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Undergraduate Research Forum

St. Norbert College

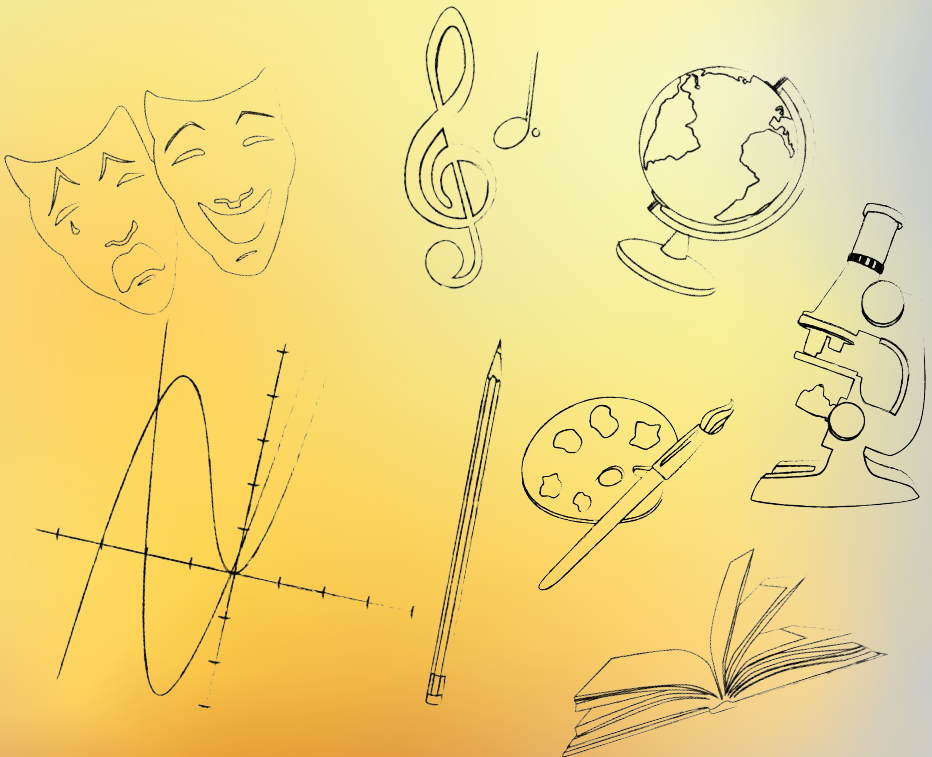
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ST. NORBERT COLLEGE

UNDERGRADUATE RESEARCH FORUM

2019

The Undergraduate Research Forum highlights the valued tradition at St. Norbert College of collaboration taking place in laboratories, studios, and other scholarly or creative settings between our students and our faculty and staff, resulting in a rich array of scholarly research and creative work. This celebration features projects that evolved out of independent studies, directed research, class assignments, and casual interactions as well as formal collaborations supported by internal and external grant funding.



THE FORUM AT A GLANCE

ORAL PRESENTATIONS

1:30 - 1:45
Mulva 101

1

Carson Torhorst

Parasites of the Burbot, *Lota lota*, from Green Bay of Lake Michigan, with a Description of a New Species of Tapeworm (*Eubothrium* n. sp.) from this Fish Host

2:00 - 2:15
Mulva 101

2

Ashley Bauer

Essential Genes for Regulating Actin Polymerization During Clathrin-mediated Endocytosis are Functionally Conserved Between *Saccharomyces cerevisiae* and *Schizosaccharomyces pombe*

2:15 - 2:30
Mulva 101

3

Taylor Rudie

Analyzing #brexit Twitter Sentiment and Its Effect on Stock Market Behavior

2:30 - 2:45
Mulva 101

4

Amy Holzer

Molecular Characterization of Parasites of the Ayungin, *Leiopotherapon plumbeus*, A unique Fish Species Endemic to the Philippines

2:45 - 3:00
Mulva 101

5

Brady Miller

Measuring the Market Impact of Wisconsin Political Events

3:00 - 3:15
Mulva 101

6

Jasmine Babineaux

Black American Leaders in Higher Education

3:15 - 4:00
Mulva 101

7 PANEL PRESENTATION

Ally Laidlaw, Cassie Nooyen, Ruthie Tucker, Victoria Watkins

Knight Domains: Digital Development and Online Presence

POSTER PRESENTATIONS

All Posters (numbered) are on the First Floor of Mulva Library

1:00 - 1:30

1

Elisha Jaeke

Measuring Food Insecurity in an Urban Milwaukee Free Clinic

2

Brittany Pockat, Madeline Christel

Heliscomys: North America's Smallest Rodent

3

Brooke Mathias

A Taxonomic Revision and Characterization of *Sciuravus nitidus* and *S. undans* (Rodentia; Sciuravidae), Early Eocene Rodents from the Bridger Formation, Green River Basin, Wyoming

4

Nick Moran, Mya McDaniel

St. Norbert Abbey and Chambers Island: A Multi-Year Study Comparing Inland and Island Mammal Populations

5

Mitchell Lipke

Transgenic *Saccharomyces cerevisiae* with Engineered Minimal Fusion Construct from *Schizosaccharomyces pombe* Shows Variable Growth Lacking Native WASP/Myosin Proteins

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Nicholas Koehn

Small Molecule Luminescence of Keto-phenolate Complexes of Aluminum(III)

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Bao Van

Common Configurations In Rank 3 Simple Matroids

1:00 - 1:30

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Elle Maricque

Jean Le Paige's *Bibliotheca Praemonstratensis Ordinis* (1633): An Original Translation

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Hannah Sherfinski

The Planarian RPE-Spondin Homolog Shows Dynamic Changes in Gene Expression Following Injury and Tissue Loss

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Najma Ahmed

Factors Underlying Low Persistence Rates Among Hispanic and African-American Students at St. Norbert College

