



Application for Sabbatical Leave

September 15, 2023

Britton Ranson Olson, Biology

Title:

Gaining Expertise in Advanced DNA Methods for New and Exciting Molecular Explorations at LSSU!

PROJECT ABSTRACT

This proposal focuses on advancing my knowledge and skills in advanced genomic applications that I will use to evaluate a number of emerging issues. The projects described here are relevant to our region and they will give LSSU students access to working with the most modern molecular tools. The proposal describes various applications such as the effect of environmental contaminants on microbial diversity, bioremediation studies, the detection of invasive species, and the development of a molecular assay for sex determination of sturgeon. The outcomes of this proposal include travel to several institutions to learn from experts on these rapidly advancing methods, with the goal of making them accessible to our LSSU campus community. The projects described here are well suited for multiple senior thesis projects and for demonstrating biological outcomes in our course laboratories and they will enhance the ongoing and future prospects of molecular based research at LSSU.

PROJECT DESCRIPTION

INTRODUCTION

Molecular analysis is often considered the gold standard in biodiversity research, as DNA sequencing techniques can accurately identify and classify species, including their relative abundances, with little to no ambiguity. Metagenomic analysis also allows us to monitor changes in community structure resulting from altering environmental conditions and the implications of contaminant exposure by measuring organism abundance and identity within a sample site. The identity of important gene targets subsequent to those exposures can be made with more refined analysis, as can the evaluation of those organisms tolerant to the exposure and their potential for bioremediation.

Environmental DNA (eDNA) analysis is a powerful tool that requires studying genetic material, often in trace amounts, that has been shed from an organism within its environment, *e.g.* in soil, water, or air. Like the hair and exfoliated skin cells shed from humans, genetic remnants are left behind by all various organisms. Without the need to observe or capture the organisms



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themselves, their presence can be detected, and this provides valuable information in regards to examining biodiversity, but also for trace-detection of invasive and at-risk species. There are challenges when relying on such small amounts of DNA, including the potential for contamination and degradation of the DNA over time. There is also difficulty when evaluating point source detection and determining the distance of the sample sites from the DNA source, *e.g.* how far downstream can one reliably detect DNA from an upstream source? For these reasons, more work is required to better strategize DNA studies and interpret their data.

BACKGROUND

eDNA Analysis-Approximately a year and a half ago I began working on a method for detecting and monitoring the invasive species, *Didymosphenia geminata*, otherwise known as Rock Snot, through environmental eDNA analysis. Using the genomic sequences from Keller et, al., the analysis was adapted to a digital PCR (dPCR) method, bringing both greater specificity, as well as sensitivity, *e.g.* detection limits are near or less than one cell. Now, having optimized and successfully detected *D. geminata* by dPCR, the project, based out the LSSU Center for Freshwater Education (CFRE), has received additional funding for the next two years. Though the project has been successful, I would like to pursue more experience working with and overseeing eDNA studies and you will see that reflected in the outcomes I describe for this sabbatical proposal.

'Experimentally advancing our scientific understanding of Rock Snot, *Didymosphenia geminata*.' Michigan Invasive Species Grant Program (MISGP). Ashley Moerke PI, Robert Pillsbury, co-PI, Britt Ranson Olson co-PI. \$62,600

Effects of Oil on Freshwater Microbial Diversity-The effects of oil exposure on biodiversity in marine systems has been studied for some time now. Our knowledge of the impacts of oil on freshwater communities, particularly those in cold climates, is far more limited. As an LSSU faculty member of the 'Biological Impacts of Oil in Our Waters of the North (BIO-OWN) Network.', which is part of the Natural Resources Canada supported MultiPartner Oil Research Initiative (MPRI) recently awarded to LSSU, I will facilitate campus investigations assessing the impact of oil on the community abundance and diversity of microbes. This will be measured through DNA analysis (quantification of 16S rRNA gene copy number), and on-site nanopore 16S rRNA sequencing of water and sediment samples.

