Honors College Undergraduate Research Showcase

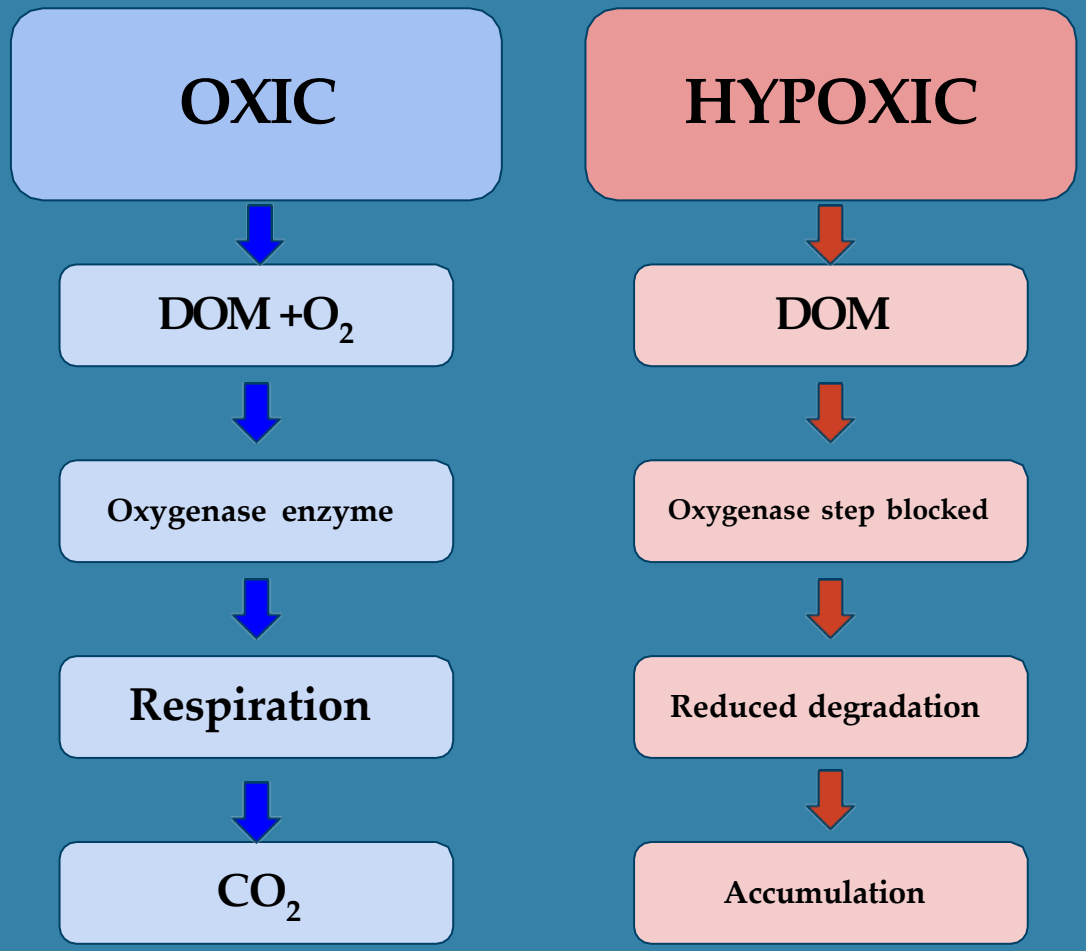
May 13, 2026

Oregon State University

Implications of Hypoxic Oxygen Concentrations on Microbial Respiration

Kayla Stanley
Mentor: Stephen Giovannoni
Major: Chemistry and Environmental Science

How does Low Oxygen Affect Carbon Degradation?



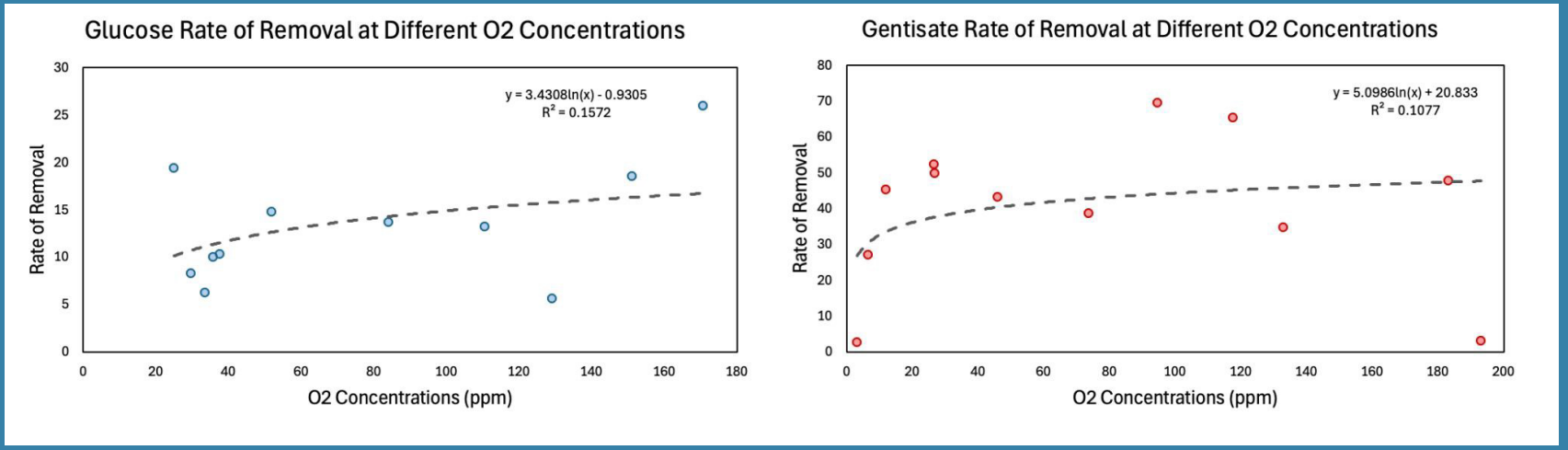
- Some carbon compounds require oxygen-dependent enzymes
- Under hypoxia, these pathways slow down
- Certain compounds accumulate

LDOM: Continues respiration under hypoxia

ODDOM: Reduced degradation under hypoxia

Testing Microbial Respiration Across Oxygen Gradients

- LDOM compounds respired efficiently at low oxygen
- ODDOM compounds showed reduced respiration under hypoxia



Why does this matter?

Implications:

- Ocean hypoxia is increasing globally
- Oxygen limitation may alter carbon storage
- Microbial metabolism influences climate feedbacks

Why I chose this project:

- Intersects chemistry + environmental science
- Combines microbiology, biogeochemistry, and climate science

Ava Loge
Animal Sciences
Fisheries, Wildlife, and Conservation Sciences

Under the mentorship of Dr. Lorien Reynolds
May 2026

Environmental Sustainability Through a One Health Perspective

A Proposed Veterinary School Class

Why Veterinary Sustainability Matters

- Veterinary care impacts the environment
- Environmental change increases disease risk
- One Health connects animals, people, and ecosystems

Informal Interviews and the OSU VTH

Theme across four interviewees:

There is high awareness of environmental sustainability issues, but low implementation.

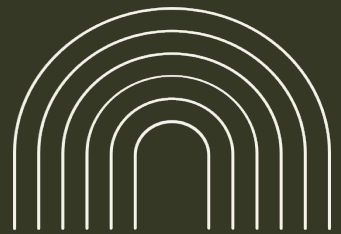
- Staff care about sustainability
- Few structured programs exist
- High volume hospital = high impact + high opportunity

Oregon State University
Carlson College of Veterinary Medicine

A New Course for a Healthier Future

- Teaches students to apply One Health and Veterinary Sustainability Goals
- Builds skills for real sustainability solutions
- Prepares future veterinarians to protect animals, people, and the planet

Thank you



Literature Cited

AAHA. (2025). One Health and HPAI H5N1: The role of veterinarians. American Animal Hospital Association.

American Veterinary Medical Association. (n.d.). One Health. https://www.avma.org.

Bardosh, K., de Vries, D., Stellmach, D., Abramowitz, S., Thorlie, A., Cremers, L., & Kinsman, J. (2022). Integrating a justice framework into One Health: Insights from the global South. BMJ Global Health, 7(3), e008418. https://doi.org/10.1136/bmjgh-2021-008418.