1:30 - 2:00

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Hannah Sherfinski

GxE Effects of OXTR and Child Maltreatment on Social Competence: A Meta-analysis

6

Ellen Socha

The Effects of Water Column Transparency on Zooplankton Community Composition of Lakes within the Superior National Forest, MN

7

Claire Hetzel

Identification of an Unknown Carotenoid in Norway Maple

8

Lydia Kramer

RNA Mediated Interference Screen to Identify Genes Required for Planarian Excretory System Function

9

Joseph Gasick

Social Media Engagement

2:00 - 2:30

10

Morgan Kelly, Monica Stephans

Muscle Activation in Collegiate Athletes Using the Matrix S-Force Performance Trainer

11

Molly Linczeski

Food Choice Behavior of Eastern Grey Squirrels (*Sciurus carolinensis*)

2:00 - 2:30

12

Sierra Peters

Hookup Culture: An Examination of the Gender, Personality, Attachment, Belief, and Attitudinal Correlates of Casual Sexual Behavior

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Abigail Janto

Systematics of Early Eocene (Wasatchian) Rodentia (Mammalia) from the Willwood Formation, Southern Bighorn Basin, Wyoming

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Catherine O'Brien, Aidan Collins

Self-Conscious Emotions in Narcissism Dimensions: Evidence of Differences in Emotional Dispositions and Reactivity

2:30 - 3:00

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Sean Bennett

Observing Surface Plasmons on Metal Nanofilms Using Reflection

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Hannah Peck, Hanna Sippel, Jaclyn Schneider

Differential Effects of Varying Concentrations of Corticosterone and Epinephrine on the Growth Rates of Bacteria from Zebra Finches (*Taeniopygia guttata*)

22

Caitlin Noseworthy

Petrographic Correlation with Geochemistry of Mafic Volcanic Rocks from Glacier Island, Prince William Sound, Alaska

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Allison Gerck

Columnaris Disease and the Population Dynamics of Infected Fish

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Sophia Larsen

Toll-like Receptor Gene Diversity in Turtles (Order: Testudines) and Implications for Disease Resistance

2:30 - 3:00

25 Amanda Schmidt, Briana Scott
Self-focus and Altruistic Behavior

33 Noah Fidlin
Explorations in Large Scale Relief Printing

34 Michael Schirger
Convex Hulls and GPS Based Applications

35 Miriam Lyons
Sequence Analysis of the ND3 Gene on the Mitochondrial Genome of *Peromyscus maniculatus*

36 Claire Stevens, Victoria Bain-Vrba
Zooplankton Dynamics in Two Contrasting Lakes: A Preliminary Study of a 33-year Record

37 Allison Wolff, Kaitlyn Tulenko, Breanna Killian
Red-shouldered Hawk Mitochondrial DNA

38 Alexis Puyleart, Leah Zimmer, Claire Rosenberger
An Investigation of an AED's Effects on the Human Torso

39 Radek Buss, Collin Ellenbecker, Emily Minton, Lauren Gray, Mona Nolte, Aysiah Jaeke, Jordyn Lawatsch
Effects of High Glucose and DCA on ROS Production and Viability of Breast Cancer Cells with Disrupted Antioxidant Systems

2:30 - 3:00

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**Katelyn Huebner, Coneria
Nansubuga, Alexis Dart, Tannor
Court, Charles Gusho**

Short- and Long-Term Hippocampal Aromatase Inhibition and Levels of Proteins Integral to Memory Function in Male and Female Zebra Finches

3:00 - 3:30

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Kelly Haen, Danielle Matuszak

Reducing Algal Blooms in Dream Lake, WI: Algal and Zooplankton Seasonal Dynamics Indicate Response to Food Web Manipulation

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Noah Swan

Saturation and Alternate Pathways in Four-Wave Mixing in Rubidium

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Annika Wallander, Laura Freimuth

Determining Taxonomic Origin of Novel Elephant Populations Using Fecal DNA

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Corinna Jauregui

Self-Reflection and Performance

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Elle Maricque, Cindy Lin

FISHing with Worms: The Search for Genes Involved in the Excretory system of Planarians and Zebrafish

3:30 - 4:00

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Erika Ditzman

The Fear and Fascination of the New Woman in George MacDonald's *Lilith*

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Victoria Watkins

Applying a Collaborative Multimodal Writing and Authoring Process to Creative Problem Solving

RESEARCH FORUM GUEST SPEAKER



Marcella Paul, Ph.D.

Professor Emeritus of Modern Languages and Literatures, formerly Director of the St. Norbert College Honors Program

Marcie grew up in Eau Claire, Wisconsin, where she reveled in the camaraderie of friends she'd known since junior kindergarten and a large, extended family who lived nearby. She grew up loving books, especially *Kidnapped*, *Black Beauty*, and any mystery she could find. She studied in Madrid, Spain, while in high school, a transformative experience that provided her with a cherished "heart-home" for the rest of her life. Her study of Spanish, studio art and art history at Beloit College was enormously enriching but did not lead to a clear career path. She avoided the "what now?" of post-college life by moving to Madrid to

teach English at a private institute right off of the Puerta del Sol. Eventually, she tore herself away from the ex-pat life, moved back to Wisconsin, completed her Masters and Ph.D. at Madison, and met Steve Kaplan. She specialized in 20th century Latin American prose, writing her dissertation on the Argentine novelist Manuel Puig (best known for his novel *The Kiss of the Spider Woman*). She and Steve spent several years in Chapel Hill, North Carolina, where Steve taught psychology at Chapel Hill and Marcie enjoyed a visiting position at Duke. They returned to the Midwest and family after the birth of their second son, and Marcie was offered a tenure-track position at St. Norbert College. Her scholarship focused on Latin American novelists' evocation and consequent subversion of the conventions of the classic detective novel (a politically conservative genre) to critique the socio-economic and political realities of Latin American countries, especially Mexico, Chile, and Argentina. She published numerous articles, several book chapters, and co-edited a volume on Hispanic detective fiction. She is fascinated by codes, masks, and sub-texts, and appreciates wit, subtlety (which she herself lacks), smarts, and a profound knowledge of the arts and their value. Since retirement she has immersed herself in NPR, literature (both fiction and nonfiction), travel to Spain, and horses (beings which offer an exquisite emotional and intuitive counterpoint to theory and method). She has begun jumping her mare, Gemma, and loves being challenged by her teenaged friends at the barn.

