

# NDSU EXPLORE

UNDERGRADUATE EXCELLENCE IN RESEARCH AND SCHOLARLY ACTIVITY 2015

# WELCOME MESSAGE



Kelly A. Rusch, Ph.D., P.E.  
**Vice President for Research and  
Creative Activity**

To students, staff, faculty and our neighbors in the community,

Welcome to the second annual NDSU EXPLORE event, an opportunity to recognize and celebrate the exemplary research and creative activity of North Dakota State University's student body. Undergraduates from all disciplines are presenting current or recently completed projects showcasing the diversity of research interests and creative processes at our university.

Under the dedicated mentorship of NDSU's distinguished faculty and researchers, students are developing critical thinking skills, solving complex problems and contributing new knowledge and ideas to their respective disciplines. Their accomplishments as scholars, scientists, artists and engineers are a credit to the education they are receiving at NDSU, and I am confident the skills they are gaining through this experience will help them stand out from their peers and build the foundation necessary to succeed throughout their lives.

Our undergraduate students are doing remarkable scholarly work. Thank you for attending our students' presentations and supporting their endeavors. We hope you enjoy exploring a part of the student learning experience at NDSU.

Regards,

A handwritten signature in blue ink, appearing to read 'K. Rusch'.

# THANK YOU

NDSU EXPLORE is funded in part by an award from the NDSU Development Foundation Board of Trustees Endowment.

Thank you to the following NDSU EXPLORE Committee members for helping make this event possible.

## **NDSU EXPLORE Committee:**

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Amanda Brooks \_\_\_\_ College of Health Professions  
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Kay Sizer \_\_\_\_\_ Research Development

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# SCHEDULE

All events will be held in the Memorial Union.

## 7:30-9 a.m.

Registration and Presentation Setup  
**Great Plains Ballroom**

## 9-9:15 a.m.

Welcome Remarks – Beth Ingram, NDSU Provost  
**Great Room**

## 9:15-10 a.m.

“The Transformational Power  
of Undergraduate Research”

### **Great Room**

Jenny Olin Shanahan, Ph.D.

*Bridgewater State University, Massachusetts*

Shanahan is the director of undergraduate research, an executive board member of the Council on Undergraduate Research (CUR) and a CUR councilor in the Undergraduate Research Program Directors Division. Shanahan has presented more than 30 faculty workshops on student research mentoring and writing across disciplines. She has published several articles on integrating undergraduate research in the curriculum, scaffolding scholarly skills from lower- to upper-division courses and managing an undergraduate research program.

## 10-11:30 a.m.

Student Presentations – Morning Session  
Oral Presentations • **Hidatsa and Rose Rooms**  
Poster Presentations • **Plains Room**

## 11:45 a.m.-1 p.m.

Recognition Luncheon for Student Presenters  
and Advisers  
**Great Room**

## 1:30-3:00 p.m.

Student Presentations – Afternoon Session  
Oral Presentations • **Hidatsa and Rose Rooms**  
Poster Presentations • **Plains Room**



### **GUEST SPEAKER**

Jenny Olin Shanahan, Ph.D.,  
*Director of Undergraduate Research,  
Bridgewater State University*

Shanahan oversees a multidisciplinary student-research grant program, two annual campus symposia of several hundred students' scholarly work and publication of *The Undergraduate Review: A Journal of Undergraduate Research and Creative Work*. In her previous position as associate professor of English and director of the Honors Program at St. Mary's University of Minnesota (2000-10), she mentored undergraduate research in English and literature. Shanahan has presented more than 30 faculty workshops on the mentoring of student research and writing across the disciplines and has published several articles on integrating undergraduate research in the curriculum, scaffolding scholarly skills from lower- to upper-division courses and managing an undergraduate research program. She serves as an executive board member of the Council on Undergraduate Research (CUR) and a CUR Councilor in the Undergraduate Research Program Directors Division. Shanahan earned her doctorate in literature from Marquette University in 2000, with a focus on Multi-Ethnic Literatures of the United States, particularly Chicana/o and African American literary traditions.

# ORAL PRESENTATION SCHEDULE

## MORNING SESSION ONE 10-11:30 a.m. – Hidatsa Room

### Emily Erickson

Activist Rhetoric in Michelle Cliff's "No Telephone to Heaven"

### Yarimson Fofana

Framing the News: How US and African Newspapers Covered Obama's Visits to Kenya and Ethiopia

### Laryssa Mortenson

A Safe Place to Speak: Webcomics' Role in the Conversation around the Sexual Objectification of Race and Gender

### Emily Karkoska

Strategic Communication in College Newspapers: A Case Study of *The Spectrum*

### Gabriel Branco

Football Championship Subdivision (FCS) Athletic Directors' Perceptions on Paying Student-Athletes' Cost of Attendance (COA)

## MORNING SESSION TWO 10-11:30 a.m. – Rose Room

### Brandt Berghuis

Phenotypic and genotypic diversity of *Uromyces appendiculatus* (common bean rust) in North Dakota

### Kathryn Helwig, Danielle Flora, Keli Johnson

A Strategic Communication Research Approach to Promoting Agricultural Communication at Land Grant Universities: The Case Study of NDSU

### Bryn Halley

Phenotypic diversity of *Puccinia striiformis* (wheat stripe rust) in North Dakota in 2015

### Lauren Singelmann

Graphical User Interface That Analyzes RNA Sequencing Data

### Karah Anderson

Strategic Communication Education

## AFTERNOON SESSION ONE 1:30-3 p.m. – Hidatsa Room

### Laura Otterness

Is Bad News Good News? Journalists' Framing of Crisis and Emergency Reporting

### Celena Todora, K. Johnson (Shippensburg University)

Can Service Learning in Basic Writing Classrooms Foster Students' Grit?

### Erika Schneider, Sarah Sisser, Morgan Klosterman, Gabrielle Maddock, Jessa Lusby, Eric Veralrud

The Strategies Undergirding Those Spectacular Super Bowl Commercials

### Jacob Huesman

Converting 3D Point Cloud Data into 2D Occupancy Grids suitable for Robot Applications

### Samuel Caspers

Cancer in the Media: An Analysis of Journalistic Framing

## AFTERNOON SESSION TWO 1:30-3:15 p.m. – Rose Room

### Mariom A. Carvajal

*Bebaeus*: A Species or a Species Complex? Studying the Implications of Biodiversity in True Bugs

### Ruvimbo Chitemere, Sammy Silbert

Functionalized Soybean Oil Thermosets for Use in Biobased, Biodegradable Fishing Gear

### Anna M. Peterson, L.E. Camacho, A. Reyaz, K.C. Swanson, K.A. Vonnahme

Impacts of stage of gestation and maternal nutrient status on binucleate cell numbers in the beef cow

### Cody Ritt, M.E. Hossain, A.N. Bezbaruah

Advancements of Phosphate Removal using Metal Cross-linked Biopolymer Beads

### McKenzi Shelton, S.L. Kaminski, C.S. Bass, D.A. Redmer, A.T. Grazul-Bilska

Expression of receptor for nitric oxide (NO), soluble guanylyl cyclase (sGC) in ovine ovarian follicles: Effects of diet and arginine.

### Dre E. Steinwehr, S.A. Hoselton, J.M. Schuh

Of mice and man: remodeling the allergic asthma model

# POSTER PRESENTATION SCHEDULE

## MORNING SESSION 10-11:30 a.m. – Plains Room

### **Nicole Ellingson**

From a Cropland to a Wetland: A Case Study in Wetland Restoration at the Albert Ekre Grassland Preserve

### **Anne Gatzke**

Impact of Various Mulches on Sweet Corn Germination, Plant Growth, and Yield

### **Steven Giesler**

3-D Printing: A New Approach to Water Filtration

### **Katie M. Gisi, S. Bajwa, D. Bajwa**

Fabricating Ceiling Tiles from Alternative Plant Fiber

### **Bryanna Hanson**

Does beef inclusion in a modern diet influence risk factors for obesity related metabolic disorders?

### **Joel Hedlof, Reed Erickson, Ben Ferguson, Mary Hedrick, Felicia Marquez, A. Dalman**

Advanced Bone Technology

### **Bryan Henderson, B. Gifford, S. Kilina**

A Theoretical Investigation of the Photoelectric Properties of Chlorine-Functionalized Carbon Nanotubes

### **Kelli Kleppe, Cassandra Hoffman, Kjrysten Olson**

Age Differences in Inhibition of Return During Visual Search

### **Callie Krupke, E. Offerdahl**

The effectiveness of C-contracting in introductory biochemistry

### **Jacob Larson, Robert Pauly, Tanner Rothstein,**

### **Jordan Brummond**

Cellulation

### **Elizabeth Leach**

Alba Bales House: Life in the Practice Home

### **Jusung Lee, Rajith S. Manan, P. Zhao**

Nickel Catalyzed alkyne hydroimination with ketimines as N-H nucleophiles

### **Niki McArthur**

Dramaturgy for “Cat on a Hot Tin Roof”

### **Augusto Moreira**

Ruggedness Test for Density Measurements of Flax Fiber

### **Chad Rehovsky**

Novel Nanocellulose Based Fire Retardants for Polymer Composites

### **Cole Rehovsky, Collin Gradin, Austin Hewitt, Austin McCullough, Alexis Johanson**

Investigation of Potential Anti-microbial Agents Capable of Inhibiting the Growth of Microorganisms Associated with Dental Implantation-related Infections

### **Amy Scegura**

Effect of Simulated Hail Treatment on Yield Loss in Chickpea

### **John Wells, Torie Jones, Luke Koran, Typhanie Schafer**

Ellendale Public History Field School Project

### **Sharon White Bear**

Mandan, Hidatsa, Arikara Nation High School Students: Hope for Future Education and Employment

### **Yue Xu, D. Roy, E. Khan**

Effect of coagulants in removing cyanotoxin- microcystins in drinking water treatment process