Bawden, R. (2021). Systems thinking and practice for action research. Educational Action Research, 29(1), 1–20.

Beechler, B. (2025). Personal communication.

Belshaw, Z. (2021). Sustainability in veterinary medicine. Topics in Companion Animal Medicine, 44, 100550. https://doi.org/10.1016/j.tcam.2021.100550.

Belshaw, Z., & Dean, R. S. (2023). Environmentally sustainable management practices support veterinary staff wellbeing. Veterinary Sciences, 10(2), 146. https://doi.org/10.3390/vetsci10020146.

Berchin, I. I., Ribeiro, J. M. P., & de Andrade Guerra, J. B. S. O. (2025). Enhancing veterinary education for sustainable development: Evaluating awareness and integrating One Health in higher education. In *The transformative power of higher education institutions in accelerating the implementation of the UN SDGs* (pp. 449–463). Springer Nature.

Bland, C. J., Starnaman, S., Wersal, L., Moorhead-Rosenberg, L., Zonia, S., & Henry, R. (2020). Curricular change in medical schools: How to succeed. Academic Medicine, 75(6), 575–594.

Burkhart, J. E., & Stobbe, T. J. (1990). Real-time measurement and control of waste anesthetic gases during veterinary surgeries. American Industrial Hygiene Association Journal, 51(12), 640–645. https://doi.org/10.1080/15298669091370284.

Carlson, C. J., Albery, G. F., Merow, C., Trisos, C. H., Zipfel, C. M., Eskew, E. A., Olival, K. J., Ross, N., & Bansal, S. (2022). Climate change increases cross-species viral transmission risk. Nature, 607, 555–562.

Centers for Disease Control and Prevention. (2025). About One Health. https://www.cdc.gov/onehealth.

Centers for Disease Control and Prevention. (2025). National One Health Framework to Address Zoonotic Diseases and Advance Public Health Preparedness. https://www.cdc.gov/onehealth.

Colorado State University College of Veterinary Medicine and Biomedical Sciences. (n.d.). Formalin-free anatomy initiative. https://vetmedbiosci.colostate.edu.

Gary R. Carlson College of Veterinary Medicine. (n.d.). About. Oregon State University. https://vetmed.oregonstate.edu.

Michigan State University College of Veterinary Medicine. (2023, November 21). Bringing One Health to life in the classroom: Course series gets a refresh. https://cvm.msu.edu.

Panico, R. (2025). Personal communication.

Purdue University College of Veterinary Medicine. (n.d.). About One Health. https://vet.purdue.edu.

Schiavone, S. C. M., Boller, M., Downend, A. B., & Rozanski, E. A. (2022). Environmental sustainability in veterinary medicine: An opportunity for teaching hospitals. Journal of Veterinary Medical Education, 49(2), 260–266.

Tornquist, S. (2025). Personal communication.

University of California, Davis School of Veterinary Medicine. (n.d.). Curriculum | Rx One Health. https://rxonehealth.vetmed.ucdavis.edu.

University of Pennsylvania School of Veterinary Medicine. (2025, February 10). Penn Vet launches new course One Health and Climate Change.

Vet Sustain. (2020). The veterinary sustainability goals. https://vetsustain.org/assets/downloads/VetSustain VeterinarySustainabilityGoals.pdf.

Vet Sustain. (2023). The Veterinary Carbon Calculator – Getting Started. https://vetsustain.org Vet Sustain. (2023b). Warren, K. (2025). Personal communication.

World Health Organization. (2023). One Health: Fact sheet. https://www.who.int/news room/fact-sheets/detail/one-health.

World Health Organization. (2023). Zoonoses: Managing public health risks. https://www.who.int.

World Organisation for Animal Health. (2025). One Health. https://www.woah.org/en/what-we-do/global-initiatives/one-health/.

World Organisation for Animal Health. (2025). One Health and zoonotic disease prevention.

Reproductive biology of vine mealybug, *Planococcus ficus* and effects of isolation and male presence on females: Adaptation Considerations

Fisheries and Wildlife and Conservation Sciences

SOPHIA REINDL[1], VAUGHN WALTON[2], ALEXANDER BUTCHER[3], KYOO PARK[4], ALEXIS SHOBE[5], OLIVIA EBERLE[6], FINN FISCHER[7]

Some Context

- **Mealybugs**: sap sucking pests in the order Hemiptera (aphids, stinkbugs, scale insects, etc)

- Pose several threats to vineyard owners:
  - Vector grapevine leafroll viruses
  - Secrete a substance called honeydew that is a substrate for sooty molds
  - Very small insect, so reaching them with insecticides can be problematic

- **Vine mealybug** (*Planococcus ficus*) is especially worrisome
  - Have more generations per growing season
  - High honeydew producers compared to other species
  - Vector
  - Were first discovered in Oregon in 2021
  - Currently not widespread in Oregon and are classified as a quarantine pest

Photo from progressivecrop.com

Photo from suterra.com

Mating Disruption

- **Mating disruption** is a management method that aims to directly target an organism's reproductive biology to prevent mating

  - Female mealybugs secrete an odorous plume called a sex pheromone that signals to the males that they are ready to mate

  - We can manufacture this exact sex pheromone and sell it to growers so they can apply it in their vineyards
    - Why?
      - Oversaturate the vineyard with the pheromone
      - Mask the signals being sent by the females

- **Important assumption**: vine mealybugs can only sexually reproduce
  - Asexual reproduction is seen in mealybugs (*Dysmicoccus brevipes* is capable of both!)

Research Questions: (1) Are female vine mealybugs capable of asexually reproducing via parthenogenesis when females are isolated from males? **(2)** Does isolation affect female size? **(3)** Does female size affect number of offspring and hatch rate?

Experimental Design

- 2 experiments were conducted

- Lab colony vine mealybugs were used: gathered their egg sacs (ovisacs) and dissected them under a lab microscope

- Transferred the eggs to 0.25-inch (experiment 1) or 0.125-inch (experiment 2) parafilm circles and glued the circles onto butternut squash with gelatin capsules
  - Eggs were placed in one of two groups: in isolation (**treatment**) or with other eggs in a group (**control**)

- Individuals were left to develop and grow up on the butternut squash in a growth chamber at a set temperature and humidity (25℃ and 78%RH)

- If a female reproduced, the ovisac she made was dissected and her offspring left to develop

Results and Significance

- **No females** produced an ovisac **without** the presence of a male
  - This suggests a lack of the ability to parthenogenetically reproduce even in a forcibly isolated environment

- Isolation had very opposite effects on female size depending on the experiment.
  - Experiment 1: larger females in **treatment**
  - Experiment 2: larger females in **control**

This suggests that in experiment 1 since there was less access to the squash (larger parafilm circle size), it was conducive to be in isolation because of reduced competition.

There appeared to be **no effect** of female size on fecundity or hatch rate, suggesting that being larger doesn't necessarily mean higher reproductive success. This may also lead to males not selecting females based on size.

Oregon State University

Neuroqueer Identity and Belonging in STEM

A Sociological Analysis of TikTok Discourse

Stephanie Mojica

B.S. Sociology, Honors College

School of Public Policy, College of Liberal Arts

Mentor: Dr. Sarah Oman, College of Engineering

COLLEGE OF ENGINEERING

Why this question

Neuroqueer means neurodivergent and LGBTQIA+. People who hold both identities show up across STEM, but the engineering education literature on this intersection is thin.

Meanwhile, neuroqueer creators on TikTok talk about their STEM lives all the time. They name what works, what hurts, and what could change.

Research question:

How do neuroqueer creators describe their STEM experiences on TikTok, and what can a sociological reading tell us about belonging in those spaces?

How I studied it

Qualitative content analysis of 20 public TikTok videos by self-identified neurodivergent and LGBTQIA+ creators discussing STEM coursework or work.

Coding: Directed analysis using a 56-code neurodivergent TikTok codebook (Cuellar et al., 2023), extended with codes for queer-STEM dynamics such as disclosure trade-offs and queer-inclusive scientific metaphors.

Two passes: a priori codes (masking, executive function, grading, advocacy, redefining success), then axial categories (barriers; identity work; agency).

Trustworthiness: analytic memos, reflexive positionality, and triangulation with engineering education research on LGBTQIA+ climate and neurodiversity.

What I found: five themes

1. Expanding the language of identity. Creators introduce terms like neurogender and autigender. As C5 puts it, “The Venn diagram is a circle.”