"Collaboration? Nothing is accomplished without it, whether one is aware or not of one's collaborators." Marcie is acutely aware of the collective nature of our inching toward enlightenment. "We are all in this together, no matter how much we disagree."

ABSTRACTS

ORAL PRESENTATIONS

1

Parasites of the Burbot, *Lota lota*, from Green Bay of Lake Michigan, with a Description of a New Species of Tapeworm (*Eubothrium* n. sp.) From this Fish Host

Carson Torhorst, Biology

Anindo Choudhury, Professor of Biology, Environmental Science

In the summer (May – August) of 2017 and 2018, 28 adult Burbot, *Lota lota*, (TL 393 – 815 mm) from Green Bay of Lake Michigan were examined for parasites. Six species of helminth parasites were identified: 2 cestodes, 1 nematode, and 3 species of acanthocephalans. A study of the *Eubothrium* species in Burbot using stained specimens, Scanning Electron Microscopy (SEM), histology, and molecular data from the rRNA gene array and cox-1 gene, suggests that it is a ‘new’ species different from *E. rugosum* of Eurasian Burbot. Museum specimens of “*E. rugosum*” from Burbot in North America are also of this new species.

2

Essential Genes for Regulating Actin Polymerization During Clathrin-Mediated Endocytosis are Functionally Conserved Between *Saccharomyces cerevisiae* and *Schizosaccharomyces pombe*

Ashley Bauer, Biology

Eric Lewellyn, Assistant Professor of Biology

Clathrin-mediated endocytosis (CME) is used by all eukaryotic cells to take up nutrients or regulate cell membrane receptors. Two yeast species, *Saccharomyces cerevisiae* and *Schizosaccharomyces pombe*, serve as models to understand CME in human cells. Genes from the *S. pombe* WASP/Myosin complex involved in CME, including MYO1, WSP1, VRP1, BZZ1, and BBC1, are inserted into *S. cerevisiae* cells and the resulting function assayed. Data suggests individual genes may vary in endocytic function and growth rescue, but with collective insertion, endocytic function is improved. These results are consistent with the hypothesis that intraspecific coevolution of these interacting proteins has occurred.

Analyzing #brexit Twitter Sentiment and Its Effect on Stock Market Behavior

Taylor Rudie, *Mathematics and Economics*

Marc Schaffer, *Associate Professor of Economics*

3

This project uses the programming language R to collect tweets containing #brexit and analyze them for positive and negative sentiment. Tweets were collected in the days before and after the original March 29th Brexit date, and code was created to analyze the tweets using a sentiment lexicon. Each set of tweets was given a score based on the sentiment analysis, and these scores were compared to movements at the FTSE 100 Index to determine whether Twitter sentiment has any effect on the primary stock market index on the London Stock Exchange.

Molecular characterization of the Parasites of the Ayungin, *Leiopotherapon plumbeus*, a Unique Fish Species Endemic to the Philippines

Amy Holzer, *Biology*

Anindo Choudhury, *Professor of Biology, Environmental Science*

4

The silver therapon or 'ayungin', *Leiopotherapon plumbeus* (Terapontidae), is a freshwater fish species endemic to the Philippines. A study of its parasites from Laguna de Bay yielded 4 species of endohelminths, including *Opegaster minima* (Trematoda: Opecoelidae) and two acanthocephalans, *Pallisentis* sp. (Quadrigyridae), and a single *Neoechinorhynchus* sp. (Neoechinorhynchidae). This study focuses on *O. minima*, using molecular (DNA sequence) data from the rRNA gene array (18S and 28S rDNA). Phylogenetic analyses did not place *O. minima* with the only other *Opegaster* species for which molecular data are available. Further, *O. minima* does not conform to the current morphological diagnosis of *Opegaster*.

Measuring the Market Impact of Wisconsin Political Events

Brady Miller, Economics, Mathematics

Daniel Kling, Visiting Assistant Professor of Economics; Jacob Laubacher, Assistant Professor of Mathematics

5

The past decade has seen Wisconsin in the national news for a number of political events: The conflict surrounding the passage of Act 10, the Scott Walker recall election, and the recent agreement with Foxconn. We use event study analysis of stock market data to determine how these events affected Wisconsin companies. We identify the timing of events that caused significant changes in the market values of publicly traded Wisconsin companies, as well as the events that had little identifiable market impact despite generating significant media attention.

Black American Leaders in Higher Education

Jasmine Babineaux, Business Administration, English

Lucy Arendt, Professor of Business Administration-Management

6

My research studied the experiences of Black American women in leadership positions in higher education, asking them to describe their personal and professional experiences and the impacts of those experiences on their success. I conducted a comprehensive literature review and interviewed 10 women in leadership positions, most in student affairs, in several higher educational institutions. As a major in both business management and English, I will be drawing upon my knowledge and skills in both disciplines to present my work to date, including a new poem that encompasses the experiences and influences of Black American women leaders in higher education.

7

Digital Development and Online Presence: PANEL Presentation

*Ally Laidlaw, Education; Cassie Nooyen, Computer Science;
Ruthie Tucker, Education; Victoria Watkins, Education
Shan Bryan-Hanson, Curator of Art Galleries*

This session features the domains of multiple ITS research assistants. Each SNC student has a domain with a different focus, showcasing the wide range of possibilities that domains can provide. The domains being discussed include self-reflective blogs, informative web pages, and an archive of SNC student-made Choose-Your-Own-Adventure stories.

