, as well as advance the field of cellular neuroBiological Sciences. In our lab, we utilize in-situ hybridization to pinpoint FAM171B gene expression within the brain tissues of mice. We previously sub-cloned FAM171B into a vector containing promoters to create a "probe" via in-vitro transcription. The "probe" is labeled with non-canonical bases, which allow tissues containing FAM171B to "light up" upon application of the "probe". Thus far, our trials have yielded successful results. With further experimentation, we hope to achieve consistent results that confirm FAM171B's expression in the brains of mice.

14. The Effects of DIO2 and DIO3 Expression on Seasonal Reproduction in a Seasonally Breeding Animal

Hyejoo Kang

Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Thyroid hormone (TH) is critical for testes development and a decrease in TH can cause hypogonadism, which decreases gonadal function. Deiodinase is responsible for the activation and inactivation of TH from the precursor, thyroxin (T4). Type 2 deiodinase (DIO2) produces the biologically active thyroid hormone, triiodothyronine (T3), while type 3 deiodinase (DIO3) produces an inactive isoform, reverse triiodothyronine (rT3). In developing testis, DIO3 expression is upregulated and DIO3 deficiency results in low T3, causing a drastic reduction in testis size. In seasonally breeding animals, testicular morphology and function are altered in the breeding (BS) compared to non-breeding season (NBS), such that they go through periods where the gonads are inactive (hypogonadism). Studying a seasonally breeding Green anole lizard, *Anolis carolinensis*, will allow us to examine natural changes in DIO2 and 3 expression patterns that might mediate these changes. Male green anole testes grow and produce steroid hormones and sperm during the BS, while they regress and the lizards no longer reproduce during the NBS. We are using quantitative polymerase chain reaction (qPCR) to measure how DIO2 and DIO3 mRNA expression in the testes differs between the BS and NBS. Since the presence of T3 is important for testicular maturity and development, we expect to find that testes from breeding lizards will have upregulated DIO2 and downregulated DIO3 compared to NBS testes. This will support the idea that TH is critical for regulating seasonal testicular changes, which may help us to understand how TH is involved in hypogonadism.

15. Induced Natriuresis on Spontaneously Hypertensive Female Rats

Okhumhekho Kassim and Jill Kneprath

Penny Knoblich, Faculty Mentor (Department Biological Sciences)

St Hypertension (high-blood pressure) can lead to several health issues. Blood pressure is strongly influenced by blood volume, which is related to sodium and water retention by the kidneys. The

kidneys excrete extra sodium and water when blood pressure is raised, a process called pressure natriuresis. Regular exercise reduces blood pressure and stimulates the release of a chemical called endothelin (ET). Endothelin has three forms and it binds to two different receptors, ETA and ETB, both found in the kidneys. Elimination of the ET-1 receptors in the kidney-collecting duct prevents the normal pressure natriuresis response. Prior studies in this laboratory found that exercised female Spontaneously Hypertensive Rats (SHR) exhibited an increase in pressure natriuresis and had a greater number of endothelin receptors in the kidneys. Further understanding of exercise, endothelin, pressure natriuresis, and blood pressure could lead to better treatments for hypertension.

Investigation of the role of endothelin in the exercise-induced improvement in pressure natriuresis was carried using an ETA receptor blocker. Female SHRs were assigned to an exercised group, which ran voluntarily from 4 to 12 weeks of age, or a sedentary group. At 12 weeks of age, the rats were anesthetized and given either the ETA blocker or the vehicle control. After catheterization of the carotid artery and jugular vein, a baseline urine sample was collected. Afterwards, arterial blood pressure was raised by ligating three abdominal arteries. Four additional urine samples were collected at the higher blood pressure, analyzed for sodium and water content, and compared between groups.

16. Counteraction of APOBEC3A by SIV Sooty Mangabey Proteins

Ryan Leba

Allison Land, Faculty Mentor (Department of Biological Sciences)

The APOBEC3 protein family is best known for its lentiviral restriction capabilities. These proteins counteract lentiviruses such as HIV by causing lethal mutagenesis. In order for these lentiviruses to survive, they need a protein to counteract the APOBEC3s. A series of proteins known as VPX and VPR are encoded by the related lentivirus SIVsmm, which infects sooty mangabeys. These proteins have recently been shown to possibly degrade APOBEC3A. Understanding a mechanism that neutralizes APOBEC3A is important because APOBEC3A and APOBEC3B have recently been implicated in oncogenesis, with one report even suggesting that APOBEC3 mutagenesis is second only to aging in terms of contribution to cancer mutagenesis. I hypothesize that with increasing levels of VPR and VPX we will see dwindling levels of APOBEC3A due to degradation mediated by the SIV proteins. To test our hypothesis VPR/VPX will be individually transfected into 293T cells, and after 48 hours, the cells will be lysed and A3A will be detected by immunoblot to assess VPR/VPX mediated degradation. If these proteins are unable to mediate degradation of APOBEC3A, we will expand our survey to other SIV strains. We are confident that we will identify a protein that is effectively able to neutralize APOBEC3A, and furthermore provide knowledge that may lead to more effective treatments for cancer patients by counteracting mutagenesis and tumor evolution.

17. Methicillin Resistance in Staphylococci Isolated From Healthy College Students

Kelsey Linnell

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

The rise of β -lactam antibiotic resistant bacteria in the United States is a notable concern for many health care workers. This is concerning because these drugs have been reliably used to treat infections for several years. Staphylococcus aureus is one organism that has been known to exhibit a significant increase in resistance to antibiotics, specifically β -lactam drugs such as methicillin. It is known that the organism is able to exhibit this resistance through two pathways. The first is a β -lactamase pathway within the organism, and the second is a penicillin binding protein (PBP2a), which was previously found to be controlled by the mecA gene. In this investigation, bacteria were

cultured from asymptomatic, otherwise healthy college-aged students to estimate the prevalence of resistant *Staphylococcus* species. Twenty-seven samples were collected and identified using standard identification techniques as well as molecular techniques. Those samples were then tested for their resistance using multiple different β -lactam drugs. Of those 27 samples, 6 were found to be methicillin resistant, which was consistent result with what we anticipated to find. Those 6 resistant strains are currently being evaluated for minimum inhibitory concentrations of methicillin and the presence of *mecA*, the PBP2 allele associated with methicillin resistance.

18. Quantifying Cochlear Nerve Myelination in Mice Lacking Thyroid Hormone Transporters

Natalie Moses

David Sharlin, Faculty Mentor (Department of Biological Sciences)

Our lab has been investigating a group of proteins that mediate the transport of thyroid hormone (TH) across the cell membrane and recently found mice lacking two specific TH transporters (*Mct8* and *Oatp1c1*) have normal cochlear development, but altered auditory processing. Specifically, this data demonstrated that the speed at which auditory signals pass from the cochlea to the brainstem were delayed. The experiments performed were designed to test the hypothesis that auditory deficits observed in animals lacking TH transporters *Mct8/Oatp1c1* is due, in part, to altered myelination of the auditory pathway. After breeding the animals and processing nervous and cochlear tissue, myelin-staining techniques were used to determine the levels of myelination between central and peripheral nervous systems. Our findings will have two important implications. First, this research will further define the need for these transporters in development to produce normal auditory function. Second, it will allow for either the prevention of auditory deficits due to lack of thyroid hormone (hypothyroidism) during development or potentially offer novel modalities for treating deficits associated with low thyroid hormone.

19. Investigation of Metacognitive, Motivational and Self-Efficacy Influences on the Performance of Undergraduate Introductory Non- Major Biological Sciences Students

Rachel Newinski

Brittany Smith, Faculty Mentor (Department Biological Sciences)

It is a concern of both students and instructors that students are able to learn and perform well in an educational setting. Likewise, it is important that students feel confident in themselves and the information they know and are able to remember, as well as being motivated to learn. These occurrences have been named self-efficacy, metacognition, and motivation, respectively. Independently these facets of learning have been studied extensively. The hope of this study is to observe these phenomena happening simultaneously in an introductory undergraduate Biological Sciences course for non-Biological Sciences majors. This is done by comparing student's exam scores and their surveyed attitudes both before and after exams through the course of a semester. Attitudes were surveyed using a pre and posttest survey that involved both binary and Likert scale assessments of confidence, motivation, and metacognition. In this study, it was observed that there was a significant difference between the upper 50% scoring students and the lower 50% scoring students in their agreeance of feeling confident in their ability to learn across two exams. This finding was mirrored when comparing the top scoring students with the lower scoring students and their agreeance of their motivation to learn. However, when the magnitude of the difference between the actual and predicted exam scores of the top 50% was compared to that of the lower 50%, a difference was observed but it was not deemed significant. The findings of this study mirror that of other similar works in that top performing students are more motivated to learn and have higher levels of self-efficacy.

20. Analysis of Amygdala Morphology and Neurogenesis in Green Anole Lizard in Breeding Versus Non-Breeding Season

Jaden Roddick and Abodalrahman Algamdy

Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Steroid hormones and their derivatives play a major role in the reproductive system. Studying the effects of the hormones on the brain can lead us to further information regarding the process of the reproductive system. Because the amygdala is responsible for reproductive behaviors, such as copulation, we will use this area of the brain to retrieve desired data. We are examining the relationship between steroid hormone and neuron size, number and neurogenesis in the amygdala. We are using the green anole lizard (*Anolis carolinensis*) as a model organism to study neurogenesis in the amygdala. Green anoles are seasonally breeding animals and exhibit unique behavioral and physiological differences in the breeding season compared to the non-breeding season. These behavioral differences are likely caused by seasonal changes in circulating steroid hormone levels. Green anoles were caught in natural habitat during the breeding season, transferred to the laboratory, and gonadectomized. A capsule containing either testosterone, estradiol, or left empty was inserted under the anole's skin. The animals were injected with BrdU for three days after the treatment. After one month, brains were collected, sectioned, and placed on slides. BrdU and Hu markers were applied to the slides to display the presence of new neurons. Sections of brain were used to count cell number and soma size were treated with Nissl stain. Measurements were taken using a microscope to examine the sections of brain. We expect to see a decrease in neuron number in the amygdala during the breeding season.

21. Mineralization and Structural Anatomy of Bone from Male C57/BL6 Mice with Reduced Testosterone Levels

Katie Rubitschung

Michael Bentley, Faculty Mentor (Department of Biological Sciences)

Osteoporosis is common in post-menopausal women and is related to reduced levels of estrogen. However, in later years, men also develop osteoporosis as testosterone levels decline. Calcium and phosphorus homeostasis is a complex process involving many different components. More than 99% of total body calcium and phosphorus is stored in bone in the form of phosphate and hydroxide salts. Little information is available concerning the role of testosterone in bone mineralization. The goal of this research is to study bone density, calcium levels, and phosphorus levels in both castrated and non-castrated (control) male C57/BL6 mice. The control group consists of eleven non-castrated male mice. The experimental group consists of eleven mice, which had been anesthetized with isoflurane and castrated using aseptic surgical technique. In variable time periods following surgery, the mice were euthanized and the long bones were harvested and weighed for bone density measurement. Calcium and phosphorus levels were measured using scanning electron microscopy (SEM) and energy dispersive x-ray spectroscopy (EDS). The results will provide information about the effect of low levels of testosterone on bone mineralization. Preliminary results show a mineralization decline between the uncastrated (control) mice and castrated (experimental) mice, indicating testosterone levels are a factor affecting bone mineralization. Understanding testosterone's effects on bone mineralization is critical to the treatment of osteoporosis.

22. Transcriptome Analysis of Staph. Aureus in Response to Specific IgY through RNA-Seq

Reed Woyda

Allison Land, Faculty Mentor (Department of Biological Sciences)

Antibodies, also known as immunoglobulins (Ig), bind specific antigens, usually from bacteria or virus, and stimulate the immune system to respond accordingly. Camas Incorporated of Minnesota has produced patents for preventing and or decreasing respiratory illness in livestock. This is done by adding antigen-specific IgY to animal feed. They found that delivering the IgY via intranasal spray within feedlots resulted in the reduction of morbidity or mortality in certain agriculture animals. While treatments such as these are known to be effective, bacteria are notorious for their ability to evolve resistance. Therefore, I hypothesize that the binding of specific IgY to *S. aureus* will alter RNA transcription, resulting in the up regulating of pathogenic factors, compared to the control. *Staphylococcus aureus* was isolated from a field sample obtained by Camas Incorporated and will be used in this experiment due to its known detrimental effects to livestock. A positive control culture will contain an antibiotic, known to alter transcription, and addition of a non-binding IgY will serve as a negative control. The experimental condition will contain *S. aureus* and specific IgY. Antibodies will be purified from yolks of eggs which were laid by chickens immunized against *S. aureus*. RNA will then be purified from culture samples, reverse-transcribed into cDNA and prepared for DNA sequencing. Analysis of the transcriptome will be performed using various software. On examination of the differential transcriptional data, I anticipate being able to determine if *S. aureus* experienced altered regulation of pathogenic genes in response to IgY binding.

23. Are Hypothyroidism-Induced Reductions in Brain Derived Igf1 Due to Reductions in Serum Growth Hormone?

Alec Wright

David Sharlin, Faculty Mentor (Department of Biological Sciences)

Low thyroid hormone (TH) during development results in permanent neurological deficits. Similarly, low insulin-like growth factor 1 (Igf1) during development results in neurological deficits. Furthermore, studies in rodents have documented similar neuroanatomical defects between low serum TH and low serum Igf1. Serum Igf1 levels are controlled by pituitary-derived GH that stimulates the production and secretion of Igf1 from the liver. Considering that TH is well known to regulate pituitary derived GH production, it is reasonable to propose that changes in locally produced brain-derived Igf1 following thyroid hormone insufficiency is due, in part, to a disruption of the TH-GH-Igf1 axis. To clarify this, we are investigating whether changes in brain-derived Igf1 mRNA is an indirect result of changes in serum GH that accompany low TH. To test this idea, pups derived from control or hypothyroid timed-pregnant dams are injected daily with 15ng/day of GH or saline for 7 days post birth and then 30ng/day for the following 7 days post birth. On postnatal day 14 (P14), brains were dissected and blood serum was collected. Using enzyme-linked immunosorbent assays (ELISA) serum GH and Igf1 are being determined and compared between groups. Using quantitative real-time PCR (qRT-PCR) brain derived Igf1 mRNA will be determined in known TH-responsive brain regions. It is predicted that these data will demonstrate that changes in brain-derived Igf1 levels following hypothyroidism are independent of the reductions in serum growth hormone associated with low TH; identifying a potentially novel process by which low TH in development results in neuroanatomical defects.

24. The Effect of Culture Medium Surfactants on Cytometric Analysis of Mycobacterium Avium Subsp. Paratuberculosis

Rachel Ascheman

Timothy Secott, Faculty Mentor (Department of Biological Sciences)

The purpose of this study is to identify the susceptibility of dormant MAP cells to detergents used in agriculture. MAP cultures were grown in two media differing only in primary carbon source,

Tween 80 and glycerol. Both cultures were analyzed with the fluorescent dyes CTC and Syto24. CTC is a fluorescent dye used for detection of respiring cells via electron transport chain; Syto24 is a fluorescent dye that binds to DNA. Preliminary results of this study indicate that Tween 80 influences the permeability of the dyes and may impair binding by nucleic acid stains used for viability assays, confounding efforts to analyze dormancy in mycobacterium. Identification of the negative interaction between Tween 80 in culture medium and viability assays means that alternate carbon sources should be used when investigating dormancy in MAP.

25. Effects of Cardiac Arrhythmic Mutant D95V on Calmodulin Structure and Stability

Jacob Rachuy

Allison Land, Faculty Mentor (Department of Chemistry)

APOBEC3A is a catalytically active DNA cytosine deaminase expressed in monocyte immune cells. This function allows APOBEC3A to mutate and restrict viruses, potentially including HIV. HIV-1, the causative agent of the major HIV/AIDS pandemic, is incapable of infecting monocytes. HIV-2, a less common variant, is capable of infecting monocytes. The unique protein Vpx, produced by HIV-2, but not HIV-1, is thought to be responsible for allowing HIV-2 infection in this immune cell. The objective of this study is to determine the sensitivity of human APOBEC3A to HIV-2 Vpx. We hypothesize that HIV-2 Vpx will be capable of mediating degradation of APOBEC3A and limiting its mutagenic capabilities, thus allowing HIV-2 to infect monocytes. To test this hypothesis, a mutant Vpx protein, called H82A, was constructed using mutagenic primers. This mutant lacks the ability to bind to APOBEC3A. Once created, the plasmid containing Vpx-H82A was transfected into 293T cells along with APOBEC3A. Vpx without the mutation, along with APOBEC3A, was also expressed in 293T cells. Immunoblotting was utilized to visualize these results and determine if Vpx mediated degradation of APOBEC3A. We determined that neither wild type HIV-2 Vpx nor Vpx-H82A altered APOBEC3A levels. Currently, we are exploring the sensitivity of APOBEC3A to Vpx from other lentiviruses such as SIVmac, a simian immunodeficiency virus affecting Rhesus macaques. The same methods will be employed and an expression plasmid for the Vpx-H82A has been made. This project will contribute to our understanding of the innate immune response to lentiviral infection.

26. Using Total Protein Stain as a Loading Control for Western Blot Analysis of SOD2

Nicole Bean

Theresa Salerno, Faculty Mentor (Department of Chemistry)

A deficiency in the antioxidant enzyme Superoxide Dismutase (SOD), more specifically the SOD2 isoform, can lead to an increase in oxidative stress resulting from hyperglycemia. Most of this previous work has been focused on total SOD enzymatic activity, not specific isoform expression, and most of the studies have used diabetic models rather than dietary studies. In this study, rats were fed diets supplemented with sucrose and two other sweeteners, Stevia and saccharin. SOD2 expression was measured at the protein level using the Western blot technique. The initial objective of this project was to establish a proper normalization for SOD2 relative quantitation using the Western blot technique and an IR labeled secondary antibody. The Revert Total Protein Stain has been tested as a loading control with a Sigma Prestige antibody for SOD2. By comparing different protein levels on the blot, we have established a linear range for the detection of both total protein and the SOD 2 protein target and have optimized the technique as a successful quantitation tool for SOD2 protein relative expression. The technique will now be applied to measure SOD2 protein expression in the control and experimental kidney samples. This will first involve homogenization and extraction with a RIPA buffer followed by centrifugation and the quantitation by the BCA

assay so that all protein samples are analyzed in the linear range of detection for the target and total protein.

27. Isomorphous Replacements and Crystal Structure of $\text{Pb}(8-x)\text{Ca}_x\text{Na}_2(\text{VO}_4)_6$ Solid Solutions

Aynura Berdyeva

Lyudmyla Stackpool, Faculty Mentor (Department of Chemistry)

Compounds with the apatite structure and general formula $\text{M}_{10}(\text{EO}_4)_6(\text{X})_2$, where $\text{M} = \text{Ca}^{2+}$, Sr^{2+} , Ba^{2+} , Eu^{3+} , Na^+ etc.; $\text{E} = \text{P}^{5+}$, V^{5+} , Si^{4+} , As^{5+} etc.; and $\text{X} = \text{OH}^-$, F^- , Cl^- , Br^- , I^- , O_2^- etc. find an application as bioactive, luminescent and laser materials, sensors, solid electrolytes, absorbents and catalysts. Compounds with apatite structure can easily accommodate a great variety of substitutions. Substitutions make not only changes in already existing properties but also cause the emergence of the new ones. Thus, synthesis and study of solid solutions is a way to produce novel functional materials. Among all apatites only Pb-containing compounds retain the apatite structure in which the Y ions are absent in the center of structural channels. Whenever the anions are removed from the channels, the apatite lattice collapses, except for those cases where the M2 sites are occupied by cations having 6s² – lone pair (Pb^{2+}). These stereochemically active lone pairs orient toward the channel and create a negative charge which, stabilizes the apatite structure. The solid solutions $\text{Pb}(8-x)\text{Ca}_x\text{Na}_2(\text{VO}_4)_6$ were synthesized by the solid-phase method and studied by X-ray powder diffraction and scanning electron microscopy. The substitution of calcium for lead under the scheme: $\text{Pb}^{2+} \rightarrow \text{Ca}^{2+}$ was accompanied by a decrease of the unit cell parameter c, whereas a change in the parameter was found to be within an error of its determination. Such changes are due to the compression of the structural channel, which occurs as the substitution of lead for calcium takes place.