**AFTERNOON SESSION 1:30-3 p.m. - Plains Room**

**Maxwell Baldwin**

Engineering pollinator phenotypes: consequences of induced size variation on adult morphology and flight performance metrics in the solitary bee, *Osmia lignaria*

**Cooper Bierscheid**

Utilizing Additive Manufacturing Processes for Medical Devices: Prosthesis

**Hae Ju Choi**

Dihydroxylation of Erucic acid to afford Anti Diol

**Cassandra Coghill**

Implementations of Title IX in Tribal Colleges

**Austin Espe, Nathan Fisher**

Linking tracheal system development with airway immunity

**Yining Fang**

Conflict & Harmony

**Mary Hedrick, A. Denton**

Molecular Dynamics Simulations of Ionic Microgel Dispersions in the Cell Model

**Bradley Hoffmann, Austin Nodland, Catherine Gruat-Henry, A.E. Brooks**

Using Engineering to Unravel the Mystery of Spider Silk Fiber Formation

**Alex Jansen**

Fargo Community Centre

**Jocelyn Kylo, Lauren Hankla**

Analysis of North Dakota Coverage in News Media

**Adrian Nelson**

A Picture is Worth a Thousand Words: A Content Analysis of *Sports Illustrated* Covers and Gender Equality

**Ashlyn Nelson, B.M. Olson, A.J. Schmidt, E.L. Zacharias, K.J. Hackney**

Blood Flow Restriction Exercise Induced Muscle Swelling is Not Enhanced With Low Cuff Pressure-Small Cuff Width Prescription

**Glen Peterson**

Oil Sorption of Non-woven Biological Mats

**Anna Renner**

Chromatographic Analysis of Electronic Cigarette Refill Liquids

**Megan C. Ruch, T. G. Gilbery, S. Underdahl, M. L. Bauer, K. C. Swanson**

Influence of forage inclusion level on growth performance and feeding behavior in finishing steers.

**Alexa Rutherford**

Relationship between Ornamentation and Nest Investment in the White-winged Junco

**Nick Sikorski, Brielle Boeckel, Addie Long, Angus Stoudt**

The Nature of News: A Global Media Analysis

**Patrick Simpson**

Remanufacturing of 3D Printer Filament

**Samantha Yineman, Denielle Danielson, Justin Paulson, Jena Marie Lorsung, Tanner Gustafson, Alexander Hathaway**  
Osteoblast Integration into a Dental Implant

# PROJECT ABSTRACTS

## Maxwell Baldwin

Engineering pollinator phenotypes: consequences of induced size variation on adult morphology and flight performance metrics in the solitary bee, *Osmia lignaria*

Body size is an important trait because it strongly correlates with morphology, performance and fitness. In insects, the body size model argues that adult size is determined during the larval stage of life—by the mechanisms regulating growth rate and the duration of growth. Though explicit links have been drawn between larval growth and adult size variation, few studies have examined how changes in size affect adult morphology and performance. In this study, we asked how altering larval growth impacts adult morphology and performance in the solitary bee pollinator, *Osmia lignaria*. We manipulated the duration of larval growth by altering food provisions during larval development. This induced twice the variation in body size as is observed in natural populations with more than a 10-fold difference between smallest and largest adult bees. The impact of altered larval development on adult morphology was evaluated by examining allometric relationships between body size and head, thorax and abdominal masses. We also examined how flight morphometrics varied with body size by evaluating wing loading and a flight power index. *O. lignaria* thoraces increased hypermetrically with body mass, but head and abdomens increased isometrically. Wing loading decreased with increasing adult mass, suggesting that flight was more energetically demanding in larger bees; however, the flight power index remained similar across different body sizes, indicating that increased thoracic investment offset challenges in flight for larger bees. These scaling relationships are consistent with the ecology of *O. lignaria* because reproductive performance is limited provisioning of nests rather than egg production.

## Brandt Berghuis

Phenotypic and genotypic diversity of *Uromyces appendiculatus* (common bean rust) in North Dakota

For the last decade, North Dakota has been a leading producer of dry beans in the United States, comprising more than 30 percent of the annual production (USDA). Along with its significance in North Dakota, beans are classified as one of the most important grain legumes in the world (Araya, 2004). However, there are several limiting factors that can hinder production of dry beans, such as diseases. Dry edible bean rust caused by *Uromyces appendiculatus* is a disease that affects bean yields both in North Dakota and throughout the world. In 2008, a new race of the pathogen was identified in North Dakota and has the potential to cause a multimillion-dollar yield loss in the region (Markell, 2012). Due to the variability in the pathogen, the objective of this study was to investigate the genotypic and phenotypic diversity of the *U. appendiculatus* population in North Dakota. *U. appendiculatus* isolates were collected from gardens and fields throughout North Dakota from 2010-14. Phenotypic diversity can be expressed as the virulence phenotype race obtained on a set of differentials. Combining the phenotypic and genotypic information of the pathogen will help strengthen breeding efforts and future disease management implications.



## Cooper Bierscheid

### Utilizing Additive Manufacturing Processes for Medical Devices: Prosthesis

Currently, there are 11.5 million individuals missing one or more limbs according to the cdc.gov. On top of that, the cost to obtain a myoelectric prosthetic device can be anywhere from \$25,000 to \$100,000. The team researched using alternative manufacturing methods such as 3D printing to reduce the cost down to \$1,700.

Children were a special focus as they grow out of their prosthetic devices. The team was able to obtain IRB approval for research on human subjects. The first candidate studied was a three-year-old who is a bilateral, trans-radial, congenital amputee (born missing both arms without elbows). Interviews and questionnaires were conducted with the client's family to determine target design criteria. Next, we developed and built prototype devices using additive manufacturing (3D printing). The device, dubbed PAL (printed artificial limb) has finger grasp, rotational wrist, and elbow that are all controlled by the body's electrical signals.

These devices will be put through clinical trials alongside specific engineering tests to ensure a quality product. The goal for the research was to help the first client but has now evolved into an open-source business called Protosthetics. By using 3D printing, the product can be manufactured for mass customization. This solution can be applied to any individual's unique needs. The major finding was the capability of 3D printing in the acceleration of product development and distinctive design possibilities when all other processes fall short.

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## Mariom A. Carvajal

### *Bebaeus*: A Species or a Species Complex? Studying the Implications of Biodiversity in True Bugs

Even though there are about 1 million insects described, it is estimated that the actual number of species in the world is between 10 to 30 million. Being conscious of this wide biodiversity could impact our understanding of topics like phylogeny, biodiversity assessment and pest management. True bugs are one of the most diverse insect groups, and they are characterized by having elongated mouthparts and half hard half membranous wings. Particular families of true bugs may have a different diet; while some of them feed on blood, others are predatory or plant-feeding insects. These special diets are what makes many true bugs important, from bed bugs or kissing bugs that have medical importance because of their ability to transmit various diseases to humans to plant bugs that feed on crops or predatory bugs that help control the populations of the last ones.

Acanthosomatidae is a family of plant feeding true bugs that contains around 250 species in 56 genera. From those, around 10 have been identified as pests. *Bebaeus* is an Acanthosomatid genus that contains only one species. However, further research revealed that this may not be true. The objective of this study is to discuss the species number for the genus *Bebaeus*, provide its first host plant record and analyze its biodiversity and agricultural implications.

## **Ruvimbo Chitemere Sammy Silbert**

Functionalized Soybean Oil  
Thermosets for Use in Biobased,  
Biodegradable Fishing Gear

Breaking and leaving fish line and fishhooks in water bodies can be harmful to wildlife or the unsuspecting foot. Common metal fishhooks and plastic fish line may remain in lakes or the ocean for long periods of time. Very often fish lines break after hooking plants or rocks and the hooks are both left behind. We propose the design of biodegradable fishhooks and lines made from a thermoset of functionalized soybean oils. We propose a design that would dictate that the materials be able to withstand great amounts of strain so they do not break while reeling in a fish, can be stored for long periods of time and not biodegrade or lose their strength, and harmlessly break down over time in an aquatic environment so that they do not pose a threat to wildlife. Soybean oils have been of interest for use in various durable plastic materials. Soybeans are a renewable, inexpensive and abundant material and their functionalized oils are an excellent candidate for biodegradable fishhooks and line.

## **Hae Ju Choi**

Dihydroxylation of Erucic  
acid to afford Anti Diol

The utilization of seed oils as renewable resources in industrial feedstocks have become more popular. The wild rapeseed oil contains 45-50 percent erucic acid, which has been found to have many applications as a feedstock. In addition, the rapeseed is very plentiful in North Dakota, hence erucic acid could be a local source of useful biomass.

The objectives of this study are to prepare dihydroxylated erucic acid from erucic acid and react them with acrylic acid to derive acrylates and thereafter to produce ecofriendly alternative polymers.

In the reaction, performic acid was synthesized using formic acid and hydrogen peroxide. When the performic acid reacted with erucic acid, epoxidized erucic acid and formic acid occurred. After that, sodium hydroxide was added in the flask and the mixture was stirred for one hour in the 100 °C oil bath. Finally, concentrated hydrochloric acid was added to the flask in the ice bath. After one hour, the solid was isolated via suction filtration and it was allowed to dry overnight at room temperature.

The product was confirmed by <sup>1</sup>H-NMR. The spectrum shows diol was prepared with dihydroxylation of erucic acid. We believe it is anti based on the proposed mechanism. The product was a white solid and the isolated yield was 57 percent. Acrylates could be synthesized using diols, which are made with erucic acid.

