2023 JOHNSON INTERNSHIP APPLICATION

Applications DUE No Later than Sunday April 30th, 2023 @ 11:59pm

Submit one PDF or Word document with the file name format: JohnsonInternship2023_LastFirst
Submit applications to: patrick.geoghegan@oregonstate.edu
Questions? patrick.geoghegan@oregonstate.edu

Johnson 2023 Information and Requirements

1) Applicant MUST be a declared CBEE major entering 2nd year in Fall 2023
2) All Johnson Internships are IN-PERSON on the OSU Corvallis Campus or on the OHSU Portland Campus
3) Required 300 hrs research (Start June 21, 2023 (or after) and completed by September 15, 2023)
4) Compensation: $4425 (+ additional $550 living allowance)
5) Reporting Requirements:
   - Weekly Journal (including research hours)
   - Poster Presentation at the Johnson Internship Symposium and one of the OSU Undergraduate Research Poster Fairs (Fall 2023 or Spring 2024), AIChE Annual Student Conference (November 2023, Orlando, FL) or a Conference suggested by your research mentor.

Application Information

1. NAME and OSU Student ID

2. MAJOR (ChE, BioE, or EnvE)

3. OSU GPA (OSU courses ONLY - minimum 3.0 GPA required).

4. Faculty Mentor and Project Selection (attached list)
   Review the list of *Open Projects* and rank your choices by Faculty Name and Project #.
   You may rank only one or all six (your choice). If you rank a project you MUST be willing to do it if you are assigned to that project. Final selections will be made by the Faculty Mentors.

5. Please attach an essay (1-page max.) on *what excites you about the field of chemical engineering, bioengineering, or environmental engineering and how do you see the Johnson Internship helping you to achieve your career goals?*

6. Please attach a detailed resume, including as much high school and OSU information and work experience as you think is important to give the committee a good picture of your strengths and experiences.

7. Please also attach a one slide Personal Powerpoint (converted to pdf) that is primarily pictures (with some annotation) that introduces you and contains information about your family, pets, hobbies, high school activities, etc. (see webpage for examples).

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Johnson Summer Intern Program – Summer 2023 Open Positions

Faculty Mentor: Dr. Tala Navab-Daneshmand tala.navab@oregonstate.edu
Project Title: Antibiotic resistance pathogens in wastewater and receiving environments
Description: Bacterial pathogens resistant to antibiotic treatments are emerging contaminants of human health concerns. Wastewater systems are the reservoirs of fecal contamination and antibiotic resistance genes. In Navab lab we study the prevalence and dissemination of antibiotic-resistant bacteria and their determinant genes in wastewater and receiving environmental reservoirs, and aim to investigate engineering solutions to combat this global problem.

Faculty Mentor: Dr. Xue Jin xue.jin@oregonstate.edu
Project Title: Wildfire impact on drinking water quality and treatment

Description: As the climate changes, catastrophic wildfire has increased in both frequency and intensity in many parts of the world including the Northwestern United States. The rising trend in wildfire activity triggers a series of risks to source water quality (such as elevated levels of particles, heavy metals, organics and nutrients) and thus causes challenge for drinking water treatment plants. In this project, the student will characterize post-fire source water quality and conduct experiments to simulate the drinking water treatment process.

Faculty Mentor: Tyler S. Radniecki, PhD Tyler.Radniecki@oregonstate.edu
Project Title: Turning organic waste into renewable energy
Description: This project will explore how to optimize the processes of turning numerous organic waste streams (e.g. cooking oil, food waste, dairy waste from creameries and grain waste from craft breweries) into renewable methane gas. This conversion process takes place in a biological reactor called an anaerobic digester where microbes break down organic wastes to produce energy rich, methane-containing biogas. The student(s) working on this project will have the opportunity to run their own anaerobic digesters and determine how changes in organic waste stream composition and concentration affects the anaerobic digester's performance and methane production. Additionally, student(s) will have the opportunity to learn new analytical analyses including gas chromatography (to measure what is in the biogas), liquid chromatography (to measure what is in the liquid phase) and spectrophotometry (to measure what is in the liquid phase).