28. Effects of Abiotic Stress on miR393 in Soy Bean Plants

Derick Che

James Rife, Faculty Mentor (Department of Chemistry)

Abiotic biotic stress is environmental conditions that reduce agricultural yield. Plants have evolved mechanisms to counteract these stresses. Since the plant hormone auxin regulates many aspects of plant development, it is a key factor in the stress response mechanism. Auxin causes the TIR1/AFB family of F-box proteins to trigger degradation of Aux/IAA transcriptional repressors. Relief of Auxin/IAA repression liberates the Auxin Response Factors to activate transcription of Auxin Responsive Genes. Some microRNAs play important roles in the auxin-signaling pathway by targeting mRNAs in this pathway for destruction. For example, this study focused on miR393, which targets the mRNA for the F-box protein AFB2. Previous work used RT-qPCR to measure AFB2 mRNA levels in soybeans under conditions of cold, drought and salinity stress. Root samples showed a 50% decrease in expression of AFB2 mRNA in drought and cold treated plants; whereas high salinity doubled the expression of AFB2 mRNA.

The objective of the current project was to measure miR393 levels in the samples used in the previous study to see if there was a correlation between miR393 and the AFB2 mRNA. No significant effects on the expression of miR393 were seen in root samples treated by the abiotic stressors. Moreover, there was no significant correlation between the levels of miR393 and AFB2 mRNA in these plants suggesting that factors other than miR393 are contributing to AFB2 mRNA expression.

29. Developing Hops Extraction Method for Brewing

Anh Cong

Brian Groh, Faculty Mentor (Department of Chemistry)

Hops are an essential ingredient in developing a bitterness in flavor and a unique aroma in beer. These characteristics are due to a few important components including bitter acids, essential oils, and polyphenols. These compounds are not found abundantly in hops, however, which complicates the extraction process. This project focuses on developing a method of extraction that can maximize the yield of these desired components from hops. The extraction is carried out using ethanol as a solvent under regulated conditions. A concentrated extract is produced following evaporation of the solvent. Experimental parameters evaluated include duration of extraction time, solvent volume, and the evaporation procedure. Chemical analysis methods including UV-VIS spectrometry, gas chromatography, and gas chromatography-mass spectrometry are used to assess the components present and their quantities in the extracts. Comparison between the data collected from the extracted samples and a standard toluene extraction method is used to verify the efficiency of our process and the quality of the product. This information can potentially lead to the development of an extraction method that results in a commercially viable extract that can benefit the craft brewing industry.

30. miR160 and 167 and their Target mRNAs

Patrick Connolly

James Rife, Faculty Mentor (Department of Chemistry)

Corn is the second most prevalent crop across the world. Use of nitrogen fertilizer is a major factor in corn yields. However, nitrogen efficiency in cereal crops is estimated to be at only 33%. Understanding how corn responds to changes in nitrogen levels can lead to an environmentally responsible increase in crop yields. Earlier work in this lab demonstrated that nitrate levels affect miRNA 160 and 167 levels in corn roots. These miRNAs are thought to target the mRNAs of auxin response factors (ARF). One-week-old corn plants were transferred to a hydroponic vessel containing Hoaglund's solution minus nitrate. Two days after nitrogen starvation half of the plants were kept in Hoaglund's minus nitrogen, and half were transferred to a Hoaglund's with nitrogen solution. Root tips and root elongation zones were harvested at 1 hour and 22 hours after the transfer and analyzed for miRNA 160 and 167 levels. Nitrate was found to decrease levels of miR160 and 167 in the root tips and increase in the levels of 160 and 167 in the root elongation zones. MiR160 and 167 target mRNAs for ARF 17 and 6 respectively. These mRNAs will be examined to see if changes in their levels correlate with the miRNA levels.

31. Exploring Reactions Between Substituted-Aromatic Aldehydes and Guanosine

Dahye Kim

Danae Quirk Dorr, Faculty Mentor (Department of Chemistry)

The reactivity of substituted-aromatic aldehydes with guanosine and arginine can help elucidate information about how these chemicals could react within our bodies. The aromatic aldehydes selected in this experiment include o-nitrobenzaldehyde, p-nitrobenzaldehyde, salicylaldehyde, and 5-nitrosalicylaldehyde. Reactivity of each aldehyde was explored through four different reactions: 1) aldehyde alone, 2) aldehyde with guanosine, 3) aldehyde with arginine and 4) aldehyde with guanosine and arginine. In total, sixteen separate reactions were conducted at 50C. d6-Dimethyl sulfoxide was used as the solvent in each reaction. Reaction mixtures were analyzed by proton nuclear magnetic resonance (¹H-NMR) and high performance liquid chromatography (HPLC).

32. Oxidation Effects the Myosin Motor Domain Function and Structure

Rachel Ott

Rebecca Moen, Faculty Mentor (Department of Chemistry)

This research examines the functional and structural effects of oxidative modification in Dicty myosin II in the motor domain. Myosin has been shown to be a target of oxidative stress. Reactive oxygen species target specific amino acids within contractile proteins leading to site directed oxidative modifications. Oxidative stress of muscle proteins is associated with aging and chronic diseases that induce muscle wasting. The goal was to obtain molecular level information on the myosin-actin relationship to understand the effects of myosin oxidation and muscle dysfunction using site-directed mutagenesis (SDM), molecular modeling, enzyme kinetics, site-directed spin-labeling and electron paramagnetic resonance (EPR). The structural focus was on the force-generating domain of myosin, specifically the relay helix, which undergoes a large structural change with contraction. SDM was used to introduce new cysteine sites to monitor structural changes in the relay helix. Labels bind by disulfide linkage to amino acid residues at i and $i+4$ on an alpha helix at sites 492 and 496, and 639 and 643 in the myosin primary sequence. The function of this mutated myosin was tested using an actin-activated ATPase assay to confirm that neither mutagenesis nor spin-labeling affected myosin's function. The oxidized labeled-myosin actin-activated ATPase activity showed a 3-fold decrease in activity compared to the unoxidized labeled myosin. Results for changes in myosin structural dynamics based on EPR data is yet to be determined although simulations of the data suggest a change will be detectable. These results provide knowledge on protein oxidation effects with potential therapeutic significance.

33. The Effect of Sweeteners on the Expression of Superoxide Dismutase Isoforms

Natalie Prak

Theresa Salerno, Faculty Mentor (Department of Chemistry)

We have examined the effect of sweeteners on the mRNA expression of two superoxide dismutase isoforms, SOD1 and SOD2, both of which are involved in reducing levels of intracellular reactive oxygen species (ROS). Medical complications can occur as a result of excess reactive oxygen species (ROS) generation, as has been documented for diabetics and others with hyperglycemia. The effects of sucrose and other sweeteners, such as saccharin and Stevia, on the expression of SOD1 and SOD2 in the kidney have not been examined. Wistar-Kyoto rats were fed diets supplemented with sweeteners for a period of 6 weeks, at which point kidney samples were taken. RNAs were extracted from kidney samples using a MirVANA kit (Ambion) and reverse transcribed using a high capacity cDNA reverse transcription kit with random primers (Life Technologies). Quantitative PCR was then used to analyze samples using the $\Delta\Delta Ct$ method. Our results have indicated that the addition of sweeteners has no significant effect on the expression of SOD1 and SOD2 mRNA, indicating that any potential down-regulation of SOD isoforms is not done at the mRNA level. Further analysis of SOD1 and SOD2 protein expression by protein extraction and Western Blot technique should be done to determine if SOD protein expression is changed due to treatment. These results should confirm or refute the idea that SOD expression is regulated at a different point in protein production.

34. MicroRNA Expression in Maize Roots Under Nitrate Starvation Conditions

Derek Anderson

James Rife, Faculty Mentor (Department of Chemistry)

Nitrogen is a vital nutrient for all organisms, and nitrogen availability is a major factor in agricultural productivity. Efficient plant growth relies on control by the auxin hormone system,

which helps regulate plant root systems by increasing lateral root growth. The purpose of this experiment is to explore how the expression of miR160 and miR167 responds to nitrate availability, as they have previously been shown to regulate Auxin Response Factors (ARFs). Zea mays plants were grown under normal conditions for two weeks, then subjected to nitrogen starvation for two days and finally exposed to various nitrate availabilities for 1 or 22 hours. Extraction of total small RNAs from the roots was performed with a mirVana miRNA isolation kit. The microRNAs were reverse transcribed using a TaqMan Small RNA Assay Reverse Transcription kit. The resulting cDNA was then analyzed via qPCR using TaqMan primers specific for Zea mays miR160 and miR167. The results indicated miR160 and miR167 expression in the elongation zone was lower in nitrate-free conditions compared to their expression in the 1mM nitrate samples. Relative expression levels were reversed in the root tips. Expression of these miRNAs in the root tips in the nitrate-free samples was higher relative to their expression in the 1mM nitrate samples. Future analysis of the extracted mRNAs from these samples will be conducted to see if there is a correlation between these miRNAs and ARF mRNA expression.

35. Cardiac Activator Drug Effects on Myosin Structure and Function

Madeline Straka

Rebecca Moen, Faculty Mentor (Department of Chemistry)

Heart failure is an emerging epidemic in the United States, for example, between 1996 and 2006 the number of hospitalizations due to heart failure rose by 25%. Systolic heart failure is caused by a decrease in heart contractility. One approach to treat heart failure is to increase heart muscle contractility. This can be achieved by using cardiac activators. One example of a cardiac activator is the drug EMD 57033 (Merck). This drug is known to specifically interact with the motor protein in cardiac muscle called myosin. Muscle contraction uses force generated from the interaction of two proteins, myosin and actin. Myosin utilizes the universal biological energy source adenosine triphosphate (ATP) through the mechanism of chemo-mechanical coupling, breaks down ATP to adenosine diphosphate (ADP) and phosphate as it produces mechanical force. During the process of contraction, myosin undergoes a series of structural changes involving the actin-binding region, the ATP binding pocket of myosin and the force-generating domain. EMD 57033 is a drug compound that binds to myosin in the force-generating region and increases both actin-myosin interaction as well as the rate of ATP breakdown. Myosin II from the organism *Dictyostelium* will be used as it serves as the classic model system for studying myosin II structure. My hypothesis is that EMD 57033 will increase the rate of ATP hydrolysis in myosin II and increase actin-myosin functional interaction. This change in function is likely due to changes in the internal structural dynamics in the myosin motor, specifically in the force-generating region.

36. Investigating the Reactivity of Cuminaldehyde and Isovaleraldehyde toward DNA

Ekaterina Voytsekhovskaya

Danae Quirk Dorr, Faculty Mentor (Department of Chemistry)

Aldehydes are among the compounds that are commonly used in production of food and cosmetics and, therefore, come in contact with human bodies more often than expected, which makes it important to have deep understanding of their properties and biological activity. Aldehydes have been known to be involved in the process of chromosomal aberrations and have a potential to react with DNA bases to form adducts. Little is known about the nature and biological potential of these adducts. The goal of this research is to obtain more information with regards to the composition of the two adducts formed in the reactions of isovaleraldehyde and cuminaldehyde, with 2'-deoxyguanosine. This information is necessary in studying their genotoxicity as well as in understanding how aldehydes can react with DNA. This research focuses on purification and further

structural determination of the adducts that were previously found to form in the reactions of isovaleraldehyde and cuminaldehyde with 2'-deoxyguanosine. In these reactions, L-arginine was used to facilitate the reaction while each of the aldehydes was independently reacted with 2'-deoxyguanosine in methanol in a sealed flask with constant stirring. The reactions were further analyzed using ¹H NMR, HPLC, and TLC.

37. Modular Construction Utilization in the Healthcare Industry

Andrew Bortolotti

Brian Wasserman, Faculty Mentor (Department of Construction Management)

The purpose of this paper is to introduce the concept of modular construction and the role modular construction currently holds in the healthcare industry. What constitutes modular construction and the processes involved in using prefabricated components will be addressed. Potential benefits, as well as detriments, are explored. Research of modular construction utilization in the building of new healthcare facilities and in the renovations of existing structures will provide a more in-depth analysis. Specific cases will be examined to further highlight the advantages of a modular construction design.

38. Construction Waste Management

Connor Campbell

Brian Wasserman, Faculty Mentor (Department of Construction Management)

Construction waste management is being addressed in every aspect of the construction process, from design to build. There are steps that can be used and companies that can be trusted to deal with this issue. Simply by following the mantra Reduce Reuse and Recycle, construction companies can do their part. Reduce the materials, space and energy needed to complete a project can contribute to savings. Reuse materials, resources and possibly buildings to once again limit the materials and energy needed on a project. Lastly recycle products used to stop materials from ending up in landfills when they can be used again in future building materials or alternative materials with a lower impact on the environment. Details and examples on how companies and construction managers can contribute will be outlined in the following results.

39. MS4 on Minnesota State University, Mankato

Juan Lopez

Brian Wasserman, Faculty Mentor (Department of Construction Management)

Storm water runoff is one of the leading sources of water pollution. It harms many bodies of water such as streams, rivers, lakes and wetlands. Storm water runoff typically carries pollutants including fertilizers, pesticides, metals, pathogens, oils, litter, sediment and other debris. Industries, urbanized areas, and construction projects are the main sources of pollutants being transported through storm water. Impervious surfaces, typically asphalt or concrete areas, such as streets, driveways, rooftops, parking lots, are the basic characteristics of urbanized areas. Storm water runoff comes in larger quantities and travels quicker from impervious surfaces. Which leads to an unnatural amount of water flowing into rivers, streams, and wetlands. The consequences of this is damage to wetlands, rivers, and streams, including, flooding, erosion, pollutant levels rising. Thus, the reason MS4 is very important in urbanized areas. This poster will focus on MS4 on Minnesota state university, Mankato's campus. The best management practices (BMP) MSU utilizes. How much storm water should be retained, how the storm water is retained, and the route it takes when it is not retained. How MSU utilizes plants towards its advantage, tree trenches, rain gardens etc. Following a

controlled experiment illustrating a simplified version of MS4 and how it effects storm water runoff.

40. Modular Construction Innovation

Chase Olson

Brian Wasserman, Faculty Mentor (Department of Construction Management)

This project examines the new innovations in pre-fabricated construction components including techniques, cost savings, economics and the environmental impact of modular construction. This research includes information from scholarly articles as well as Interviews with construction executives with experience with this construction concept. Benefits we will discuss that come from assembling construction members in a controlled environment are the reduced man hours, reduced need for skilled labor, fewer fall hazards and fewer weather related delays. The areas of construction we will examine are modular home construction, pre-fabricated wall sections and pre-fabricated bathroom units in large-scale residential and commercial construction.

41. Dual Polarized Substrate Integrated Waveguide

Michael Hedin

Xuanhui Wu, Faculty Mentor (Department of Electrical Engineering)

Traditionally, coaxial cables or two-wire cables are used to transmit electromagnetic signals. These methods, however, result in a great deal of energy loss due to skin effect, dielectric loss, copper loss and radiation loss. Additionally, these transmission lines are non-planar which make their integration with planar circuits found inside electronics today extremely complex. Metallic waveguides are an alternative to such waveguide options. However, they are bulky, non-planar, and thus cannot be easily integrated into modern circuit boards.

A substrate integrated waveguide (SIW) is a new generation of transmission line that proves a superior substitute to traditional transmission lines and metallic waveguides. The SIW is synthesized through the use of two rows of metal posts sandwiched by metal plates. These metal posts effectively form sidewalls to guide electromagnetic waves similar to how the sides of a three dimensional metallic waveguide aid transmission. SIW's planar nature allows it to be easily integrated into the printed circuit boards (PCB) commonly found inside almost every electronic device and implemented cheaply using existing fabrication technology. Its low profile structure coupled with respectable performance, such as high Q-factor and low propagation loss, make SIW's a reliable option for low-cost mass production of millimeter-wave applications. These concepts will be investigated further and utilized to design a novel dual polarized SIW. Resulting designs will have possible applications in mobile devices where high frequency operation and power efficiency are key.

42. Footstep Power Generation

Nibrasul Karim Nibras, Sampath Senanayakalage, and Justin Shaffer

Puteri Megat Hamari, Faculty Mentor (Department of Electrical Engineering)

Sustainable energy usage has been a prime target for humankind over the course of many years now. Renewable sources of energy are the key to achieving that target and generating power through footsteps is one of the prime examples. To utilize the mechanical energy created by footsteps, we design the flooring with piezo electric crystal material. The pressure from footsteps create electrical energy, which is captured by the floor sensors and then converted to electrical charge by the piezo electric transducers. This then acts as a power source and helps distribute

electricity to light up streetlights, airports, railway stations, departmental stores among many others. Using capacitors, the energy can also be stored and used in remote locations or during off peak season. This is especially useful in developing countries where such areas are usually overcrowded and the energy needed to power these services are high. Generating power through footsteps can lower the economic costs and improve the efficiency in creating electricity. Budgeting from the government can also be reduced in providing electricity, as it will be created in a non-conventional method using footsteps.

43. Ball-Wheeled RC Car

Isaac Matzke, Lucas Speer, and Michael Tonsager

Puteri Megat Hamari, Faculty Mentor (Department of Electrical Engineering)

Our project revolves around designing and creating a prototype of a remote-control car that uses a spherical tire, giving 360-degree control. This car would allow for a full range of motion in every direction, in turn allowing for greater maneuverability with a substantial drop in skill requirement. Our prototype will use a joystick control and an Arduino microprocessor to power servo motors to drive the ball tires, rubber balls in our prototype. Our project hopes to serve as a proof-of-concept for a viable design for a commercially available sphere-tire car.

44. E-Plane Substrate Integrated Waveguide Reflector Antenna

Adam Schultz

Xuanhui Wu, Faculty Mentor (Department of Electrical Engineering)

A Substrate Integrated Waveguide (SIW) is a new generation of transmission line with the most significant advantage being converting nonplanar components to planar ones. With the development of wireless systems, waveguide components have been widely used in various microwave and millimeter-wave communication systems due to the advantages such as high quality factor and high power capability. The proposed E-plane SIW reflector antenna will be significantly smaller than current technologies that have been implemented for mobile communications and will increase data transfer rates. Current SIW antennas only radiate E-field normal to the PCB. This design will make the E-field radiate horizontal to the PCB.

