ESW BIOFUELS

Spring 2022 Newsletter

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Team Updates

Rebranding of ESW Biofuels

Biofuels underwent a minor name alteration to better align itself with the team's overall goals and types of projects it has been involved in. After reflective discussions and thoughtful name ideas, the team is happy to announce the new name: **Biofuels and Environmental Design**.

The team hopes that this new name adheres to Biofuels' original goal to improve campus and local regions' sustainability through biofuels initiatives and implementation, but also increases opportunities to collaborate with projects branching into environmental design.

ESW Biofuels in Fall 2021

Team Updates

Biofuels and Environmental Design Alumni Listserv

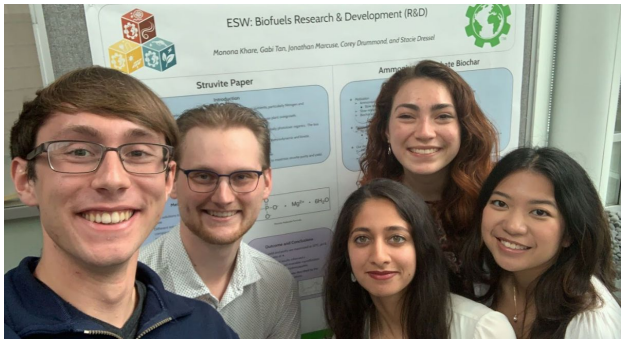
An important addition to ESW Biofuels and Environmental Design this semester is the alumni listserv. The purpose of this listserv will be to engage with our alumni members about ESW events such as alumni panels, coffee chats, and more. The team will also be using this listserv to send information on what is happening on the team through the biannual newsletter.

If you are an alumni and would like to join the ESW Biofuels and Environment Design listserv, please email **ESW-biofuels-alum-L-request@cornell.edu** with the subject line "**Join**", and please feel free to spread the word amongst alumni. The team is incredibly excited about connecting with past team members and looks forward to engaging with them in the future!

Team Updates

The sub-teams at the new annual ESW Spring Expo!

Business and Outreach



Research and Development

Bioenergy Implementation

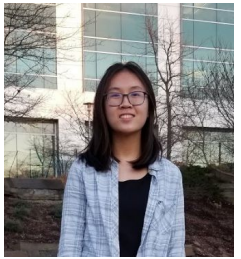
Biofuels Spring 2022

Team Updates

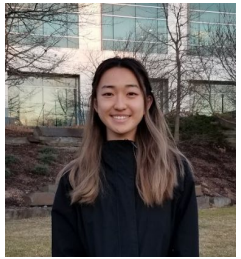
Welcome New Members!

This semester ESW Biofuels and Environmental Design is proud to welcome four new members to the team! Joining the Bioenergy Implementation sub-team are Anna Bleich, a sophomore majoring in Mechanical Engineering, Megan Xu, a freshman majoring in Chemistry, and Peibo “Naomi” Guo, a Civil and Environmental Engineering graduate student. Additionally, joining the Business and Outreach sub-team is Karen Morales, a sophomore majoring in Mechanical Engineering. We are excited to welcome them to the team!

Anna Bleich



Megan Xu



Naomi Guo

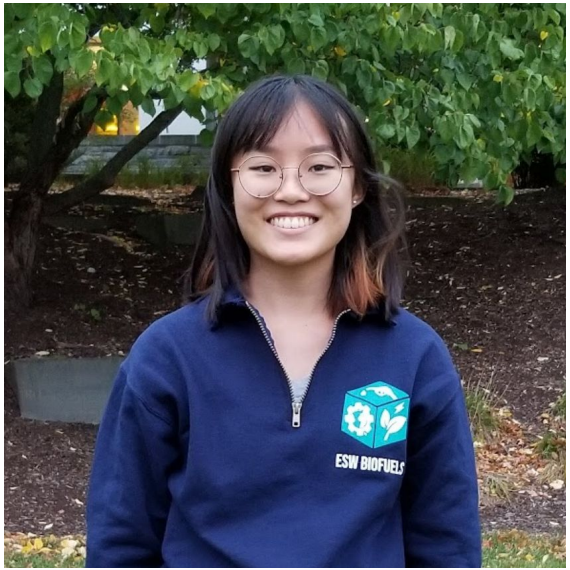
Karen Morales

Graduating Seniors

Maple Chen

Maple majored in biomedical engineering. During her time on Biofuels, she was first a member on the Bioenergy Implementation sub-team. She later became the Bioenergy Implementation sub-team lead and then during her senior year, the Biofuels team lead.