Faculty Mentor: Dr. Stacey Harper Stacey.Harper@oregonstate.edu
Project Title: Micro and nanoplastics fate, transport and effects on aquatic organisms
Description: Aquatic ecosystems are polluted with plastic waste on a global scale. As plastics degrade in the environment, they inevitably pass through the size range in which they would be considered microplastics (< 5mm) and nanoplastics (1-1000 nm). The goal of this research is to provide foundational information about what physicochemical properties (e.g., composition, size, shape) and environmental components (e.g. salinity, pH, organic matter) are determinative of risk. This project entails 1) a thorough characterization of the physicochemical composition, size, and shape of common plastics that have been milled to the micro- and nano-scale, 2) studies to determine the biological consequences of micro- and nanoplastics exposure in freshwater and estuarine model organisms using rapid toxicity testing strategies, and 3) studies todetermine how real world transformations of micro- and nanoplastics may alter plastics fate or the fate of plastic additives and co-contaminants. All of the data from these studies will be used to inform a multi-stressor risk assessment model.

Faculty Mentor: Prof. Chih-hung Chang chih-hung.chang@oregonstate.edu
Project Title: Materials for Extreme Environments
Description: Materials that can sustain and perform under extreme conditions are critical for our society's sustainable future, including new-generation fission reactors, hydrogen production from seawater, concentrated solar power, high-temperature turbines, and the battery that runs in space. These extreme conditions include high-radiation environments, high and low temperatures, large thermal loads, aggressive chemical environments, high and low pressure, and high electric and magnetic fields. In this project, we will design, fabricate and characterize materials for extreme environments.

Faculty Mentor: Prof. Gregory S. Herman Greg.Herman@oregonstate.edu
Project Title: Development of Sustainable Semiconductor Processing Modules

Description: For this project we are developing educational modules in sustainable semiconductor processing that we plan to share with community colleges throughout the Northwest. Our goal is to illustrate concepts related to thin film deposition, patterning, and characterization using low-cost approaches. For this project we will develop concepts for modules, search the educational literature for comparable modules, write up procedures, test them out to determine potential issues, confirm learning objectives are met, and perform a cost analysis on necessary equipment and supplies.

Faculty Mentor: Dr. Skip Rochefort skip.rochefort@oregonstate.edu

Project #1 Title: Plastic Wastes (Ocean and Land) to Fuel

Description: This project looks to recycle waste plastics to a diesel product using a pyrolysis reactor. The goal of the project is to develop a simple, low cost reactor to deploy in underserved communities with plastic wastes issues. Testing of the product using a gas chromatograph and analysis of combustion products from a small-scale diesel engine are planned for 2023. The students will work as part of a TEAM of undergraduate researchers that have been involved in the project for over three years. We have collaborations with communities in Kodiak, AK and Santa Cruz, CA. There is the possibility of a trip to Alaska to collect ocean plastic waste from remote beaches. In addition, we are working with several industrial and community partners consulting on various aspects of pyrolysis technology.

Project #2 Title: Hydrogels for Encapsulation of Bacteria for Bioremediation of Toxic Chemicals.
Description: This is a 5-year $1.5 million project to develop hydrogel beads that contain bacteria and a food source (called cometabolism). The goal of the project is to study materials and methods to produce gel beads containing bacteria that can be injected into contaminated aquifers to break down toxic chemicals.

Project #3 Title: Hemp-based compostable non-woven Menstrual Health Products for underserved Communities
Description: This project is focused on developing feminine hygiene pads for underserved communities. In summer 2022 two students traveled to a small village five hours from the capital of Botswana for six-weeks to deliver compostable feminine hygiene pads. They learned a lot about the culture and challenges of delivering the feminine hygiene products which we hope to build on in the coming year. This project involves a collaboration with 7 Points LLC, a company leading the movement to a hemp-based economy, particularly in the non-woven markets of women's health and medical supplies. We also work closely with the OSU Global Hemp Innovation Center.