45. Additive Manufacturing: Parametric Analysis of Building Parameters to Maximize Strength of Material

Preston Torres

Shaobiao Cai, Faculty Mentor (Department of Mechanical Engineering)

With the introduction of 3-D printing, fused deposition method (FDM) has become increasingly prevalent as a tool and method due to its high efficiency, convenience in handling various geometries, and material structure in production. This paper presents a study of FDM design/build parameters and their significance on the mechanical properties of 3-D printed materials. To gain insight into practical application, Taguchi experimental design methodology for a three-parameter (print speed, layer height and print temperature), three level (high, medium and low) study was implemented. The results showed a significant change in the mechanical properties resulting from the selection of various levels of these parameters, indicating that material properties such as strength may be manipulated with various level combination of the building parameters. Optimum levels of building parameters were further identified for achieving maximum mechanical strength of the material.

46. Effect of Binder Saturation and Sintering on Stainless Steel – Hydroxyapatite Biocomposite Manufactured by 3D Printing

John Ruprecht

Kuldeep Agarwal, Faculty Mentor (Department of Automotive Engineering)

One of the major factors limiting use of implants is their failure prematurely. Most common biomaterials for implants are metals, alloys and ceramics. Bones have tensile strength of 70 – 150 MPa. However, mechanical properties of metals differ from bone: Stainless steel (SS) - tensile strength 586-1352 MPa. These differences lead to stress shielding resulting in loosening of implants due to degradation of human tissues around them. Calcium phosphates have best biocompatibility and properties closest to natural bones: tensile strength 38-48 MPa. However, they have poor fracture toughness that limits their application in implants. Therefore, there is a need for materials that combine mechanical performance of metals such as SS with biocompatibility of calcium phosphates. This work studies the effect of binder saturation and sintering on stainless steel – hydroxyapatite (HA) biocomposite during the 3D printing process. The ExOne 3D printing system is used to create samples of porous SS-HA composite. In the first step, 3D Printing creates a SS samples by adding a binder to the layer. This binder saturation is varied to create different porosities in the samples. Once the samples are “printed” they are subjected to two different time temperature curves during sintering. The sintering helps in changing the density and porosity of the material to match the desired properties of the bone. A total of 8 experiments are done by having 2 levels each of the binder saturation, sintering time and temperature and the results are reported comparing them to bone properties.

47. Escherichia coli (E. coli) Impairment in Minneopa Creek

Caitlin Flynn and Melissa Jones

Beth Proctor, Faculty Mentors (Department of Environmental Science)

The outlet of Lily Lake (2 inflows) and Lake Crystal (1inflow) form the lower Minneopa Creek that flows from the city of Lake Crystal through Minneopa State Park (Park, 162,000 annual visitors) to the Minnesota River. This portion of Minneopa was listed as impaired waters for Escherichia coli (E. coli) in July 2016. The purpose of this research was to determine E. coli levels at several sites including each lake inflows and outlet, the wastewater treatment plant (WWTP) and Park. E. coli levels are reported as number of colonies per 100 mL of water. Most sites are class 2 (E. coli standard 126 April 1-Oct 31). The Lily Lake outlet and the WWTP are class 7 (E. coli standard 630 May 1 –Oct 31). On November 8 there were 144 and 20 entering and 20 leaving Lily Lake, 10 entering and 0 leaving Lake Crystal, too numerous to count at the WWTP and 180 at the Park. On November 29 there were 100 and 10 entering and 60 leaving Lily Lake, 150 entering and 5 leaving Lake Crystal, 350 at the WWTP and 120 at the Park. These data suggest that the lakes are acting as a buffer (more E. Coli entering the lakes than leaving them) and the WWTP is a potential source of E. coli at the Park. Note the WWTP is not required to disinfect their effluent in the colder months. More monitoring is needed over the warmer months to determine sources of the E. coli impairment.

48. Are Escherichia coli (E. coli) Isolated from Minneopa Creek Developing Resistance to 10 Antibiotics?

Melissa Jones and Caitlin Flynn

Beth Proctor, Faculty Mentor (Department of Environmental Science)

E. coli is a pathogenic indicator for water contamination by manure. Many antibiotics are used as additives in livestock feed and are important human medicines. The purpose of this research was to determine if E. coli collected from multiple sites along Minneopa Creek are sensitive, developing

resistance, or resistant to 10 antibiotics (Amoxicillin/Clavulanic Acid, Cefotaxime, Ciprofloxacin, Erythromycin, Gentamicin, Lincomycin, Neomycin, Oxytetracycline, Rifampin, and Tetracycline). All antibiotics are used to treat *E. coli*, except Lincomycin, which was included as a negative control. Antibiotic resistance was measured on samples collected on November 8 and November 29, 2016 using the Kirby-Bauer disk diffusion assay. On both dates, *E. coli* colonies tested were sensitive to Gentamicin and Ciprofloxacin. All but one colony tested were sensitive to Cefotaxime, Tetracycline and Oxytetracycline. Eleven out of 13 colonies tested November 8 were sensitive to Rifampin, but 19 out of 22 colonies tested November 29 were resistant and 2 were developing resistance. Four out of 12 colonies tested November 8 were developing resistance to Amoxicillin/Clavulanic Acid and 16 out of 22 colonies tested November 29 were completely resistant and 2 were developing resistance to it. Eight out of 12 colonies tested November 8 were developing resistance to Neomycin and 7 out of 22 colonies tested November 29 were developing resistance to it. Out of 12 colonies on November 8, 6 were developing resistance and two were resistant to Erythromycin and on November 29, 15 out of 20 colonies were developing resistance and 4 were resistant to it.

49. Genesis of the Magenta Zone, NorthMet Copper-Nickel-PGE Deposit, Minnesota

Daniel Crane and Cole Huggins

Steven Losh, Faculty Mentor (Department of Geology)

The Magenta Zone is a 50-million ton body of economically-significant sulfide mineralization located within the NorthMet Copper-Nickel-Platinum group element deposit in northeastern Minnesota. The magenta zone is of particular interest because it does not follow the normal pattern of mineralization currently known to form in this deposit, which has been accepted to be of magmatic origin. Core samples were obtained from PolyMet and were sent out for processing into thin sections and for geochemical analysis. Thin sections were analyzed using thin section petrography and scanning electron microscopy to identify rock type, minerals present and textures present that may be indicative of how the sulfide grains formed. It is immediately apparent upon basic inspection of the magenta zone thin sections that the rocks have been subjected to varying degrees of hydrothermal alteration forming alteration minerals such as chlorite, sericite, serpentine and talc that were not present in non-magenta zone rocks. Sulfide grains were found to have both magmatic and alteration textures, with grains surrounded by alteration minerals and grain boundaries that were jagged, suggesting that they were not in equilibrium with the surrounding minerals they formed. Geochemical analysis also showed interesting compositional relationships that require further analysis. Overall, it was found that the magenta zone mineralization formed under different conditions than what is known to occur in the deposit and is most likely the result of hydrothermal alteration. The findings of this study may help geoscientists to better understand this economically valuable deposit as well as similar deposits around the world.

50. Gamma Radiation Effects on the Mortality and Fertility Rates of *Drosophila Melanogaster*

Wyatt Pouliot and Curran Couchman, Jacob Bukkila, and Nicholas Miller

Andrew Roberts, Faculty Mentor (Department of Physics)

We analyzed the effects of mild radiation doses on *Drosophila melanogaster* by using the known characterization of the radiation dose rate produced by the AN 400 Van de Graaffe Particle accelerator in the Applied Nuclear Science Lab at Minnesota State University, Mankato. The purpose was to see how well we could deliver consistent, controlled, and reproducible radiation doses to the fruit flies over extended periods of time. By performing proper methods of conditioning we were able to irradiate the organisms on the hot spot at an approximate 1 R/hr and also produced a maximum dose rate of 1500 mR/hr at the hot spot. Examination of the controlled

and irradiated populations of the *Drosophila melanogaster* began once the tested group had been exposed to 10 rads of positive ion beam emissions. Our population analysis, over the course of many trials of radiation exposure to the fruit flies, consisted of investigating biological factors such as mortality rates, fertility rates, and other physical abnormalities found after successive generations being irradiated.

51. Structural Characterization of Carbonaceous Meteorites by Micro-Raman Spectroscopy

Donald Rudquist

Analía Dall'Asén, Faculty Mentor (Department of Physics)

Meteorites provide precious clues about the formation of planets in the solar system. In particular, carbonaceous chondritic meteorites, considered the most primitive surviving materials from the early Solar System, can contribute to understand how planetesimals (the precursors to planets, of 1-100 km in radius) formed from dust (micron-size grains) by studying their mineralogical composition. These relics are mainly composed of chondrules (micro/millimeter-sized inclusions) surrounded by a matrix of microparticles. The composition of the chondrules and surrounding matrix of this kind of meteorites can be characterized at the microscale using micro-Raman spectroscopy due to its sensitivity to carbon structures. For this purpose, we use a custom-built micro-Raman system that first, has to be tested with well-known materials and then with meteoritic samples. Here we present the results obtained using this Raman system from well-known samples, such as diamond, silicon and fullerenes (C₆₀), and from different carbonaceous meteoritic fragments in order to characterize the structure of their chondrules and surrounding matrix, and thus to analyze their mineralogical composition.

Dance

The Promotion of Body Positivity in Ballet

Claire Achen

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

Ballet: Social Dance or Social Control?

Autumn Bornholdt

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

Defying Gender Norms in Romantic Ballet

Regan O'Connor

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

The Promotion of Body Positivity in Ballet

Claire Achen

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

The ideal female Western ballet body is an image that persists as the norm of what a ballerina should look like. This ideal includes a slender woman with long legs and arms, a small head, little to no bust line, and a short torso. It is an image that continues to be synonymous with success and beauty as a ballet dancer. Social and historical research indicated that this long held belief and damaging ideal pervades the way past, and present ballet dancers view themselves, their bodies, as well as their performance in other dance forms such as modern and jazz dance. This paper will focus on Western ballet relative to the impact the ideal ballet body has on its participants and on dance in general. This ideal is still very much a part of today's ballet and concert dance culture in the west. In addition, this paper will also offer that positive influences do exist that challenge the persistent falsities spread by this ideal and argue that more education needs to be presented to teachers and students alike to stop the dangerous implications of this ideal. As a result, such education could support much needed body positivity in the realm of ballet and in the overall Western concert dance world.

Ballet: Social Dance or Social Control?

Autumn Bornholdt

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

This paper examines the employment of ballet as an instrument of social control by governments during times of conflict. Ballet's inception under Louis XIV is first emphasized as essential to understanding the body politics behind the art form and how they resulted in ballet's potential to influence the masses. Ballet is then discussed in regards to the Fronde civil wars during the reign of King Louis XIV, to WWII through the lens of the British home front, and to the Cold War through the actions of the U.S. government. All three examples demonstrate the utilization of ballet with the intention of inspiring nationalism and unification among citizens, which is achieved via ballet's codified structure and capacity for narrative. As a result, Frederick Ashton and George Balanchine serve as key figures that aid in the development of the arguments surrounding Britain during WWII and the U.S. during the Cold War due to their artistic enlistment by their respective governments. The larger implications of this paper support how art reflects particular social and political climates, which is still relevant today.

Defying Gender Norms in Romantic Ballet

Regan O'Connor

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

The purpose of this paper is to identify how three Romantic ballets defied gender norms. The plots of the ballets of Giselle, Swan Lake, and The Green Table, will be analyzed to reveal how they challenged gender norms. The goal of this paper is to examine gender norms and challenge how they correlate with today's societal standards, as acceptable and unacceptable. Through research centering on gender and dance, the significant finding of this paper will address questions about gender and ballet relative to whether or not ballet can change its heteronormative standards. Further, this paper will conclude by examining today's society to determine if it has adjusted in its acceptance of changing gender norms or completely dismissed the idea of adaptation.

Anthropology

The Language of Beauty Products

Eve Hoisington

Chelsea Mead, Faculty Mentor (Department of Anthropology)

Eastern Yiddish

Erika Winter

Chelsea Mead, Faculty Mentor (Department of Anthropology)

Ethnography of the Dead: How Gravemakers Can be Used to Reconstruct the Identity of the Past

Trisha Walker

Kathleen Blue, Faculty Mentor (Department of Anthropology)

The Language of Beauty Products

Eve Hoisington

Chelsea Mead, Faculty Mentor (Department of Anthropology)

This study investigates three groups of makeup products from three different brands and analyzes the shade names for each product in order to determine the association that consumers draw from food related names, sexual innuendos, or names that describe color; and to what level these associations influence the consumer in their purchase. The study consists of data collection and analysis, as well as an online survey conducted through Qualtrics. Knowing more about why consumers choose the products they do will not only assist marketers and advertisers, but will also help consumers to be more mindful of their choices. At the time of application, the study is still ongoing, therefore conclusions are yet to be drawn from the findings.

Eastern Yiddish

Erika Winter

Chelsea Mead, Faculty Mentor (Department of Anthropology)

Eastern Yiddish is geographically spoken in Eastern European countries such as Poland, Ukraine, Lithuania, and Belarus however it's hotspots are located in North America and Israel—within largely Jewish populations. Originating in Eastern Europe, the experiences of WWII and the Holocaust led to a severe decline in speakers of Eastern Yiddish. Today, Eastern Yiddish is not commonly used other than amongst members of the Jewish populations with roughly 1,541,290 speakers in the world. While the language is used by a substantial number of speakers it is not widespread or institutionally supported outside of its particular home communities. Programs at higher education institutions, amongst community members, and amongst scholars are working to preserve and support the use of Yiddish in general if not this particular dialect.

Ethnography of the Dead: How Gravemakers Can be Used to Reconstruct the Identity of the Past

Trisha Walker

Kathleen Blue, Faculty Mentor (Department of Anthropology)

When someone dies in modern America, after their body is mourned, buried and time passes, oftentimes only two things linger to preserve who they were in life: their skeleton and their gravemarker. Gravemarkers provide a noninvasive glimpse into the identity of an individual: their name, birth and death, kinship connections, religion, military service, economic status and more can be observed carved into stone and laid above their burial. Collections of gravemarkers form cemeteries, and when observed as a whole the identity of a population can be reconstructed.

To understand more about the population of Mankato and how it has changed over the past century, I decided to analyze Mount Olivet, a medium-sized cemetery located within the city that was first used to bury the dead at the turn of the twentieth century and is still actively used today. From October to November 2016, I photographed every gravemarker in the cemetery, which resulted in over two thousand photographs. I used the photographs I took to pull as much information as I could from each individual with a gravemarker at Mount Olivet to create a spreadsheet. Using the spreadsheet, I was able to look at population trends and specific individual circumstances to create an ethnography of Mankato's dead. I decided to focus on four specific features on gravemarkers at Mount Olivet: text, symbols and artwork, life expectancy, and military service. Each of these features were used to reconstruct the identity of both individuals and the greater Mankato population.

History

The Black Press in Minnesota During World War I

Alejandra Galvan

Angela Cooley, Faculty Mentor (Department of History)

Lori Lahlum, Faculty Mentor (Department of History)

Jane Fonda: Traitorous Radical or Influential Activist?

Sarah Johnson

Matt Loayza, Faculty Mentor (Department of History)

Under Pressure: The Nonpartisan League in South Central Minnesota

Jonathan Soucek

Lori Lahlum, Faculty Mentor (Department of History)

The Black Press in Minnesota During World War I

Alejandra Galvan

Angela Cooley, Faculty Mentor (Department of History)

Lori Lahlum, Faculty Mentor (Department of History)

April 2017 marks the 100th anniversary of the United States entering World War I. Many enjoy learning about the battles, the military, and the Homefront. But there is a need for more scholarship to understand the role African Americans played in the war. From my research, many African Americans disagreed with US involvement. Why would a country agree to fight for democracy overseas when its citizens need freedom at home? Racism in the United States concerned African Americans deeply. At the same time, however, African Americans viewed World War I as a way to demonstrate their patriotism. Black citizens argued that despite President Wilson's decision to ignore racial discrimination at home, the United States still required support from all citizens. Their hope was to convince the rest of the nation if African Americans are willing to sacrifice their lives for a country that treats them as second class citizens, it would put an end to discrimination and segregation. The black community searched for a way to voice their opinions and one way they accomplished this was through newspapers. The expansion of the black press toward the end of the nineteenth century led African Americans in Minnesota to become more involved in politics and in racial injustices. Based on research of St. Paul's African American newspaper, *The Appeal*, black citizens remained loyal to their country during World War I while bringing attention to the injustice at the same time.

Jane Fonda: Traitorous Radical or Influential Activist?

Sarah Johnson

Matt Loayza, Faculty Mentor (Department of History)

As a political and human rights activist, Jane Fonda influenced many United States citizens through her involvement in the Vietnam Anti-War Movement during the late 1960's into the 1970's. However, she is often regarded as a traitorous radical who was successful in her activism only because of her celebrity status and association with prominent male counterparts. This research aims to change the negative and patriarchal perception of Jane Fonda's activism during United States conflict with Vietnam. Jane Fonda's activism centered primarily on G.I. Rights and the Black Panther Movement, but she also spoke at antiwar rallies and participated in an acting troupe, called Free the Army. Her involvement in the antiwar movement culminated in her visit to Hanoi in North Vietnam, which solidified her reputation amongst government officials and others as a traitorous radical. This research examines the portrayal of Jane Fonda in print media, at both the national and local levels, from 1970 to 1973. This research will examine how Jane Fonda was portrayed over time within each source as well as the differences between them. The print media sources utilized for the research include nationally read periodicals, local and national newspapers, and Black American and New-Left print sources. Most all print media sources discredited Jane Fonda's activities as an activist by consistently referring to her as a movie star, with exceptions found in New-Left and Black American sources.

Under Pressure: The Nonpartisan League in South Central Minnesota

Jonathan Soucek

Lori Lahlum, Faculty Mentor (Department of History)

The Nonpartisan League attempted to enter Minnesota in 1918, with Charles Lindbergh, Sr. as the League-endorsed candidate for governor in the Republican primaries. As the League moved into Minnesota in 1917, it hoped to achieve the same success it had in North Dakota. Unfortunately, the United States entered World War I in April of 1917 as the Nonpartisan League began to organize in Minnesota. The League opposed America's entry into the war, but supported the war effort when the United States declared war on Germany. League opponents and much of the general public, however, labeled the Nonpartisan League a disloyal organization. In Minnesota, the League faced its greatest opposition in the south central region, where county officials and citizens prevented League meetings by using terror and intimidation tactics. Many of these actions seem contrary to Minnesota's moralistic political culture, but the national security crisis of World War I caused the moralistic culture of the area to adopt several traits of the traditionalistic political culture. Evidence of this blending of political cultures includes a disdain for outside influence, heightened attention to elite interests, and terror and intimidation tactics. This study analyzes League activity in Blue Earth, Brown, Martin, and Jackson counties, and each provides an explanation as to why the League did not succeed in south central Minnesota. In fact, Lindbergh won just one county in the area, Brown County, and the Nonpartisan League failed to establish a significant political presence in the region.

Psychology and Sociology

The Effect of Parent Marital Status on the Happiness and Aspirations of College Students

Ethan Wynia, Akorede Teriba, Danielle Petruska, Jacklyn Gehling, and Quincey Krein

Emily Stark, Faculty Mentor (Department of Psychology)

Characteristics of Psychedelics Users in the U.S.