2. Resistance to pathology. Creators reject deficit framings and the “gifted” label that rewards masking while ignoring its cost.

3. Reimagining pedagogy. Ungrading and contract grading; queer-inclusive metaphors (cis/trans alkenes; wave-particle duality as an opening for nonbinary identity).

4. Intersectional and structural barriers. Race, class, and disability stack with queerness; therapy alone cannot fix what grading regimes and lab norms produce.

5. Community and visibility. TikTok works as a counter-public: shared scripts, peer mentorship, and validation that institutions have not built.

Why it matters & Thank you

Belonging is a property of design, not a side effect of kindness.

What instructors and departments can do now:

Move toward feedback-first assessment. Build identity-affirming examples into course content. Make mentorship visible. Treat access as a design obligation across the department, not an exception granted to individuals.

Thanks to:

Dr. Sarah Oman, mentor (College of Engineering)
Committee: Dr. Katherine Hubler & Dr. Dwaine Plaza
Dr. Bori Csillag, who gave me my first TA position at OSU
The OSU Honors College, and the creators whose work shaped this study

College of Engineering, College of Veterinary Medicine, College of Science

ENGINEERING NEURONAL CELL LINES CAPABLE OF ENDOGENOUS FLUORESCENT RESPONSES AND OPTOGENETIC EXCITABILITY

Renata Hemstreet, H.B.S. Bioengineering

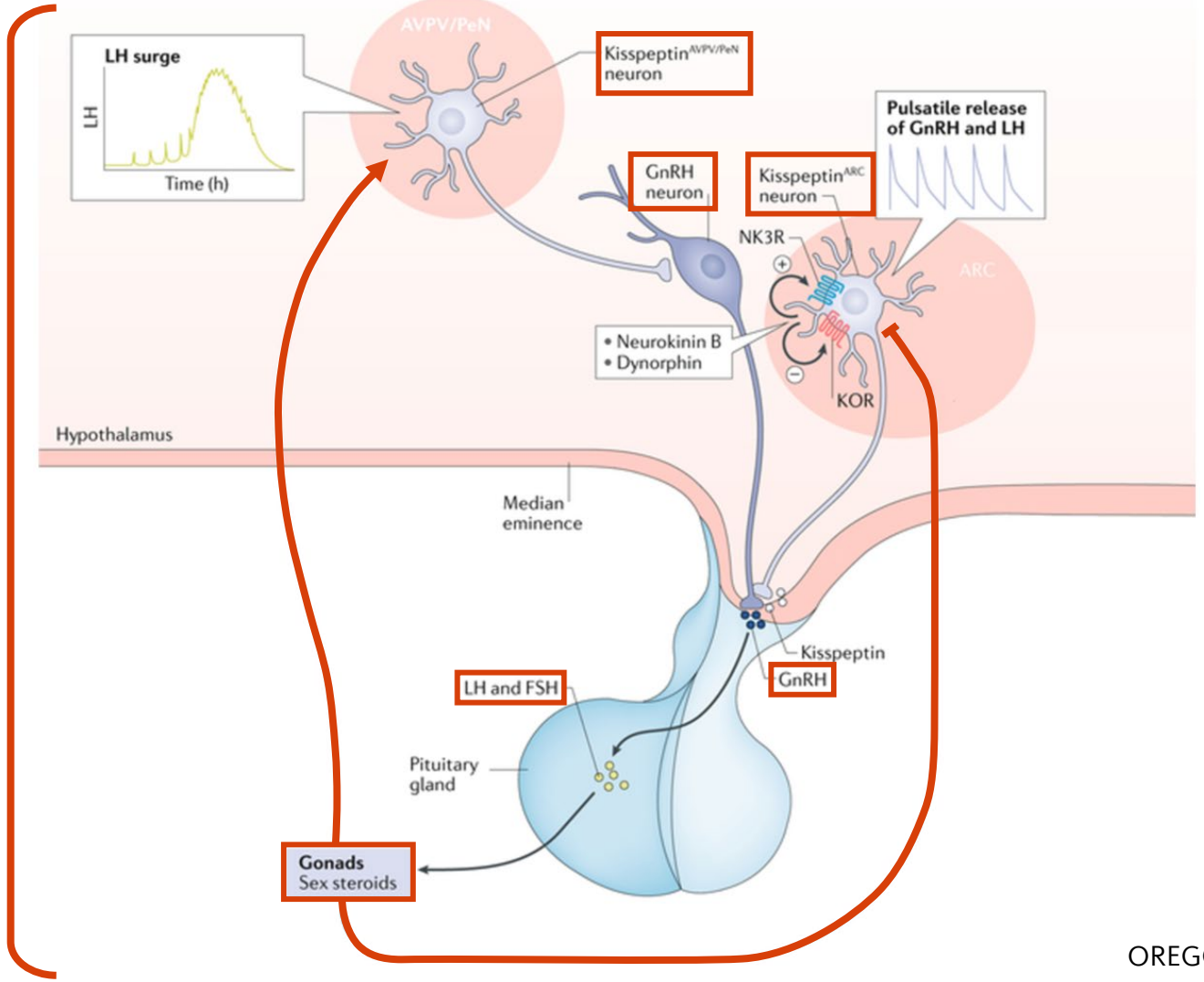
Honors College Spring Undergraduate Research Showcase, May 13th 2026

PI: Dr. Patrick Chappell

Oregon State University

NEUROENDOCRINE CONTROL OF REPRODUCTION

HPG Axis



STUDY OBJECTIVES

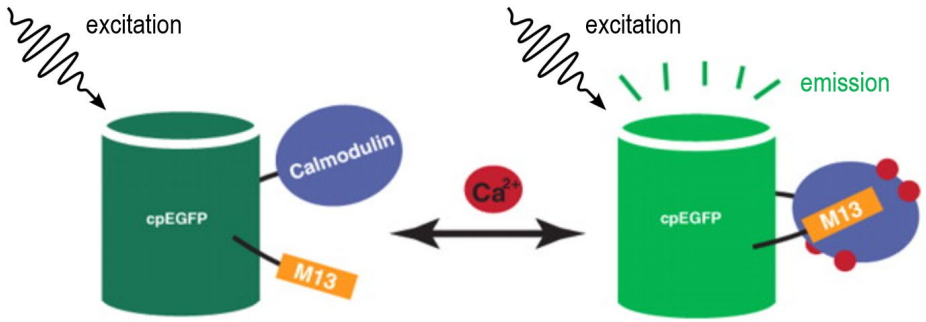
1

Remove reliance on synthetic calcium indicators

2

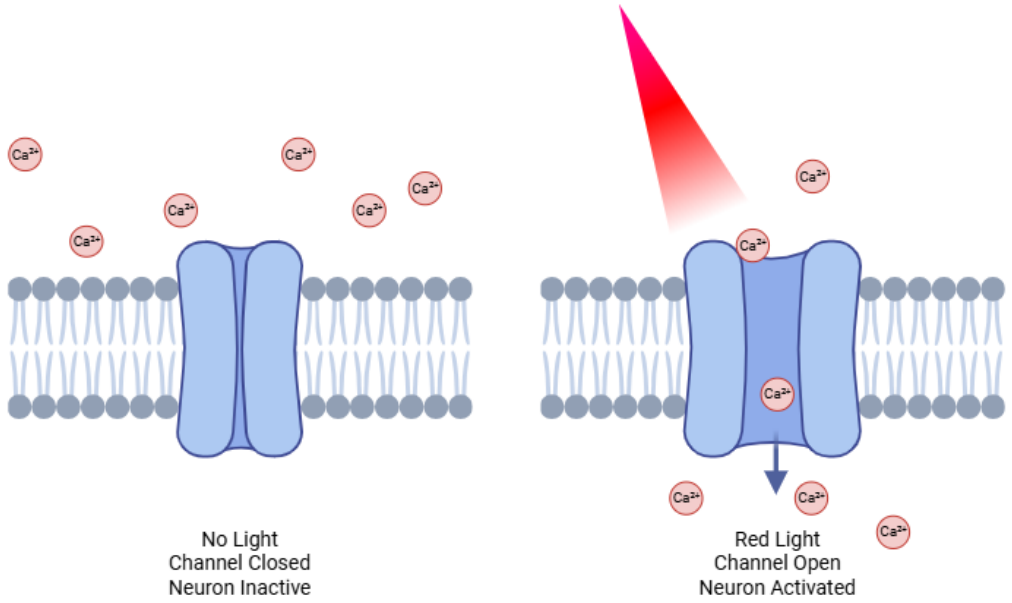
Introduce a non-ATP dependent method of neuron excitation