## Nicole Ellingson

From a Cropland to a Wetland:  
A Case Study in Wetland  
Restoration at the Albert Ekre  
Grassland Preserve

In 2013, a wetland restoration project began at the Albert Ekre Grassland Preserve in southeastern North Dakota. Due to fluctuations in water levels, crops were produced at this location in four of the previous 20 years. It was decided to initiate a long-term wetland restoration experiment at this site with the objective to determine which wetland restoration method produces the greatest native plant diversity. Prior to restoration, the site was planted with Round-Up Ready soybeans during the 2013 growing season and a total of seven applications of Round-Up were applied to the site in order to reduce the seedbank. During restoration in 2014, three treatments were installed on the restoration site: seed only (S); seed and hay mulch (SM); seed, mulch and donor plugs (PSM). In 2015, vegetation started establishing on the treatments and areal cover surveys were conducted to determine which restoration method produced the greatest native plant diversity. ANOVA was used to determine if there were differences in the number of species in each treatment, as well as differences in the relative cover of bare ground, moss and vegetation among treatments. While ANOVA yielded no significant differences among treatments, we believe this is a reflection of the short time between restoration and sampling, as it can take many years before native vegetation reestablishes on a restored site. After more time has passed, we will resample the site to evaluate the progress of our restoration treatments towards our objective.

## Emily Erickson

Activist Rhetoric in Michelle Cliff's  
"No Telephone to Heaven"

In this time of controversial racial tension, viral marketing and the negative connotations of "Social Justice Warriors", civil rights activists and movements in America are not granted the recognition and interpretation they deserve. In order to open the gateway to understanding social justice and Postcolonial attitudes, this research paper analyzes Michelle Cliff's 1987 novel, "No Telephone to Heaven," through a Postcolonial theoretical lens and studies the author's use of sociolinguistics to represent the power dynamics within activist rhetoric. Although Cliff's novel was set in Jamaica during and following the nation's independence from Britain in 1962, there are correlations between the activist discourse in Cliff's writing and the rhetoric and sentiments of the Black Lives Matter movement, which began in 2012 and is still intensely active today. I intend to study the foundational writings of Postcolonial theory (that of Said, Fanon and Derrida) as well as the modern activist rhetoric of the current civil rights movement in America. My research will add a contemporary element to the current analyses of Cliff's novel and inspire further academic examination of modern civil rights movements.

## Yining Fang

Conflict and Harmony

This project is focusing on designing a multipurpose emergency response and neighborhood fitness center to serve as a place for celebrating the unique potential of masonry as a building material. By investing a bit of effort, we grow to understand both the historical tradition of masonry and new, forward-looking ways of employing this "natural" material to serve and support human needs and aspiration.

In the U.S., buildings consume 90 percent of the energy, which makes being sustainable a practical challenge of architecture. Masonry materials, presenting as local and long-lasting materials, are important for us; as students, we must become familiar and get in touch with it, from both structural and exterior expression.

As always, the clear and expressive structure of space is a key aspect of the design challenge. It is also important for the facility and clients to have a distinctive image that will give it its own identity and say something positive.

## Yarimson Fofana

Framing the News: How U.S. and African Newspapers Covered Obama's Visits to Kenya and Ethiopia

The media play critical roles in politics, especially in projecting images of politicians. By the nature of coverage they provide for politicians and their various activities, the news media frame the discourse and influence perceptions of the public. The U.S. Presidency depends on various communication apparatus for maintaining good relations both locally and internationally, thus invests considerably in ensuring good media coverage. President Barack Obama's historic visit to Kenya and Ethiopia in 2015 provided an opportunity to examine how selected U.S. and African newspapers covered the events. A content analysis of four elite U.S. newspapers and four Kenyan and Ethiopian newspapers was done using LenisNexis to isolate the coverage relating to the visit, with the individual story as the unit of analysis. The results show many similarities and differences, with the U.S. newspapers paying more attention to the economic aspects while the African newspapers framed the visits more emotionally. The results will add to our growing knowledge of media in politics in general but particularly to presidential media relations strategies.

## Anne Gatzke

Impact of Various Mulches on Sweet Corn Germination, Plant Growth and Yield

**Problem Statement:** Sweet corn is a favorite summertime crop among consumers in North Dakota. Having marketable corn during the peak summertime demand can be difficult due to colder temperatures in the spring. Increasing soil temperature through the use of different mulches could provide an earlier and better yield.

**Methodology:** Three cultivars of sweet corn (65-, 75- and 84-day) will be evaluated based on plant growth and ear quality for each type of mulch used in the study. There are four mulch treatments – black plastic, clear plastic, biodegradable mulch and no mulch. There will also be four different planting dates consisting of April 15, May 1, May 15 and June 1. Ear size, sugar content and weight will be recorded for ear quality data. Harvest measurements will determine percentage of marketable ears.

**Results:** This is a two-year project, with the first year being completed. With the results that have been gathered, we've found the different mulches have different results along with other additional benefits. In the upcoming year, our experiment will be replicated to draw stronger conclusions and to discover new information.

**Implications:** Positive results from this study can impact many areas of horticultural crops and the methods used to produce them in North Dakota and the Midwest. Sweet corn production would be impacted first, but this also suggests that similar research with other crops could result in positive results, as well.

## Steven Giesler

### 3-D Printing: A New Approach to Water Filtration

People often find themselves in situations where clean drinking water is not readily available. One solution to this problem is the use of portable water filters. However, some water filters are too expensive or bulky to be economically sensible. A recent surge in additive manufacturing, involving the use of 3-D printers, has provided an alternative solution to this problem.

This project's primary objective is to test the usability of 3-D printed water filters. There are two major aspects to testing the filters: structural and performance. The filters will be designed with AutoCAD software and manufactured in a 3-D printer. Laboratory tests will be conducted to measure the performance of the water filters.

The tests involve running manufactured wastewater with a known particle size distribution through the filters. Each filter's performance is measured in three ways: net permeability, susceptibility to plugging and durability. The filters are expected to remove turbidity and *Escherichia coli* (*E. coli*) bacteria. Results show the current filters being tested can remove particles as small as 500 micrometers in size. This corresponds to conventional particle filtration (1 – 1,000 micrometers), but improvements in design are expected to screen out even smaller particles. Once an optimal design has been selected, new water filters will be manufactured from various polymers and modified with various surface coatings for specific contaminant removal.

A survey has been conducted to explore people's perceptions to the risks and benefits of 3-D printed water filters. It is important to gauge both professional and public responses to this new application. An individual may soon download a water filter design from an online website (or submit a personal design), have it manufactured at a local 3-D print vendor and then use the subsequent filter. The low-cost process will produce a small, portable and functional water filter.

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## Katie M. Gisi

### S. Bajwa

### D. Bajwa

### Fabricating Ceiling Tiles from Alternative Plant Fiber

With the rising need for products that are environmentally friendly, it is no surprise that the construction materials industry is looking into products that have low environmental impact. Ceiling tiles fabricated using wood fiber are already widely distributed, but this project seeks to evaluate the possible use of cattails and other locally available and easily renewable plant fibers. Cattails are currently used for phytoremediation of pollutants in surface water in the Red River Valley Basin in Canada; value-added use of cattails would remove the pollutant from that location. Because wood fiber ceiling tiles have already proven successful, it is expected that a comparable product can be created from other plant fibers, as they are all composed of similar ligno-cellulosic fibers.

The approach for this project is to develop a lab experiment to test two locally available natural fibers, cattail and wheat straw, against wood fiber in gypsum-based ceiling tiles. Sample tiles will be manufactured using a process similar to what is used in the industry today. These samples will then be evaluated for important properties such as sound attenuation, light reflectance and strength. The samples' performance will be compared to industry standards, and the impact of the two new plant fibers on tile properties will be quantified.

## Bryn Halley

Phenotypic diversity of *Puccinia striiformis* (wheat stripe rust) in North Dakota in 2015

Stripe rust has risen into focus for the Northern Great Plains region of the United States. Many hard red spring wheat (HRSW) varieties do not carry sufficient resistance to the disease. Although winter wheat carries more resistance, it's still left vulnerable to the evolving rust races. Since 2000, there has been an increase of *Puccinia striiformis* races that are adapted to the summer climates in North Dakota, making it a priority to identify stripe rust resistance genes in North Dakota-adapted hexaploid wheat. The objectives of this research are to gain more knowledge about the response of wheat varieties grown in North Dakota to stripe rust and the effective genes available for resistance, as well as determining what races of the *Pst* pathogen are present across the state and their significance in the pathogen population. Stripe rust samples were collected across North Dakota during the 2015 epidemic. Samples were increased and single pustule isolates will be characterized for virulence pattern (race) on a set of differential lines carrying different single genes for stripe rust resistance. To determine the current risk of near future stripe rust epidemics, a collection of HRSW cultivars growing in the North Dakota, South Dakota and Minnesota region will be evaluated for their disease reaction to North Dakota stripe rust collections.

## Bryanna Hanson

Does beef inclusion in a modern diet influence risk factors for obesity related metabolic disorders?

The objectives of this project were to determine if replacing sugar with nutrient dense beef in a total western diet (TWD) would alter body composition, onset of puberty and risk factors or obesity-related metabolic disorders. Twenty-four female Berkshire pigs (gilts) were obtained at weaning; approximately five weeks old. All gilts represented a common sire and were born within a window of seven days. At approximately 40 pounds, piglets were sorted by litter and weight, assigned to treatments and placed in individual pens for feeding. Gilts were pair fed at 4 percent body weight based on the lightest individual in each pair. After 91 days on test diet, gilts were transported for federally inspected humane slaughter. The gilts fed GB had a superior rate of body weight gain over time ( $P < 0.01$ ). A linear increase in longissimus muscle area and calculated fat-free total body lean was observed in GB and not in TWD. At the end of test, GB had larger cross-sectional longissimus muscle area (33.10 vs. 14.32 cm<sup>2</sup>), less subcutaneous fat depth at the 10th thoracic vertebra (2.03 vs. 3.05cm) and greater calculated fat-free muscle mass expressed as a percentage of empty body weight (51.63 vs. 31.99 percent) than TWD, respectively. Blood chemistry treatment differences were observed ( $P < 0.01$ ) with blood sodium, hematocrit and hemoglobin reading higher for GB vs. TWD. Stunting of growth, attenuation of muscle deposition and increased adiposity are partially alleviated when cooked ground beef is substituted for sugar in a total western diet.