Logan Neitzke-Spruill

Carol Glasser, Faculty Mentor (Department of Sociology)

Flight Simulator Training

Ethan Wynia, Abby Phillips, Jessica Raisa, Steven Arriaza, and Reijuana Harley

Kristie Campana, Faculty Mentor (Department of Psychology)

The Effect of Parent Marital Status on the Happiness and Aspirations of College Students

Ethan Wynia, Akorede Teriba, Danielle Petruska, Jacklyn Gehling, and Quincey Krein

Emily Stark, Faculty Mentor (Department of Psychology)

The purpose of this study is to examine an effect of marriage or divorce and expressed parental personalities may have on the children's personal view of themselves and their aspirations. Research by Lu (Lu, 1997) shows that characteristics of age and gender had indirect effects of happiness through social support, Thus we hypothesize the following: First, children of parents who stayed married will have a higher sense of happiness, through extensive social support opportunities. Secondly, we believe children of married parents will have a higher focus on attending college and more prestigious career choices. Finally, children of parents who stayed married will have a higher score on a happiness scale, perhaps because of more extensive social support opportunities. Research will be conducted by distributing a survey to participants. The survey is created through Qualtrics, and consists of 50 questions asking about demographics, parent's marital statuses, aspirations, and their views of both parents. One aspect explored in our study focuses on the participant's happiness, which was done by implementing questions from the Subjective Happiness scale (SHS) (Lyubomirsky, 1999), as well as their current aspirations, and whether they perceive themselves as following closely to a certain parental figure, or following their own distinctive path. Data collection is ongoing, and currently approximately 200 participants have completed the survey. Our study may reveal that people with married parents are perceived happier and have higher goals set for themselves.

Characteristics of Psychedelics Users in the U.S.

Logan Neitzke-Spruill

Carol Glasser, Faculty Mentor (Department of Sociology)

There is a growing amount of literature surrounding the use of psychedelic use for both medicinal and spiritual purposes. Despite prohibition, Western medicine is beginning to show that these substances have therapeutic potential derived specifically from mystical experiences. The present study seeks to outline the characteristics of psychedelic users, their patterns of use, as well as identify possible determinants of a mystical experience. Participants were drawn from psychedelic related websites and asked to complete an anonymous-online questionnaire. It has been hypothesized that those who report affiliation with a religious group will be more likely to have a mystical experience from using psychedelics. It was also predicted that those who perform some sort of ritual preparation prior to using psychedelics will be more likely to undergo a mystical experience.

Flight Simulator Training

Ethan Wynia, Abby Phillips, Jessica Raisa, Steven Arriaza, and Reijuana Harley

Kristie Campana, Faculty Mentor (Department of Psychology)

Flight simulators are an expensive addition to an aviation program, but little is currently known about how they are used in the education of pilots. The purpose of this study is to examine how different programs use flight simulators, and whether they appear to benefit students. We will distribute a survey to chairs of aviation departments. The survey, conducted through Qualtrics, asks a variety of questions about whether a department has a flight simulator, and how they use that simulator in their courses (or how they believe they might use a simulator if they do not currently have one). Questions ask about how and when the simulator is introduced to students in a program, how students are graded on their performance, and information about how instructors view the usefulness of simulators for student learning. Data collection is underway (IRB# 964064-3). We have invited over 100 department chairs to participate, and are waiting for them to complete the surveys. Upon completion, we will conduct descriptive statistics and content coding to learn about commonalities and differences across departments. This study will better show us how flight simulators are used in different departments and may help inform other aviation departments on how to make the best use of this expensive equipment. This may also improve education quality for pilots in training.

Dance

Increase in Nutritional and Wellness Research: Challenging the Hyper-Thin Female Dancer

Rachel Dreist

Julie Kerr-Berry, Faculty Mentors (Department of Theatre and Dance)

Martha Graham: A Structural Functionalist

Bethany Koshak

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

The Rise of the Cosmic Dance Among the Renaissance Nobility

Alyssa Anthony

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

Increase in Nutritional and Wellness Research: Challenging the Hyper-Thin Female Dancer

Rachel Dreist

Julie Kerr-Berry, Faculty Mentors (Department of Theatre and Dance)

This paper focuses on whether an increase in nutritional and wellness research challenges the hyper-thin female ballet dancer. Female ballet dancers are known for being hyper-thin, which implies they do not eat enough. Through research into current literature on nutrition and wellness, as well as by conducting interviews, this paper will argue that there is a need for ballet dancers to be educated in these two areas. This paper will also argue that even through current research has been conducted with regard to dancer nutrition and wellness, and that ballet dancers have access to it, it does not mean they are taking advantage of it. Furthermore, this paper will contend that ballet dancers may think they are eating healthy, but in reality, their caloric and nutritional intake is low. It will conclude that the ballet world needs to change from within and that the need to be hyper-thin has to change in order for ballet dancers to be truly healthy. Dance companies like the St. Paul Ballet are stepping in the right direction by introducing Take Back the Tutu, which is a health and wellness series for dancers.

Martha Graham: A Structural Functionalist

Bethany Koshak

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

The purpose of this research is to analyze the choreographic work of Martha Graham based on the social theory of structural functionalism. Such research contributes to the under recognized field of dance scholarship. Application of this theory is possible to this art form, because dance is a reflection of the cultural values from the society within which it develops. Structural functionalism is a sociological theory that provides reasoning behind all social interactions and structures. It was first developed by Talcott Parsons. Parsons broke structural functionalism down into four functional imperatives all social structures must have to exist: adaptation, goal attainment, integration, and latency. Martha Graham's early choreographic works are examples of these imperatives. Using these imperatives, movement, costumes, set design, and the narratives of four of Graham's early choreographic works will be viewed and analyzed to provide evidence that she was a structural functionalist. The works are: Heretic, Primitive Mysteries, Lamentation, and Frontier. Results of this research reveal the sociological dimensions of Graham's work, which has implications to fields of dance and sociological research.

The Rise of the Cosmic Dance Among the Renaissance Nobility

Alyssa Anthony

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

During the 14th to 16th centuries, Renaissance dance had a complex history in terms of whether or not it was considered an appropriate activity for people to participate in by church and public officials. Historical dance research during Renaissance revealed a renewed interest in classical Greek and Roman philosophy. Subsequently, dance was viewed as a way to physically parallel the pathways of the stars, moons, and planets that were amidst the heavens. This perspective, which was introduced by Plato, provided evidence that dance was worthy of being performed by upper class peoples. The other viewpoint consisted of condemning dance as a "devilish invention," which was an idea perpetuated by early Christian sources. According to McGowan (2008), dance truly encapsulated the "political, social, and aesthetic climate of the age (p. 304)." This paper will focus on those elements of Plato's philosophy about dance and examine how those ideas were embodied, as well as hierarchy that established what dance was appropriate versus those considered sinful. This paper's significance is how it utilized Plato philosophy, applied it to the Renaissance, and to dance. It concludes by acknowledging how religious beliefs during this era will clarify why dance, at time, held negative connotations. The friction between dance and religion is relevant today.

Educational Studies

Children's Book

Natalia Bornholdt

Jenny Ruth Dawley, Faculty Mentor (Department of Educational Studies: K-12 and Secondary Studies)

Changes in Intercultural Competency among Undergraduate Students in Elementary Education

Mercedes Johnson, Elizabeth Hall, and Mariah Adams

Elizabeth Sandell, Faculty Mentor (Department of Educational Studies: Elementary and Early Childhood)

Reflection about One Educator's Experience of Culturally Responsive Instruction of One Child on the Autism Disorder Spectrum

Elizabeth Rossow

Elizabeth Sandell, Faculty Mentor (Department of Educational Studies: Elementary and Early Childhood)

Children's Book

Natalia Bornholdt

Jenny Ruth Dawley, Faculty Mentor (Department of Educational Studies: K-12 and Secondary Studies)

The purpose of the children book I wrote and illustrated is to introduce students living in Minnesota to a non-Western culture and to the different intersectional realities that people face when living with special needs and in poverty. The book is meant to be part of an art unit of study where students learn about Bolivia and texture. The main character is a child who is visually impaired. Throughout the story, she shares her story and a traditional recipe. The book concludes with a positive affirmation of the main character despite any hardships that she might encounter. I wrote this book in Spanish and English to reach a bigger audience. The illustrations have a tactile quality. Most of them were made with a variety of materials, but mostly felt and paper. In the process of writing the book, I discovered an immense joy to share my culture, new ways to communicate, and alternative routes to reach students with special needs. After this experience, I feel the need to be an advocate for special-ed students and multicultural education.

Changes in Intercultural Competency among Undergraduate Students in Elementary Education

Mercedez Johnson, Elizabeth Hall, and Mariah Adams

Elizabeth Sandell, Faculty Mentor (Department of Educational Studies: Elementary and Early Childhood)

There are continuing demographic differences between the student population and the teacher population. These differences maintain significant social and cultural gaps. Some investigators (Solomon & Levine-Rasky, 2003; Arthur & Collins, 2010) suggested that, without intervention, pre-service teachers may accidentally stereotype students and families and respond to them in oppressive ways. Students from cultural and linguistically diverse backgrounds which are different than those of teachers often perform poorly in public education. Students are at risk for achievement gaps, over representation in special education, high suspension and expulsion rates, and high drop-out rates (Jencks & Phillips, 1988; Losen & Orfield, 2002; Townsend, 2000). The purpose of this study was to understand the changes in cultural competency among undergraduate students. The research question was "What changes occurred in intercultural competence among pre-service elementary school teachers from initial enrollment until beginning of student teaching?" This research project is based on the Developmental Model of Intercultural Sensitivity (DMIS), originally described by Bennett (1986; 1993). With concepts from cognitive psychology and constructivism, Bennett described intercultural competency as "the way a person understands, feels about, and responds to cultural differences" (2010). The DMIS presents predictable stages through which people progress as their cultural competency increases. The results of this study will contribute to information regarding the impact of the teacher preparation programs being used in the College of Education (COE). The university may use this information in considering the effectiveness of its cultural diversity goal: experience diversity with supervised reflection and recognize and respond to conditions of marginalized populations.

Reflection about One Educator's Experience of Culturally Responsive Instruction of One Child on the Autism Disorder Spectrum

Elizabeth Rossow

Elizabeth Sandell, Faculty Mentor (Department of Educational Studies: Elementary and Early Childhood)

The role of the teacher of a student with Autism Spectrum Disorder (ASD) is like that of a cross-cultural interpreter: someone who is able to translate the expectations of the non-autistic environment to the student with ASD (Mesibov & Shea 2009). The purpose of this project was to explore the implications of cultural responsiveness of general education teachers and how it affects students with ASD. The source of the data was a journal kept by a teacher in a classroom in Minnesota. The study included a literature review about the culturally responsive teaching of classroom teachers, special education teachers, and other school staff members. Data analysis found themes related to instruction, child response, educator response, or consequences or results. The research project provides information about how general education teachers can be more culturally responsive and improve communication to support students with ASD.

American Indian Studies, Anthropology, & Biological Sciences

The Birch Coulee Battlefield: Examining Changing Native Representation in the U.S. – Dakota Conflict

Bethany Ryhkus

Chelsea Mead, Faculty Mentor (Department of American Indian Studies)

History and Revitalization of the Hawaiian Language

Shannon Bruce

Chelsea Mead, Faculty Mentor (Department of Anthropology)

Perceptions of Kichwa

Mikyla Denney

Chelsea Mead, Faculty Mentor (Department of Anthropology)

Blue Earth County Prairie Flora Field Guide

Addeline Theis

Matthew Kaproth, Faculty Mentor (Department of Biological Sciences)

The Birch Coulee Battlefield: Examining Changing Native Representation in the U.S. – Dakota Conflict

Bethany Ryhkus

Chelsea Mead, Faculty Mentor (Department of American Indian Studies)

In the museum setting, Native history has too often been misrepresented or elided in favor of a more watered-down Eurocentric narrative. Museum representation has the ability to shape or reinforce the views of its visitors, thus making the subject matter and the manner in which it is presented of utmost importance. This research traces the ways in which the U.S.-Dakota Conflict has been memorialized throughout history through its manifestation in the Birch Coulee Battlefield historical site. My approach was first, to provide a Dakota-centric historical context for the U.S.-Dakota Conflict through historical and contemporary texts; second, to trace the ownership and use of the Birch Coulee battlefield site through county records and historical documents; and finally, to visit the site itself to examine the way this history is presented to the public. Through these methods, I was also able to loosely trace the public's changing sentiments towards the Dakota people, which is closely tied to the way the U.S.-Dakota Conflict was represented throughout the site's history. Finally I end with a critique of the current Birch Coulee Battlefield historical site and offer suggestions for how it can improve its representation of the Dakota people.

History and Revitalization of the Hawaiian Language

Shannon Bruce

Chelsea Mead, Faculty Mentor (Department of Anthropology)

Of the several thousand languages known around the world today, it is estimated that fifty percent or more will become extinct within the next century. Many of the world's unique languages are in danger of dying out unless drastic steps are taken to begin increasing the number of native speakers, but many of these languages continue to decline despite revitalization efforts. The Hawaiian language is an exception to this. The goal of this research was to trace the causes of the decline of the Hawaiian language and its subsequent revitalization. Originating on the Hawaiian Islands in the Pacific, the Hawaiian language was the dominant language of the native people until the encroachment of European missionaries and settlers from the 1800s on caused a drastic decline in the use of the language by native speakers through the control of education, laws, and prejudices. However, beginning in the late twentieth century, revitalization efforts began to increase the number of both native and secondary speakers through elementary and university education programs, laws, Hawaiian-language radio shows, and other endeavors by native Hawaiian speakers. Thanks to their efforts, Hawaiian is one of the few endangered languages that has shown successful revitalization efforts, though the language isn't out of the woods yet.

Perceptions of Kichwa

Mikyla Denney

Chelsea Mead, Faculty Mentor (Department of Anthropology)

The purpose for my research was to identify and analyze the perspectives and preconceptions that non-Indigenous people have about the Kichwa Indigenous community, with an emphasis on their language ideologies, in Ecuador. I explored how non-Indigenous Spanish speakers conceptualize Kichwa in the area, language revitalization efforts, and the relationship overall with the Indigenous community. This research will help scholars working on Indigenous languages better address language ideologies that non-Indigenous peoples have about their languages. Clarifying language ideologies can be a potential starting point for conflict resolution and discovering common ground or deconstructing ideologies that hinder cooperation.

I interviewed nine participants in Spanish, asking them a variety of questions about their understanding and perceptions of the Kichwa language and culture. Going into my research I suspected to learn about at least some discrimination and/or negativity towards the Kichwa language. However, many of the people I interviewed said that the Kichwa language is viewed positively. They all personally supported the efforts of the Indigenous people and had good things to say about them. Learning how the non-Indigenous population perceives Indigenous languages can help foster cooperation between the groups and contribute to conflict resolution.

Blue Earth County Prairie Flora Field Guide

Addeline Theis

Matthew Kaproth, Faculty Mentor (Department of Biological Sciences)

The tallgrass prairie remnants found throughout Blue Earth County, Minnesota provides habitat for native floral. To preserve and protect the existing biome and begin restoring degraded land, conservation of local floral needs to be educated to the public. With the hopes that a more educated public, we might expect to see a stronger conservation efforts within the community. This current project focuses on the creation of a Blue Earth County Prairie floral guide. This will lead to be a tool in education of floral species to the public. A species list was constructed for the county, focusing on the predominant and endemic species that are a primary focus in many prairie habitats. Over 80 species were considered for this project. Each species was drawn from specimens that are a part of the Radicle Herbarium at Minnesota State University, Mankato. The final project was a field guide compiled of illustrations paired with descriptions of each plant and arranged with a dichotomous key to allow for easy identification of prairie species in the Blue Earth County and the surrounding area within our ecologically important biome.

Art

Satirical Imagery of the Ramesside Period: A Socio-Historical Narrative

Keely Wardyn

Alisa Eimen, Faculty Mentor (Department of Art)

Surface Decoration of Ceramics

Sarah Meyer

Mika Laidlaw, Faculty Mentor (Department of Art)

Collaborative Zine Project: Visual Representations of Feminist Truths

Nicole Soley and Britta Sturm

Ellen Schofield, Faculty Mentor (Department of Art)

Woodlin Latocki, Graduate Student Mentor (Department of Art)

Evidence of a Myth

Rylie Palo

Alisa Eimen, Faculty Mentor (Department of Art)

Satirical Imagery of the Ramesside Period: A Socio-Historical Narrative

Keely Wardyn

Alisa Eimen, Faculty Mentor (Department of Art)

During a short period in New Kingdom Egypt (c. 1550-1070 BCE) artwork of an interesting nature was created in a small workers' village called Deir el-Medina. These artworks often feature animals with human characteristics: mice dress as noblewomen, foxes play lutes, cats are geese herdsmen, and lions play board games. Satirical drawings, as they are referred to, were created by the craftsmen who decorated the tombs in the Valley of the Kings. These drawings poke fun at the rigid and formal decoration of imperial spaces. However, these artworks were more than comic relief for the artists; they also reflect the social and political atmosphere in Egypt from the eighteenth dynasty onward. The Ramesside period (c. 1292–1069 BCE), during which these images were made, was a time of diminishing pharaonic authority and growing economic uncertainty. The first organized workers' strike in history was planned by the same artists who were creating satirical artworks. Although the strike was a success, the Ramesside period would continue to be plagued by administrative errors and instability. Satirical artworks provide insight into the historical, social and political atmosphere at the time of their creation, revealing a narrative of the artists who shaped the Valley of the Kings.

Surface Decoration of Ceramics

Sarah Meyer

Mika Laidlaw, Faculty Mentor (Department of Art)

Surface decoration of ceramics is a very important part of creating visually appealing works of art. It's important for an art educator to understand the materials being used to best serve the students. It's also important for me as an artist to know what results will be achieved from using different materials. Knowing the colors that are most appealing will help with selecting underglazes to purchase. Due to the cost of materials and usually small budget of both art classrooms and emerging artists, it's essential to purchase materials that will be used most frequently. It's also important to understand the different methods of application for the surface decoration. My goals were to try out as many different colors of underglaze on ceramic tiles as I could to determine which colors worked the best as well as to experiment with different ways of application. This included painting underglaze in 1, 2, or 3 layers onto ceramic tiles and using different controlled applicators. I also experimented with other forms of surface decorations such as underglaze pencils and crayons. I created decorative tiles that show others my findings. I learned that painting and using a syringe were the easiest for underglaze application as well as the most cost-effective. I learned what colors created the most visually appealing art. I determined that the results from the crayons and pencils were appealing for my own personal art. These results will impact my own artwork and future students as well as others who see my tiles.

Collaborative Zine Project: Visual Representations of Feminist Truths

Nicole Soley and Britta Sturm

Ellen Schofield, Faculty Mentor (Department of Art)

Woodlin Latocki, Graduate Student Mentor (Department of Art)

The artistic interpretations created throughout this project carry the weight of feminist concerns and personal narratives, curated into a series of zines and collaborative art objects. Zines - indie, inexpensive, mass-printed paper booklets - are weapons of democratic information exchange. They are occasionally inflammatory, visually and verbally expressing the 'explosions of our time' along with the current political climate. We identified collaborators that existed outside of the art community and themes to explore. We collected written poetry, photographs, drawn and found imagery, stickers, papers, and verse. We researched the risograph printing process and prominent contemporary zine-makers. To work within our allocated budget, we designed the zine collection combining risograph and xerox printing processes. The project's themes are communicated utilizing hand-drawn and appropriated imagery, illuminating causes and unique points-of-view. The overlapping of colors and images, both hand-drawn and digital, in the printing processes create rich, visual narratives. The compiling of personal imagery from several individuals results in zines that speak to feminist voices and shed light on societal issues. Viewers of zines are encouraged to consider relationships between art and accessibility, materials, process, and community. The creation of zines through risograph and xerox processes results in a media that falls in between the realm of formal art objects and that of disposable media, expressing specific yet universal ideas. The resulting zines are representative of feminist thought from diverse women's perspectives, and the spread of thought seeks to empower others through their shared storytelling abilities.