GENETIC ENGINEERING



Genetically Encoded Calcium Indicator

GCaMP6s



Optogenetic Channelrhodopsin

ReaChR

RESULTS AND CONCLUSION

- Successful genetic engineering with GCaMP6s and ReaChR
- ReaChR characterization shows promise
- GCaMP6s must be abandoned
- Moving forward…
  - Simultaneous genetic incorporation
  - In vivo applications

Oregon State University

Teaching Finite State Machines to First-Year Engineering Students

Tyler Henderson – Electrical and Computer Engineering

Dr. Jennifer Parham-Mocello

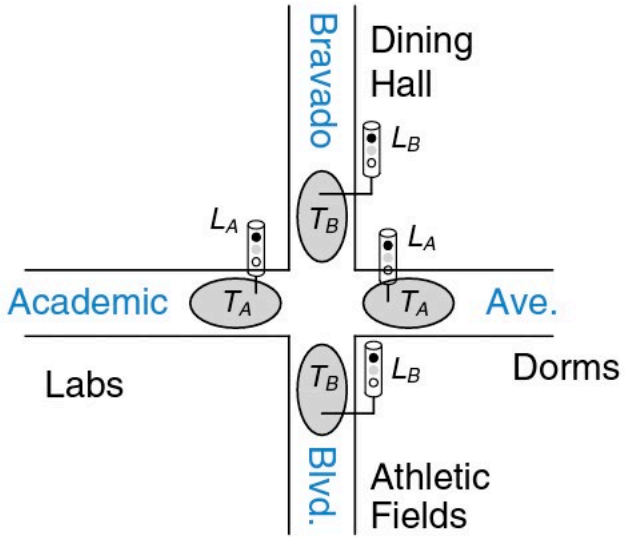
COLLEGE OF ENGINEERING

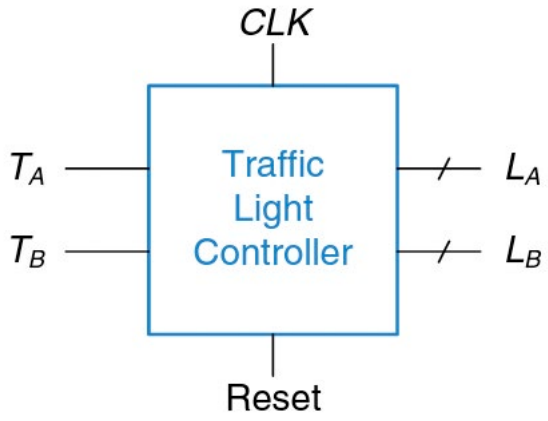
Background

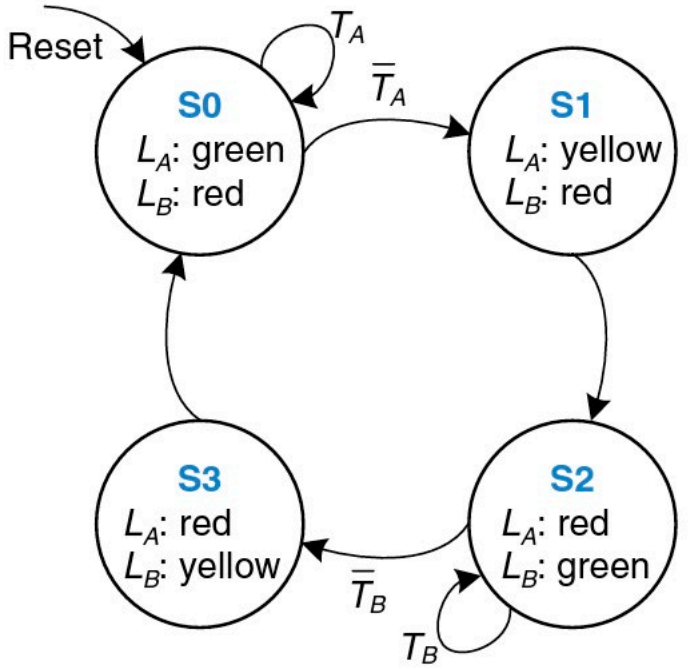
- Teaching background began in high school
- Always loved tutoring others in mathematics
- Wondered how to improve student's perceptions about the subject
- "Finite State Machines" are introduced late in ECE/CS curriculums
- Wondered if introducing them sooner would benefit engineering students' experiences, as well as EECS

Oregon State University
College of Engineering

What are Finite State Machines?



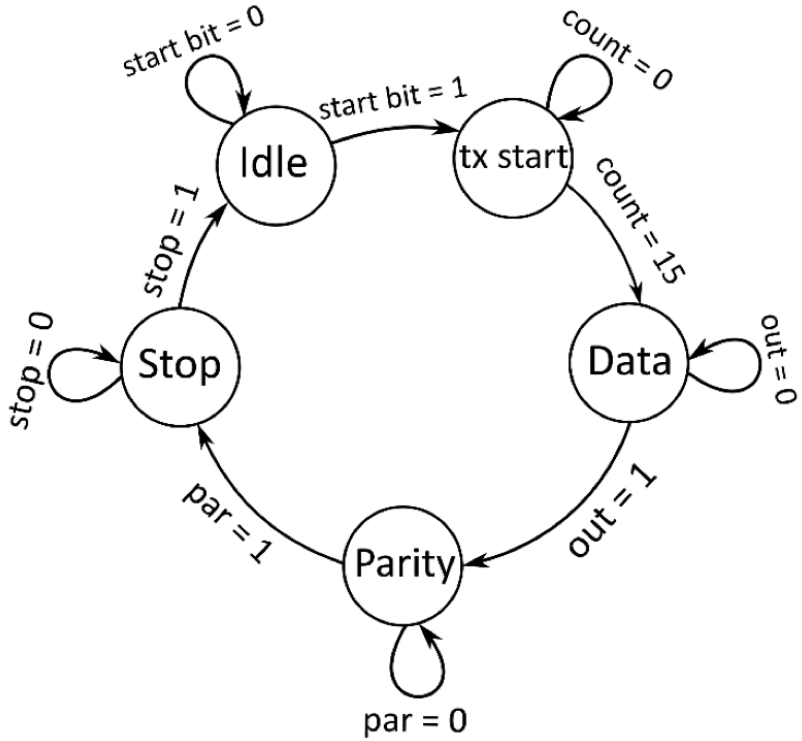




[1] S. Harris and D. Harris, Chapter 3.4 - Finite State Machines. Elsevier Science Technology, 2012, vol. 2, pp. 123–141. [Online]. Available: https://ebookcentral.proquest.com/lib/osu/reader.action?c=UERGdocID=980017ppg=10

Oregon State University
College of Engineering

FSM's



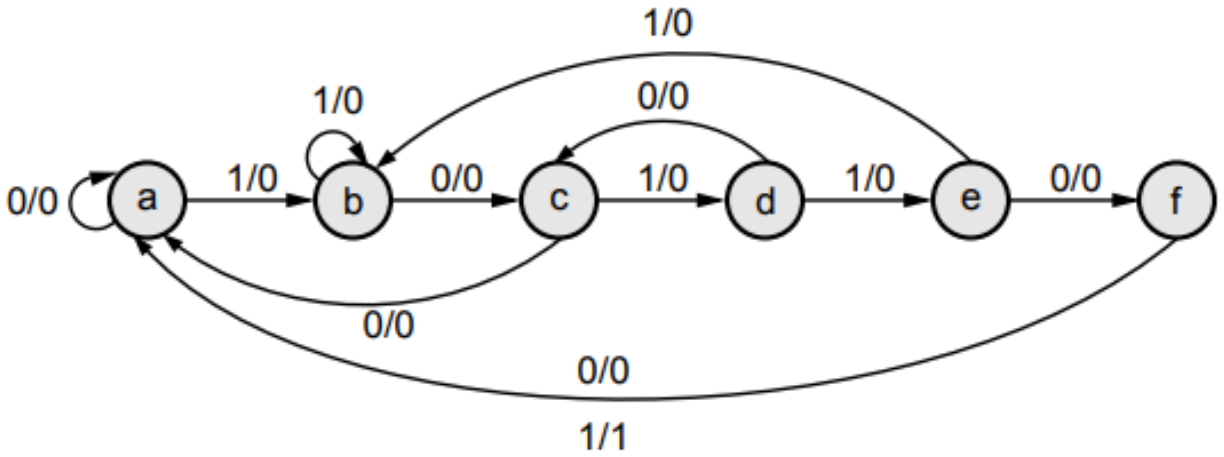


Fig. 5.10.15

[2] (PDF) design and implementation of power-efficient FSM based UART, https://www.researchgate.net/publication/357763146_Design_and_Implementation_of_Power-Efficient_FSM_based_UART (accessed May 12, 2026).