Project #4 Title: Hemp/Plastic Composites
Description: This project involves a collaboration with 7 Points LLC, a company leading the movement to a hemp-based economy, for the development of plastic/hemp composites for 3-D printing filament and injection molding grade material. We also work with a local company, Atacama Inc., for the compounding and injection molding of material. The goal is to increase the wgt% of hemp fiber in the plastic, evaluate the material properties, and potentially replace glass fiber and carbon fiber as a more sustainable composite material.

Project #5 Title: Recycled Polypropylene (PP) Materials for HP-Inkjet Printer Bottles
Description: The goal of this project is to increase the amount of Post-Consumer Recycled (PCR) polypropylene (PP) in the bottles used to hold ink. This project involves working closely with HP technologists to develop reliable screening methods and material specifications for plastic used in the Injection Stretch Blow Molding (ISBM) of the ink bottles.

Project #6 Title: A Wildfire Resistant Roof and Personal Shelter
Description: This project uses a technology we have developed to implement it in a wildfire resistant roof on one part, and in another application, to modify the personal protection shelters used by wildland firefighters to improve their safety. We have worked several years on this project and it has been dormant for about one year. We want to revitalize it because it is such an important project that could help save lives every wildfire season. There are more experiments required to prove concept and more design changes to be made before going to market.

Note: All students working in the Rochefort Polymer Lab also become involved with ***K-12 STEM Outreach*** activities throughout the academic year and summer during the Johnson Internship. There are currently 18 UG students working in our lab on various teams, so no one is ever alone. We all work in teams.

Faculty Mentor: Dr. Kelsey Stoerzinger kelsey.stoerzinger@oregonstate.edu

Project #1 Title: Impact of pH and anions on the electrocatalytic hydrogenation of benzaldehyde

Description: Electrochemical approaches are inherently modular and enable decentralized upgrading of waste carbon to value-added chemicals and fuels. A primary component of the aqueous phase of such carbon feedstocks are carbonyl functionalities, where benzaldehyde (almond extract) represents a model compound. This project investigates how electrocatalytic reduction of benzaldehyde depends on pH to better understand the catalytic upgrading process.

Project #2 Title: Investigating the Selectivity of Electrocatalytic Hydrogenation of Cinnamaldehyde on Ag Catalysts Toward Cinnamyl Alcohol

Description: Monometallic Ag catalysts have demonstrated higher selectivity towards forming unsaturated alcohols from α,β-unsaturated aldehydes than most other metals under thermocatalytic conditions, in part because some non-aromatic α,β-unsaturated aldehydes adsorb to the surface with a favorable orientation. Currently, very little information is known about the analogous electrochemical reaction, however the favorable adsorption of α,β-unsaturated aldehydes on Ag makes it a promising candidate for electrocatalysis. The goal of this project would be to investigate whether electrohydrogenation of cinnamaldehyde on Ag demonstrates similar selectivity towards cinnamyl alcohol and whether aromatic α,β-unsaturated aldehydes adsorb favorably as well.

Faculty Mentor: Dr. Zhenxing Feng zhenxing.feng@oregonstate.edu

Project #1 Title: Techno-Economic Analysis of Electrochemical Energy Systems

Description: Techno-economic analysis can provide guiding insights about market values and key problems of the electrochemical energy systems such as battery, fuel cells and electrolyzers. The student will use references and evidence found online or journal references to build a model and perform analysis. A simple excel with high school math is good enough.

The student will work with graduate students and/or senior undergraduate students in Dr. Zhenxing Feng's group to analyze different electrochemical systems. The student will gain knowledge of these electrochemical energy systems and their applications in both lab and industries.