Evidence of a Myth

Rylie Palo

Alisa Eimen, Faculty Mentor (Department of Art)

Presently, The Bible is not deemed a historical document by the majority of modern scholars. Instead, its accounts are labeled as complete myths. However, if the popular consensus is incorrect, scholars would then have an ancient and historically accurate document at their disposal. Egyptian dynasties largely dictate the current and accepted chronology of history. Each Egyptian king's name and the extent of each reign must be known, to form a complete chronology from c. 3000 BC to c. 300 BC. Many reign lengths are only partially known, while others are completely unknown. The Bible would provide scholars with historical insight as well as a significant resource for accurately dating history. An examination of the historical validity of one Old Testament narrative was organized: archeological findings and biblical interpretations were analyzed and compared concerning the biblical story of Joseph and the Israelites. Over 30 years of research conducted and documented by David Rohl in his book *Exodus: Myth or History* was thoroughly studied, as were biblical passages from the New King James Bible. Archeological evidence matching the biblical story of Joseph and the Israelites was found in abundance. It was discovered that scholars failed to realize the historical accuracy of The Bible due to their false interpretations of biblical text. Because they had wrongly interpreted biblical passages, they had searched for the evidence in the wrong timeframe. The consequence of this error comes at a price most scholars are not willing to pay: this price is chronological revisionism.

Automotive Engineering

2017 Hydrogen Research Project

Joseph Doroff and Grant Stoos

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Turbocharger Selection Using Live Data on a Single Cylinder Engine

Ethan Klaphake

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

Electric Formula

Terry Portra, Christian Kelm, David Kutschke, and Justin Byers

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Efficiency of an Inlet Restricted Engine

Joshua Seaver

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

2017 Hydrogen Research Project

Joseph Doroff and Grant Stoos

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Hydrogen powered vehicles can potentially reduce American demand for oil, and reduce America's carbon footprint. Research is being conducted on the limitations of hydrogen powered vehicles. Advantages of hydrogen would be its high octane rating, high energy content, and theoretical zero tailpipe emissions. The Automotive Engineering Technology Department at Minnesota State University, Mankato is currently researching advantages, and limitations of hydrogen powered vehicles. Students have successfully converted a 2015 Arctic Cat Prowler 700 HDX to run on both gasoline and hydrogen gas. The project has two goals, the first being to examine if hydrogen's drawbacks can be offset through turbocharging, and determining if hydrogen fuel is a viable option for consumers. Previous testing of the vehicle showed a severe power deficiency under hydrogen operation. On gasoline, the Prowler makes 45 horsepower from the factory. Computer simulations on hydrogen show that the Prowler currently makes 17 horsepower, a 60% decrease in power. For hydrogen to be a viable option for the consumer, this power deficiency must be corrected. This power reduction stems from the poor volumetric efficiency properties of hydrogen gas. Volumetric efficiency is the volume of fresh air entering the cylinder divided by the total volume of the cylinder. To combat this, a turbocharger was installed. To verify the turbochargers effect on performance, acceleration tests were performed, as well as an EPA tier 2 emissions test, to establish baseline emissions and performance. Once the custom turbocharger system was completed, the exact same tests were repeated and compared to the baselines.

Turbocharger Selection Using Live Data on a Single Cylinder Engine

Ethan Klaphake

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

A Turbocharger is a device use to increase the output of an internal combustion engine. As an engine climbs in RPM its turbocharger begins to spool. A certain spool speed is needed to match the engines flow demands and achieve proper boost pressure. This has led to many different designs of turbochargers. From large turbochargers with massive flow rates for large displacement engines and huge amounts of power. While small turbochargers produce small flow rates for small displacement engines. Smaller turbochargers may also create boost in the engine sooner than a larger turbocharger. Based off this known information a selection for a turbocharger becomes a complicated process. Using evidence logs, recorded from the 2016 Minnesota State University, Mankato's Formula SAE vehicle, their boost pressure goal was not met while the vehicle was on a road course. This was caused by slow spooling of the turbocharger as the engine climbed RPM resulting is low to no positive boost pressure. A smaller turbocharger was instead used to allow for quicker onset of boost.. The two engines were compared as recorded live using a MoTec data logger. The results showed that the smaller turbocharger built positive boost pressure sooner in the RPM sweep as well as holding the targeted pressure at the top of the range. This information will demonstrate that for non-drag race applications a smaller turbocharger has more overall benefits then a larger.

Electric Formula

Terry Portra, Christian Kelm, David Kutschke, and Justin Byers

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

With the diminishing supply of fossil fuels paired with the importance of reducing the pollutants that these fuels create, the goal is to research performance along with duty cycles of battery packs used in electric vehicle platforms. Electric vehicles produce no greenhouse emissions on their own, the only emissions produced are in making the electricity. By researching the power demand of an electric vehicle in an urban situation, it can be proved whether a battery powered car is more economically viable versus an internal combustion engine. By creating a controlled lot testing environment with a specially designed track, power output using the cars telemetry will then be tracked and recorded. The cars drive cycle which will consist of speed in (m/s) versus time (s) will make it possible to compare power usage to that of an internal combustion engine. Testing two different chemistries of battery packs Lithium Cobalt Manganese & Lithium Ion Phosphate with varying power densities and outputs as well as two different motor configurations, exploration of the ideal performance specifications for an urban vehicle based on a predetermined drive cycle is possible. The theoretical performance was calculated using formulas connecting speed, acceleration, weight, rolling resistance, and distance travelled to develop a baseline value. Calculation of the vehicles tractive force required to turn the wheels through a drive cycle made it possible to compare theoretical drive numbers with actual drive cycle data. With this drive cycle data, electric vehicles proved to be more efficient.

Efficiency of an Inlet Restricted Engine

Joshua Seaver

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

An automotive engine with inlet restrictions will hurt its performance. There are two ways to regain the lost performance. Either increase its inputs, or increase its efficiency. The inlet restriction problem limits the input, so, the theory is that the efficiency must be raised to have the same output as if there was no restriction. To overcome the inlet restriction, ways of increasing the engine efficiency were tested. Both mechanical efficiency, and thermal efficiency were increased. Mechanical efficiency was improved by increasing how much the engine compressed the inlet air, and thermal efficiency by using energy that would have been exhausted from the engine, to do work. Mechanical efficiency was also raised by changing the timing of the engines valves. The first test was with the mechanical efficiency. It was found that by raising the compression ratio by 5% increased engine output by about 2%. This was achieved by using a piston that had a smaller combustion space. Back to back tests were performed. Even with the turbocharger, our volumetric efficiency is still low, so compressing the air even more should have a higher output. Thermal efficiency was raised by using the engines exhaust in a turbocharger in increase the flow demand on the restriction. This has raised the horsepower output by about 25%. Valve timing was also changed which gave the engine a gain of 25% horsepower. In all, the theory held that by making the engine more efficient, it can make up for losses in engine input.

Integrated Engineering, Environmental Science, and Computer Science

Design and Validation of a Low Cost High Speed Atomic Force Microscope

Michael Ganzer and Tien Pham

Robert Slezzer, Faculty Mentor (Department of Integrated Engineering)

The State of the Art in Speaker Adaptation for Automatic Speech Recognition (ASR)

Zhejian Wang

Rebecca Bates, Faculty Mentor (Department of Integrated Engineering)

Plastic Waste Identification and Potential Solutions: A Case Study of Bocas Town, Panama

Hailey Gorman

Beth Proctor, Faculty Mentor (Department of Environmental Science)

Improving Speech Recognition for Interviews with Both Clean and Telephone Speech

Sung Choi

Rebecca Bates, Faculty Mentor (Department of Computer Science)

Design and Validation of a Low Cost High Speed Atomic Force Microscope

Michael Ganzer and Tien Pham

Robert Slezzer, Faculty Mentor (Department of Integrated Engineering)

The Atomic Force Microscope (AFM) is an important tool for characterization at the nanoscale. They operate by rastering an atomically sharp needle attached to a flexible cantilever across a surface while using an optical lever to measure the tip sample interaction. A control loop is used to keep the tip sample interaction constant. The output of the control loop is used to determine the topography of the surface. Unfortunately, the complex optical and control systems in an AFM make them both expensive and slow. Fortunately, DVD Optical Pickup Units (OPUs) are designed to measure and compensate for wobble in DVD disks to maintain laser focus at the nanoscale with a high bandwidth. Because DVD players are high volume consumer electronics these OPU are widely available and optimized for both cost and performance. However, interfacing with an OPU is a difficult task because the documentation available for it was scarce and, at times, inaccurate. With further research and experimentation, the authors were able to reverse engineer aspects of OPU that were poorly documented and design a circuit to power a KSS-213C OPU. Additionally, circuits were designed to collect distance data from the KSS-213C. A test structure was designed to demonstrate the capability of the KSS-213C to make nanoscale measurements. The precision of the KSS-213C was measured and is reported.

The State of the Art in Speaker Adaptation for Automatic Speech Recognition (ASR)

Zhejian Wang

Rebecca Bates, Faculty Mentor (Department of Integrated Engineering)

Automatic speech recognition (ASR) incorporates knowledge and research in linguistics, computer science and electrical engineering to develop methodologies and algorithms to translate human speech into text. In ASR, speaker adaptation refers to the technologies that adapt acoustic features to better model the variation for individual speakers. Its goal is to reduce the mismatch between individual speakers and the acoustic model in order to reduce the word error rate (WER). Adaptation strategies include long short-term memory recurrent neural networks (LSTM-RNN), maximum likelihood linear regression (MLLR) for hidden Markov models (HMM), and I-vectors. Recently, deep neural networks (DNN) have become an alternative modeling approach. Combined with older adaptation techniques, DNNs have improved ASR performance significantly. This research presents a review of adaptation techniques used with DNNs, examines existing experimental results, and investigate speaker difference in recognition using a virtual machine (VM) from the Speech Recognition Virtual Kitchen (SRVK). The SRVK toolkit is comprised of Linux-based VMs which allow users at teaching-focused institutions to participate in ASR research. The TI-digits will be used as training datasets, as they have sufficient individual speaker data to separate for adaptation experiments. WER is the main indicator for performance evaluation. The work presented includes discussion and comparison results of each strategy used with DNN, an overview of the SRVK toolkit, results of recognition performance, and potential methods to improve adaptation within the toolkit.

Plastic Waste Identification and Potential Solutions: A Case Study of Bocas Town, Panama

Hailey Gorman

Beth Proctor, Faculty Mentor (Department of Environmental Science)

Isla Colon is an island within the Bocas del Toro archipelago of Panama. Recently, the island has been of interest to travelers seeking adventure and paradise. However, with growing population the island has undergone increasing environmental stress. There are many forms of environmental stress, but for this project plastic waste related to quality of water was of focus. The purpose of this study was to determine the extent of plastic waste in Bocas Town, to analyze how tourism affects the amount and location of this waste, and to determine if locals are denied environmental justice. It was hypothesized that all areas of Bocas Town would be exposed to plastic waste, but areas outside of the waterfront zone would be more littered, as those areas tend to be out of tourist's sight. In addition, both locals and tourist would agree plastic waste is an issue, and note its connectivity to low water quality. Three steps were taken to test these hypothesis. The first involved interviewing two influential people in the waste management movement: Martin Downer and Robert Bezeau. Following insight from interviews, a random survey was conducted for locals and tourists regarding recycling habits and personal opinions. Lastly, amounts of plastic waste were quantified through land surveys across Bocas Town. Following these steps all hypothesis were supported. The current practices of Bocas Town are unsustainable, and suggested improvements include increasing water quality and utilizing water refill stations so that this generation, and future generations, have the opportunity to truly experience paradise.

Improving Speech Recognition for Interviews with Both Clean and Telephone Speech

Sung Choi

Rebecca Bates, Faculty Mentor (Department of Computer Science)

High quality automatic speech recognition (ASR) depends on the context of the speech. For example, cleanly recorded speech has better results than speech recorded over telephone lines. In telephone speech, the signal is band-pass filtered which limits frequencies available for computation. Consequently, the transmitted speech signal may be distorted by noise, causing higher word error rates (WER). The main goal of this research is to examine approaches to improve recognition of telephone speech while maintaining or improving results for clean speech in mixed telephone-clean speech recordings. The test data includes recorded interviews where the interviewer was near the hand-held, single-channel recorder and the interviewee was on a speaker phone with the speaker near the recorder. Available resources include the Eesen offline transcriber and two acoustic models based on clean training data or telephone training data. The Eesen offline transcriber is on a virtual machine available through the Speech Recognition Virtual Kitchen and uses an approach based on a deep recurrent neural network acoustic model and a weighted finite state transducer decoder to transcribe audio into text. This project addresses the problem of high WER that comes when telephone speech is tested on cleanly-trained models by 1) replacing the clean model with a telephone model and 2) analyzing and addressing errors through data cleaning, correcting audio segmentation, and adding words to the dictionary. These approaches reduced the overall WER. The presentation includes an overview of the transcriber and acoustic models, the methods used to improve speech recognition, and transcription results.

Speech, Hearing, and Rehabilitation Studies, Health Science, Human Performance, Nursing, Economics, Family Consumer Science, Geography, Honors, Psychology, and Dance

- 1. Integration of Movement with Literacy Intervention: Outcomes of Three Children with Dyslexia**
Cortney Chelmo and Erin Krenik
Megan Mahowald (Department of Speech, Hearing, & Rehabilitation Studies)
- 2. Rubric Scoring with Language Samples**
Audrey Davies, Kaela Delperdang, and Diane Meyer
Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)
- 3. Effect of a Literacy Intervention on Word-Level Skills for a 5th Grader with Dyslexia**
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- 4. Self-Rating Abilities of Communication of People with Aphasia**
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- 8. Cognitive Intervention in a College-Aged Student with Learning Disabilities**
Kellie Metzger and Monique LaFontaine
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- 10. 5th Grade Language Sample**
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- 11. An Analysis of Impacts on Health Education and Health Promotion Professors' Ratings**
Jessica Beetch
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- 12. Clergy Curricula Burnout Assessment**
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Chelsea Dolezal, Courtney Simonette, and Sydney Orr
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- 14. Sampled College Students' Attitudes Towards the National Suicide Prevention Lifeline (NSPL)**
Krystal Klicka
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- 15. Binge Drinking: Not Just an American Phenomenon and How the United Kingdom and Ireland Address It**
Penelope Nelson
Pat Nelson, Faculty Mentor (Department of Government)
Jennifer Londgren, Faculty Mentor (Department of Health Science)
- 16. Stress Perceptions and Management Methods Amongst University Students**
Courtney Sill
Joseph Visker, Faculty Mentor (Department of Health Science)
- 17. Assessment of Job Satisfaction Among Healthcare Professionals**
Alexa Turgeon
Joseph Visker, Faculty Mentor (Department of Health Science)
- 18. Jump Rope Study**
Brennen Godeen
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- 19. Academic and Non-Academic Stress of College Students Enrolled in Physical Activity Classes**
Lauren Kizlik and Kristin Nassen
Jessica Albers, Faculty Mentor (Department of Human Performance)
- 20. Emergency Room Utilization for Patients with Co-Conditions of Memory Loss and Cardiac Disease: A Family Nursing Opportunity**
Megan Matthews
Kristen Anderson, Faculty Mentor (Department of Nursing)
- 21. The Role of Legal Tender on Risk Premium in Retail Business**
Tawakalitu Olanigbogbo
Ishuan Li, Faculty Mentor (Department of Economics)
Marie Cato, Graduate Student Mentor (Department of Anthropology)
- 22. Effects of STEAM Play at a Children's Museum**
Ellen Dobbins, Correy Steffen, and Ella Silver

Heather Von Bank, Faculty Mentor (Department of Family Consumer Science)

23. Identifying Ecological and Personal Factors that Prevent Obese Individuals from Effectively Losing Weight

Elizabeth Herrick

Brooke Burk, Faculty Mentor (Department of Recreation, Parks, and Leisure Services)

24. The Effects of Personality on Second Language Learning

Kayla Smith

Anne Dahlman, Faculty Mentor (Honors Program)

25. Assessing Knowledge of Alzheimer's Disease in Younger and Older Adults

Abbey Linderholm

Jeffrey Buchanan, Faculty Mentor (Department of Psychology)

26. Common Misconceptions in Psychological Science

Jacklyn Gehling

Karla Lassonde, Faculty Mentor (Department of Psychology)

27. Intuitive Lie Detection: The Role of Subjective Judgments in Facilitating Deception Detection

Elijah Hill and Paige Shoutz,

Emily Stark, Faculty Mentor (Department of Psychology)

28. An Updated Look at Consultation Training, Skills and Engagement in the Schools

Erin Kahnke

Carlos Panahon, Faculty Mentor (Department of Psychology)

Shawna Petersen-Brown, Faculty Mentor (Department of Psychology)

Megan Johnson, Graduate Student Mentor (Department of Psychology)

29. Spaced and Expanded Practice: A Comparison of Methods to Enhance Retention

Katherine Kalenberg

Shawna Petersen-Brown, Faculty Mentor (Department of Psychology)

Carlos Panahon, Faculty Mentor (Department of Psychology)

Jannine Ray, Carrington Riss, and Ashlee Lundberg, Graduate Student Mentors (Department of Psychology)

30. Do Beliefs about Deception Influence Accuracy? A Study of Lie Detection

Brooke Klontz, Casey Peterson, and Tori Witte

Emily Stark, Faculty Mentor (Department of Psychology)

31. The Stigma of Sex Work and Criminalization: Its Impact on Victim Blame and Empathy

Elliott Kunerth and Kelsi Pettit

Eric Sprankle, Faculty Mentor (Department of Psychology)

32. A Comparison of Hospital Reports and Past Media Reports on the Living Conditions and Treatment of Patients at Minnesota's First Hospital for the Insane

Jordan Maciej

Andrea Lassiter, Faculty Mentors (Department of Psychology)

33. Cyberbullying: Coping Strategies in Elementary and High School Students

Jenna Macziewski

Carlos Panahon, Faculty Mentor (Department of Psychology)

Shawna Petersen-Brown, Faculty Mentors (Department of Psychology)

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34. The Influence of Personality on Deception Detection Ability

Natosha McClain

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35. Validating Instructional Hierarchy

Josie Mikosch

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Carlos Panahon, Faculty Mentor (Department of Psychology)

Cassandra Schreiber, Graduate Student Mentor (Department of Psychology)

36. The Effect of Employee Satisfaction on Job Performance

Klarissa Pierce

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37. 2016-2017 Psychology Department Assessment Outcomes and Recommendations

Akorede Teriba, Jessica Eul, Sedona Kintz, Sandra Kisor, and Chloey Pestorious

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38. Role of Environmental Factors in Black Boy's Academic Achievement

Emily Wilson and Quincey Vaagensmith

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39. Reading for Understanding: Research on Reading Comprehension in Higher Education

Stephanie Winter

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40. Effectiveness of Lumosity vs. Well Known Memory Techniques on Memory Tasks and Perceptions

Rebecca Osborn, Ethan Wynia, and Faithe Patrick

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41. Locating Unexploded Bombs in Conflict Landscapes Using Geographic Object-Based Image Analysis: A German Case Study from World War II

Anna Brand

Cynthia Miller, Faculty Mentor (Department of Geography)

Fei Yuan, Faculty Mentor (Department of Geography)

42. Communication Through Dance: A Deeper Look into the way Movement is Used to Communicate

Makayla Foertsch

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

43. The Black Ballerina: Race and American Ballet

Abigail Okoneski

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

44. The History and Construction of the Ballet Tutu

Julia Armstrong

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

45. A Corseted World: How this Binding Undergarment Affected a Dancer's Body

Abby Pleiss

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

1. Integration of Movement with Literacy Intervention: Outcomes of Three Children with Dyslexia

Cortney Chelmo and Erin Krenik

Megan Mahowald (Department of Speech, Hearing, & Rehabilitation Studies)

Children with dyslexia or learning disabilities may have more difficulty attending to academic tasks. Three upper elementary aged participants with dyslexia (or suspected dyslexia) participated in literacy intervention over the course of seven months. This intervention sessions for literacy included activities in the Words Their Way program. Probe data collected included decoding of DIBELS passages and sentence imitation. The participants would read a passage for 1 minute, and write sentences after being presented to them vocally. Intervention sessions also included some physical activity. Different activities incorporated were bowling, memorization running games, or tossing things into buckets. Participants completed pre/post testing across reading and writing skills and participated in probes consisting of decoding and sentence imitation. Overall, all participants increased on some literacy targets. The research findings suggest that physical movement increases productivity during literacy intervention sessions.