During May and June, 2023 I acted as faculty research advisor to a visiting United States Coast Guard (USCG) cadet. We designed her study to act as a pilot project for microbial diversity analyses and train with on-site nanopore 16S rRNA sequencing technology. That project required equipment purchases, sample collection, application of oil to test samples, DNA extraction, sequencing reactions, and finally nanopore and 16S species analysis. We successfully generated microbial diversity profiles from a total of twelve sample sites from around the



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region and produced twenty-two 16S rRNA barcoding profiles. That being successful, a main outcome of my proposal is to further my knowledge and technical skills for performing the larger scale genomic analyses which will be required for evaluating the impact of oil on diversity and functional changes within the microbial population. We will work with fellow BIO-OWN collaborators at the Genomics Research Core, University of Windsor for this portion of the study. I am seeking time to travel to their lab to strengthen my skills with these techniques, and I will also pursue a certificate in Genomic Data Science Specialization.

International Consortium of Oil Research - Our Waters of the North (ICOR-OWN). MultiPartner Oil Research Initiative. Natural Resources Canada. \$2.9 million

USCG Cadet Summer 2023 Research Experience. U.S. Coast Guard Great Lakes Oil Spill Center of Expertise (GLCOE). Rylie Brick and Britt Ranson Olson. \$10,000 project contract.

Natural Attenuation-Another objective of the BIO-OWN network will rely on further microbial DNA analysis to reveal microbial species that are tolerant to oil exposure and those that may be able to metabolize the oil hydrocarbons. Their potential for remediation will be evaluated through calculating hydrocarbon degradation rates and further DNA analysis will reveal which freshwater microbial communities degrade oil. These studies will increase our understanding of the use of microbial communities for bioremediation in cold climate, freshwater regions. In regards to the MultiPartner Oil Research Initiative, remediation will be evaluated in both microcosm (tiny jar) communities, but also *in situ* at various sites around the Great Lakes. Another outcome of this sabbatical will be to travel and learn about the apparatuses currently used for these kinds of studies by MPRI partners at Memorial University of Newfoundland.

Molecular Sex Determination-Finally, there is a critical need for the ability to identify the sex of sturgeon through means other than ultrasound, as the sexes of the adult are indistinguishable externally. DNA sequencing techniques can accurately identify genetic differences, especially in cases where traditional morphological approaches may fall short. For species management, monitoring, and industry (*e.g.* sport, caviar) the means to accurately distinguish between male and female is of great value. In 2021, a female-specific sequence was identified within the sturgeon genome and a method for amplifying that sequence using standard PCR procedures, Kuhl 2021. I would like to refine this method, transitioning it from a PCR method to a qPCR assay, allowing for detection of both sexes; the female sex-specific indicator and also a positive indicator for the genetic males. This male 'control' is not currently in the literature and so the steps required to do so are included as part of my sabbatical outcomes.



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OUTCOMES

The first outcome of this proposal will be directed towards advancing my technical skills and gaining expertise in more advanced DNA methods and genomic analysis. This training will begin with my travel and participation in the Queens University Environmental eDNA Workshop, in Elgin, Ontario. <https://qubs.ca/eDNAWorkshop> This is a five-day course, which introduces participants to various methodologies and hands-on training in analysis and interpretation of data, as well as standards to overseeing eDNA studies. I will also attend the eDNA Technical Exchange Workshop hosted virtually by the U.S. Geological Survey.

<https://www.usgs.gov/publications/government-edna-working-group-6th-annual-edna-technical-exchange-workshop> My goal through this is to introduce myself to existing and developing eDNA networks and learn of future eDNA research directions. I will apply what I learn from the workshops to the ongoing *D. geminata* study, and will work to prepare a manuscript from that project over the course of this sabbatical.

Towards this first outcome I will also complete the coursework required to receive a certificate in Genomic Data Science Specialization taught by Johns Hopkins University faculty. This is an educational module provided as OpenCourseWare,

<https://www.coursera.org/specializations/genomic-data-science> and it teaches methods for analyzing and interpreting genomic and gene function data, and modern tools for managing genomic data. This certification will help prepare me for managing larger genomic data sets, and learn of the various statistics applications for further analyze of these huge data sets which will ultimately be generated from the microbial community abundance and diversity studies that will be collected through the BIO-OWN project. The specialization consists of six classes, and takes approximately six months to complete.

Finally, I will travel and work closely with BIO-OWN collaborators at the University of Windsor to enhance my technical skills, and apply what I have learned through the Genomic Data Specialization coursework, to the broader metagenomics and metatranscriptomics analyses we will be performing.

Activities, in Summary:

Complete the Queens University Environmental eDNA Workshop, in-person, Elgin, Ontario.

Attend the eDNA Technical Exchange Workshop virtually, hosted by the USGS.

Earn certificate in Genomic Data Science Specialization, Johns Hopkins University.