**Joel Hedlof**  
**Reed Erickson**  
**Ben Ferguson**  
**Mary Hedrick**  
**Felicia Marquez**  
**A. Dalman**

Advanced Bone Technology

Medical innovations require extensive testing that can be costly and time consuming. Advanced Bone Technology (ABT) has developed an alternative to current testing processes. Our technology lowers the barrier of entry for medical device research. This was accomplished by observing the current state of medical device testing equipment and finding a more accurate, innovative approach to medical device testing. By using a composite resin material and a 3D printing process able to replicate geometry at a very high resolution, ABT has developed an artificial human bone that will replicate the mechanical and geometric properties of any native bone. This "SimBone" will be used in all types of medical device testing. ABT hopes to deliver highly accurate bone surrogates to researchers, product developers and practitioners for use in the design of innovative medical devices and procedures without safety, economic, administrative or ethical concerns.

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**Mary Hedrick**  
**A. Denton**

Molecular Dynamics Simulations  
of Ionic Microgel Dispersions  
in the Cell Model

Ionic microgels are colloidal, cross-linked polyelectrolyte networks with practical applications in the chemical, biomedical, food and pharmaceutical industries. Permeable to solvent and ions, microgels swell/de-swell in response to changes in temperature and pH. To study the distribution of ions inside and outside of microgels, we perform molecular dynamics simulations of a coarse-grained model, representing a microgel as a uniformly charged sphere in a spherical cell. We compare resulting ion distributions with predictions of Poisson-Boltzmann theory. This research is sponsored by the National Science Foundation.

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**Kathryn Helwig**  
**Danielle Flora**  
**Keli Johnson**

A Strategic Communication  
Research Approach to  
Promoting Agricultural  
Communication at Land-Grant  
Universities: The Case Study  
of NDSU

While North Dakota State University is known for its agriculture school, one program lags behind. In comparison with other agriculture communication programs throughout the nation, NDSU's program is not performing in ways that it was originally thought it would. In spite of the efforts put forth by the faculty in the Department of Communication, they are not able to fully understand, relate to and reach students interested in agriculture communication. While initial participation in the program is expected to be low, any major increase since the introduction of agriculture communication has yet to occur. The program has only graduated a total of 13 students since 2012. We have been researching land-grant universities similar to NDSU to determine how they promote their agricultural communication programs to students. Extensive interviews and surveys are being used to get the opinions of former and current faculty, current students enrolled in agricultural communication, students who have switched majors from agricultural communication, alumni of agricultural communication and others who impacted agricultural communication in some way. While this research has not been finished at the time of submission, we expect to learn and suggest a more strategic way that NDSU can promote its agricultural communication program to current and incoming students, as well as all staff involved with the degree. By conducting this case study of NDSU, we will be able to not only help NDSU with restructuring their agricultural communications program, but other land-grant universities struggling with agricultural communication as well.

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**Bryan Henderson**  
**B. Gifford**  
**S. Kilina**

A Theoretical Investigation  
of the Photoelectric Properties  
of Chlorine-Functionalized  
Carbon Nanotubes

Carbon nanotubes are an exciting material with many potential applications. Of particular note are carbon nanotube's photoelectric properties, which have possible uses in solar cells. These properties can be tuned by covalent functionalization with different compounds. It is important to know exactly how this functionalization affects the photoelectric properties of the carbon nanotube so the most desirable properties can be obtained. In this research, we have theoretically examined the properties of carbon nanotubes functionalized with chlorine. Results were obtained using both VASP and Gaussian 09 software with a variety of different functional and basis sets to compare different methodologies. Several different arrangements of both charged and neutral chlorine were compared to find the most stable configurations. The electronic structure and absorption spectra of each arrangement was determined. We found that tubes functionalized with charged chlorine had a substantial closing of the band gap, resulting in a substantially red-shifted absorption spectrum. Tubes functionalized with neutral chlorine were much less red-shifted; however, these systems were much more stable. Overall, the strong red-shifting of the carbon nanotubes functionalized with charged chlorine in particular makes them an exciting candidate for their use in photoelectric devices.

**Bradley Hoffmann**  
**Austin Nodland**  
**Catherine Gruat-Henry**  
**A.E. Brooks**

Using Engineering to Unravel  
the Mystery of Spider Silk  
Fiber Formation

Major ampullate spider silk produced by the golden orb weaver (*Nephila clavipes*) has been sought after for its characteristics of strength and toughness. Discovery of major ampullate silk's genetic sequence paved the way for molecular biologists, material scientists and engineers to recapitulate and manipulate the mechanical properties of this high performance fiber. This research has led to synthetic silk fibers being produced in a way that is significantly different from the natural process. As a result, synthetic silk has uncharacteristic properties in comparison to that of the natural silk. Research and experimentation has been conducted in the past to create a single synthetic silk fiber that mimics the fibers produced by the spider. That research, however, only focuses on the genetic elements of the silk and not the process of creating the fiber. This produces mechanically inferior fibers. A device engineered to produce a solid silk fiber from a high concentration solution by integrating the natural elements of fiber production (i.e., pressure, pH and ionic gradients) will more accurately replicate the spider's ability to produce silk. Not only will the device mimic the pH and ionic gradients found in the natural gland, but pulling the fiber from the device as opposed to extruding it via pushing will also promote more native shear forces that are important for proper alignment of silk proteins. These aspects combined with previously conducted research will allow the production of a higher-quality silk fiber, which could bring spider silk closer to commercial use and production.

**Jacob Huesman**

Converting 3D Point Cloud Data  
into 2D Occupancy Grids suitable  
for Robot Applications

Point clouds are a common data type in robotics applications. They allow a robot to "see" its environment. Unfortunately, its use for path planning is somewhat limited. There is just too much data for a robot to look through to calculate a path in a timely fashion. The objective of this research project is to create an algorithm that can take a 3D point cloud data set and convert it into a 2D occupancy grid, a much more common data type for navigation/path planning algorithms. The algorithm is named Cloud To Map.

The development for this project proceeds according to the software development lifecycle. After extensive research, a list of requirements is developed. The algorithm is then designed and implemented. Subsequently, testing is done to ensure that the implementation satisfies the project requirements. During the testing phase, if any requirements are left unsatisfied, this process is then repeated.

The research is ongoing. The first iteration of the algorithm is only capable of converting point clouds output by a specific application. Work is being done to allow it to convert point clouds from any source. While conversion algorithms like this one have been developed before, Cloud To Map has a broader range of applications. Upon completion, the project package will be published to ROS.org, which will make it available to developers around the world as a solution to the issue defined above.



## Alex Jansen

Fargo Community Centre

The education of the community is vital to the future of the city of Fargo. Education makes the community more resilient with better practices in sustainable design, production and consumption of resources. The Fargo Community Centre allows for this with multiple uses such as education about resiliency, study and enjoyment of sustainable living practices, and research to create knowledge that will ensure the innovation potential and future of the community.

Sustainable practices are accomplished by a number of design techniques enhancing the overall experience and efficiency of the building. Multiple “front facades” create connections from various civic amenities such as the Main Public Library, the future Civic Quad and City Hall, and the most important natural resource in the community, the Red River. Reuse of materials is integrated into the design. Akin to the “Cradle to Cradle” philosophy of William McDonough, circular walkways or loops symbolically remind us to renew, reuse and recycle to prevent waste creation. The open design affords spaces where the community can gather in groups of various sizes. These open spaces are defined by modular triangles creating multiple-faceted wall surfaces and a variety of spatial proportions and sizes, reminding us symbolically of the diverse community coming together to achieve resiliency. Most importantly, the faceted modularity in the design creates a unique experience that is a continued reminder about sustainable living practices, creating a better future for the community while becoming a symbolic work of public art. It is a place where we learn about a better future.

## Emily Karkoska

Strategic Communication  
in College Newspapers:  
A Case Study of *The Spectrum*

Strategic communication is a popular concept in applied communication that, although rooted in antiquity, is enjoying a resurgent appreciation following the popularization in the maiden edition of the *International Journal of Strategic Communication* (2007). In this digital communication age, there is more competition than ever from outside media, yet college newspapers remain vibrant entities through their strategic communication practices.

Using a case study method, this research focuses on *The Spectrum* of North Dakota State University. Through a mixed methods design that includes personal interviews, review of official documents and historical content analysis, while relying on the fundamental principles of strategic communication, this research provides answers to three guiding questions:

What is the strategic challenge that college newspapers must overcome to succeed?

How do college newspapers stay alive to their missions of providing service to their constituents better than any competitors?

What specific strategic communication tactics do college newspapers employ to stay ahead in meeting the challenges of the times?

The results show that *The Spectrum* employs strategic communication in various ways, but always purposively and with a clear focus on desirable results. Through the use of online delivery platforms, public communication with students and a commitment to their founding principles, successive student managers of the newspaper have been able to achieve commendable business results at NDSU. These results are valuable guides to business management practices at college newspapers as they navigate the challenges of digital communication.

**Kelli Kleppe  
Cassandra Hoffman  
Kjyrsten Olson**

Age Differences in Inhibition  
of Return During Visual Search

Inhibition of return (IOR) is a cognitive mechanism that biases attention toward novel locations or items in the environment. For example, when searching for your missing car keys, IOR helps to guide your attention to areas that you have not yet checked. In the lab, IOR can be tested during simple search tasks, and is evident when probes are presented at a location previously occupied by a distractor item. In these instances, reaction times are typically longer compared to probes presented at previously unoccupied locations. We wanted to determine if these IOR effects persisted into late adulthood by having both young and old participants complete a visual search task. We found similar patterns of IOR for both groups, as both were slower to detect probes at searched locations. These findings suggest that IOR's influence on facilitating attention during search continues throughout the lifespan.