2. Rubric Scoring with Language Samples

Audrey Davies, Kaela Delperdang, and Diane Meyer

Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

This research compares language samples of third grade students with and without disabilities. Language sampling is an assessment tool that allow Speech-Language Pathologists to evaluate specific areas of a client's ability to produce language through different tasks. The tasks are: informational sample, personal narrative, procedural sample, and story analysis. Language samples were collected, transcribed and analyzed. Each task will be further explored for differences present. Language samples were analyzed using a rubric that evaluated language based on five areas. The five areas that we used to measure, consists of: engagement, organization, voice, language use, and fluency. The purpose of using a rubric is that scores can be standardized to allow for progress monitoring or the documenting of a child's improvement or change in language over a period of time. The rubric we are developing and implementing will be a tool used by Speech-Language Pathologists to increase efficiency in scoring language samples. We analyzed 16 language samples of typically developing third graders and 10 language samples of third graders with disabilities. The results indicate that the rubric is correlated to standardized language assessment (approaching significance).

3. Effect of a Literacy Intervention on Word-Level Skills for a 5th Grader with Dyslexia

Danielle Diggan and Danielle Barr

Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

In individuals with dyslexia, there are several methods to address therapy and intervention. One of which, is an individualized plan tailored to meet specific needs and difficulties of the individual. This single subject design study explores the effectiveness of word-level spelling intervention with an elementary aged student with developmental dyslexia. Abby (pseudonym) is an eleven-year-old child who was diagnosed with mild expressive and receptive language impairment and developmental dyslexia. Abby attended one 60-minute session weekly for 15 weeks. Sessions consisted of tasks that included reading, writing and spelling. Abby participated in spelling sorts, selected reading passages and targeted sentence writing. In order to monitor change over time, probes were given to assess spelling, dictation and decoding accuracy. Preliminary data indicated

Abby has made some improvement across all tasks. Given this approach in intervention, it is expected that Abby will continue to improve in all tasks.

4. Self-Rating Abilities of Communication of People with Aphasia

Anna Haler and Rachel Wilson

H. Sheen Chiou, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

Many people with aphasia (PWA) want therapy to be relevant to their unique needs and desires and focused on skills they can apply to their everyday lives (Tomkins, Siyambalapitiya & Worrall, 2013; Worrall, et al., 2011). It is important for speech-language pathologists (SLPs) to give value to what PWA describe as meaningful life change and integrate it into therapy (Kagan, et al., 2008). Using self-reported outcome measures can help SLPs see how PWA feel about their communication abilities to see if their therapy has met their needs. In order to work toward common goals, it's essential to understand how PWA and SLPs rate the communication of PWA. This study investigated how PWA rate their communication abilities based on reports from PWA themselves and their SLPs by assessing them using the Western Aphasia Battery (WAB), a language impairment measure, and the Assessment for Living with Aphasia (ALA), an aphasia-friendly patient-reported measure. Twenty-three subjects, ages 37 to 83, with severity of aphasia ranging from mild to very severe participated in this study. Our results indicated that PWA and SLPs understand PWAs' communication differently. The way PWA viewed their receptive language according to the ALA did not correlate to the way SLPs viewed their receptive language according to the WAB. Additionally, the way PWA viewed their speech and writing according to the ALA also did not correlate to the way SLPs viewed their speech and writing according to the WAB. Thus, SLPs should consider incorporating patient-reported measures into assessment in order to better meet PWAs' needs in therapy.

5. Communication Strategies of Aphasia

Alexandria Johnson, Elayna Dyke, and Nicole Burrington

H. Sheen Chiou, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

Anomic aphasia is the mild loss of the ability to understand or express speech caused by brain damage. It is important to use patient-reported data in order to understand the patients' views on their needs for communication strategies. The purpose of this research was to examine whether people with anomic aphasia self-reported using communication strategies before and after acquiring aphasia, and if they did, how these strategies changed. Eight males and six females with anomic aphasia, ranging from ages 37-83 were asked to self-report what they did to help their conversational partners understand their speech in a conversation before and after aphasia using the Assessment of Living with Aphasia, an aphasia friendly patient-reported outcome measure.

The results indicated that 13/14 participants with anomic aphasia self-reported that they used communication strategies after aphasia. The most common communicative strategies included gestures, pointing, writing, slow down, and relax/slow down. Majority of the participants (7/14) self-reported using more strategies after aphasia. Approximately one third of the participants (4/14) used the same amount of strategies before and after aphasia. Fourteen percent of the participants (2/14) reported using fewer strategies after aphasia. Before aphasia the participants used gestural strategies (e.g., pointing strategy for 35% of the participants), whereas after aphasia they used more relaxation/slow down as a communication strategy (64% of the participants). The findings may be beneficial to speech-language pathologists to choose individualized communication strategies to improve overall communication for people with aphasia.

6. Story Re-Tell Abilities of Bilingual Elementary Students in the Midwest

Asha Khalif

Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

Bethany Bishop, Graduate Student Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

The purpose of this comparative study is to determine bilingual 1st-2nd grade students' ability to produce narratives in both their primary and secondary language, through utilizing a developed language sample rubric to determine which language was stronger in retelling the story. The participants were 16 Somali students who are bilingual in Somali and English.

Two stories were presented to the children, and each story was told in both languages, Somali and English. Detailed rubrics were scored to analyze the results of each participant's retelling of story. The scores were derived from the following categories: Engagement, Organization, Voice, Language Usage, and Fluency. Children were rated on a 5 point scale ranging from Emerging to Proficient in language. Participants' story retell abilities were scored in both languages and compared. Most of the participants showed a developing stage in both English and Somali, whereas some of the participants showed a proficient stage in both languages. The implications of this work will include designing a rubric that helps determine language proficiency, which can inform learning abilities that a student has and the specific language and the learning barriers that may emerge. Because there is a small number of bilingual Speech Language Pathologist's, it is becoming increasingly important for school practitioners and professionals to utilize tools that are valid, reliable, and efficient when assessing bilingual children's language abilities and monitoring progress in the educational field. Significant correlations between elementary students' narrative ability and their success in both reading and writing have a great impact on future academic success. It is important to address and assess children's language abilities early on to ensure that the best possible action is taken in order for the student to be successful in academics.

7. Severe Aphasia Life Participation

Jordyn Ludemann and Heather Tyler

H. Sheen Chiou, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

Aphasia is a language disorder that results from damage to the parts of the brain that contain language production and comprehension. Due to the profound loss of language function, people with severe aphasia have a difficult time communicating their wants and needs in life. In addition, both people with aphasia and their families reported a precipitous decline in social interactions and attributed this to communication impairment. It is important for speech-language pathologists (SLPs) to use aphasia-friendly self-reported measures to get an understanding of the individual's overall life participation and quality of life. The aim of this research is to examine people with severe aphasia's ability to self-report their own life participation, and compare perspectives from people with severe aphasia and their care partners. Ten participants between the ages of 32-76, including five with severe aphasia; and four spouses and one caregiver were assessed using the Assessment for Living With Aphasia - Revised (ALA-R), an aphasia-friendly tool that gives individuals with aphasia the opportunity to self-report life participation. Our results indicated that people with severe aphasia had a different perspective on their life participation compared to the perspectives of their care partners. On average, only 29% of the given answers from the participants with aphasia were identical to that of their care partners. Both groups were most consistent when answering questions related to the satisfaction of participation in everyday activities and social interactions; while the majority of the inconsistent answers were related to community involvement and overall outlook on life. Our findings supported the importance of understanding life participation

of people with aphasia by using patient-reported outcome measures and promoted mutual understanding of real-life goals between people with severe aphasia and their care partners.

8. Cognitive Intervention in a College-Aged Student with Learning Disabilities

Kellie Metzger and Monique LaFontaine

Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

Complex cognitive and academic activities require substantial working memory and attention. College students with learning disabilities may have difficulty with working memory and attention. The effectiveness of cognitive therapy in a college-aged individual with learning disabilities that affect her working memory and sustained attention skills was explored through a single subject design study. The participant, Veronica (pseudonym), is a twenty-one-year-old college senior who is diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) and self-referred herself for intervention to improve her ability to attend to and remember information from class and her textbooks. Intervention focused on working memory and attention strategies to improve phonological memory, working memory, and sustained attention. Each week, the participant was given three dictation probes and one reading comprehension probe in order to monitor progress. Pre and post cognitive and literacy assessment was completed. Results indicate improvement of working memory and attention awareness within the classroom setting.

9. Exploratory Study of First Grader's Language Development in Correlation with their Socioeconomic Status

Kendra Patton and Hannah Stepanek

Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

Language samples are an efficient way to measure students' language abilities and to identify children who may have language difficulties. The purpose of this study is to find a correlation between the 1st grade students' language development based off of scoring from a developed rubric and the students' scores on the Oral and Written Language Scales (OWLS) and Northwestern Educational Assessment (NWEA). Language samples were collected by researchers at an elementary school in a rural town in the Midwest. A standardized language assessment, OWLS, was also collected. Information was obtained from the school regarding socioeconomic status (SES) and NWEA scores. Research has found that SES correlates to language input the child receives from their home environment, which impacts their language skills. Twenty-nine 1st grade students' language samples were analyzed based on a rubric that assessed the areas of engagement, organization, voice, language use, and fluency. Results indicate that there are significant differences between children from low SES compared to children who are not across the OWLS and NWEA assessments, but not the total rubric scores. Assessments were not correlated with each other.

10. 5th Grade Language Sample

Allison Seeman, Eden Schwahn, and Sydney Loomis

Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, & Rehabilitation Studies)

Language samples are oral speech samples collected based off of five questions or tasks. This study explores how fifth grade students perform on different language sample tasks and explores the correlation between scores on the 6+1 Language Rubric and reading and writing standardized scores. Language samples were collected in a Midwestern, rural elementary school from 20 fifth grade students. The samples were then analyzed using a 6+1 writing rubric focusing on engagement, organization, voice, language use (vocabulary), and sentence fluency for each answer. After collecting this data, it was compiled and correlated to standardized reading and oral

language scores. Results indicate that standardized reading assessment is correlated to the total rubric score for district reading assessments ($r(20) = .48, p < .05$) and state reading assessment scores is correlated to the total rubric score ($r(20) = .47, p < .05$). The results show that the rubric scoring is an effective tool to help identify the type and quality of language that is necessary for literacy achievement. More information/investigation is needed to determine why standardized language assessment and rubric did not correlate. Possibly the results are due to small sample size, and or the language sample assesses different information than the standardized language assessment. Additionally, further information about participants may be helpful about their demographics and a reading sample and a writing sample to compare it to the oral language sample. This would be a closer representation of their standardized scores. The results are based on a small population sample and collecting more scores from other kids in different school districts to get a larger sample size could show different results and correlations.

11. An Analysis of Impacts on Health Education and Health Promotion Professors' Ratings

Jessica Beetch

Joseph Visker, Faculty Mentor (Department of Health Science)

Professor evaluations (both formal and informal) are commonly used to assess instructor teaching abilities and courses as a whole. Recently however, the validity of professor evaluations has been brought into question. The purpose of this study was to assess variables that contribute to both high and low professor ratings using a popular online professor rating website. Professors ranking Assistant, Associate, or Full from SABPAC approved Health Education and Health Promotion programs were selected. Qualifying professors were split into a high or low rated group. Fifty-six professors were included in the analysis, (23 males and 33 females). A series of Independent Samples T-tests were conducted to assess differences in professor ratings based on selected variables. A qualitative approach was also used to analyze student comments. A statistically significant difference in ratings was found between those professors rated as physically attractive and those who were not. Themes given to high rated professors included being noted as easy and interesting. Themes given to low rated professors were unclear and lots of work/busy work. The results of this study indicate there may be variables beyond teaching ability that influence student ratings of professors.

12. Clergy Curricula Burnout Assessment

Seth Dahle

Joseph Visker, Faculty Mentor (Department of Health Science)

Stress and burnout rates among those serving in the Christian Ministry are high among various denominations. To date, no studies have examined if clergy members are trained to mitigate stress and burnout during Seminary. The purpose of this study was to fill the gap in the research and examine the extent to which Seminary professors address stress and burnout in their courses and to examine factors that may prevent the teaching thereof. A cross-sectional design, using a survey to gather data from current Seminary faculty was utilized. The survey was distributed via email using the Qualtrics online survey distribution system. Professors from seven Evangelical Lutheran in America [ELCA] Seminaries were invited to participate. Descriptive statistics were used to assess survey items. Results indicate that courses specific to stress and coping skills do not exist within current curricula. While all participants indicated that stress and burnout are a problem, 75% of respondents noted that other topics take priority in the curricula. Several additional factors that inhibit faculty from addressing stress management in their current courses were noted. The results of this study show that Seminaries are not adequately preparing future ministers to deal the stress that

comes along with leading a congregation. Due to constraints in the classroom, other opportunities to address stress and burnout during Seminary need to be explored.

13. Evaluation of Online Spinal Muscular Atrophy (SMA) Support Groups

Chelsea Dolezal, Courtney Simonette, and Sydney Orr

Joseph Visker, Faculty Mentor (Department of Health Science)

Spinal Muscular Atrophy (SMA) is a rare neuromuscular genetic condition that takes away the ability to perform daily tasks such as walking, eating, sleeping, and breathing. Diagnoses of diseases can often leave individuals and families feeling isolated and scared. Because of the rarity in certain types of diagnoses, it may be difficult to find support and understanding from those without the same condition. Online support groups have been used by SMA patients and those impacted by SMA diagnoses as a way to obtain information and seek support. Unfortunately, no data exists on the true impact these SMA-specific support group have on participants. Therefore the purpose of this study was to assess the extent to which participants felt empowered by the use of online Facebook© SMA support groups. Surveys were distributed to individuals on three SMA Facebook© support groups, yielding 25 responses. The survey was comprised of modified Likert type items used to measure empowerment as well as various demographic items. Approximately, 67% of individuals felt a greater sense of self worth when being involved in support groups. Further, 91.66% felt that they made new social contacts and 83.34% of participants agreed or completely agreed that they felt less lonely. Additionally, 82.34% of participants said they regularly or often felt a sense of “not being the only one”. These results indicate that online support groups have the potential to serve as an easily accessible and effective method for improving empowerment among those impacted by SMA.

14. Sampled College Students' Attitudes Towards the National Suicide Prevention Lifeline (NSPL)

Krystal Klicka

Amy Hedman-Robertson, Faculty Mentor (Department of Health Science)

Purpose: determine a sample of university students' knowledge of the NSPL, self-efficacy in helping someone suicidal, perceived helpfulness and likelihood to use the NSPL to help another.

Of the 560 participants, nearly 60% stated that at least one person had expressed suicidal thoughts to them. Mean knowledge score of the NSPL was 1.99 (SD = 1.26), range 1-4. Mean self-efficacy score was 2.81 (SD = .58), range 1 to 4. Pearson correlation showed a significant, weak relationship between self-efficacy and reported number of people who expressed suicidal thoughts to participants, $r(550) = .26$, $p = 0$. Mean perceived helpfulness score was 2.78 (SD = .85), range 1 to 4. Participants reported higher perceptions of the NSPL helpfulness for warning signs that included suicide in the description. Mean likelihood to call the NSPL for another was 2.41 (SD = .89), range 1 to 4. A significant, positive moderate relationship was observed between likelihood to call the NSPL for another and perceived helpfulness of the NSPL in helping another, $r(533) = .41$, $p < .01$. Analysis showed that knowledge of the NSPL, self-efficacy, and perceived helpfulness of the NSPL predicted participants' likelihood to call the NSPL index, $F(3, 528) = 42.11$, $p < .01$.

Despite many participants indicating that another had expressed suicidal thoughts to them, their self-efficacy to recognize suicidal thoughts and plans in another was low. Possible reasoning for low utilization of NSPL includes stigma towards suicide, usage of other resources, and uncertainty of outcomes related to NSPL

15. Binge Drinking: Not Just an American Phenomenon and How the United Kingdom and Ireland Address It

Penelope Nelson

Pat Nelson, Faculty Mentor (Department of Government)

Jennifer Londgren, Faculty Mentor (Department of Health Science)

American college campuses have "thirsty Thursdays." Every sporting event, social event (such as the State Fair and Renaissance Festival) and concert has alcohol readily available as long as you produce a picture id. The British are known for nipping down pints at their local pub or at sporting events. The Irish are notorious for being able to hold their liquor. The Emerald Isle is known for their whiskey, porter and stouts. Does having one's culture completely submerged in alcohol make a difference in the amount of binge drinking that occurs? How does advertising play into this? How effective are these ad campaigns? What are local governing bodies doing to address the public health issues associated with binge drinking? How are local communities educated about the signs and symptoms of binge drinking? Are possible treatment options readily available and advertised?

On a recent study abroad trip to England, North Ireland and Ireland, the focus was on how those countries deal with alcohol and drug issues as compared to here in the United States. It became readily apparent that a majority of the focus is on alcohol because it is a legal substance and therefore can advertise at will. The breweries, distilleries and cider mills have plenty of money to afford the steep advertising costs necessary to ensure their brands are prominently displayed everywhere. Binge drinking is a direct result of this advertising as witnessed by the evidence in this presentation.

16. Stress Perceptions and Management Methods Amongst University Students

Courtney Sill

Joseph Visker, Faculty Mentor (Department of Health Science)

There are certain aspects in the life of a university student that are known to contribute to their overall stress levels. These stressors may include finances, relationships, course load, and work responsibilities. Understanding effective methods of stress mitigation is essential for the well-being of university students. Therefore, the purpose of this study was to assess stress levels among selected university students and coping mechanisms used to mitigate stress. Data was collected using two validated instruments from approximately 250 students attending three different general education classes. Descriptive statistics were used to assess survey items and a series of Independent Samples t-tests were used to assess differences in coping strategy use between those who were and were not classified as being stressed. Results indicated that slightly less than half of the participants were classified as stressed. Participants meeting the criteria for being stressed had higher scores for unhealthy coping strategies while those not currently stressed showed higher scores in health-conducive coping mechanisms. Additionally, the research showed that there are indeed a number of coping strategies more frequently used by university students overall. The results of this study can assist health professionals in recommending effective stress coping strategies for students.