Prepare manuscript from *D. geminata* eDNA analysis project.

Travel to the Great Lakes Institute for Environmental Research, University of Windsor.

<https://www.uwindsor.ca/glier/154/chris-weisener>



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Student involvement:

LSSU student senior thesis project – ‘Environmental DNA analysis and Detection of *Didymosphenia geminata*.’ I currently have a junior seminar (BIOL399) student in the pipeline for this project. They are preparing their thesis proposal this Fall 2023 semester and plan on completing this project by Fall semester, 2024.



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The second outcome will be my training in methods to perform *in-situ* testing on the effects of oil on indigenous microbial communities, the goal being that this technique will be used in the placement of sampling apparatuses at sites around the Great Lakes. To achieve this, I will travel to the lab of Professor Uta Passow, Canada Research Chair in Ocean Sciences, Memorial University of Newfoundland, to learn about the preparation, positioning, and collection from on-site samplers described as biodegradation frames. These apparatuses will contain the microbial samples from which community effects and biodegradation potential can be examined. These objectives align with those of the MultiPartner Oil Research Initiative and are also common goals of the U.S. Coast Guard Great Lakes Oil Spill Center, housed at CFRE. Finally, the on-site nanopore DNA sequencing that we successfully piloted earlier this summer with the USCG cadet training funds will be used for microbial diversity analyses from specimens harvested from these samplers.

Activities, in Summary: Travel to Dr. Uta Passow's lab at for observation of *in situ* sampling techniques, Memorial University of Newfoundland.

<https://www.mun.ca/research/extraordinary-research/research-chairs/dr-uta-passow/>

Student involvement:

I will be able to use the samples collected through this method in the Advanced Cellular and Molecular Biology BIOL421, a course that I teach annually. This will allow for molecular analysis by the students, focusing on biodiversity of organisms and contamination effects (oil), and this would substantiate a valuable DNA barcoding project, allowing the students hands-on experience in DNA extraction, sequencing, species identification, and data analysis. Statistical analysis is a critical piece of the LSSU School of Science and Medicine senior thesis and a component of our departmental seminar rubrics, and so an in-class project such as this would be excellent preparation for competing that capstone experience.

LSSU student senior thesis project - 'Identification of Microbial Species for the Natural Attenuation of Oil', based upon specimens collected from the sampling apparatuses that I am seeking training on (1-2 student projects). It is expected that we will have samples available for processing during the 2024-2025 academic year, so students would be able to start their analysis during those semesters.



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The third outcome of this proposal will be the development of a DNA assay (multiplex qPCR technique) for the sex identification of sturgeon. This will require qPCR primer and probe design based on the female-DNA specific sequences, as well as species-specific sequences, thus providing a critical control and male indicator for the method. The steps required for this will include bioinformatics analysis of the sturgeon genome, identification of the 18S rRNA sequence (species-specific sequences), design of compatible primers and probes and assay parameters, running the multiplex analysis, and any troubleshooting necessary to produce reliable, accurate results. A modernized, molecular-based test for sex determination would substantiate a manuscript on the design of the assay, as well as future funds for the processing of samples collected from around the Great Lakes basin.

Activities, in Summary:

The design and demonstration of a molecular sex identification assay for sturgeon, for which traditional morphological analysis is not adequate.

If successful, a future manuscript would be appropriate.

Student Involvement:

LSSU student senior thesis project – ‘Molecular Sex Determination of Sturgeon’ (1-2 student projects). Students would be able to participate in the optimization process during the Spring 2025 semester, and would will also be able to design projects, once the technique has been finalized, through processing archived samples, and so these would substantiate projects that could be performed well after the period of my sabbatical.



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TIMELINE

2024					
July	August	September	October	November	December
1st Outcome Further education in DNA techniques & analysis					
Attend Queen's University Environmental eDNA Workshop, Ont CAN					
<u>Genomic Data Science Specialization Coursework</u>					
	Introduction to Genomic Technologies course	Python to Genomic Technologies course	Algorithms for DNA Sequencing Technologies course	Command Line Tools for Genomic Data Science course	
	<i>D. geminata</i> eDNA manuscript preparation	manuscript preparation, cont.			
2nd Outcome Training in <i>in situ</i> techniques for studying oil degrading microbes					
Travel and observation in Dr. Uta Passow's Lab, Memorial University of Newfoundland, dates TBD					
3rd Outcome Developing a molecular method for sex identification of sturgeon					
Bioinformatics → Assay design					