POSTER PRESENTATIONS

Measuring Food Insecurity in an Urban Milwaukee Free Clinic

Elisha Jaeke, Biology, Spanish

1

Food insecurity – the disruption of regular food intake due to financial hardship or lack of resources – is linked to adverse mental, physical, and developmental health outcomes. Understanding its prevalence and severity at the Aurora Walker’s Point Community Clinic merited investigation, as immigrants and refugees are among the most vulnerable. Over half of the study’s participants were identified as food insecure, with socioeconomic and demographic similarities to the food secure group. These findings did not reflect what was hypothesized, but rather indicated that there is a greater complexity to food insecurity within the Walker’s Point Clinic patient population.

Heliscomys: North America's Smallest Rodent

*Brittany Pockat, Natural Science; Madeline Christel, Biology
Deborah Anderson, Professor of Biology*

2

Heliscomys is a tiny pocket-mouse that lived 33 million years ago, during the Oligocene of North America. The best-known species of the genus is *H. hatcheri* represented by associated upper and lower teeth, complete upper and lower dentitions, and postcranial material. A new species, *H. ostranderi*, was recognized based on significant differences in the upper molars. These two species are indistinguishable based on the morphology of the lower molars alone. New specimens, recovered from the Brule Formation of Nebraska, have made it possible to differentiate between *H. ostranderi* and *H. hatcheri* using a combination of mandibular and lower molar morphology.

A Taxonomic Revision and Characterization of *Sciuravus nitidus* and *S. undans* (Rodentia; Sciuravidae, Early Eocene Rodents from the Bridger Formation, Green River Basin, Wyoming

Brooke Mathias, Biology

Deborah Anderson, Professor of Biology

3

New specimens from the Bridger Formation allow for a critical review of the alpha taxonomy and evolution of the two most abundant species of sciuravid rodents from the Early Eocene of the Green River Basin, *Sciuravus nitidus* and *S. undans*. Previously, the two species were considered to be synonymous, based on studies of the upper and/or lower dentitions. Specimens with nearly complete associated upper and lower dentitions are studied for the first time and they reveal clear distinctions between the two species in the molar crown patterns, incisor shape, and mandible morphology.

St. Norbert Abbey and Chambers Island: A Multi-Year Study Comparing Inland and Island Mammal Populations

Nick Moran, Biology; Mya McDaniel, Biology

Adam Brandt, Assistant Professor of Biology

4

This study is the second year of an annual mark-recapture study to be used on assessing the fluctuations of population dynamics within different environments. Study sites at the St. Norbert Abbey (De Pere, WI) and Chambers Island (Gibraltar, WI) were chosen to represent open and closed systems respectively. Open systems are expected to have more variance in their population dynamics, due to migration. Any small mammals trapped were tagged and their morphological measurements were taken. Results indicate a larger *Peromyscus* population on Chambers Island, greater species richness at the St. Norbert Abbey, and reduced populations overall from the previous year.

Transgenic *Saccharomyces cerevisiae* with Engineered Minimal Fusion Construct from *Schizosaccharomyces pombe* Shows Variable Growth Lacking Native WASP/Myosin Proteins

Mitchell Lipke, Biology

Eric Lewellyn, Assistant Professor of Biology

5

Clathrin-mediated endocytosis (CME) is a ubiquitous vesicle trafficking pathway. The WASP/myosin complex enables CME through actin polymerization and has been successfully replaced with protein fusion constructs in *Saccharomyces cerevisiae*. Current work aimed to determine functional conservation of this complex. We hypothesized a fusion protein of *Schizosaccharomyces pombe* origin may be compatible in *S. cerevisiae*. In growth analyses, the construct rescued deletion of some WASP/myosin genes. This recovery highlights the functional conservation of CME. The construct failed to recover LAS17 deletion, supporting the inability of Myo1 and Wsp1 to function tethered and the requirement for two zones of action.

The Effects of Water Column Transparency on Zooplankton Community Composition of Lakes within the Superior National Forest, MN

Ellen Socha, Environmental Science, Biology

Carrie Kissman, Assistant Professor of Biology, Environmental Science

6

Our research adds to a dataset that was created in 2015 on the zooplankton community dynamics and lake transparencies of 14 lakes in the Superior National Forest, MN. These 14 lakes span a transparency gradient. We hypothesized that there is a relationship between water column transparency and zooplankton community composition such as species diversity, richness, and density. Preliminary analyses suggest that there is a relationship between lake transparency and zooplankton community assemblages.

Identification of an Unknown Carotenoid in Norway Maple

Claire Hetzel, Environmental Science

David Poister, Professor of Chemistry, Environmental Science

7

Previous research has identified a spike of some unknown carotenoid in Norway Maple leaves. It has been determined that this unknown carotenoid is increasing only in the Norway Maple during the fall and is not detected in other species. In the current project, the compound has been isolated by HPLC and further analyzed by IR in the attempt to determine the molecular structure. Using a carotenoid database in conjunction with the analytical methods, the chromophore has been identified as consistent with the structure of alpha-carotene and lutein. Further research is needed to determine the functionality of the terminal region of the molecule.

RNA Mediated Interference Screen to Identify Genes Required for Planarian Excretory System Function

Lydia Kramer, Biology

Ryan King, Associate Professor of Biology

8

Development is regulated by a suite of genes that control the movement and differentiation of groups of cells to build functional organ systems. We used RNA sequencing to identify a collection of genes with enriched expression in planarian protonephridia (excretory system). These genes likely regulate the differentiation of protonephridia and provide the specialized functions for the various cell types in this organ system. We are using RNA mediated interference to systematically disrupt each gene's function and uncover their role in protonephridia regeneration. While the screen is ongoing, we have uncovered several genes required for normal function and regeneration of protonephridia.