[3] "Sequence detector - analysis and design of synchronous Sequential Circuits," EEE Department, https://eee.poriyaan.in/topic/sequence-detector-11655/ (accessed May 12, 2026).

Oregon State University
College of Engineering

Research Questions

1. How do you introduce Finite State Machines to students who are not in a programming or digital logic class?

2. What do students think about learning Finite State Machines in a non-programming/digital logic class?

Oregon State University
College of Engineering

How I addressed these research questions

1

Development of the curriculum, how they rank the examples we used, etc.

2

Analysis of survey questions – both open ended, Likert-scale, and simple Yes/No.

Oregon State University
College of Engineering

Thank You!

Benthic macroinvertebrates as bioindicators of microplastic pollution in freshwater ponds across Californian grasslands

Cori Floum

College of Earth, Ocean, and Atmospheric Sciences

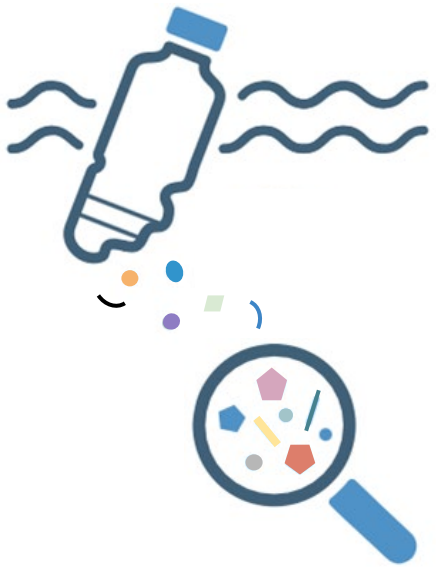
Primary Advisor: Stacey Harper

May 13, 2026

Background: Microplastics & BMI Bioindicators

Microplastics (MPs): petroleum-based moldable polymers between 1µm and 5mm in size

Benthic macroinvertebrates (BMIs): spineless, macroscopic, bottom-dwelling animals (>500µm)



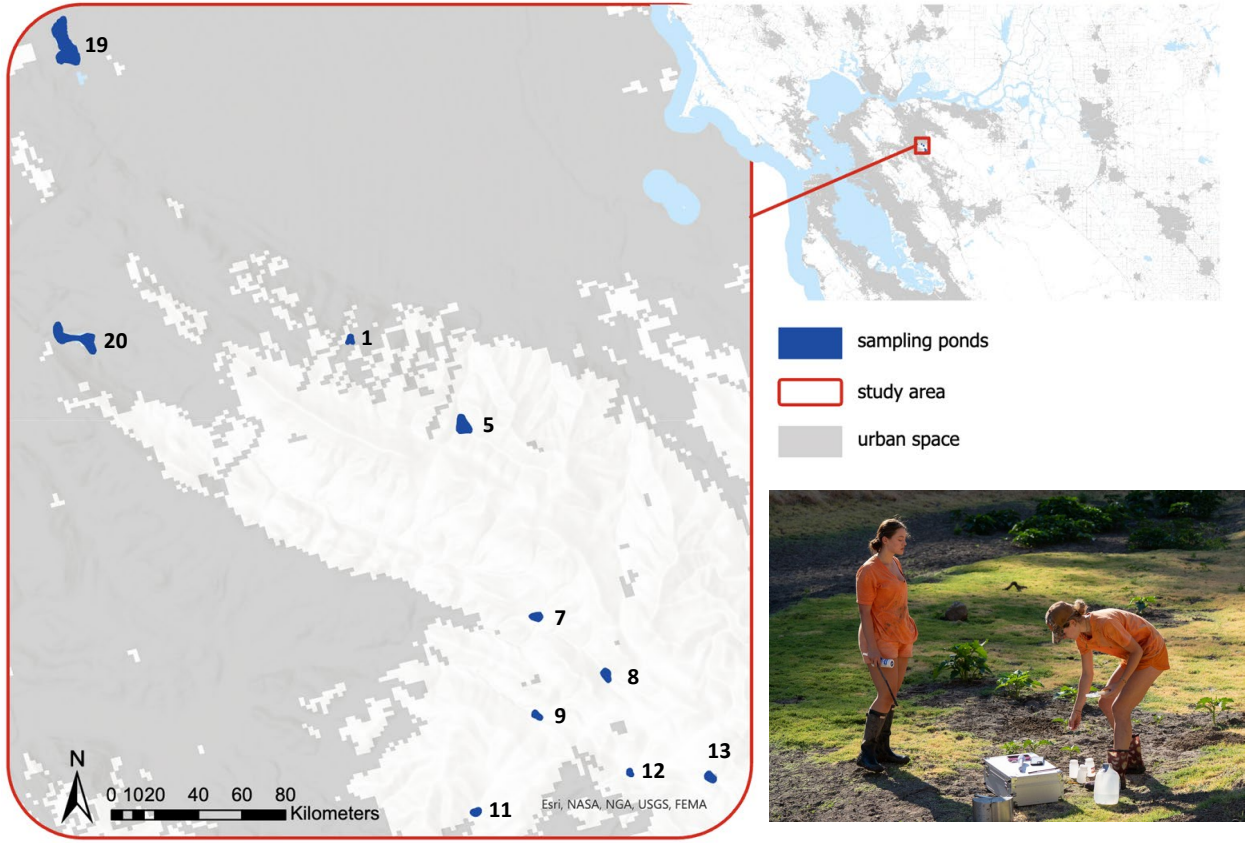
Leach toxic additives such as BPA and other bisphenols, styrene, dioxins, phthalates, perfluorinated compounds, heavy metals, and more.

Highly sensitive bioindicators of ecological stress

Critical role in terrestrial and aquatic food chains

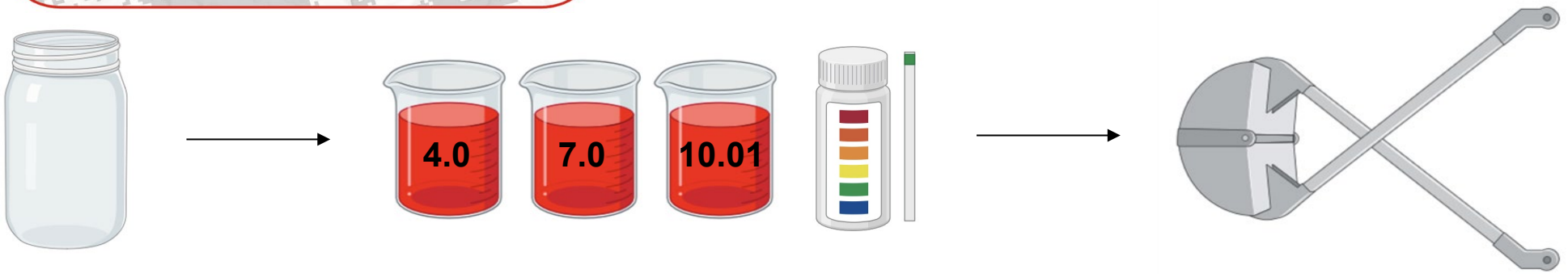
Research Question: Does microplastic pollution significantly impact benthic macroinvertebrate abundance and diversity in freshwater ponds in the Walnut Creek open space?