**Callie Krupke  
E. Offerdahl**

The effectiveness of C-contracting  
in introductory biochemistry

Introductory biochemistry for majors is an upper-level course that serves students from more than three colleges and 15 different majors. This diversity brings majors with different strengths in biology and chemistry. The class can be difficult for students. To address this diversity, a "c-contract" was implemented in the introductory biochemistry 460 course. The contract was given after the first exam. Students were contacted via email if they were considered "at-risk" of failing the course. Students considered "at-risk" were those who performed less than 70 percent on the first exam. An email stating there was a "c-contract" available for all students who wanted to take advantage of it was sent to the rest of the class. The contract consisted of 15 obligations to be performed each week and handed in at quiz or test time in the format of a binder. By analyzing students who were "at-risk" but did not take advantage of the contract, students who signed the contract but did not complete it to the end of the semester and the students who completed the contract, we were able to assess if the contract had a significant impact on students overall scores at the end of the semester. We were able to find a statistically significant difference in the students who signed and completed the contract from the students who voided their contract or did not sign at all. This contract can help other instructors having difficulty reaching out to students with multiple majors in their specific course.

**Jocelyn Kylo  
Lauren Hankla**

Analysis of North Dakota  
Coverage in News Media

The news is important. Hard hitting, groundbreaking stories that flash across the screen not only inform the public, but can also strike curiosity, fear or enjoyment into the viewer. The news stories that resonate across the country do have something in common, however: they mostly derive from the big, busy states with cities where life never seems to slow down. North Dakota, to either its benefit or disadvantage, is not one of those states. North Dakota's seemingly irrelevant status does not seem to go unnoticed by its citizens, but does seem to by the U.S. population as a whole. The goals of this research are to determine what aspects of news stories make national news, why North Dakota does not seem to contribute to national news and how this lack of exposure affects the state.

**Jacob Larson**  
**Robert Pauly**  
**Tanner Rothstein**  
**Jordan Brummond**

Cellulation

As is well known, cancer is one of the most serious and widespread diseases facing mankind today. According to the Pharmaceutical Research and Manufacturers of America, more than 770 new drugs for cancer are currently under development. Some drugs can cost up to \$5 billion and often take 10 to 15 years to develop. This high cost and long developmental time impacts the cost of drugs and the potential viability for life saving therapies.

Currently, drug development starts with testing in a static environment, even though it is known fluid within the body is not static. Once statistically viable results are shown development progresses into small animal testing. Our hypothesis is that a fluid dynamic laboratory environment that replicates the in-vivo conditions reliably will bridge the gap between static and small animal testing. Bridging the gap has the potential to eliminate non-viable drugs early on and reduce the time and cost of development.

Cellulation attempts to bridge this gap by flowing a small, regulated amount of simulated bio-fluid through a growth chamber where cells can grow. Engineering methods were applied to microbiology cell culturing techniques and two prototypes have been developed thus far.

Results have shown dynamic fluid flow results in a more accurate representation of the human body. In the near term, we look to integrate and control more facets of the human body into the device. Future goals are to develop a fully modular cell culturing system that is easy to use for any researcher conducting cellular biology experiments.

**Elizabeth Leach**

Alba Bales House: Life  
in the Practice Home

The Alba Bales building has stood on campus for more than 90 years, but its original function and meaning have been lost in the present day. When it was built in 1922, Alba Bales, known then as the Home Management House, served as a hands-on classroom for young women learning how to manage a home. As of 1982, this building no longer served its original purpose. Analysis of archival records and previous research will be used to determine how the Alba Bales House functioned, why it was built on campus and how it served the campus community. This on-going ethnohistorical research project will help to increase understanding of gender on the NDSU campus and will, more generally, shed light on the history of NDSU and how the college itself functioned in the larger community of Fargo. Moreover, this research will speak to the importance and influence of Alba Bales, former NDSU dean of women and noteworthy home economics scholar.

**Jusung Lee**  
**Rajith S. Manan**  
**P. Zhao**

Nickel Catalyzed alkyne  
hydroamination with ketimines  
as N-H nucleophiles

Hydroamination reaction, the direct addition of an amine N-H bond across an unsaturated C-C bond, is a powerful and atom-efficient synthetic strategy for valuable nitrogen containing compounds. These nitrogen-containing compounds are important in biological as well as industrial chemicals. Metal catalyzed alkyne hydroamination with N-H ketimine as nucleophiles is unknown. We investigated and developed a method by using cheap, earth abundant metal, nickel-based hydroamination as compared to the more established expensive metals such as gold, palladium and rhodium. Significant ligand and solvent effects on chemoselectivity and stereoselectivity will be presented. This research is funded by ND EPSCOR (EPS-0447679).

## Niki McArthur

### Dramaturgy for “Cat on a Hot Tin Roof”

The motivation for the dramaturgy of “Cat on a Hot Tin Roof” by Tennessee Williams is to give historical reasoning for the events that take place throughout the play as well as provide context for the language used. The gap often left unfilled is the application of historical accuracy in theatrical productions that are set in a time and/or place far from the artists’ reach. “Cat on a Hot Tin Roof” premiered on Broadway in the year in which it was set: 1955, in rural Mississippi. The style of direction and playwriting was focused on realism; in order to capture the realism that would have taken place on stage in 1955, it is imperative to keep the play historically accurate.

Dramaturgy is the study of plays or other dramatic works and the representation of the main elements of drama on the stage. It is the job of the dramaturgist to provide context through research of said time and place. “Cat on a Hot Tin Roof” called for research of Tennessee Williams and his life to see the connection between his personal life and the lives of the characters he created, a timeline of the 1950s to provide context as to what was generally happening at the time, Mississippi and plantation life homosexuality in the 1950’s and how it was looked at or treated, and the role of females in the 1950s.

It is expected that through remaining historically accurate the production will pull the audience into a much different time and place.

## Augusto Moreira

### Ruggedness Test for Density Measurements of Flax Fiber

Density is a fundamental physical property of a reinforcement for composites. It appears widely in calculations, which are mostly used for engineering designs. The density of homogeneous solid materials is generally straightforward to determine, because it requires only measurements of mass (or weight) and of volume of a specimen. Flax fiber requires a different method of density measurement because it is a porous material and possesses unique surface chemistry.

Two methods can be utilized to verify the density of natural fibers, but they have their particularities. The first one is called Gas Pycnometry, which is more precise. The second is called Buoyancy (Archimedes), and it is acceptable as an alternative to the first cited in applications where less precise results are sufficient.

The second method was chosen for the experiment with flax fiber. One of the reasons for this choice was the lower cost of the equipment, since it uses a simple density measurement kit for laboratory mass balances. For the Pycnometry test, an expensive machine must be acquired and maintained.

The main issues of the experiments were to verify which fluid and vacuum chamber pressure prior to immersion could give the best results. Types of oil used for the experiments include: canola, soybean and mineral oil. A range of pressure used was between 50-100kPa.

It has been realized from the experiments that the vacuum chamber pressure is more significant than the type of fluid, but only when high pressure is used.

## Laryssa Mortenson

A Safe Place to Speak:  
Webcomics' Role in the  
Conversation around the  
Sexual Objectification  
of Race and Gender

The increased awareness and sometimes resistance against the systematic discrimination against women of color has prompted individuals to create or popularize different mediums for sharing information and combating white supremacist patriarchal ideals. Online comics, or “webcomics,” are one of these mediums. Using a feminist lens, I would like to examine one or two webcomics including Shing Yin Khor’s piece, “What would Yellow Ranger Do?” to determine how women of color’s experiences are being communicated and perceived differently in the webcomic medium. I claim that form as well as content plays an important role in creating the objectification and distance from their own identities as women of color. Exploring women of color’s use of webcomics not only adds to the study of webcomics as a medium (something that has yet to be academically examined in-depth), but shows the ways in which the conversation and resistance against racism and sexism is changing and growing.

## Adrian Nelson

A Picture is Worth a Thousand  
Words: A Content Analysis of  
*Sports Illustrated* Covers and  
Gender Equality.

Since Title IX, women’s sports participation and coverage has been ever evolving. But has the gender gap in media coverage of women athletes actually shortened? This research paper is a content analysis of *Sports Illustrated*, one of the most prominent sports magazines in the world. I will research how often women athletes are portrayed on the cover and whether female athletes or female sports coverage articles are being headlined. Using past research findings by other researchers on this topic, I will research a more recent sample and create a content analysis coding guide to put my findings in quantitative and qualitative results. General expectations are that women’s sports coverage is minimal. But will the results match these expectations? Is the gender gap being closed in sports? The final goal is to see whether changes are being made or if they are needed.