Social Media Engagement

Joseph Gasick, Business Administration

Miles Condon, Assistant Professor of Business Administration

9

We are working with members of the Major League Soccer team Philadelphia Union to answer some questions they have about their social media page and their attendance at games. They have some concerns that their social media isn't effective in bringing fans to games, so our job is to figure out if social media engagement (likes, comments, shares, etc.) on posts can translate to an increase in attendance. In order to do this, we will look at past attendance numbers from different teams and find engagement numbers on their social media pages and analyze the data to come to our conclusion.

Muscle Activation in Collegiate Athletes Using the Matrix S-Force Performance Trainer

Morgan Kelly, Biology; Monica Stephans, Biology

David Bailey, Professor of Biology

10

High-intensity interval training exercises and equipment alternate periods of lactate-producing exercise with short periods of rest to increase strength, speed and power. We used 8-channel electromyography to determine differences in the activation of muscles of the hip, thigh, and lower leg when using the Matrix S-Force Performance Trainer at various grip positions and resistance levels in female collegiate soccer and hockey players. The results may provide insight as to whether and how the S-Force can effectively generate more force and sustainability in muscle contractions at varying levels of resistance to increase the structural, biochemical, and physiological characteristics of targeted muscles.

Food Choice Behavior of Eastern Grey Squirrels (*Sciurus carolinensis*)

Molly Linczeski, Biology

Adam Brandt, Assistant Professor of Biology

11

Eastern Grey Squirrels (*Sciurus carolinensis*) often eat human refuse. There is little research to determine if their diet is based on nutrient richness or availability. We hypothesized that the availability of human refuse influences *S. carolinensis* diet and predicted that nearly identical food items of different protein content would not be discriminated. Five locations were chosen along the Fox river around St. Norbert College in which food pellets of high and low protein were available. Trail cameras were used to record motion around the bait containers for one week. Significance of food choice patterns was determined using R statistical software.

Hookup Culture: An Examination of the Gender, Personality, Attachment, Belief, and Attitudinal Correlates of Casual Sexual Behavior

Sierra Peters, Psychology

Stuart Korshavn, Associate Professor of Psychology

12

This study tested a model that included various factors that could be associated with casual sexual behavior. The results demonstrated that men were more likely to hookup than women. However, high sensation seekers, irrespective of gender, reported participating in more casual sex than low sensation seekers. When more proximal sexual attitudes, scripts, and beliefs were considered, sensation seeking ceased to be a significant predictor. Desire to be seen as a player, using casual sex as a means to elevate ones status, not taking responsibility for birth control, and a desire for sexual freedom, were significant predictors of casual sexual behavior.

Systematics of Early Eocene (Wasatchian) Rodentia (Mammalia) From the Willwood Formation, Southern Bighorn Basin, Wyoming

Abigail Janto, Biology

Deborah Anderson, Professor of Biology

13

Thousands of fossil rodents have been recovered from the Early Eocene Willwood Formation of the southern Bighorn Basin, Wyoming. Detailed biostratigraphic resolution is tied to measured stratigraphic sections for each fossil rodent locality. This is an ideal data set for exploring Eocene rodent evolution. Such investigations have yet to occur because the alpha taxonomy for these rodents is unresolved. This is not due to a lack of study. Widespread parallelism and ambiguously described taxa have slowed the process. The purpose of this study was to clarify the alpha taxonomy for six species of ischyromyids commonly found in the Bighorn Basin.

Self-Conscious Emotions in Narcissism Dimensions: Evidence of Differences in Emotional Dispositions and Reactivity

Catherine O'Brien, Psychology; Aidan Collins, Psychology

Michelle Schoenleber, Assistant Professor of Psychology

14

Shame and guilt have previously been shown to be implicated in narcissism (Tracy et al., 2009). Consequently, Study 1 examined the relationship between narcissism dimensions and propensities for and aversions to shame and guilt. Grandiosity was associated with an interaction between guilt-proneness and aversion ($\beta=.13$, $p<.01$). Vulnerability was associated with shame-proneness and aversion (β s=.12 and .42, $ps<.01$), though not via interaction. In Study 2, a social rejection task was used to examine the relationship between narcissism dimensions and emotional reactivity. Whereas grandiosity was associated with reduced guilt, vulnerability was associated with increased shame and guilt.

Small molecule Luminescence of Keto-phenolate Complexes of Aluminum (III)

Nicholas Koehn, Chemistry

Kurstan Cunningham, Assistant Professor of Chemistry

15

Aluminum coordination chemistry is an attractive route toward functional molecular materials due to the low cost of aluminum (\$2.00/kg) and its high natural abundance (8% of Earth's crust). Within this group, the photochemically active aluminum complexes often contain large aromatic groups which decrease the solubility of the complex in polar solvents and red-shift the emission wavelength. Our small molecule aluminum complexes overcome these obstacles as they are designed to emit at a higher wavelength, important due to the limited availability of blue color emitters, and to dissolve in polar solvents for more environmentally friendly industrial applications.

Common Configurations In Rank 3 Simple Matroids

Bao Van, Mathematics

Simon Pfeil, Assistant Professor of Mathematics (2016-2018)

16

We are interested in ranked-3 matroids in geometric representation. By adding one more element into the matroid, we can have multiple geometric representations, in which some of them are isomorphic. Through this process, we want to find which matroid structures contain a specified number of elements. Further, we want to uncover the most common and least common matroid structures.

Jean Le Paige's *Bibliotheca Praemonstratensis Ordinis* (1633): an original translation

Elle Maricque, Biology

Michael Holstead, Adjunct Assistant Professor of Classical Studies

17

Few of the early documents of the Norbertine order have been translated into English, so I have undertaken to translate a sermon that St. Norbert gave in Latin to his confreres in the 12th century. As part of my research I have traced the textual transmission of the sermon back to Jean Le Paige's *Bibliotheca Praemonstratensis Ordinis* (1633), whose version of the sermon I have used for my translation. In this Forum I will discuss the textual transmission of the sermon, its context in Le Paige's book, and my translation of the original Latin into English.