Methodology: Sample Collection

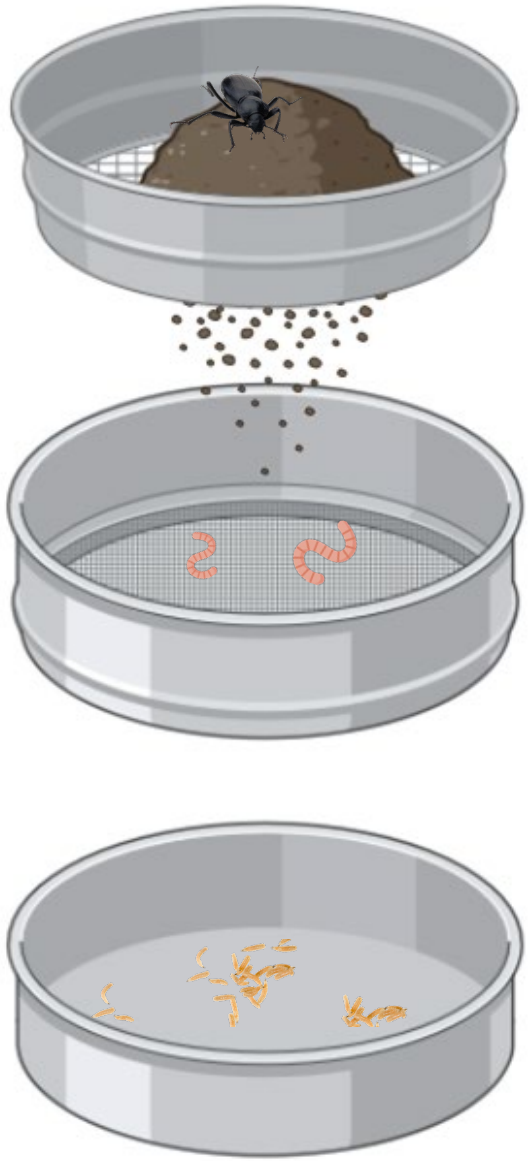


- 10 ponds, 3 sampling locations at each: 5’’ in depth
- Pond water grab samples in MAG-washed and furnaced (723.15 ° K) mason jars
- Same 17 water quality parameters measured again on sampling date
- Petersen grab used to collect 3L of sediment at each sampling location

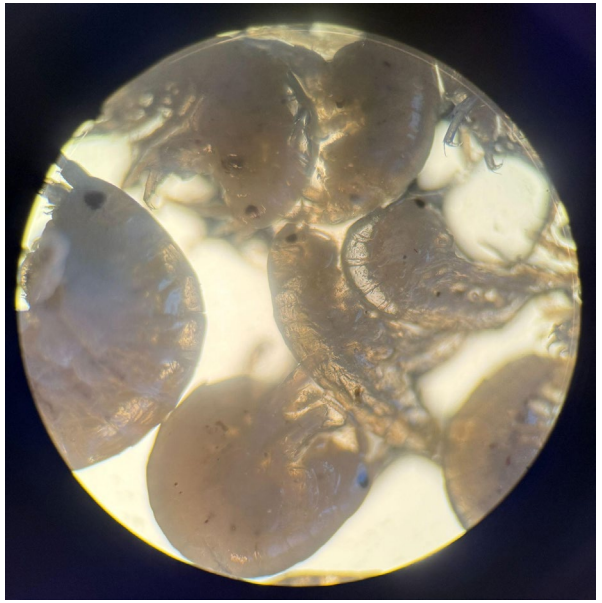
3 field blanks for atmospheric fallout



Methodology: BMI Analysis



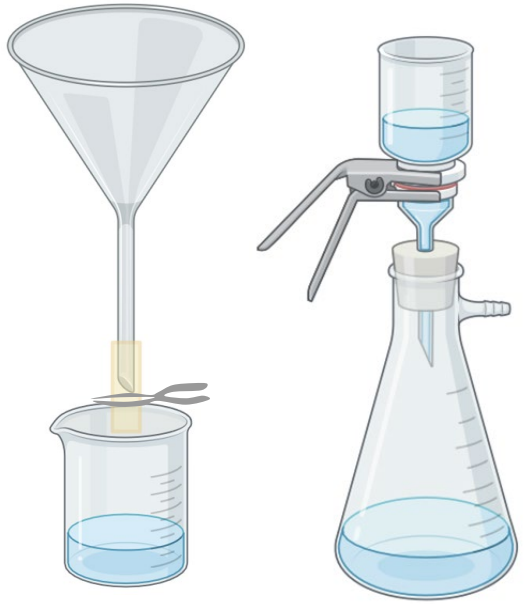
- Washed through system of sieves (smallest: 500µm)
- Stored in 70% ethanol
- Identified under compound microscope

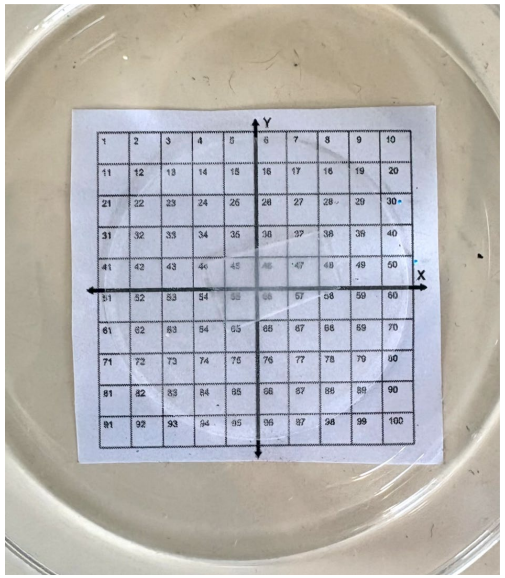


Methodology: Laboratory Processing & Microplastic Analysis

1. Homogenization and measuring out to 370 ml
2. Spiking with 3 types of surrogate plastics
3. NaBr density separation
4. Vacuum filtration through 20µm polycarbonate track-etched filters

3 processing blanks filled with MAG water

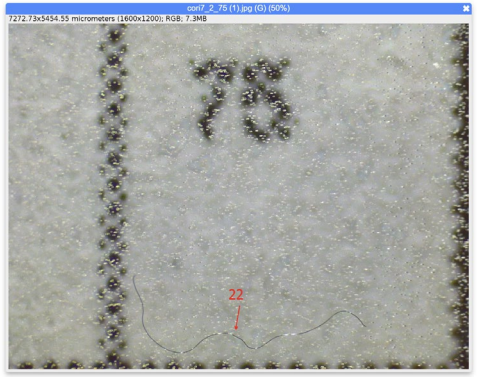




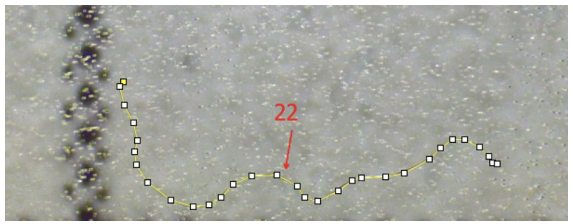
- Imaging blanks for each sample imaged without a laminar flow hood