After graduating, she will be pursuing her PhD in Bioengineering at the joint UC Berkeley / UC San Francisco program.



Graduating Seniors

Dhruv Girgenti

Dhruv majored in Operations Research and Information Engineering. During his time on Biofuels, he was a dedicated member of the Business and Outreach sub-team.

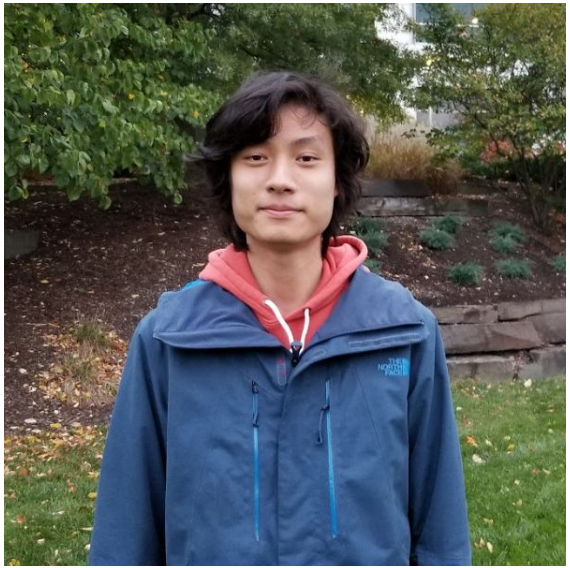
After graduating, Dhruv will begin working as an Analyst at Deloitte Consulting LLP in the New York City area.

Graduating Seniors

Yang Han

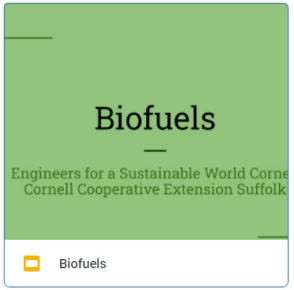
Yang majored in Chemical Engineering. During his time on Biofuels, he was a member of the Bioenergy Implementation sub-team, and in his senior year, became a Bioenergy Implementation sub-team co-lead.

After graduating, Yang will begin an internship at a winery in California.



Business & Outreach

B&O continued to update their lesson plans for CCE Suffolk throughout this semester. The lesson plan content went through several rounds of revisions, and interactive activities, both virtual and hands-on, were included at the end of each draft. The lesson plans were then sent to CCE Suffolk and their educators for feedback that B&O then used to begin further revisions. So far, all minor comments have been implemented, and the focus has shifted to separating the current activities and material into both younger and older student lesson plans in order to maximize their efficacy and impact. The target audience of the lesson plans has also shifted from elementary to middle and high school students.



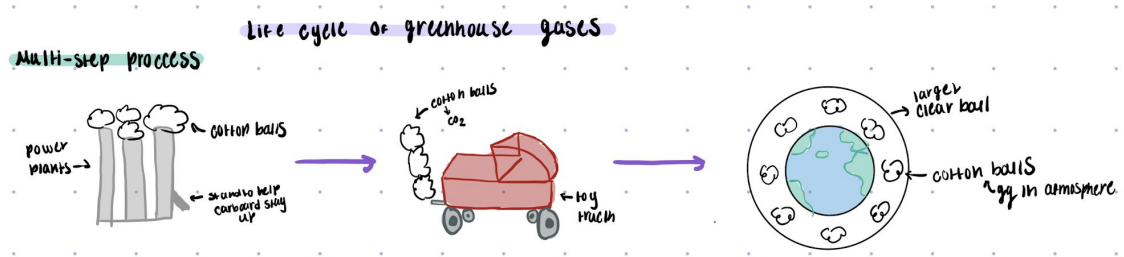
B&O's Slides for the Lesson Plans for CCE Suffolk