2025					
	January	February	March	April	May
1st Outcome Further education in DNA techniques & analysis					
	Attend eDNA Technical Exchange Workshop, virtual	<u>Genomic Data Science Specialization</u>			
		Bioconductor for Genomic Data Science course	Statistics for Genomic Science course	Receive certificate	
Travel and observation in the Great Lakes Institute for Environmental Research, University of Windsor, dates TBD					
2nd Outcome Training in <i>in situ</i> techniques for studying oil degrading microbes					
Placement of biodegradation frames					
3rd Outcome Developing a molecular method for sex identification of sturgeon					
	Order custom primers/probes	Run Assay	Optimize /troubleshoot	Optimize & collect sample data	

REFERENCES

Keller, Stephen R.;Hilderbrand, Robert H.;Shank, Matthew K.;Potapova, Marina. Environmental DNA genetic monitoring of the nuisance freshwater diatom, *Didymosphenia geminata*, in eastern North American streams. *Diversity and Distributions* 23(4): 381-393, 2017

Kuhl H, Guiguen Y, Höhne C, Kreuz E, Du K, Klopp C, Lopez-Roques C, Yebra-Pimentel ES, Ciorpac M, Gessner J, Holostenco D, Kleiner W, Kohlmann K, Lamatsch DK, Prokopov D, Bestin A, Bonpant E, Debeuf B, Haffray P, Morvezen R, Patrice P, Suci R, Dirks R, Wuertz S, Kloas W, Scharl M, Stöck M. A 180 Myr-old female-specific genome region in sturgeon reveals the oldest known vertebrate sex determining system with undifferentiated sex chromosomes. *Philos Trans R Soc Lond B Biol Sci.* 2021

CURRICULUM VITAE

Britton Ranson Olson, Ph.D.

School of Science and Medicine
Lake Superior State University
650 W. Easterday Avenue
Sault Ste. Marie, MI 49783

Phone: (906) 635-2157
Fax : (906) 635-2266
Email: branson@lssu.edu

EDUCATION

PhD Biomedical Sciences, Health and Environmental Chemistry, Oakland University, 2007.

Dissertation: *In vitro* and *in vivo* transcription studies of the *hemA* gene of *Rhodobacter sphaeroides* 2.4.1.

MS Biological Sciences, Michigan Technological University, 2001.

Thesis: Environmentally Mediated Intellectual Manifestations.

BS Biological Sciences, Lake Superior State University, 1999.

Thesis: Which came first, the prolactin or the caregiving?

RESEARCH & TEACHING POSITIONS

Professor. 2021-current. Lake Superior State University.

Affiliate Faculty, 2021-current. Lake Superior State University Center for Freshwater Research and Education.

Associate Professor. 2012-2021. Lake Superior State University.

Assistant Professor. 2007-2012. Lake Superior State University.

Graduate Research Associate. 2003-2007. Oakland University.

Graduate Research Associate. 2001-2003. Wayne State University School of Medicine.

Graduate Teaching Assistant. 1999-2001. Michigan Technological University.

TEACHING EXPERIENCE

Lake Superior State University

BIOL105 Functions of the Human Body

BIOL121 Human Anatomy and Physiology I

BIOL122 Human Anatomy and Physiology II

BIOL199 Freshmen Seminar

BIOL223 Clinical Microbiology

BIOL299 Sophomore Seminar

BIOL300 Histotechniques

BIOL389 Internship in Biology

BIOL421 Advanced Cell and Molecular Biology

BIOL490 Senior Directed Study

BIOL495 Senior Project

CHEM353 Introductory Toxicology

HONR202 Current Topics in Molecular Biology

HONR401 Honors Thesis

INTD490 Senior Directed Study

Oakland University - Microbiology Labs

Michigan Technological University –Hematology, Clinical Lab Science, Mycology

CURRICULUM VITAE

Britton Ranson Olson, Ph.D.