LAS EZ

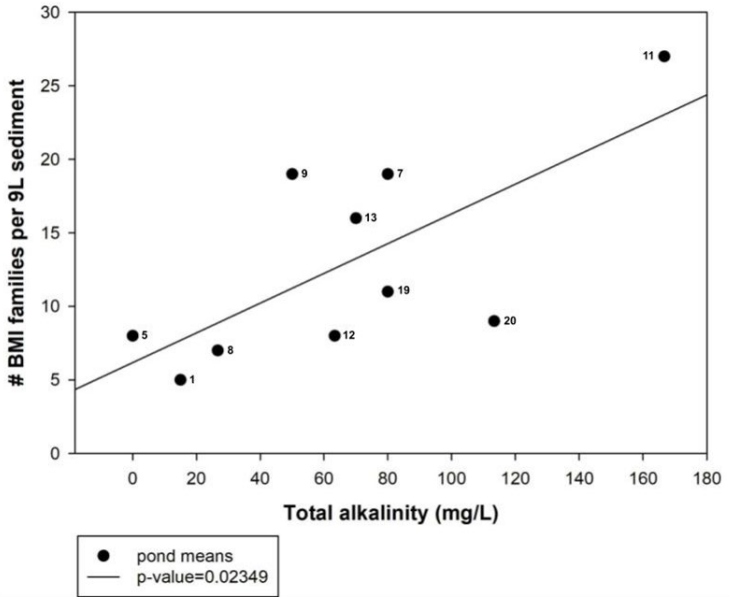
CellSens

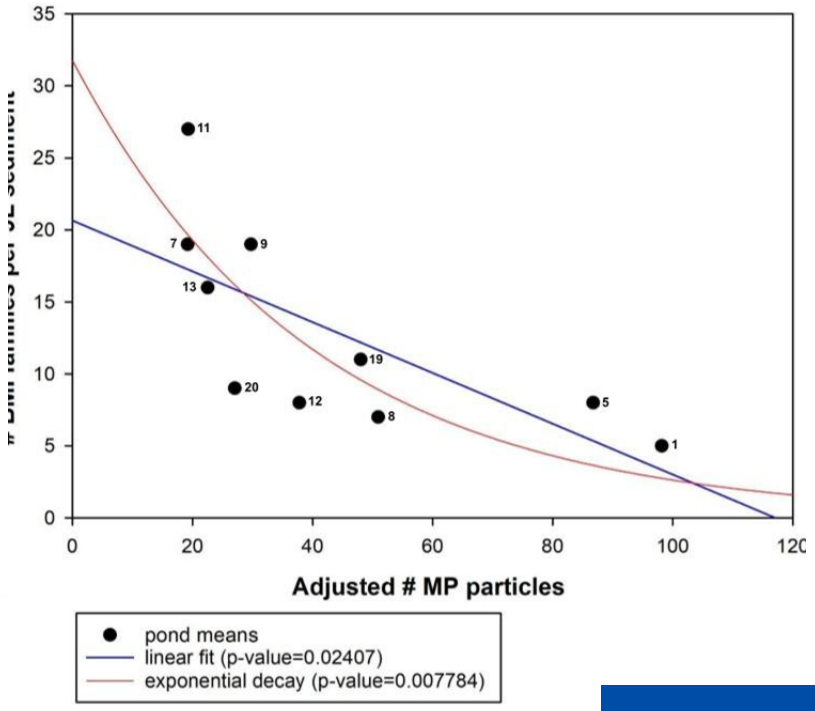


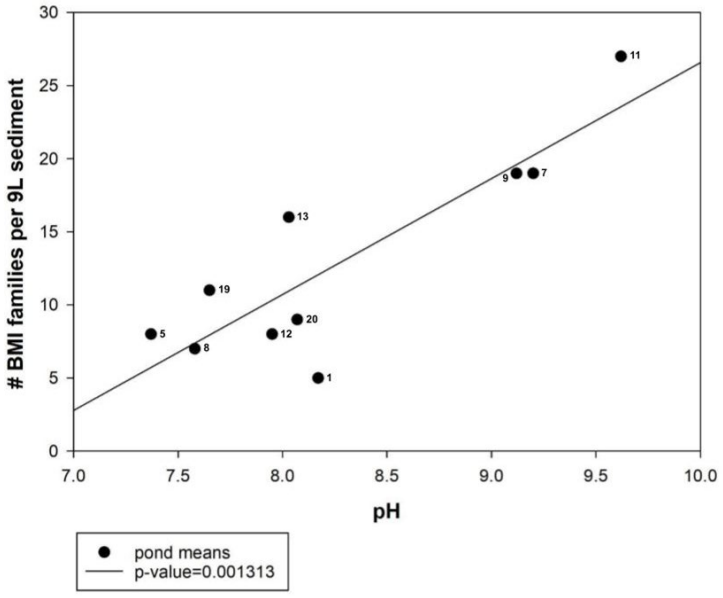
ImageJ
Image Processing & Analysis in Java

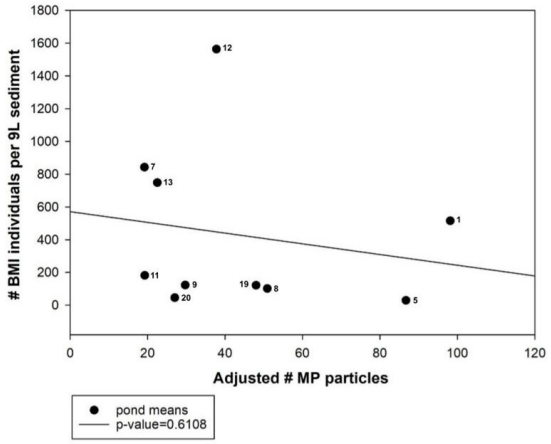


Results, Limitations, & Discussion







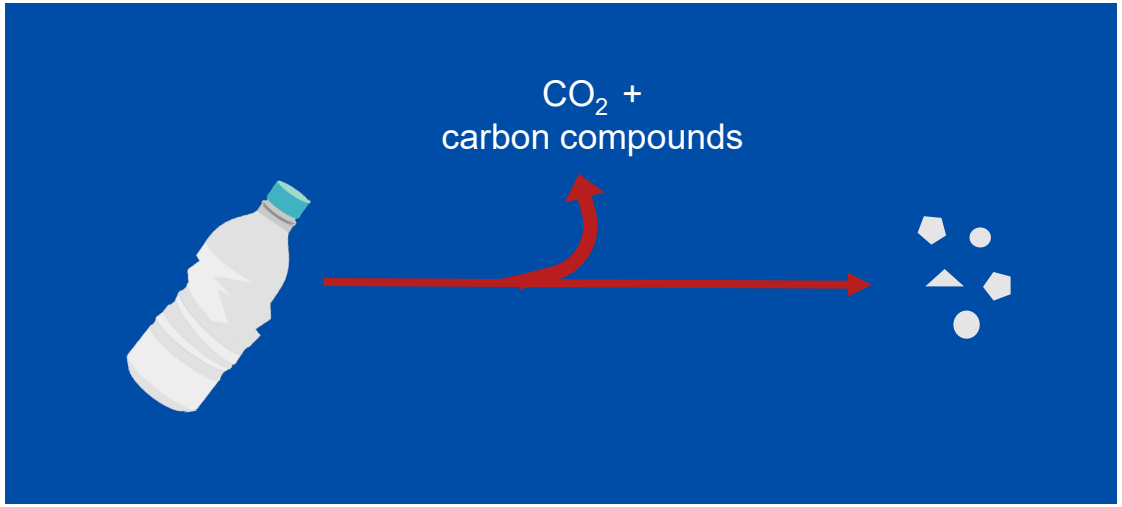


★ pH and alkalinity as potential confounding variables

★ BMI abundance & MP counts: no significant relationship

★ BMI diversity & MP counts: significant exponential decay

FTIR would provide a more comprehensive understanding of particle composition



Cooling System Design of a Formula Style Vehicle

A Project by: Cole Teffeteller

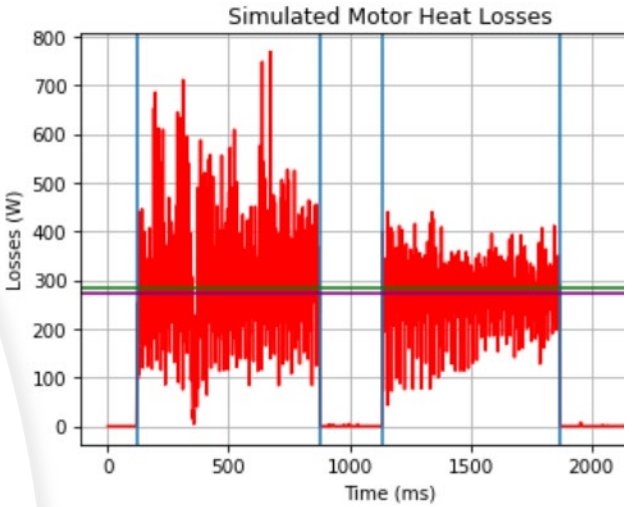
Mentors: Dr. Joseph Piacenza
Benjamin Smucker
Jacob Rocha

Project Goals

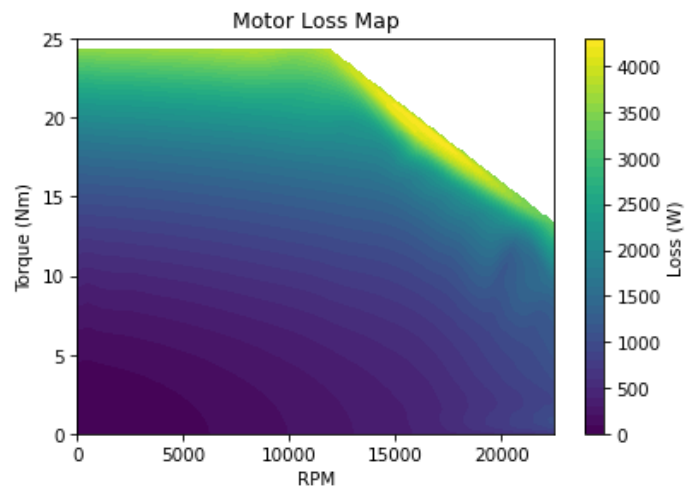
- Global Formula Racing (GFR) Team Goals
  - Win FSAE Michigan by 100+ points
  - Place top 10 in Europe
- Overall Vehicle Goals
  - Reduce weight by 20 kg
  - Incremental performance improvement
- Cooling System Goals
  1. Keep motors at or below 90 C
  2. Reduce weight or minimize necessary weight increases
  3. Reduce aerodynamic losses to improve vehicle performance