The Planarian RPE-Spondin Homolog Shows Dynamic Changes in Gene Expression Following Injury and Tissue Loss

Hannah Sherfinski, Biology

Ryan King, Associate Professor of Biology

18

Planarians have an immense regenerative capacity due to a large population of stem cells. How injury and tissue loss stimulate stem cell proliferation and tissue regeneration is a long-standing question in regeneration research. To identify genes involved in regeneration, we performed an RNA sequencing experiment on 2.5-day regenerating planarians. Among the genes showing significant changes in expression was the planarian homolog of RPE-Spondin (Smed-RPESP). We show Smed-RPESP expression is initiated rapidly following amputation or injury near the wound site and are working to determine whether it regulates stem cell dynamics and tissue repair mechanisms during regeneration.

GxE Effects of OXTR and Child Maltreatment on Social Competence: A Meta-analysis

Hannah Sherfinski, Biology

Raquel Cowell, Associate Professor of Psychology

19

Previous literature has shown that the oxytocin receptor gene polymorphism (rs53576) is associated with an array of social behaviors important for healthy social development in non-maltreated youth (Li et al., 2015). The aim of this meta-analysis is to analyze the interaction between the oxytocin receptor gene polymorphism (rs53576) and child maltreatment, such as abuse and neglect, on social competence. Maltreatment is a prevalent issue affecting one in seven children each year (CDC, 2019). As such, a deeper knowledge of this gene x environment interaction will provide healthcare professionals with greater awareness of the complexities surrounding cases of childhood maltreatment.

Observing Surface Plasmons on Metal Nanofilms Using Reflection

Sean Bennett, Physics

Erik Brekke, Associate Professor of Physics

20

When light hits a metal-glass interface, typically either reflection or refraction occurs. However, with sufficiently thin metals at a particular angle, the light's energy can instead be transferred to the metal's electrons as surface plasmon waves. In this experiment we explore this by shining a laser through a prism with a 50nm thick silver film on top. By observing the intensity of reflected light as a function of the incident angle on the metal, we calculated a band of no reflection at $47.8 \pm 0.8^\circ$ with 650nm light. From this band, we can infer the creation of surface plasmons.

Differential Effects of Varying Concentrations of Corticosterone and Epinephrine on the Growth Rates of Bacteria from Zebra Finches (*Taeniopygia guttata*)

Hannah Peck, Biology; Hanna Sippel, Biology; Jaclyn Schneider, Biology

David Bailey, Professor of Biology

21

Bacterial growth in the gut is affected by exposure to host signaling molecules. This experiment focused on bacteria isolated from the gut of zebra finches and the response of the bacteria to stress hormones. Bacteria were exposed to high and low physiological concentrations of corticosterone and epinephrine. Phases of bacterial growth of *Enterobacter cowanii*, *Enterobacter hormaechei*, *Pseudomonas* sp., and *Enterobacter cloacae* during stress hormone exposure were differentially affected relative to controls in nutrient broth, with the majority of variation due to epinephrine. This set of experiments has laid the foundation for in vivo experimentation to replicate and extend these results.

Petrographic Correlation with Geochemistry of Mafic Volcanic Rocks from Glacier Island, Prince William Sound, Alaska

Caitlin Noseworthy, Geology

Tim Flood, Professor of Geology

22

The origin and age of the Glacier Island ophiolite in SE Alaska was uncertain. As part of the REU Keck Consortium, four weeks in summer of 2018 were spent collecting samples from the island. Whole rock geochemistry data was obtained using XRF and LA-ICPMS. The age of the ophiolite was determined using U/Pb analysis. The combined data helped determine the origin of the ophiolite. In conjunction with the Keck project, this study performed a petrographic analysis of thin sections to determine the alteration of the samples. We conclude that the petrographic results are consistent with the geochemical data.

Columnaris Disease and the Population Dynamics of Infected Fish

Allison Gerk, Mathematics, Biology

Terry Jo Leiterman, Associate Professor of Mathematics

23

Flavobacterium columnare is a bacterial pathogen that forms biofilms on the surface of freshwater fish. As the biofilm grows, the resulting infection causes a fatal disease to fish known as columnaris. During this biofilm growth, *F. columnare* sheds from the host fish and enters the aquatic ecosystem where it resides, remaining viable, until it infects another fish. Our study presents a model for the population dynamics of freshwater fish after *F. columnare* is introduced into the healthy population. We explore the interconnected relationship between healthy fish, infected fish, and deceased fish through the interdisciplinary lens of mathematics and biology.

Toll-like Receptor Gene Diversity in Turtles (Order: Testudines) and Implications for Disease Resistance

Sophia Larsen, Biology

Adam Brandt, Assistant Professor of Biology

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The number of emerging infectious diseases in wildlife is increasing with significant impacts to rare, threatened, and endangered species. Conservation efforts for turtles would benefit from a better understanding of the relationship between the pathogens that cause these catastrophic diseases and the molecular mechanisms for resistance. Here we begin to explore the mechanisms of disease resistance and susceptibility among turtles by examining the genetic diversity of Toll-like receptor (TLR) genes which function in the immune response. Findings from this study will be applicable to turtle conservation, such as abating disease outbreaks and increasing success of captive breeding and reintroduction programs.

Self-focus and Altruistic Behavior

Amanda Schmidt, Psychology; Briana Scott, Psychology, Sociology

Michelle Schoenleber, Assistant Professor of Psychology

25

Shame is a self-focused emotion that elicits needs for social approval/acceptance (Lagatutta & Thompson, 2007). Logically, then, shame-proneness should be associated with greater prosociality, engendering positive interpersonal outcomes. However, research demonstrates a negative association between shame-proneness and prosociality, as measured by questionnaires (Roos, 2014). We instead examined this association using two, real-time prosocial behaviors in the lab. Additionally, we manipulated participants' state levels of self-focused attention, predicting that enhanced self-focus would increase shame-proneness's effects on prosociality. Results indicate no relationship between shame-proneness and a baseline prosocial opportunity; however, post-self-focusing-manipulation, shame-proneness was associated with greater real-world prosocial behavior with a confederate.