HONORS

Student Government Leadership Award nominee, Advisor of the Year 2017, 2020
Student Government Leadership Award nominee, Professor of the Year 2020
Distinguished Teacher Award nominee. Lake Superior State University. 2011, 2013, 2014, 2015, 2023
Recipient of the Excellence in Academic Advising Award for leadership and dedication to the students, awarded by the faculty and staff of Lake Superior State University. 2015
Golden Anchor Award for faculty making a difference in student's lives. Lake Superior State University. 2009, 2013 & 2014

PUBLICATIONS & PRESENTATIONS

*Severance, Taylor, R., Ranson-Olson, Britton, D., and Kristina J. Olson-Pupek. 2019. Stress Level Related to Acetaminophen Usage in Social Conformity. Oral presentation. Michigan Undergraduate Psychology Research Conference, Calvin College.

Ranson-Olson B, and J Zeilstra-Ryalls. 2017. Investigation of the Effects of Perfluorinated chemicals using *Rhodobacter sphaeroides* as a Cell Model. American Society for Microbiology Microbe 2017, New Orleans, LA.

Technical presentation to EPA senior scientists, 2016. The potential of our model to serve as a broad model of PFAS toxicity reviewed by Gerald Ankley, U.S. EPA Environmental Effects Research Laboratory; Edward J Perkins, Senior Scientist (ST) Environmental networks and toxicology, US Army Engineer Research and Development Center; Dan Villeneuve, *U.S. EPA Mid-Continent Ecology Division (MED)*.

*Mulrone E, and B Ranson-Olson. 2015. Toxicity Mechanisms of Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) on *Rhodobacter sphaeroides*. Michigan branch of the American Society for Microbiology, Eastern Michigan University.

*Mulrone E^a, and B Ranson-Olson. 2014. Effects of Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) on *Rhodobacter sphaeroides* Enzyme Activity. Michigan branch of the American Society for Microbiology, Davenport University.

^a**winner best in-state undergraduate presentation**

Ranson-Olson B, and J Zeilstra-Ryalls. 2013. Identification and application of a bacterial model for toxicity studies of perfluorooctanoic acid and perfluorooctane sulfonic Acid. 113th General Meeting American Society for Microbiology, Denver, CO.

Ranson-Olson B, Zeilstra-Ryalls JH. 2008. Regulation of the *Rhodobacter sphaeroides* 2.4.1 *hemA* gene by PrrA and FnrL. *Journal of Bacteriology*. 190(20):6769-6778.

Ranson-Olson B, Jones D, Donohue T, and J Zeilstra-Ryalls. 2006. *In vitro* and *in vivo* analysis of the role of PrrA in *Rhodobacter sphaeroides* 2.4.1. *hemA* gene expression. *Journal of Bacteriology*. 188(9):3208-18.

Ranson-Olson B, and J Zeilstra-Ryalls. 2006. Resolving the roles of FnrL and PrrA in transcription of the *Rhodobacter sphaeroides* 2.4.1 *hemA* gene. 106th General Meeting American Society for Microbiology, Orlando, FL.

Ranson B, and J Zeilstra-Ryalls. 2005. New Insights into *Rhodobacter sphaeroides* 2.4.1 Expression: Regulation by PrrA. 105th General Meeting American Society for Microbiology, Atlanta, GA.

* *LSSU Undergraduate Student*

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GRANTS and MONIES AWARDED

- Natural Resources Canada. MultiPartner Oil Research Initiative. International Consortium of Oil Research - Our Waters of the North (ICOR-OWN). Lake Superior State University \$2.9 million. 2023
- Michigan Invasive Species Grant Program (MISGP). 'Experimentally advancing our scientific understanding of Rock Snot, *Didymosphenia geminata*.' Ashley Moerke PI, Robert Pillsbury, co-PI, Britt Ranson Olson co-PI. \$62,600. 2023
- Collaborator on Bowling Green State University Building Strength Grant Award, 'Preliminary Studies of Health Effects of Per- and Polyfluoroalkyl Substances (PFAS)'. Combined efforts from myself and collaborators at BGSU to purchase multiple strains of human microbiome bacteria. These specimens will be used in the LSSU and BGSU laboratories for generating data and work towards future grant proposals and publications. Project award \$10,000; LSSU match \$500. 2020
- Fund for LSSU 'Development of a Biologically Based Screening Method for Perfluorinated Chemicals and Other Contaminants of Emerging Concern'. \$1,154. 2017
- Collaborator on Bowling Green State University Building Strength Grant Award, 'Determining the genetic basis of perfluorinated carbon compound (PFC) toxicity.' Combined efforts from myself and collaborators at BGSU to fund whole genome sequencing of mutant strains isolated in the LSSU laboratories. This data will be used in future grant proposals and publications. Project award \$10,000; LSSU match \$500. 2017
- Funding Innovations in Teaching Award. LSSU. 'Developing an Institutional Test Prep Course'. \$639. 2014
- National Association of Advisors for the Health Professions travel grant. \$1000. 2014
- Modulus Single Tube Luminometer Instrument Grant. Turner Biosystems. Principle Investigator. \$9,500. 2009
- LSSU Issues and Intellect: facility fees as LSSU hosts the American Society for Microbiology Michigan branch conference entitled 'Microbiology of the Great Lakes'. \$400. 2009
- Student Travel Grant. Oakland University. 2006
- Corporate Activities Program Student Travel Grant. American Society for Microbiology Michigan. 2005
- Graduate Research Associate Grant. Wayne State University School of Medicine, Dept of Pathology. 2001-2003
- Board of Trustees Academic Achievement Scholarship. Lake Superior State University. 1994-1999