Testing and Calculation

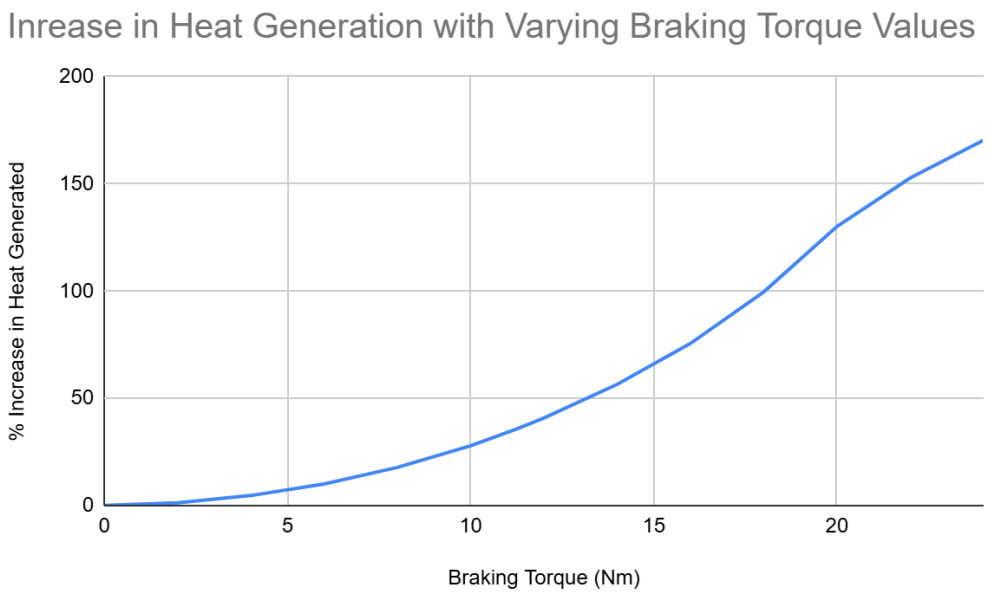
- Physical Tests
  - Pressure and flowrate to find water flow
  - Fan tests for measuring radiator resistance
- Estimate Heat Generation
  - Data based and theoretical methods used.
  - Maximum value used for increased safety & reliability.



Simulated Motor Losses During an Endurance Event



Motor Heat Generation vs RPM and Torque

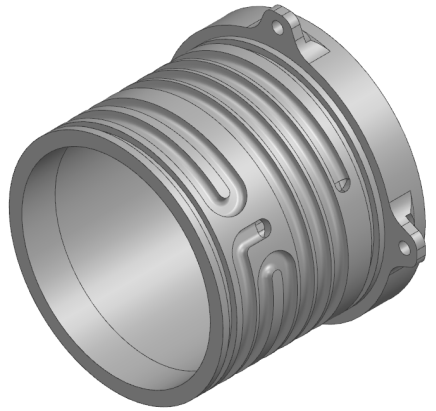


Analyzing Braking Strength vs Heat Generation Increase

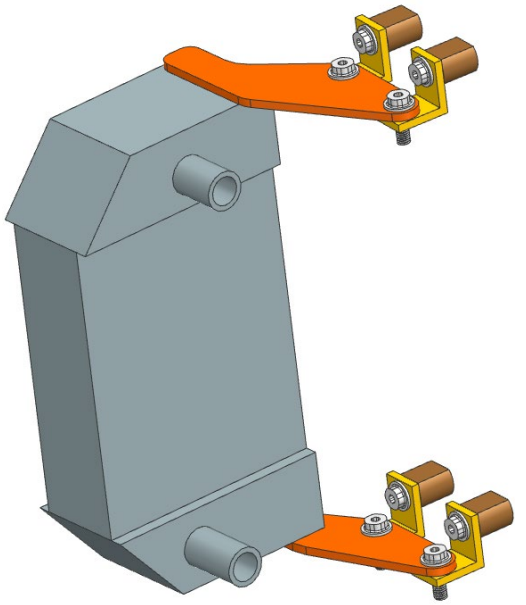
Component Specification

3 Tiers of Priority

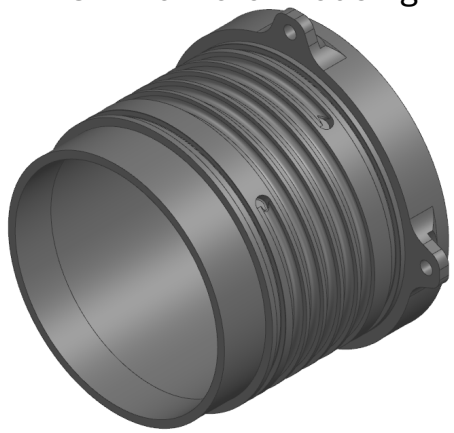
1. Cooling Related Goals
   - Adherence to heat generation
   - Improving water flow rate
2. Vehicle & Performance Goals
   - Reducing weight
   - Reduced aerodynamic impacts
3. GFR Design Ethos
   - Simplicity, reliability, and simulation validated by physical testing



GFR26 Motor Housing V1

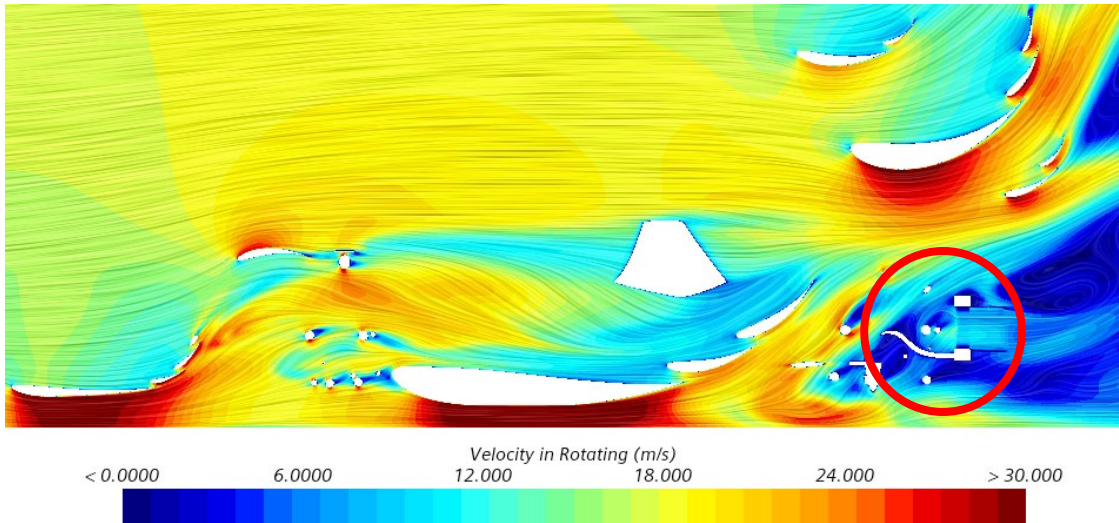


GFR26 Radiator Assembly



GFR26 Final Motor Housing Design

Simulating Radiators with Full Vehicle



Manufacturing and Assembly

- 5 axis CNC motor housings
- Modified radiators
- Custom 3D printed fan ducting

Results and Validation

Planned Testing:

- Temperature sensor measurements
- Flow rate validation
- Pressure transducer testing
- On/Off regenerative braking tests

Cooling System	Total Weight (kg)	Points Penalty via Weight	Power Usage (W)	Retail Cost ($)	Points Penalty via Aero Losses	Total Point Penalty
GFR25	7.895	4.74	124.4	828.32	3.1	7.84
GFR26	7.248	4.34	145.8	847.94	0.7	5.04
Deltas	-8.1%	-0.4	+17.2%	+19.62	-2.4	-2.8

Design Comparison from GFR25 to GFR26 Cooling System

Questions?

Oregon State University
College of Engineering

Thank you!

Thank you!