Project #2 Title: Electrocatalysis in Fuel Cells and Electrolyzers

Description: Electrocatalysts are key to improve the efficiency of many electrochemical reactions such as oxygen reduction reaction (ORR) in fuel cells, oxygen evolution reaction (OER) in electrolyzers and electrochemical carbon dioxide reduction reaction (CO2RR). Feng group synthesizes various electrocatalysts and quantify their electrochemical performance for applications in energy conversion and storage. The student will will work in Dr. Zhenxing Feng's lab for the following work

The student will work with graduate students and/or senior undergraduate students in Dr. Zhenxing Feng's group to synthesize and test materials for their catalytic performance in reactions such as ORR and OER.

Project #3 Title: Battery Deactivation and Direct Cathode Recycling

Description: OnTo Technology at Bend of Oregon State develops advanced recycling for lithium batteries including elimination of hazards and efficient recovery of critical materials. These techniques are known as deactivation and cathode-healing™ respectively. Using these technologies, OnTo will field a pilot plant for recycling electric vehicle and energy storage end-of-life batteries. The student will work in Dr. Zhenxing Feng's lab at Corvallis for the collaboration of OnTo Technology for the following work

The student will evaluate methods for recovery and separation of battery materials. The experience will utilize analytical techniques to support the comparison, these techniques include methods available through OSU (e.g. TGA, DSC, Particle size analysis, IR/UV-vis.

Faculty Mentor: Dr. Lucas Ellis lucas.ellis@oregonstate.edu

Project #1 Title: Understanding the role of plastic additives on waste plastic upcycling

Description: The conversion of waste plastics into value-added chemicals is inherently difficult. Adding to the complexity are the additives like plasticizers, antioxidants, dyes, and even metals found in plastics. Yet, little has been known about the role of these additives on catalyst performance in chemical recycling technologies. This project will investigate the role of plastic additives in chemical recycling, including the impact on conversion performance, methods for removal, and identifying the fate of these additives after conversion.

Project #2 Title: Understanding the impact of branched feedstocks in tandem dehydrogenation and olefin metathesis
Description: Tandem and cascade chemistries, like tandem dehydrogenation and olefin metathesis are gaining interest in their application in waste plastic conversion due to their novel ability to produce different classes of reaction products by simply modifying reaction conditions. Yet, one challenge with this chemistry is the application to more 'sterically hindered' feedstocks, like polypropylene. In this project, we will investigate the kinetic barriers to using chemistries like olefin metathesis for branched feedstocks, like polypropylene. We will use model compounds to investigate the role of branching in this novel chemistry.

Oregon Health & Science University

OHSU Mentor: Dr. Joe Aslan aslanj@ohsu.edu

OHSU Mentor: Prof. Owen McCarty mccartyo@ohsu.edu

Description: The Aslan and McCarty labs study molecular mechanisms of platelet function in health and disease. We are seeking to host a 2023 Johnson Summer Intern at OHSU with interests in biochemistry, cell biology and systems biology for microscopy studies of platelet adhesion and effects of novel therapies on platelet activation. Previous Johnson Scholars from our OHSU groups have contributed to and led publications below and have gone on to medical and graduate research programs.

• Assessment of the effects of Syk and BTK inhibitors on GPVI-mediated platelet signaling and function (AJP Cell Phys, 2021)
https://doi.org/10.1152/ajpcell.00296.2020

• Phosphoproteomic quantitation and causal analysis reveal pathways in GPVI/ITAM-mediated platelet activation programs (Blood, 2020)
https://ashpublications.org/blood/article/136/20/2346/461284/Phosphoproteomic-quantitation-and-causal-analysis

• The BCR-ABL inhibitor ponatinib inhibits platelet immunoreceptor tyrosine-based activation motif (ITAM) signaling, platelet activation and aggregate formation under shear (Thromb Res, 2015)
https://www.thrombosisresearch.com/article/S0049-3848(14)00618-5/fulltext

OHSU Mentor: Prof. Sandra Rugonyi rugonyis@ohsu.edu

Sandra Rugonyi, PhD
The Rugonyi lab studies interactions between cardiac mechanics and function, especially in congenital heart disease. Our studies span embryonic cardiac development to adult heart disease. We are looking for interns with interests in embryology and/or heart disease, who would like to integrate experimental biology and engineering techniques, including computational modeling and programming.