STUDENT SUPPORT

- US Coast Guard Cadet Summer 2023 Research Experience. U.S. Coast Guard Great Lakes Oil Spill Center of Expertise (GLCOE). Faculty research advisor to Rylie Brick. \$10,000 project contract.
- 'Tumor Effect of Plant Cell Glycolysis.' **Undergraduate Research Award**. Thesis advisor to student: Naomi Astorga. **\$379**. 2023
- 'The Effects of Diaphragmatic Breathing on Melatonin and Sleep Among Collegiate Student-Athletes.' **Undergraduate Research Award**. Thesis advisor to student: Mackenzie Kalchik. **\$477.91**. 2021
- 'Social networking: social media vs. video chatting and stress response in young adults.' **Undergraduate Research Award**. Thesis advisor to student: Brianna Regan. **\$255**. 2020
- 'The Effect of PFAS on Endogenous Gut Flora'. **Undergraduate Research Award**. Thesis advisor to student Carlie Weaver. **\$500**. 2020
- 'Effectiveness of Homeopathic Remedies and Synergistic Combination Therapies on Bacteria Compared to Antibiotics'. Abigale Edmonds. 2020
- 'Perfluoroalkyl substances (PFAS) and their effect on gut microbiota associated with liver disease'. Angelina Stout. 2020
- 'The Effects of Wim Hof Breathing Without Cold Exposure on Stress, Memory Function, and