17. Assessment of Job Satisfaction Among Healthcare Professionals

Alexa Turgeon

Joseph Visker, Faculty Mentor (Department of Health Science)

Job satisfaction plays an important role in various work-related factors such as interest, productivity and retention. The availability of healthcare jobs is growing and job satisfaction is key for retention of current workers. The purpose of this study was to assess job satisfaction among healthcare professionals; specifying registered nurses, licensed occupational therapists and licensed physical

therapists. These three professions were chosen for this study because they have a job growth rate that is much faster than average and average incomes above sixty-five thousand dollars a year.

The short form of the Minnesota Satisfaction Questionnaire was distributed to health care facilities employing the targeted professions. Surveys were independently distributed at each facility. Surveys were gathered from twelve registered nurses, twelve physical therapists, and sixteen occupational therapists. Using SPSS, an Analysis of Variance (ANOVA) was used to assess differences in satisfaction between the three professions and descriptive statistics were used to analyze individual items. General job satisfaction rates were high with no significant difference in general job satisfaction rates between the three professions. Though general job satisfaction rates were high, individual items such as pay rate and opportunities for advancement show room for improvement. Individual item data will be discussed further. The results of this study could provide insight into areas where job satisfaction could be improved to benefit retention.

18. Jump Rope Study

Brennen Godeen

Jessica Albers, Faculty Mentor (Department of Human Performance)

Jumping rope is an aerobic activity that is commonly used in a variety of exercise settings. However, the prescription of this exercise lacks accuracy. The purpose of this research study is to further the understanding of the physical activity intensity levels during jump rope intervals. A variable to be measured in this study will include heart rate progression during jump rope intervals.

Recruitment flyers were placed in various locations around the community of Mankato. A health screening waiver was completed. A consent form was then signed and documented. The participant was fitted with a polar heart rate monitor. The participant then laid supine for 10 minutes while resting heart rate was collected. The participant then completed the single under interval test. This set included 3 intervals of jumping single unders for 3 minutes each interval. If the participant could complete 3 double unders in consecutive fashion, they were asked to complete the double under interval set. The double under set includes 3 intervals of jumping double unders for one minute. This set was collected on a later day. A recovery period of 2 minutes was completed following each jumping interval. During the recovery period, participants were asked to rate the perceived exertion using the Borg scale and their mood using The Feeling Scale. Mistakes made while completing the jump rope interval were recorded. Data is being analyzed and will be included at URC symposium

19. Academic and Non-Academic Stress of College Students Enrolled in Physical Activity Classes

Lauren Kizlik and Kristin Nassen

Jessica Albers, Faculty Mentor (Department of Human Performance)

College students often see a decline in their physical activity, in pair with an increase in psychological stress. Many universities aim to increase physical activity and spark new interest by offering a wide variety of health and physical activity classes for all students. The purpose of this study was to explore demographic differences among students in the physical activity classes and to examine how stress affects how students self-select into different types of physical activity classes. Students who agreed to participate in the study signed a consent form stating they are 18 years or older and understood the procedure and requirements. Participants (n=159) were then asked to fill out a demographics questionnaire and were to take two surveys sent out through electronically through Qualtrics during the second and third week of the semester. The surveys assessed psychological stress, both academically related (Academic Stress Scale) related and non-academically related (Perceived Stress PSS-10) stress. SPSS was used to analyze the data. Between

group differences were analyzed using Multiple Analysis of Variance (MANOVA). All data is collected and is currently being analyzed for the Undergraduate Research Symposium. Results will be concluded at a further date.

20. Emergency Room Utilization for Patients with Co-Conditions of Memory Loss and Cardiac Disease: A Family Nursing Opportunity

Megan Matthews

Kristen Anderson, Faculty Mentor (Department of Nursing)

Alzheimer's Disease (AD) affects 5.3 million people in the US; with an estimated financial impact of \$236 billion in 2016. Unfortunately, only 33% of those with AD are aware of their diagnosis and up to 85% of AD patients also have Cardiovascular Disease (CD). The prevalence of AD and CD have significant impacts on nursing care. The aim of this study was to explore Emergency Department (ED) use and subsequent hospitalization for those affected by AD, both AD/CD, and CD compared to unaffected persons. A secondary analysis of the National Interview Survey (2012) was conducted comparing frequency of ED utilization and hospitalization between patients with only AD, with both AD and CD, with CD only, and unaffected patients. 'Memory loss' was used as a proxy for AD and related dementias. As predicted, ED use was higher for patients with a dual diagnosis of AD/CD. Subsequent hospitalization was also higher in AD/CD patients. These findings suggest that nurses must be aware that their patient admitted with CD may have undiagnosed AD, putting the patient at a greater risk for falls and other risk factors. Nurses can play a key role assisting with early diagnosis of Alzheimer's disease, facilitating an action plan for medical management that may allow the patient an active role before cognition is significantly impaired. Future research should explore family's facilitating beliefs and strengths around care of the affected loved one to enhance care of the affected person and leading to decreased hospital utilization.

21. The Role of Legal Tender on Risk Premium in Retail Business

Tawakalitu Olanigbogbo

Ishuan Li, Faculty Mentor (Department of Economics)

Marie Cato, Graduate Student Mentor (Department of Anthropology)

This research project examines the role of legal tender accepted at a major retail business in the United States, Sam's Club, on risk premia. Legal tender types play a significant role on net cash flow, therefore net income and solvency. As technology improves, credit and debit cards, have become common payment methods beyond cash and checks. I examine how retail sales of types of goods are correlated with methods of payment. This project uses a large dataset comprising membership purchases of itemized goods at all retail stores of Sam's Club in the United States, it examines the data through visualization and prediction models using IBM software Watson. The findings of this project can provide insights on managing risks to major retailers such as Sam's Club.

22. Effects of STEAM Play at a Children's Museum

Ellen Dobbins, Correy Steffen, and Ella Silver

Heather Von Bank, Faculty Mentor (Department of Family Consumer Science)

STEAM education (science, technology, engineering, arts and math) is a relatively new concept developed in part from STEM programs by adding art to the curriculum. Recent studies have shown that art and science work together in close proximity. This new paradigm of teaching allows for artistic and creatively charged learning. However, due to the test-oriented constraints of the United States educational system, STEAM is not implemented in most curriculum. Exploring research in this area will provide a holistic learning experience for the participants engaged in the activity.

Student research assistants observed children and families during “STEAM Saturday” programming events. Research assistants completed an observational checklist for each child-caregiver dyad that attended the activity as well as recording types of words that children and adults used by marking the frequency in which participants demonstrated different skills (i.e. problem solving, design, observation). Findings indicate that children and families discussed components of STEAM based activities in diverse ways. Future studies will explore if families talk about STEAM concepts differently depending on the activity. Results gathered from this research project will be available to the staff at the children's museum for grant funding of STEM and STEAM based learning activities. Through this work, we can offer new STEAM activities to the museums' schedule of programs and foster museum staff development that will subsequently benefit the children and families of our community.

23. Identifying Ecological and Personal Factors the Prevent Obese Individuals from Effectively Losing Weight

Elizabeth Herrick

Brooke Burk, Faculty Mentor (Department of Recreation, Parks, and Leisure Services)

35.1% of the US adult population is classified as obese, and a total of 69% are either overweight or obese (CDC, 2014). Individuals in this classification often seek treatment for personal or medical reasons. The most prevalent treatment modality is dietary restriction; however, it is important to note that 33-83% of dieters regain more weight than had originally lost (Mann et al., 2007; Swanson & Dinello, 1970). Chronic dieting may cause sarcopenia, which is characterized by significant loss of lean body mass, which results in lower resting energy needs, and slower weight loss. This research project aims to create a screening tool that allows healthcare professionals to determine whether patients will easily lose weight or not. With this screening tool, a more individualized treatment plan can be created, which will ultimately increase the healthcare provider's successful treatment of patients. To study this phenomenon, 19 subjects have completed the study, 14 in the control group and 5 in the experimental group. Subjects have completed Resting Energy Expenditure, BodPod, and bioelectrical impedance along with a three-day diet analysis and a recreation engagement survey. Currently, preliminary results are unavailable because we are collecting data to meet our goal of 40 participants. However, we anticipate the results of this study would eliminate the need for a full body assessment and make the process of finding out whether the participant was an easy or difficult weight loser, faster, more cost effective, and able to be easily repeated in frontline healthcare practices across the nation.

24. The Effects of Personality on Second Language Learning

Kayla Smith

Anne Dahlman, Faculty Mentor (Honors Program)

Language is the most important form of communication. Without language, communication would be difficult. In current times, learning a second language is often encouraged and is a valuable asset to possess. With the encouragement of learning a second language, it is important to determine what factors affect an individual's ability to learn a new language. Based on research, there are several individual factors at play when learning a new language. One such factor is one's personality. In order to determine how one's personality might affect an individual's ability to learn a second language, a single case study of a second language learner was conducted. Through the completion of the case study, it was determined that motivation is a major factor of personality that has an impact an individual's ability to learn a second language. It was also found that introversion and extraversion do not play a significant role in an individual's ability to learn a second language but they help to determine what factors of the learning process an individual will need more help with.

Overall, these findings would inform a teacher to learn what aspects of learning a second language a student would need the most help with and therefore would help with the learning process.

25. Assessing Knowledge of Alzheimer's Disease in Younger and Older Adults

Abbey Linderholm

Jeffrey Buchanan, Faculty Mentor (Department of Psychology)

In this study, younger and older adults completed the Alzheimer's Disease Knowledge Scale (ADKS) in order to measure their knowledge of Alzheimer's disease (AD). AD is the most common type of dementia that affects millions of people in the United States. Much research has focused on identifying potential causes of AD, how to best support family caregivers, and methods for preventing this disease. Due to the continuous research and media attention of AD, it is not surprising that many misconceptions have come to attention. It is important that these myths are addressed because misconceptions about the disease can lead to ineffective care for an individual with AD. In the current study, it was predicted that older adults would adhere to fewer myths than younger adults because they are likely to have more exposure to the disease. Data collection is complete with the college student sample, but is ongoing with the older adult sample. Therefore, data collection and analysis is pending and will be complete in March 2017. Implications of the results in terms of the possible need for improved education about Alzheimer's disease will be discussed.

26. Common Misconceptions in Psychological Science

Jacklyn Gehling

Karla Lassonde, Faculty Mentor (Department of Psychology)

Research reveals that introductory learners often leave their courses with common psychological misconceptions intact (Landau & Bavaria, 2003; Taylor & Kowalski, 2004). Refutation texts, which state previously acquired but incorrect knowledge and then directly refute it while also providing the correct information, have become a recent strategy to change flawed psychology knowledge (Lassonde, et al., in press; Kowalski & Taylor, 2009). The present study explored Introduction to Psychological Science students' understanding of nine common misconceptions in psychology. Students participated in a classroom intervention technique during which an instructor provided refutation-style lectures. Students' knowledge and understanding of a given misconception was assessed before the professor lectured about the falsity of the misconception to determine what, if anything, they knew about the topic. Next, the instructor read a refutation style text and then handed out a short popular press article related to correcting the misconception and provided time for discussion. Finally, students answered the follow up questions, "what does the evidence state?" and "did you learn something new? If so, what?" to assess knowledge. These twenty-minute lecture activities occurred approximately once a week, for nine weeks. The results revealed that most commonly, students believed the misconception and based their belief off intuition, previous experience, or the media, rather than scientific evidence. During the last week of the course, a post-test assessment, yet to be analyzed, was given to students to determine the influence of refutation-style lectures on misconception revision.

27. Intuitive Lie Detection: The Role of Subjective Judgments in Facilitating Deception Detection

Elijah Hill and Paige Shoutz,

Emily Stark, Faculty Mentor (Department of Psychology)

When we make judgments of others, we follow specific criteria. We watch others; we watch their body language, we watch their eye contact, or we watch for any unusual habits that they may partake in. Along with these, we also listen to our gut feeling about the person or the overall situation we

find ourselves in. Together with all of these criteria we come to a conclusion of whether or not a person is being truthful with us or trying to deceive us. However, there are few "tells" or cues, whether physiological, biological or verbal, that are directly associated with telling a lie. As a result, many deception studies (Bond & DePaulo, 2006/2008) have only found a slightly above chance rate of differentiation between truths and lies, across a wide range of participants.

Some lie detection studies have examined intuition, and how participants make judgements based on contextual cues, such as their emotional responses rather than a logical analysis of the situation. Albrechtsen, Meissner, and Susa (2009) have demonstrated this by showing that when participants relied on their intuitive processes, it results in more accurate judgments in detecting deception. It seems that many people when placed in a situation where they are trying to detect lies may use their intuition to judge the situation. The goal of this current research is to compare objective measures of lie detection accuracy to more subjective or intuitive measures, to see if people can intuitively detect when people are lying.

28. An Updated Look at Consultation Training, Skills and Engagement in the Schools

Erin Kahnke

Carlos Panahon, Faculty Mentor (Department of Psychology)

Shawna Petersen-Brown, Faculty Mentor (Department of Psychology)

Megan Johnson, Graduate Student Mentor (Department of Psychology)

The goal of this project was to expand upon the findings from Constenbader, Swartz, and Petrix (1992) that analyzed training and current practices in consultation for practicing school psychologists. Constenbader and colleagues found that 61% of practitioners had less than one semester of training, half agreed that their training was less than adequate, and practitioners currently spend less than 1/3 of their time in consulting roles, however, they want to spend more time consulting. Consultation is a key component in practice and training for school psychologists. Because of this, it is important to update this research to see if practitioners are better equipped to support staff and help students achieve academically and behaviorally in the schools. A survey consisting of 38 multiple choice and Likert scale (1-5 point scale from great ability to little ability) questions was sent to practicing school psychologists within the Midwest and Eastern regions of the US. Questions that were included in the survey asked for basic demographics, experience level, formal training in consultation, consultation model used, time spent engaged in consultation and desired time spent doing consultation work. The current data were analyzed and compared to the Constenbader and colleagues (1992) findings.

29. Spaced and Expanded Practice: A Comparison of Methods to Enhance Retention

Katherine Kalenberg

Shawna Petersen-Brown, Faculty Mentor (Department of Psychology)

Carlos Panahon, Faculty Mentor (Department of Psychology)

Jannine Ray, Carrington Riss, and Ashlee Lundberg, Graduate Student Mentors (Department of Psychology)

In order to promote quality instruction and maximized student learning, it is essential for schools to integrate the most practical, effective, and efficient teaching methods into the curriculum. The purpose of this research is to investigate the effect of varying spacing patterns between practice sessions on retention of information. This study will investigate the effects of practice at consistent intervals (spaced practice) and practice at increasing intervals (expanded practice). Though the research is limited, it has suggested that expanded practice may be more effective than spaced practice, particularly in a K-12 school setting. Third graders will be taught a set of unknown words

and definitions using incremental rehearsal (IR). Seven terms will be selected within a content area agreed upon by teachers and researchers and taught through the IR intervention. After the teaching session, students will participate in three practice opportunities corresponding to their assigned condition. During practice opportunities, students will be presented with the words from the teaching session and asked to read each one and provide the definition. If the student reads and/or defines a word incorrectly, error correction will be used. The primary dependent variable will be retention of words and definitions in the final practice opportunity at 28 days after teaching. Data will then be analyzed using an independent samples t-test. Data is currently in progress of being collected within the schools.

30. Do Beliefs about Deception Influence Accuracy? A Study of Lie Detection

Brooke Klontz, Casey Peterson, and Tori Witte

Emily Stark, Faculty Mentor (Department of Psychology)

Lie detection is an important topic to study because it gives researchers, police officers, and people in general tools to have when faced with a situation where you have to distinguish truth from lies. Forrest, Feldman, and Tyler (2006) found that people with accurate beliefs about the type of cues that predict when someone is lying were more accurate at actually detecting deception, compared to people with inaccurate beliefs about lies. The current study measures participants' beliefs about cues to deception, and also examines their accuracy at detecting lies, to determine whether participants' beliefs influence their accuracy. Our participants for this study are students who attend Minnesota State University Mankato, who are enrolled in psychology classes. Each participant sits at a computer and watches a series of videos with students telling stories, some of which are true and some are lies. After each video, they rate the person in the video, and also note whether they think they person was lying or telling the truth. Finally, they complete a scale measuring their beliefs about cues to deception. We expect that participants with more accurate beliefs about deception will be more accurate at distinguishing the true stories from the lie stories, and will rate the truth-telling people in the videos more positively than the liars. Having a greater knowledge on how lie detection works, and how beliefs influence deception detection, can better our understanding of how accurate people's instincts might be when trying to detect a lie.

31. The Stigma of Sex Work and Criminalization: Its Impact on Victim Blame and Empathy

Elliott Kunerth and Kelsi Pettit

Eric Sprankle, Faculty Mentor (Department of Psychology)

The purpose of this study was to explore sex worker stigma, specifically regarding the effect their job title and criminalization status may have on victim blame and empathy. Although the negative effects of sex work criminalization have been well-documented in qualitative research, it has not been experimentally tested. Utilizing a 2 (professional dominatrix, professional naturopath) x 2 (legal, illegal) experimental design, 363 undergraduate participants were randomly assigned to 1 of 4 conditions. Participants were asked to read a news article describing a sexual assault in which the aforementioned variables were manipulated to describe the survivor's job and her job's legality. After reading the article, participants completed the Victim Empathy Scale. Results indicated no significant differences between conditions. However, 47% of the sample failed a basic, two-question manipulation check of the independent variables. After excluding that data, results now indicated main effects for both independent variables. The women working as sex workers were blamed for their own assault significantly ($p < .05$) more than non-sex workers. Additionally, those working illegally were blamed significantly ($p < .05$) more for their assault than those working legally. There was no significant interaction. The results of this study add to the qualitative data regarding the reality of sex work stigma, it's real-world consequences of victim blaming, and the effects of

criminalization. Limitations include using a convenience sample, especially toward the end of the semester when careless reading and responding were evident. Future research should focus on more targeted sampling to reduce validity concerns.

32. A Comparison of Hospital Reports and Past Media Reports on the Living Conditions and Treatment of Patients at Minnesota's First Hospital for the Insane

Jordan Maciej

Andrea Lassiter, Faculty Mentors (Department of Psychology)

Since the beginning of treatment of the mentally ill, there has also been perceptions of mistreatment. This research will examine descriptions of the conditions of the Minnesota's First Hospital for the Insane as told by hospital reports and state documents, and compare this with media reports from the past. By comparing official state documents with state and media records, I hope to give a more thorough and accurate depiction of what life and treatment was like there in the past. The first hospital in St. Peter, Minnesota, opened in 1866 and has been treating patients ever since. Some techniques that are no longer used for treatment of the mentally ill were very typical at such hospitals in America in the late 1800s. This research will describe 1) what the conditions were like in this hospital before 1900, 2) what was reported in state executive documents and newspapers, and 3) what significance the differences and similarities between the two sources hold.