## Ashlyn Nelson B.M. Olson A.J. Schmidt E.L. Zacharias K.J. Hackney

Blood Flow Restriction Exercise  
Induced Muscle Swelling is  
Not Enhanced With Low Cuff  
Pressure-Small Cuff Width  
Prescription

Blood flow restricted exercise, or BFR, is a new and innovative exercise technique with many applications for public use. Very little research exists on whether this technique is safe and effective. The purpose of this study was to examine the acute change in muscle swelling during and after lower body blood flow restricted exercise as well as accompanying effects to metabolic, cardiovascular, and perceptual indicators elicited by exercise. Fourteen resistance-trained, male subjects completed knee extension-flexion resistance exercise during two sessions: 1) Control; 2) BFR exercise. BFR exercise used a 5 cm external cuff around the proximal thigh inflated to 140 mmHg, while Control had free limb blood flow. Five minutes post-exercise muscle swelling increased 11.3 percent and 12.4 percent in Control and BFR, respectively ( $p > 0.05$ ). No differences ( $p > 0.05$ ) in peak lactate (Control=  $6.0 \pm 1.3$  vs. BFR=  $5.9 \pm 0.9$  mmol), peak heart rate (Control=  $140 \pm 19$  vs. BFR=  $144 \pm 13$   $\text{b} \cdot \text{min}^{-1}$ ), or RPE (Control=  $5.8 \pm 2.8$  vs. BFR=  $6.3 \pm 2.4$  arbitrary units) were observed. In resistance trained participants, low cuff pressure (140 mmHg) and small cuff width (5 cm) BFR exercise does not enhance acute muscle swelling or alter metabolic, cardiovascular or perceptual stress indicators to a greater extent than low-intensity exercise alone. More research is needed to determine the lowest cuff pressure and smallest cuff width that can be safely utilized with BFR exercise while still achieving the appropriate amount of physiological stress to elicit physical adaptations.

## **Laura Otterness**

Is Bad News Good News?  
Journalists' Framing  
of Crisis and Emergency  
Reporting

Much of today's reported news is negative, largely because people have a much stronger response to negative information than positive, and traditionally, news has been defined more in negative terms. Framing, defined as the process of developing or presenting a particular conceptualization of an issue, is commonly used in journalism, especially crisis reporting. By presenting crisis reportage in one way and not another, the media can exercise a considerable amount of power over which crises the public sees, how it sees it, and how much it would care about it. This research was undertaken to examine how the media covered different crises with a view to describing similarities, differences and peculiarities. The results will add to the growing body of knowledge on how framing contributes to public perceptions, unintended consequences, and social and governmental effects. The results will elucidate the common beliefs in and practices of "CNN Effect" and "Afghanism" which are common with many media. The final picture to emerge would show that media framing of certain crises causes other crises to be understated, some of which are just as or even more important.

**Anna M. Peterson**  
**L.E. Camacho**  
**A. Reyaz**  
**K.C. Swanson**  
**K.A. Vonnahme**

Impacts of stage of gestation  
and maternal nutrient status  
on binucleate cell numbers  
in the beef cow

Our laboratory has demonstrated that maternal nutrition in beef cows can impact uterine blood flow and vascular function of excised placental arteries. However, there is little evidence to suggest that maternal nutrition is impacting capillary number. There is evidence in other species that multi-nucleated cells (i.e. binucleate cells; BNC) in the placenta may produce vasoactive factors. The objective of the current study was to test the hypothesis that maternal nutrient restriction followed by early realimentation would increase BNC numbers in the bovine placentome. On day 30, multiparous beef cows (n=46) were assigned to receive 100 percent of requirements (control) throughout the experiment or 40 percent less (restricted) until day 85 or day 140, at which time they received control levels. Cows were slaughtered on day 85, 140 and 254 of gestation and placentomes were collected and placed in Carnoys fixative. Tissue sections were stained with Lectin to visualize BNC. Using image analysis, BNC number, percentage cotyledon area, and percentage BNC per cotyledon area was determined. While there was no effect of diet ( $P > 0.11$ ) on any variable, there was a main effect of day where BNC numbers decreased as gestation advanced (572.5, 499.7,  $477.3 \pm 23.7$  for day 85, 140 and 254, respectively). While BNC number was unaffected by diet, studies are underway to investigate what vasoactive factors may be produced by the bovine BNC, and if maternal diet can alter the expression of those factors.

## **Glen Peterson**

### Oil Sorption of Non-woven Biological Mats

Oil spills have extremely adverse environmental impacts. Synthetic sorbents used for cleanup are nondegradable, causing their own adverse environmental effects. Biological materials have potential as an alternative to synthetic sorbents. Using a non-woven mat structure, milkweed and cotton fibers could provide excellent oil sorption properties, while also being capable of biodegradation.

An experiment will be designed to test the sorption capabilities of the non-woven mats. The variables include type of biological material, thickness of mat, area density of mat and time allowed for sorption. These variables will allow for the analysis of optimized characteristics for the non-woven mat.

Milkweed fiber with an intermediate area density (about 500 g/m<sup>2</sup>) and a large thickness (20 mm) is expected to be the optimal non-woven mat. Milkweed has been shown to have high oleophilic characteristics, due in part to a unique wax that covers the fiber. Also, an intermediate area density would allow for high sorption, while also being able to contain the oil within its structure. Finally, a large thickness will provide a larger volume to the mat, allowing for a higher sorption capacity.

Oil has been shown to degrade faster when combined with a biological material rather than a synthetic material. With the introduction of a biological alternative to synthetic sorbents, the overall environmental impact of oil spills can be reduced.

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## **Chad Rehovsky**

### Novel Nanocellulose Based Fire Retardants for Polymer Composites

Polymer composite materials have a variety of possible future uses in fields such as aerospace, automobile, construction, packaging, energy, electronics and biomedical. A major concern related to polymer composites, though, is that when they are exposed to high temperatures, they can decompose, catch fire and yield toxic gases. The objective of this project is to create a fire retardant system for polymer composites using zinc oxide (ZnO) coated cellulose nanocrystals (CNC). ZnO and CNC solutions were created and then added to high-density polyethylene to test fire retardance properties. In preliminary fire resistance testing, composites of 0.4 percent ZnO/ 0.4 percent CNC, 0.6 percent ZnO/ 0.6 percent CNC and 1 percent CNC appeared the most promising. Cone calorimeter ASTM E1354 and flame spread ASTM E84 are being conducted to quantify the fire resistance of thermoplastic composites and change in mechanical properties. The results of this project will be helpful for improving the fire retardancy of polymer composite used in the aerospace and automotive industry and reduce other economic losses through fires.

**Cole Rehovsky**  
**Collin Gradin**  
**Austin Hewitt**  
**Austin McCullough**  
**Alexis Johanson**

Investigation of Potential  
Anti-microbial Agents Capable  
of Inhibiting the Growth of  
Microorganisms Associated  
with Dental Implantation-related  
Infections

**Statement of Problem:** Approximately 500,000 dental implant procedures are performed every year, and this number is growing exponentially [1]. Data have shown that these operations have a failure rate of around 5 percent [2]. Though seemingly low, this rate corresponds to the failure of 25,000 dental implants each year, where a leading cause of implantation failure is attributable to infection-related complications [1]. The economic impact of which has resulted in financial losses that have been estimated at approximately \$50 million per year.

**Methods:** The screening process for identifying chemical agents that exhibit the intended anti-microbial action will be facilitated by the utilization of Biolog® phenotypic microarray plates on oral bacteria. These products will allow for rapid, simultaneous investigation of numerous chemical agents. The inhibitory action exhibited by these agents will be interpreted by measuring the density of bacterial cell growth prior to and after exposure to the chemical agents.

**Product:** The intention of this experiment is to identify a chemical agent that demonstrates antimicrobial activity against microorganisms associated with dental implant-related infections. The agent must exhibit a minimal level of cytotoxic activity toward native tissues and maintain its intended action once incorporated into an actual dental implant.

**Implications:** It is hypothesized that integrating an appropriate chemical agent into the design of dental implants has the potential to reduce the incidence of dental implantation rejection, thus reducing financial losses to patients and health care professionals.

[1] *Dental Implant Facts and Figures*. 2015. American Academy of Implant Dentistry. (12 October 2015)  
<[http://www.aaid.com/about/press\\_room/dental\\_implants\\_faqs.html](http://www.aaid.com/about/press_room/dental_implants_faqs.html)>

[2] Lee Ann Brady, DMD. 16 March 2012. *Dental Implant Failure Rate*. Lee Ann Brady LLC. (12 October 2015)  
<<http://leeannbrady.com/restorative-dentistry/dental-implant-failure-rate>>

**Anna Renner**

Chromatographic Analysis of  
Electronic Cigarette Refill Liquids

Electronic cigarettes are popular alternatives to conventional cigarettes and have been claimed to deliver nicotine without exposing the user to harmful chemicals such as those present in tobacco smoke. However, previous research has shown that refill liquids for electronic cigarettes and the aerosol emitted by the devices contain some impurities, toxic compounds, and other possibly harmful substances, including flavor additives. Additional data is needed in order to more thoroughly determine the variety of compounds present, their typical levels in the liquids and aerosols and the health risks associated with exposure to them. Flavor additives present a unique challenge to investigators; although many are recognized as safe to consume in food, their effects when inhaled are currently uncertain. The aim of this project is to analyze electronic cigarette refill liquids for a variety of flavor compounds. Eight samples of refill liquids were analyzed using three chromatographic techniques: HPLC (high performance liquid chromatography), LC-MS (liquid chromatography–mass spectrometry) and GC-MS (gas chromatography–mass spectrometry). Analysis indicated that the samples may contain benzyl cinnamate, 4-chloro-2,5-dimethoxyaniline, diacetyl trimer, 2-ethylhexyl fumarate, menthol, menthyl acetate, methyl dihydrojasmonate, persicol, (R)-(+)-pulegone and 2,3,5,6-tetramethylpyrazine. Future steps in this project include performing an MS/MS study to verify the presence of these flavor compounds and systematically developing and validating a method for determining their concentrations in refill liquids. The results of this project may help to elucidate the potential effects of electronic cigarettes on human health and thus enable consumers and regulators to make better-informed decisions regarding electronic cigarettes.