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- Concentration'. Sam Cornett. 2020
- 'Effects of essential oils and standard antibiotic efficacy against *Escherichia coli*.' Abigail Woods. 2019
- 'Use of *Rhodobacter sphaeroides* as a model of animal toxicity by testing PFOA's and PFOS's effect on ATP production'. Nicholas Hansen. 2019
- 'Stress Level Related to Acetaminophen Usage in Social Conformity.' **Undergraduate Research Award.** Thesis advisor to student: Taylor Severance. **\$500.** 2018
- 'The Effects of PFASs on the Development and Mitochondrial Function of Zebrafish Ova.' Undergraduate Research Award. Thesis advisor to student: Renee Resendes*. \$318.35. 2018
***winner best indoor thesis project, LSSU Department of Biology**
- 'Assessment of recovery after scheduled time off to hospital employees working night shift.' **Undergraduate Research Award.** Faculty advisor to student: McKenna Blyly. **\$500.** 2018
- 'The Effects of Music Genre and Use of Headphones on Cortisol Levels'. Kaycie Overmyer. 2017
- 'Effects of Cortisol Levels on Gamma Brain Waves'. Sarah Crawford. 2016
- 'The effect of yoga on cortisol and melatonin levels on student athletes at LSSU'. **Undergraduate Research Award.** Faculty advisor to student: Emily Estep*. **\$500.** 2016
***winner best indoor thesis project, LSSU Department of Biology**
- 'Anxiety Levels in NCAA Student Athletes vs. Student Non-Athletes'. Halley Borseth. 2015
- 'The Acute Effects of Range of Motion on Individuals with Neuromuscular or Skeletal Impairments'. Shana Sherbutt. 2015
- 'Toxicity mechanisms of Perfluorooctanoic Acid (PFOA) and perfluorooctane sulfonic acid (PFOS) on *Rhodobacter sphaeroides*'. **Undergraduate Research Award.** Faculty advisor to student: Erin Mulroney. **\$500.** 2015
- 'Prevalence and Antibacterial Resistance of Bacterial Isolates in Powdered Infant Formula'. Brittany Litchard. 2014
- 'Population Dynamics of Oral Normal Flora in the Presence of Lagers and Ales'. Tabitha Hines. 2014
- 'Effect of Natural Sleep Aids on Melatonin Levels'. Michael Pointe. 2014
- 'Effects of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) on *Rhodobacter sphaeroides* genes and enzyme activity'. **Undergraduate Research Award.** Faculty advisor to student: Erin Mulroney. **\$500.** 2013
- 'Effects of (LED)-backlit E-book lighting on alpha brain wave frequencies, melatonin production, and sleep quality in college students'. **Undergraduate Research Award.** Faculty advisor to student: Haleigh Edgar. **\$300.** 2013
- 'Iron concentration and availability in human breast milk and baby formula and its effect on bacterial growth. Cassy Schemberger. 2012
- 'Fluoride content as a measure of water quality'. Brittany Cousino. 2012
- 'The Production of Poly(3-hydroxybutyrate) in *Rhodobacter Sphaeroides* Under Ultraviolet Light and Starvation Inducement.' Kathryn Mulka. 2012
- 'Population dynamics of bacteria that cause periodontal disease'. Megan Scott. 2012
- 'Effects of various cooking spices on fungal growth'. Glen Galle*. 2012
***winner best indoor thesis project, LSSU Department of Biology**
- 'The Effect of Protective Agents on Ultraviolet (UV) Light Depletion of Bacteria'. Kathryn Mulka. 2012
- 'Green Tea and Its Inhibitory Effects on *Streptococcus mutans* in the Human Mouth'. Nick Barbon. 2012
- 'A multivariate approach to finding the optimum conditions to grow the yeast form of *Blastomyces dermatitidis*.' Assisting Elaina Murray. 2012.
- 'Designing a method to detect the presence of *Shigella* spp. in recreational waters'. Louisa Munro. 2011
- 'Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid's (PFOA) mechanism of toxicity to the *cbb3*-cytochrome in *Rhodobacter sphaeroides*. Corey Dooley-Pfeiffer. 2011
- 'Green Tea Effects on *Streptococcus mutans* in the Human Mouth'. Nick Barbon. 2011
- 'Antimicrobial Effects of Natural Remedies on Animal Ear Infections'. Stephanie Plummer. 2011

CURRICULUM VITAE

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PROFESSIONAL SERVICE

UNIVERSITY

LSSU Pre-Professional Advisory Committee Chair (2013-present)

Faculty advisor to the LSSU Pre-Professional Society student organization (2015-present)

LSSU institutional coordinator for the following programs;

Michigan State University College of Human Medicine Early Assurance Program (2015-present)

Mid-Michigan Community College Radiology Program (2011-present)

LSSU/Bay College/MSU EAP articulation program (2015-present)

LSSU institutional coordinator for the Michigan State University College of Human Medicine annual 'Your Health Lecture Series' LSSU campus events, roundtable student discussions, and continuing medical education (CME) event at War Memorial Hospital (2013-present)

LSSU Sabbatical Committee, School of Science and Medicine representative (2018-2020)

LSSU Excellence in Academic Advising Selection Committee member (2019)

LSSU University Policies and Procedures (2011-2017 upon its dissolution)

LSSU HS-IRB committee member (2010-2013)

DEPARTMENTAL

Pre-Professional Advisory committee member (2008-12)

Website committee member (2010 until its dissolve)

Biomedical program development (2012-2014)

Biology, Geology, and Nursing faculty search committees (2008, 2009, 2011, 2015)

Medical laboratory science committee (2011)

Research seminar committee (2008-present)

Alumni committee (2008-2012)

Microscope committee (2009-present)

Outreach. Molecular Biology Day for Sault Area High School students (20013, 2014, 2016, 2019, 2023), Coordinator of the annual 'Your Health Lecture Series' publically attended (2013-present), Higher Orbits, LSSU campus (2022), Explorations in Healthcare Camp (2015, 2016), St. Mary's School visits and science fair (2014, 2015), implemented ASM K-12 Education and Outreach funds to the LSSU Upward Bound Program, Sault Area High School, Algoma District schools, and Brimley Community College (2009), LSSU Biomedical Camp (2008-2012)

AFFILIATIONS

Michigan Branch American Society for Microbiology board member-at-large

American Society for Microbiology member

Michigan Advisors for the Health Profession member

National Association of Advisors for the Health Professions member