Reducing Algal Blooms in Dream Lake, WI: Algal and Zooplankton Seasonal Dynamics Indicate Response to Food Web Manipulation

Kelly Haen, Biology; Danielle Matuszak, Biology

Carrie Kissman Assistant Professor of Biology, Environmental Science

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Dream Lake in Hobart, WI has frequent algal blooms. Pre-, during-, and post-manipulation data were taken weekly in summers 2012-2018, during which we implemented a top-down trophic cascade by adding piscivores and a bottom-up fertilizer reduction approach. We hypothesized that algal bloom frequency would decline, and recreational and aesthetic value would increase. In 2014, a winter kill event reduced fish populations. Increased water transparency and decreased algal biomass during-manipulation, and increases in zooplankton biomass during- and post-manipulation, indicate that Dream Lake may be responding to the manipulations.

Saturation and Alternate Pathways in Four- wave Mixing in Rubidium

Noah Swan, Physics, Mathematics

Erik Brekke, Associate Professor of Physics

27

We have examined the frequency spectrum of the blue light generated via four-wave mixing in a rubidium vapor cell inside a ring cavity. We have observed two distinct frequency components separated by 116 ± 4 MHz, indicating alternate four-wave mixing channels through the $6p_{3/2}$ hyperfine states. The dependence of the generated light on excitation intensity and atomic density are explored, and indicate the primary process has saturated. This saturation results when the excitation rate through the $6p$ state becomes equal to the rate through the $5p$ state, giving no further gain with atomic density while a quadratic intensity dependence remains.

Determining Taxonomic Origin of Novel Elephant Populations Using Fecal DNA

*Annika Wallander, Biology, Spanish; Laura Freimuth, Biology
Adam L. Brandt, Assistant Professor of Biology*

28

Poaching is a major cause of elephant population decline and molecular techniques are crucial elements for conservation. There are two species of elephants in Africa, African savannah elephant (*Loxodonta africana*) and African forest elephant (*Loxodonta cyclotis*). Knowing the taxonomy of elephants in understudied populations such as Guinea-Conakry and Botswana is imperative for sound management practices. Using non-invasively collected fecal samples and diagnostic single nucleotide polymorphisms we examined the taxonomy of the elephants in these populations. Understanding the extent of hybridization will contribute to a database for triangulating the provenance of confiscated illegal ivory.

Self-Reflection and Performance

*Corinna Jauregui, Psychology
Hannah Kling, Assistant Professor of Economics*

29

This project is about the effect of self-reflection on academic performance. Last semester, Dr. Kling gave students a weekly reflection sheet in which they identified any struggles in the class and created a plan of action to clear any confusion. We want to see how this self-reflecting impacted students' performance. Using a variety of quantitative and qualitative methods, we are evaluating how self-reflection affected student performance across the semester. We are still completing our quantitative analysis, but initial qualitative measures suggest some students received mild benefit from this regular process of self-reflection.

FISHing with Worms: The Search for Genes Involved in the Excretory System of Planarians and Zebrafish

*Elle Maricque, Biology; Cindy Lin, Biology
Ryan King, Associate Professor of Biology*

30

Planarians have become a powerful model organism for studying regeneration. Previously, we performed screen that identified 80 genes with enriched expression in the planarian excretory system. Many of these genes are conserved in the human genome, but their function and expression in the vertebrate excretory systems have not been examined. To explore whether these newly identified genes have conserved expression in vertebrates, we have cloned homologs of these genes in zebrafish and are using *in situ* hybridization to map their expression in the zebrafish excretory system.

The Fear and Fascination of the New Woman in George MacDonald's Lilit

*Erika Ditzman, English, Communication and Media Studies
John Pennington, Professor of English*

31

This project explores the anxiety at the end of the century concerning the rise of the “New Woman,” a label which was coined by Sarah Brand in *The Superfluous Woman* (1894) and in other novels of the 1890s. *Lilit*, George MacDonald’s final fantasy novel published in 1895, focuses on the myth of Lilit (Adam’s first wife before Eve). MacDonald uses the myth to address concerns evoked by the rise of the New Woman. Our study examines how MacDonald’s *Lilit* posits a tension--that between the fear and fascination of the New Woman and her divergence into the public sphere.

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Applying a Collaborative Multimodal Writing and Authoring Process to Creative Problem Solving

Victoria Watkins, Education

Krissy Lukens, Director of Academic Technology

Using multimedia authoring software students collaboratively author and illustrate original choose-your-own-adventure stories. While constructing the stories, they are immersed in a process that fosters creativity, collaboration, critical thinking, communication and cooperation. Educators use this digital storytelling process in their own classrooms. I will share the technological skills I learned as well as the benefits I found for this process.

33

Explorations in Large Scale Relief Printing

Noah Fidlin, Art

Katie Ries, Associate Professor of Art

After being introduced to relief printmaking through one of my courses at Saint Norbert College, I became interested in creating a new piece for Really Big Prints, an event held at the University of Wisconsin Manitowoc, when the opportunity arose. The piece that I created was entitled “Local Aquatic Life,” which was carved by hand onto a 32” by 64” piece of birch plywood, then inked and printed onto multiple sheets of paper by myself and those who were present at the Really Big Prints event.

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Convex Hulls and GPS Based Applications

*Michael Schirger, Computer Science, Mathematics
Bonnie McVey, Associate Professor of Computer Science; Dave
Pankratz, Associate Professor of Computer Science*

A convex hull in terms of GPS coordinates is the smallest convex polygon that contains all the points. Any line that can be drawn between two points must remain within the convex hull. GPS coordinates collected in the background can be displayed on a map as a convex hull. The Android mobile app is also capable of finding the intersection (common area) and union (combining sets of points) of any number of convex hulls. Applications include determining the specific area affected by an outbreak of a disease, creating a perimeter for chemical or nuclear leaks and many others.