**Cody Ritt**  
**M.E. Hossain**  
**A.N. Bezbaruah**

Advancements of Phosphate  
Removal using Metal Cross-linked  
Biopolymer Beads

Aqueous phosphate removal was successfully achieved with novel iron cross-linked alginate (FCA) beads. All experiments were conducted with bead batches of 0.12 g (dry weight). About 94 percent removal of phosphate was achieved in 6 hours from solutions having an initial phosphate concentration of 5 mg PO<sub>4</sub><sup>3-</sup>-P/L. With 50 mg PO<sub>4</sub><sup>3-</sup>-P/L, the beads were found to remove only about 41 percent in 6 hours, but they achieved 89 percent phosphate removal in 96 hours. Isotherm studies with the dry FCA beads found the adsorption capacity to be 69.9 mg PO<sub>4</sub><sup>3-</sup>-P/g of beads. The beads were also effective in removal of 40 – 140 µg PO<sub>4</sub><sup>3-</sup>-P/L, implying that the beads can be used for the remediation of eutrophic lakes. No or minimal interference from coexisting ions and natural organic matter was found. Production of beads was optimized through a series of trial and error experiments. The successful sorption of aqueous phosphate by FCA beads coinciding with effective production is expected to have enormous implications for nutrient recovery from contaminated waters, including eutrophic lakes and wastewater. These recovered nutrients can then be implemented in agricultural uses. This will require further investigation into the intricate relationship between FCA beads and common agricultural soils to determine what physical and/or chemical impacts they may have on the soil.

**Megan C. Ruch**  
**T. G. Gilbery**  
**S. Underdahl**  
**M. L. Bauer**  
**K. C. Swanson**

Influence of forage inclusion  
level on growth performance  
and feeding behavior  
in finishing steers.

Forty-four steers (452 ± 4.6 kg), predominately of Angus and Simmental origin, were used in a randomized block design to determine the effects of forage inclusion level on growth performance and feeding behavior in finishing steers. Steers were fed dry-rolled corn based diets which included a mixture of hay and corn silage as the forage source. Dietary treatments were 5 percent, 10 percent, 15 percent or 20 percent forage. Diets were fed for 84 days. Feed intakes and feeding behavior were measured using the Insentec system. A visit was defined as each time the Insentec system detected a steer at a bunk. A meal was defined as eating periods which may include short breaks separated by intervals not longer than 7 minutes. Animals were weighed the first two days, then every 28 days after, and finally the last two days of the study. Steers were slaughtered with an average weight of 625 kg. There was a linear decrease ( $P \leq 0.02$ ) in DMI intake, ADG and G:F as forage inclusion increased. Number of visits and meals per day and eating time per visit, per meal, and per day were not affected by forage inclusion. Feed DMI per visit did not differ between treatments but eating rate per meal decreased linearly ( $P < 0.001$ ) with increasing forage inclusion. Eating rate (g/min.) responded quadratically ( $P = 0.04$ ) with the greatest eating rate observed in the 10 percent forage treatment. Hot carcass weight and dressing percentage decreased ( $P = 0.02$ ) linearly as forage inclusion increased. These results indicate that a decrease in forage inclusion in a finishing diet will increase DMI, ADG and G:F as well as increase DMI per meal.

## Alexa Rutherford

### Relationship between Ornamentation and Nest Investment in the White-winged Junco

The dark-eyed junco is a small passerine widely distributed across the United States. The dark-eyed junco has many subspecies with various degrees of white ornamentation on the tail and occasionally the wing. Endemic to Virginia, the Carolina subspecies of dark-eyed junco (*Junco hyemalis carolinensis*) has previously been shown to have a possible relationship between reproductive success and ornamentation. The white-winged junco (*Junco hyemalis aikeni*) is a larger, more highly ornamented subspecies endemic to the Black Hills region of South Dakota. This little-studied subspecies is unique in its degree of ornamentation, in that individuals have larger portions of white ornamentation on the outer retrices of its tail as well as white wing bars. In order to understand why ornamentation might have evolved differently across closely related subspecies, we asked how its presence might affect individual quality if it is an honest trait. Further, we asked how reproductive success is affected. This was done by looking at the correlation of white ornamentation (on both the male and female parents) with the total nest investment, measured as nestling mass on day six of development. Based on findings in the Carolina subspecies, we expected to find that more highly ornamented individuals would have less nest investment; however, our results showed the reverse. Unexpectedly, there was a strong positive correlation in amount of ornaments (on both sexes) with total nest investment. This suggests that parents with more wing-white and tail-white may display enhanced parental behavior. Future work may explore differences in ornamentation to be a result of the evolution of honest signaling.

## Amy Scegura

### Effect of Simulated Hail Treatment on Yield Loss in Chickpea

This study evaluated the amount of damage from simulated hail exposure and its effect on yield. Data from this research will aid crop adjusters to quantify hail damage in chickpea fields at certain growth stages. A single chickpea genotype, CDC Frontier, was grown at the Carrington Research Extension Center in North Dakota in 2015. Five treatment levels – untreated, 25, 50, 75 and 100 percent – were applied at vegetative, first flower and late bloom growth stages. Treatment levels were determined by the canopy height before treatment by adjusting the height of the flail mower to remove 25 percent of canopy height for the 25 percent level and 40 percent of canopy for the 50, 75 and 100 percent treatments. Individual one-square-foot samples of plant material were collected after initial treatment to determine the biomass reduction and assess damage on individual plants. Post-harvest data, seed yield, one thousand seed weight and seed size distribution were collected to correlate with the level of damage. Average seed yields were 2,209, 1,530, and 1,196 pounds per acre for treatments at the vegetative, first flower, and late bloom stages, respectively. The average seed yield for the five injury levels – untreated, 25, 50, 75 and 100 percent – were 2,209, 1,871, 1,468, 1,367, and 1,314 pounds per acre, respectively. One thousand seed weight and seed size distribution followed similar expected trends. Hail events later in the season with increased level of damage reduces seed yield, and correlation analyses showed that plant injury data will be useful in establishing procedures to aid insurance adjustment.

**Erika Schneider**  
**Sarah Sisser**  
**Morgan Klosterman**  
**Gabrielle Maddock**  
**Jessa Lusby**  
**Eric Veralrud**

The Strategies Undergirding  
Those Spectacular Super  
Bowl Commercials

The annual Super Bowl is the most watched TV content, attracting more than 114 million viewers, and thereby presenting an unequalled communication platform for advertising that now costs \$8.4 million per minute. Research has considered various aspects of the ads, especially their marketing import (Tomkovic, 2001; Deveny, 1993), viewer attentiveness (Buck, 1992; Freeman, 1999; Jensen, 1998), and exclusivity (Elliott, 1999), among others. Advertising execution is primarily packaging an interesting narrative through selected creative strategies (Drewniany and Jeweler, 2014). Super Bowl commercials have been studied extensively but little is known about the creative strategies employed by those commercials adjudged to be the best every year (USA Today Admeter, 2015). This research was undertaken to examine what strategies undergird the best Super Bowl commercials aired in the last 25 years using qualitative research and a longitudinal quantitative content analysis. The analyses show these ads reflect a wide range of creative strategies. The use of eroticism is evident in ads while emotionalism is associated with annual fixtures. Over time, with ever-increasing costs for the ads, advertisers seem to cautiously push the envelope towards more innovative and creative approaches. The full results include extensive critical and interpretive analyses using the Qualitative Data Analysis Software, ATLAS.ti, to more deeply explore the semiotic significance of the signs and symbols that constitute some of the advertising creative copy of the commercials. Putative contributions hold promise for the appreciation of Super Bowl commercials as important marketing tools and significant cultural products.

**McKenzi Shelton**  
**S.L. Kaminski**  
**C.S. Bass**  
**D.A. Redmer**  
**A.T. Grazul-Bilska**

Expression of receptor for nitric  
oxide (NO), soluble guanylyl  
cyclase (sGC) in ovine ovarian  
follicles: Effects of diet  
and arginine

Plane of nutrition has been shown to alter reproductive functions. Arginine (Arg) is a precursor for proteins, selected amino acids, NO and polyamines. NO synthesized by the enzyme endothelial NO synthase binds to receptor sGC resulting in vasodilation. NO and its receptor sGC are involved in the regulation of ovarian function. Our aim was to investigate the role of the NO system in ovarian function, by determining if Arg supplementation impacts sGC protein expression in ovarian follicles in nutritionally compromised ewes. Expression of sGC was determined using immunohistochemistry followed by image and statistical analyses. These data show that: 1) sGC is expressed in blood vessels and thecal layer in the ovary; 2) diet but not Arg affected sGC expression in thecal layer; 3) sGC expression is greater in healthy antral than in atretic and early antral follicles. Thus, plane of nutrition may affect follicular function by changing sGC expression in ovarian blood vessels. The mechanism of regulation of ovarian sGC expression by diet remains to be elucidated. These results contribute to the area of animal nutrition and may have some implications for human health, demonstrating that diet and/or Arg may have effects on reproductive functions. Additional study should be undertaken in the future to determine if diet and/or Arg-treatment may have effects on fertility and offspring outcome using animal models.

**Nick Sikorski**  
**Brielle Boeckel**  
**Addie Long**  
**Angus Stoudt**

The Nature of News:  
A Global Media Analysis

The nature of news in newspapers has been studied extensively (Galtung and Ruge, 1965; Tuchman, 1968; Schudson, 1978), but hardly from the perspective of similarities and differences among newspapers of different world regions. Thus, not much is known about differences, similarities, and peculiarities among newspapers of different countries.

This research was undertaken to examine how newspapers from different world regions cover the news. Data for analysis came from 19 daily newspapers in seven countries of different world regions. The study period was one continuous and one constructed week between 2013 and 2014, and the coding guide was adapted from the UNESCO/IAMCR (1986) Global Newspaper Study.

The results show many newspapers seem to have a common definition of news as a significant recent development in the immediate area. They rely extensively on hard news in politics, business, health and sports. There are minor differences, which reflect geo-political and cultural characteristics of the newspapers' locations. The final picture that emerges shows they are, indeed, cultural artifacts and more than just purveyors of news. The results have serious implications for understanding the value of newspapers and the other related organs for mass communication in society.