33. Cyberbullying: Coping Strategies in Elementary and High School Students

Jenna Macziewski

Carlos Panahon, Faculty Mentor (Department of Psychology)

Technology is always developing, and new apps are constantly being created. With the rise of technology, cyberbullying is becoming more and more of a risk in the schools. Cyberbullying is becoming the new way to bully because they are more comfortable saying things behind a screen that they are not comfortable saying in person. Cyberbullying is starting as low as third grade. For example, over 90% of third graders play online games, and 35% of them own a cell phone. Cyberbullying is most common in middle school, through social media apps such as; Snapchat, Instagram, or Twitter. Parents in grades 3rd through 12th grade will be contacted via permission slip seeking permission for their child to complete a brief online survey. The students' will select from a provided list of common responses to how one would respond to being cyberbullied. They will then rate how effectively their responses to being cyberbullied helped stopped the bullying. It is hypothesized that that the acts of being cyberbullied will begin to occur at a younger age than previously reported. In addition, we predict that the students will indicate the intervention being utilized are not as effective as intended.

34. The Influence of Personality on Deception Detection Ability

Natosha McClain

Emily Stark, Faculty Mentors (Department of Psychology)

Deception detection is a valued skill in the justice system, but a meta-analysis of studies completed by Bond and DePaulo found that people are only slightly better than chance at distinguishing truth from lies (2006). Although studies show that people are only accurate at detecting lies about 54% of the time, researchers are still examining individual differences in deception detection abilities because it is a cherished skill (Bond & DePaulo, 2006). In this study, students used a computer to view video clips of eight undergraduate students each telling a different story, four of which are true and four of which are a lie. Students then indicated whether they believed the person was telling a truth or a lie and filled out a short personality scale (adapted from Eysenck, 1971) measuring the Big

Five personality traits. This study hypothesizes that individuals who score high on openness to experience, agreeableness, and extraversion will be better able to detect deception than individuals who score low on those traits. Data collection is currently underway and will hopefully reveal individual differences in deception detection abilities.

35. Validating Instructional Hierarchy

Josie Mikosch

Shawna Petersen-Brown, Faculty Mentors (Department of Psychology)

Carlos Panahon, Faculty Mentor (Department of Psychology)

Cassandra Schreiber, Graduate Student Mentor (Department of Psychology)

Efficiently and reliably identifying the most effective intervention is critical to timely remediation of reading difficulties. This study will utilize basic reading data and the Instructional Hierarchy (IH) to identify effective reading fluency interventions. This study will focus on the first two stages of the IH: acquisition and fluency. Students will be recruited from second and third grade classrooms because students at this age are generally learning how to read fluently. Baseline words correct per minute (WCM) will be obtained by reading three grade level passages for 1 minute each. Then, students will be exposed to two repeated reading interventions targeting the acquisition and fluency phases, respectively. The students will receive each intervention twice, and their average reading fluency gains within each intervention, from the first read to the final read, will be calculated. The intervention which results in the greatest average reading fluency gain will be identified for each student. We will then investigate whether initial fluency and accuracy according to baseline WCM is a reliable predictor of the most effective intervention. We will discuss the extent to which a brief reading assessment is a good predictor of the type of reading intervention from which students may benefit.

36. The Effect of Employee Satisfaction on Job Performance

Klarissa Pierce

Andrea Lassiter, Faculty Mentor (Department of Psychology)

Today's society is all about the highest means of proficiency. For any type of corporation, it is imperative that they achieve this in order to bring in more revenue and create a profit. Businesses would not be able to function without their employees, and it has shown in research that workers will put in more effort, leading to higher overall job performance, when they feel satisfied with their job. In order for companies to serve well, they need to put their employees' opinions at the forefront. Evidence will be collected from different sources to provide conclusive statements upon the relationship between employee satisfaction and job performance, and effective ways to encourage employees in the workplace. By implementing these methods, corporations can increase their retention rates and focus on the work at hand while decreasing the amount of money that must be put into recruiting and training new members when dissatisfied employees do not meet their job requirements or choose to leave.

37. 2016-2017 Psychology Department Assessment Outcomes and Recommendations

Akorede Teriba, Jessica Eul, Sedona Kintz, Sandra Kisor, and Chloey Pestorius

Emily Stark, Faculty Mentor (Department of Psychology)

This study addresses the level at which students in the Psychology Department at Minnesota State University, Mankato tend to enjoy their classes, how well they achieve in their classes, how supportive their instructors are, and the various aspirations students have. In addition, the study attempts to tell us what we can do to increase student satisfaction and career readiness, and improve

student advising. Through the use of surveys, interviews, and discussion groups, we are gathering information that would be useful in assessing our department. This information is part of the department's annual program review and will be used to improve the program for future students. This study also represents a novel approach to program assessment, through incorporating current students in the design and analysis of the surveys and interviews.

38. Role of Environmental Factors in Black Boy's Academic Achievement

Emily Wilson and Quincey Vaagensmith

Jeffrey Brown, Faculty Mentor (Department of Psychology)

Despite theoretical advances in the non-eurocentric psychological study of children, comparatively little work has been done on black boys. Previous work has found that multiple environmental factors - including socioeconomic status, parenting practices, racial/ethnic identity and discrimination, and social/emotional well-being - promote risk or resilience in black boys (e.g. Noguera, 2003; Spencer, Cole, DuPree, Glymph, & Pierre, 1993). There still exists a need to characterize the exact nature of how they shape academic achievement in this population. The proposed systematic literature review seeks to summarize and synthesize the most recent work on the topic in order to differentiate which factors are most crucial to target when supporting black boys in schools. Relevant research articles will be identified using databases such as PsycINFO, and search terms will be documented. There will be a particular focus on the specific direction and effect sizes between the environmental factors and academic achievement. The results of the systematic literature review will inform future work on the topic, and predict future directions that primary research on resilience in black boys may take. In addition, the data from the literature review will directly inform a meta-analysis to further quantify the role of environmental factors in risk and resilience on black boys.

39. Reading for Understanding: Research on Reading Comprehension in Higher Education

Stephanie Winter

Shawn Petersen-Brown, Faculty Mentor (Department of Psychology)

Carlos Panahon, Faculty Mentor (Department of Psychology)

Sarah Marsh, Graduate Student Mentor (Department of Psychology)

This study examines the impact of text structure training on reading comprehension in college students. The ability of a person to comprehend and derive meaning from the text is the main goal of reading. Participants recruited were undergraduate psychology students at a university in the Upper Midwest, who were randomly assigned to complete a tutorial on text structures or to participate in a control condition. The assessment given to each participant was a novel passage which followed the problem-solution text structure. All participants responded to a detailed survey and assessment. It was hypothesized that the participants who went through the text structure training prior to taking the assessment would be able to answer the comprehension questions correctly and identify more main ideas than those who did not receive any training.

40. Effectiveness of Lumosity vs. Well Known Memory Techniques on Memory Tasks and Perceptions

Rebecca Osborn, Ethan Wynia, and Faithe Patrick

Karla Lassonde, Faculty Mentor (Department of Psychology)

When asked to remember, technology of today allows individuals to access endless amounts of information without relying on their abilities. There are many situations in which a good memory is still needed; however, many are not aware of basic strategies that could lead to memory

improvement. Students in two separate sections of a Human Memory course were asked to complete three memory assessments: One at the beginning of the course, a second at the mid-term, and a third during the final week. Throughout the course, both sections engaged in strategies to improve their memory. Additionally, one section participated in Lumosity, an online cognitive training program, for twelve weeks. The goal of the study was to determine whether students' memory improved based on course learning and/or course learning combined with Lumosity. Following each assessment, students completed open-ended questions about whether they believed their memory changed and/or improved as a function of the course and Lumosity experience. Results on assessment scores revealed gains on several of the memory assessment tasks, independent of Lumosity. This finding is consistent with scholarly work on popular cognitive training programs, but inconsistent with Lumosity claims. Students believed course work and theory led to memory improvement. Students' self-report on Lumosity indicated they enjoyed the games and would recommend the program to a friend even though they did not believe Lumosity training would yield long-term improvement. Overall, these results will be used to inform others on the best options to reliably improve memory.

41. Locating Unexploded Bombs in Conflict Landscapes Using Geographic Object-Based Image Analysis: A German Case Study from World War II

Anna Brand

Cynthia Miller, Faculty Mentor (Department of Geography)

Fei Yuan, Faculty Mentor (Department of Geography)

Unexploded bombs pose extreme danger all over the world. Estimates indicate that 10-15% of bombs dropped during past conflicts did not detonate and currently remain buried below ground. Relatively small holes interspersed among larger craters are the geographic signatures indicating their entry locations. These terrain features can be visually identified on reconnaissance photographs by skilled image interpreters. This process is extremely time-intensive and cannot be relied on to find all remaining bombs, so there is a demand for the development of faster, automated search methodologies. As millions of tons of high-explosive bombs were dropped on European cities by Allied and Axis forces during World War II, this case study focuses on both rural and urban areas in and near Aschaffenburg, Germany. To find unexploded bomb signatures, geographic object-based image analysis (GEOBIA) tools in the Feature Analyst Extension of ArcGIS search for pixel clusters that statistically resemble them in LiDAR-derived digital elevation sets. The software also identifies smaller unexploded bomb entry marks visible on 1945 reconnaissance photographs automatically and creates new spatial data points that represents possible dud locations across the entire search area. Researchers can then use these data to determine where defusing and disposal may be necessary. Consequently, large areas can be searched more efficiently and reliably. This method can also be applied to other locations that are affected by unexploded bombs which can then be cleared at much lower cost than with traditional photo-interpretive location methods.

42. Communication Through Dance: A Deeper Look into the way Movement is Used to Communicate

Makayla Foertsch

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

In art, there are artists and there are audiences, which the former is trying to reach. Accomplishing this task is the artist's role. For purposes of this paper, the artist is defined as the dance choreographer. Dance artists illustrate the complexities of communication through the medium of movement. They use processes that are grammatical or syntactical-like, yet they do not use words—rather, motion, shape, steps, and the like. Movement has a way of communicating ideas more than words at times, because the clearest of words are often too simple to establish a particular world or

perspective. Choreographers realize this when they design works. Through comparative analysis, this paper will focus on three choreographers and how they used solo choreography to communicate with audiences on a deeper level. They respond to the trends of their day through dance using movement as the medium. The open interpretation modern dance leaves with its audiences will always give a freedom to those interpreting the dances. The choreographer may intend it to have a specific intent but an audience member may have a completely different reaction to the dance whether it is from personal experiences or just what their imagination comes up with. This is a perfectly acceptable reaction to the dance. Modern wanted to move away from the fixed interpretation and it did that in allowing audiences to have an emotional response to the pieces. Each choreographer solves the problem of how to accomplish communication differently. Modern and communication have a certain level of freedom within them. Words only mean what we make them to mean which is also true for dances and works of art. In art, as in life, showing will always be preferable to telling.

43. The Black Ballerina: Race and American Ballet

Abigail Okoneski

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

How does race factor into American ballet? This question begs to be answered. However, there is much ignorance and misunderstanding in the way of a knowledgeable response. Skin color is a big factor as to whether African American dancers are selected by predominately white ballet companies. If they are selected, which is rare, many talented African American dancers are seldom selected for lead roles as a result of their skin color. This paper investigates how race, as an issue has been problematic in American ballet. Its findings are threefold: discussing the hardships, describing the stereotypes, and investigating how racism stood in the way of African American female ballet dancers. This paper will conclude with the fact that race was, and is highly controversial in this country and that the world of American ballet did not escape such controversy because of its racist practices.

44. The History and Construction of the Ballet Tutu

Julia Armstrong

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

Ballet is over 400 years old. It is performed all over the world on many different stages and to many different audiences. One of the most iconic things about ballet is the tutu. Tutu's have an interesting history unlike what one might expect. In order to have a deeper and well rounded appreciation for the common ballet costume audiences see in ballets everywhere, one must go back to the 16th and 17th century in France to look at the tutu's beginnings. The construction of a tutu is a lot more complex than one might think. Around 120 hours of work with over 25 meters of fabric is needed to make a single tutu (Constructing a classical ballet tutu). Many companies around the world need many different tutus for a cast of dancers, for a single ballet. When multiplied by the amount of different ballets companies may perform in a single year, one can appreciate the time and skill required. The sheer number of costumes needed, combined with the amount of work that goes into every costume is something to marvel at from both a historical and a design perspective.

45. A Corseted World: How this Binding Undergarment Affected a Dancer's Body

Abby Pleiss

Julie Kerr-Berry, Faculty Mentor (Department of Theatre and Dance)

The purpose of this paper is to discuss the significance of the corset, or tutu, in ballet during the nineteenth and twentieth centuries, as well as when it was abandoned with the birth of American modern dance during the twentieth century. Whether on stage or in every day life, the corset was significant in helping women achieve the ideal physique during this particular time period, while at the same time, quite restrictive. Through historical analysis, this paper will focus on the social history that kept the corset in place, and what led to its removal. When dancers are required to perform in corsets, it only allows them to move their limbs instead of their entire body. Significant to this paper was Isadora Duncan, considered the mother of American modern dance, and how she disrupted this norm by removing the corset. She explored the ways the body could freely move. Removing the corset, Duncan showcased a new art form that expressed the body in a new light. She went against social norms and helped break away from the restrictions that women faced in the early twentieth century. Findings will reveal that social norms affected what women wore in dance and in life, and in this case, did not.

Automotive and Manufacturing Engineering

Emission Testing Wood-Based Heating Systems

Justin Yang

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Carbon Fiber Driveline

Ryan Torrell

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

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Fuel Pressure and Engine Output

Nicholas Bottoms

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

Ergonomics Research and Building of a Driving Cockpit for FSAE

Hee-Jin Soh

Shaheen Ahmed, Faculty Mentor (Department of Manufacturing Engineering)

Kuldeep Agarwal, Faculty Mentor (Department of Automotive Engineering)

Formula SAE Shock Dynamometer

Brandon Lyzhof

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

Emission Testing Wood-Based Heating Systems

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In Minnesota, wood based hydronic systems are being installed in commercial and institutional facilities like farms, green houses, schools, and community centers to displace liquid propane heating systems. This transition decreases the dependence of fossil fuels and is favorable because the timber being used is harvested from a farm rather than instigating through deforestation. Also, this crop timber is vastly available, inexpensive, renewable, and creates an opportunity for jobs. Conversely, a major concern is whether or not these benefits are linked with a decrease in air quality. Therefore, The Minnesota Center for Automotive Research has agreed to measure the emissions of two Biomass Area Source Hydronic Systems for the Minnesota Department of Agriculture (MDA) following a Federally Mandated EPA Test Procedure. Entry-level technical information about Emission Stack Testing will be presented following the USEPA Test Method methodology. Two types of emissions will be collected using an air filtering system and two gas analyzers. A total of three tests will be conducted for each hydronic system to generate two scientific emission reports, an analysis of the total concentrations of particulate and gaseous emissions, and concluding remarks of the emission tests. The Minnesota Department of Agriculture will use the emission results to determine whether or not these boilers could have negative consequences for projects related to Bio-Thermal Technology. While the Minnesota Pollution Control Agency will possibly use the measured emissions data, along with their computer simulated data, to determine the need of future regulatory emissions rates.

Carbon Fiber Driveline

Ryan Torrell

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

Bruce Jones, Faculty Mentor (Department of Automotive Engineering)

Samuel Ertl, Graduate Student Mentor (Department of Automotive Engineering)

Until recently most performance vehicles have utilized steel for their drive shafts. This is because steel can handle rotating forces very well at the cost of high weight. Alternatively, carbon fiber can be a replacement as it is very resistant to these rotating forces at a significantly reduced weight but it is at the expense of being much higher cost. The added cost is due to the strength of the carbon fiber filaments and the precision required to wind the carbon fiber; this precision allows for a higher strength to weight ratio when compared to a steel counterpart. In FSAE lowering the weight of rotating pieces means that the cars can get up to speed faster, thus lowering the weight of the driveline is a large improvement. To test whether this application will work, the glue bond between the carbon fiber drive shaft and the aluminum inserts is the focus as it is the weak point. For the test there were 15 carbon fiber tubes that were 3 inches long each. Then aluminum inserts were made at 3 different insert lengths ($\frac{1}{4}$ inch, $\frac{1}{2}$ inch and $\frac{3}{4}$ inch) to test the strength. The reason for using a small test sample is so that applying a huge force is not required, then the test samples can be compared to show whether the glue strength is linear or exponential. From this we can conclude the length of insert and if the weight change is worth the new cost.

Fuel Pressure and Engine Output

Nicholas Bottoms

Gary Mead, , Faculty Mentor (Department of Automotive Engineering)

Fuel atomization is an important factor to having an efficient engine. Atomization is defined by how small the droplets of fuel are in the mist that an engine uses to produce a combustion event. The higher the injection pressure, the better the fuel will be atomized. The fuel spray will however will have greater

penetration into the air stream in the intake. Over penetration must be avoided as it will induce wall wetting on the intake manifold. Wall wetting will create puddles of fuel that cannot be efficiently burned in an engine. Too low of pressure will not atomize the fuel properly. Poor atomization will reduce the efficiency of a combustion burn. Doing a proper fuel pressure sweep to find the best pressure and penetration combination is critical for an efficient engine. A fuel pressure sweep consists of starting at a low fuel pressure and measuring engine efficiency and slowly increasing in while monitoring efficiency. The ideal fuel pressure will then be visible from resulting data.

Ergonomics Research and Building of a Driving Cockpit for FSAE

Hee-Jin Soh

Shaheen Ahmed, Faculty Mentor (Department of Manufacturing Engineering)

Kuldeep Agarwal, Faculty Mentor (Department of Automotive Engineering)

Ergonomics which is also known as Human Factors is an applied science of the interaction between products, equipment, systems, or processes and people who use them. Ergonomics plays a crucial role in designing a formula car by reducing driver's fatigue and improving driver's feedback within the rules of the FSAE (Formula Society of Automotive Engineering) competition. Each cockpit dimension is determined mathematically by using the given SAE anthropometric dimensions for the 5th percentile female and the 95th percentile male. Therefore, (1) calculating anthropometric dimensions of the participants, (2) creating an adjustable simulator, (3) testing posture conformance with the cockpit and driving efficiency, (4) building a CAD model for the seat, and (5) designing the actual driver's seat are crucial in the design process. The purpose of ergonomics in a daily driving car is to reduce the passenger's fatigue and improve the comfort, especially if they drive a long distance. However, the purpose of ergonomics in formula car is to find the best ergonomics posture for the driver while not violating the ergonomic principles and FSAE rules. I am still testing the adjustable simulator with participants. The results of the improved driving cockpit for FSAE would reduce driver's fatigue and improve driving performance in population ranges from 5th percentile female to 95th percentile male. It will assist the 2017-2018 FSAE Michigan competition under the design events and actual dynamic performance and reach the goal of being top 10 in the world's largest engineering competition.

Formula SAE Shock Dynamometer

Brandon Lyzhof

Gary Mead, Faculty Mentor (Department of Automotive Engineering)

Formula SAE is a colligate competition involving a small signal seat racecar built by students and used to compete at Formula SAE competitions all over the world. The competition has little to do with how much power the car can produce, but relies on the handling and vehicle dynamics, the shock absorbers play a vital role in keeping the tire in contact with the ground. A shock dynamometer is a measurement device that supplies an input and measures the output (force and displacement) of the shock absorber. Using a shock dynamometer, a formula SAE team can better understand their shock absorbers, understanding your shock absorbers can help with fine adjustments to the suspension system which can aid in vehicle dynamics. This year the 2017 FSAE team plans to use the shock dynamometer to ensure that the shocks are still functioning correctly and to help tune the car. Also, with using the shock dynamometer the exact force needed to compress the shock will be known, and therefore the force going through the tire can be calculated.

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