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Sequence Analysis of the ND3 Gene on the Mitochondrial Genome of *Peromyscus maniculatus*

*Miriam Lyons, Biology
Adam Brandt, Assistant Professor of Biology*

A study has found mutations in the human mitochondrial gene ND3 that coincide with population origin and causes differential mitochondrial function. Mutations among humans in equatorial climates result in greater ATP production, whereas humans in colder climates produce more heat. We analyzed ND3 in *Peromyscus maniculatus* from published sequences to identify mutations that correlate with latitudinal variation. Mutations were found that in specific geographical areas suggesting that certain populations may also have variable mitochondrial function. Findings from this study will be useful in establishing molecular means of determining species resiliency to climate change in terms of heat versus energy production.

Zooplankton Dynamics in Two Contrasting Lakes: A Preliminary Study of a 33-year Record

Claire Stevens, Biology, Environmental Science; Victoria Bain-Vrba, Biology

Carrie Kissman, Assistant Professor of Biology

James Hodgson, Professor Emeritus, Biology, Environmental Science

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This *a posteriori* project provides a unique opportunity to utilize three decades of data on the trophic cascade hypothesis. The study was conducted on two small lakes of contrasting food webs in which one lake served as a reference, and the other underwent a series of manipulations. A top-down trophic cascade caused by planktivore and piscivore addition/removal was observed. We are examining the dynamics and complexities of cladoceran communities, with a focus on *Daphnia* species. Preliminary results are complex, partially due to observations at the annual mean scale, but we have overall observed decreases in the cladoceran community follow additions of planktivores.

Red-shouldered Hawk Mitochondrial DNA

Allison Wolff, Biology; Kaitlyn Tulenko, Biology; Breanna Killian, Biology

Adam Brandt, Assistant Professor of Biology

37

Red-shouldered hawks are classified as rare or uncommon and in need of protection and management in Wisconsin. These elusive birds are difficult to study using traditional field methods because they are difficult to observe or capture more than once as adults. Using non-invasively collected DNA from shed feathers, we analyzed a portion of the mitochondrial control region to examine population genetics, nesting behavior, and relatedness. Findings from this work will be useful in better understanding Red-shouldered hawk biology and provide needed information for sound management decisions.

An Investigation of an AED's Effects on the Human Torso

Alexis Puyleart, Physics; Leah Zimmer, Physics; Claire Rosenberger, Physics

Michael Olson, Assistant Professor of Physics

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The effect an AED has on a human torso was examined by looking at the conductivity and resistance of the tissue and the electromagnetism of the heart. This was done using Ohm's and Faraday's Laws. The human torso conductivity was mimicked using a ballistics gel and NaCl mixture. The heart was 3D printed and magnetic wiring was coiled into each chamber. Probes were placed in the torso and attached to the heart to obtain an electrical reading after the shock was administered.

Effects of High Glucose and DCA on ROS Production and Viability of Breast Cancer Cells with Disrupted Antioxidant Systems

Radek Buss, Biology; Collin Ellenbecker, Biology; Emily Minton, Biology; Lauren Gray, Biology; Mona Nolte, Biology; Aysiah Jaeke, Biology; Jordyn Lawatsch, Biology

Russ Feirer, Associate Professor of Biology

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A goal of this study was to determine if disruption of protective cellular antioxidant systems would sensitize cancer cells to dichloroacetate (DCA), a compound that affects mitochondrial metabolism (reversing the Warburg Effect, elevate mitochondrial ROS production). A second goal was to investigate the effects of butathione sulfoximine (BSO) and auranofin (AUR), inhibitors of systems that detoxify reactive oxygen species (ROS), on cells grown in either low or high glucose media (1 g/L vs 4.5 g/L). Cells grown under high glucose conditions produced more ROS and exhibited greater sensitivity to the combination of DCA, BSO and AUR.

Short- and Long-Term Hippocampal Aromatase Inhibition and Levels of Proteins Integral to Memory Function in Male and Female Zebra Finches

*Katelyn Huebner, Biology; Coneria Nansubuga, Biology; Alexis Dart, Biology; Tannor Court, Medical College of Wisconsin; Charles Gusbo, Medical College of Wisconsin
David Bailey, Professor of Biology*

40

Aromatase inhibitors as endocrine-based therapies produce detrimental cognitive effects, but the neuronal mechanisms affected are unclear. Inhibition (72hr) of hippocampal aromatase in male zebra finches attenuates spatial memory and levels of a synaptic scaffolding protein (PSD95). In this experiment, hippocampal tissue was harvested following 72hr, 1wk, and 2wk inhibition in male and female finches. We will quantify levels of other synaptic proteins, those integral to hippocampal cell signaling cascades, and an estrogen-mediated transcriptional coregulatory protein. As hippocampal aromatase and circulating androgenic substrates are higher in males, the study may provide evidence for sex differences in steroid hormone-mediated cognitive effects.

Factors Underlying Low Persistence Rates Among Hispanic and African-American Students at St. Norbert College

*Najma Ahmed, Political Science, International Studies
Gratzia Villarroel, Associate Professor of Political Science*

41

According to the 2017 IPEDS, the 6-year graduation rate of Hispanic students and African American students at SNC is 38% and 63% respectively, whereas the 6-year graduation rate for white students is 75%. The purpose of this research is to explore why the graduation rate for African American and Hispanic students at SNC is significantly lower than that of white students. This is important because of the changing demographics in our country, the need to provide equal opportunity to all students, and to ensure that minority students can also reach their full potential. This research uses data gathered by IPEDS, the U.S. Census Bureau, and interviews with SNC staff.

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