**Patrick Simpson**

Remanufacturing  
of 3D Printer Filament

During the 3D printing process, waste is created in the form of supports, rafts and failed prints. There are many materials that are used for 3D printing, and one of the most common is the biobased polymer PLA (polylactic acid). The objective of this research project is to develop the machinery and processes to recycle this printing material waste back into new 3D printer filament. First, a two-stage mechanical shredder was built to process the 3D printer waste into ¼-inch diameter pieces. Next, an apparatus was designed and built that is able to draw the filament to a desired diameter of 1.75 mm or 2.85 mm directly from a compound extruder. The final product is a 1 kg filament spool of both 1.75 mm and 3 mm that is compatible in most bench top 3D printers. The mechanical properties of the recycled filament was tested and compared against commercially available filament. The end result will be to supply low cost 3D printer filament while reducing the amount of waste generated with 3D printing.

**Lauren Singelmann**

Graphical User Interface That  
Analyzes RNA Sequencing Data

**The Problem:** RNA Sequencing (RNA-Seq) is an innovative process that allows scientists to analyze genetic differences between a test and control group, showing how various treatments effect RNA expression. However, this process returns an extremely large data output, and the analysis requires a high understanding of statistics. This project consisted of developing a user-friendly software that allows users to upload RNA-Seq data, choose a statistical test and quickly and accurately receive results with the click of a button.

**Methods:** Code was written in MATLAB that sorts RNA-Seq data and performs various statistical tests. This code is in the form of a graphical user interface (GUI), which streamlines the process and allows users without a statistical background to easily run the data analysis.

**Product:** The final product is a GUI that allows users to upload files directly from their computer, choose a statistical test from the provided list, and click the 'Analyze' button. Results are then returned to the user in both a spreadsheet and a graph, allowing the user to look up the results for any gene and pinpoint specific genes that showed differential expression.

**Conclusions:** This GUI streamlines the process of comparing a test and reference group using RNA-Seq data. Users without a statistical background are now able to perform multiple statistical tests easily and efficiently, expanding our knowledge about how various treatments effect RNA.

**Dre E. Steinwehr**  
**S.A. Hoselton**  
**J.M. Schuh**

Of mice and man: remodeling  
the allergic asthma model

Allergic asthma is a chronic inflammatory disease of the airways characterized by excessive eosinophilic and lymphocytic inflammation with associated changes in the extracellular matrix, which results in airway wall remodeling. Severe asthma with fungal sensitization is characterized by airway hyper-responsiveness and bronchial constriction in response to an inhaled fungal allergen, leading to a disease course that is often very difficult to treat with standard asthma therapies. Sensitization to fungi often leads to a severe form of asthma that is particularly difficult to manage clinically, resulting in increased morbidity and hospitalizations in these patients. Mouse models of fungal allergic airway disease have proven to be useful for dissecting these complex interactions, particularly in addressing remodeling of the allergic airway of chronic asthma. In an attempt to better understand human asthma, an inhalational model of *Aspergillus fumigatus*-induced fungal asthma in a murine experimental system was developed and characterized for use in research of metabolic products, gene expression and airway changes.

**Celena Todora**  
**K. Johnson**  
**(Shippensburg University)**

Can Service Learning  
in Basic Writing Classrooms  
Foster Students' Grit?

Fostering students' motivation and interest in higher education composition classes is vital to sustain student engagement (Imafuji, 2015; Bruning and Horn, 2000; Carini, Kuh and Klein, 2006; Hidi, 1990). However, short-term motivation does not necessarily determine long-term success. Recent research has found that an individual's level of grit plays a significant role in his or her long-term success (Duckworth, Peterson, Matthews and Kelly, 2007). To investigate the role of grit in writing classrooms, we are exploring how writing instructors can foster students' grit for a greater chance of long-term success. Because the Duckworth et al. (2007) study considers interest and effort to be crucial factors in grit, we chose to examine whether or not service learning (SL) can foster students' grit, as SL been shown to increase student engagement in the past (Johnson, 2009; Darby, Longmire-Avital, Chenault and Haglund, 2014). This project will measure the impact of SL on the grit of students in basic writing classes at Shippensburg University in Pennsylvania. Duckworth et al.'s eight-question survey will be distributed at mid- and post-semester to measure the grit of students in three SL classes (Group 1) and two non-SL classes (Group 2). Data will be analyzed by using t-tests to compare (a) the average grit scores between the groups at mid- and post-semester and (b) the average grit growth of the individuals within the two groups. This research will ideally indicate whether or not SL can develop students' grit in writing classes, building upon research in both SL and composition pedagogy.

## John Wells, Torie Jones, Luke Koran, Typhanie Schafer

### Ellendale Public History Field School Project

The Ellendale Public History Field School Project was part of a course taught by Dr. Angela Smith this past summer (HIST 491). The purpose of this course was to send a group of students out to a small community museum to clean, paint, organize, write labels on previously uninterpreted displays and properly store textiles and artifacts. In order to do this, the participating students were required to go through a crash course on archival preservation techniques provided by Trista Raezer-Stursa and John Hallberg of the NDSU Archives, with additional training provided by Susan Curtis of the Emily Reynolds Historic Costume Collection. These archival preservation techniques included: removing fasteners susceptible to rusting, moving collection materials into acid-free folders and boxes, scanning aged photographs and written documents, creating padded hangers for clothing, and more.

After the training, the students went to Ellendale, North Dakota, for two weeks to work with the Ellendale community at the Coleman Memorial Museum. By the end of those two weeks, the students completed a small museum makeover and left the area knowing that the museum was in good hands. The community was invited to visit the museum and see the progress on the final evening of the field school. Approximately 30 people showed up to visit the museum and hear the students talk about their experience in their town. While it is still a work in progress, the Coleman Memorial Museum is in significantly better shape than when Dr. Smith's class arrived.

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## Sharon White Bear

### Mandan, Hidatsa, Arikara Nation High School Students: Hope for Future Education and Employment

**Statement of the Problem:** In 2012, as first-time, full-time students at a four-year institution, 39 percent of the American Indian/Alaskan Native students graduated compared to 60 percent of white students (Knapp, Kelly-Reid and Ginder, 2012). The purpose of this project was to survey junior and senior high school students of the Mandan, Hidatsa and Arikara (MHA) Nation to assess their hope for future education and employment.

**Methods:** In this research study, the survey method was used. Ninety-nine students who attended four high schools of MHA Nation constituted the sample. Their self-confidence, perceptions of support along with barriers were measured through the HOPE Survey.

**Results:** Fifty-five percent were males with ages ranging from 17-19 (79percent). Using a five-point scale, the mean for student self-confidence was 4.009. Seventy-two percent wanted/planned to attend a four-year university and 29 percent indicated a health care career. The top three health career choices: Nurse (10.1 percent), Sports Medicine (10.1 percent), and Counselor (7.0 percent). The top five sources of support for students include: Parents (90.9 percent), Friends (77.7 percent), Aunts (75.7 percent), Teachers (73.7 percent) and Uncles/Friends (71 percent). The overall confidence score achieving a higher education was 7.236 out of a 10-point scale. The top four challenges towards achieving a higher education: lack of career information (2.454), transportation (2.434), lack of college information (2.204) and race discrimination (2.010).

**Conclusions or Implications:** The findings determined a significant number of students plan to attend a four-year university, their major source of support comes from their parents and barriers are in high contrast with white students.

**Yue Xu**  
**D. Roy**  
**E. Khan**

Effect of coagulants  
in removing cyanotoxin-  
microcystins in drinking  
water treatment process

The presence of cyanotoxins in source water is a worldwide problem. The most widespread cyanotoxin, called microcystins (MCs), produced from *Microcystis Aeruginosa*, can cause severe problems to the environment, animals and human health. A standard drinking water treatment process involves coagulation/flocculation process as primary treatment to remove cyanobacteria from source water. In coagulation/flocculation processes, a chemical coagulant is added to source water using rapid/slow mixing to facilitate bonding among particulates. As the process involves chemical and mechanical stress, cyanotoxin may get released to the drinking water.

Coagulation/flocculation process can remove intact cyanobacteria effectively, however, study is limited to show the effect of coagulants in removing cyanotoxins during coagulation/flocculation. Our study would evaluate different types and concentration of coagulants to establish effective methods to remove cyanotoxins at the preliminary drinking water treatment. In this study, a jar test was conducted with microcystin-LR (MCLR) and microcystin-LA (MCLA) to show improved removal. A coagulation/flocculation process was used at laboratory bench scale. This study is important, as it establishes a method that would eliminate harmful cyanotoxins before they enter the secondary treatment process. The results would help drinking water facilities to remove cyanotoxins in the primary treatment where cyanobacteria and their toxins may be found in the source water.

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**Jena Marie Lorsung**  
**Tanner Gustafson**  
**Alexander Hathaway**

Osteoblast Integration  
into a Dental Implant

The goal of the Bison MicroVenture group is to design and test a new type of ceramic dental implant that is hydrophilic, antimicrobial, porous, adheres to bone and allows for quicker healing time than the current method of titanium implants. The osteoinfiltration team is focused on inferring information about the ideal ways that osteoblasts, or bone-building cells, will integrate into these pores of a sample from both a biological and engineering perspective. We began by using a 3D printer to create square-shaped samples with six channels in each, all with different elements of a given variable, such as channel size dimensions, surface roughness and angle. We then exposed these samples to MC3T3 mouse osteoblast cells and imaged them under various microscopic techniques to infer information about the way the cells integrated into the channels, and which variables were more favorable. Our first run of tests did not lead to any conclusive results because of high variability in the data. We have modified our experiment and intend to eliminate certain sources of error that were present previously in order to generate more significant and accurate data. These channels are intended to simulate the pores of a ceramic dental implant on a larger scale. As data is collected, we will be able to apply this knowledge to the overall implant design to replicate the conditions for osteoinfiltration that were found to be most favorable.