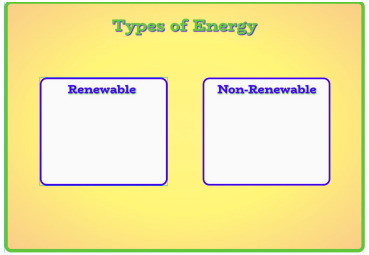
Business & Outreach

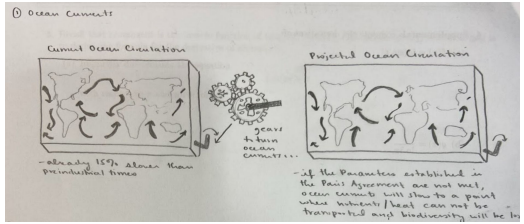
This semester for the PowerHouse project, B&O began designing nine potential exhibits. The nine exhibits were broken into three subcategories based on the lesson plans we created for CCE Suffolk. The following subcategory exhibit ideas are: *Climate Change and Ocean Health* (which includes an exhibit on ocean currents, one on rising sea levels, and one on carbon emissions expelled from various nations), *Biofuels* (which includes an exhibit on the life cycle of greenhouse gasses, one displaying how to create and use algae biofuels, and a mini greenhouse), and lastly *Oceans and Energy* (which includes an exhibit on tidal energy, one on what it means to be renewable vs nonrenewable, and one on offshore wind and solar farms). Among these exhibit ideas, B&O has delved deeper in creating design plans with algae biofuels, the model of nations' CO2 emissions, renewable vs non-renewable, rising ocean levels, and tidal energy. Next semester, B&O plans to work on researching grants for the PowerHouse, beginning the last four exhibits, and continuing the current designs.

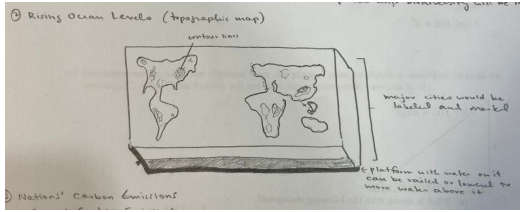
Business & Outreach

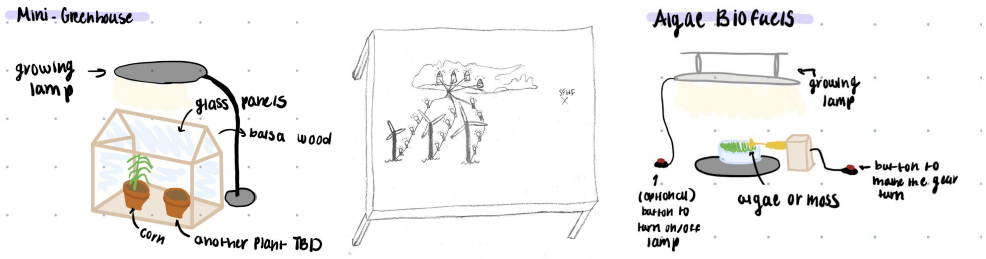
PowerHouse Exhibit Design Sketches & Ideas











Biofuels Spring 2022

Business & Outreach

Midway through the fall 2021 semester, CCE Suffolk proposed another project involving the creation of a podcast that would detail environmental issues on Long Island and resulting detrimental impacts on the Shinnecock Nation. In December 2021, the team then won a Cornell Engaged Opportunity grant of $3,000 to help fund expenses for this project.

This semester, B&O has done a significant amount of research on the Shinnecock Nation, environmental issues facing Long Island, and cultural impacts as a result of climate change. From this research, B&O developed questions and prompts they plan to ask the Shinnecock representatives on the podcast (which is projected to be recorded next semester). Some topics of inquiry include environmental racism, declining shellfish populations, receding shorelines, ocean acidification, overfishing water quality issues, government actions and their effectiveness, and traditional ecological knowledge.

Business & Outreach

B&O also updated the ESW Biofuels website! One major update was uploading the new sponsorship packet on the “Sponsors” tab. Another was adding the new Biofuels projects under the “Projects” tab, including R&D’s Ammonium Phosphate Biochar and Modeling Struvite Formation, BioImp’s Continuous Biodiesel, and B&O’s Podcast and Long Island Outreach. Following that, the new team members were added under the “Meet Us” and “Apply Now” tabs.

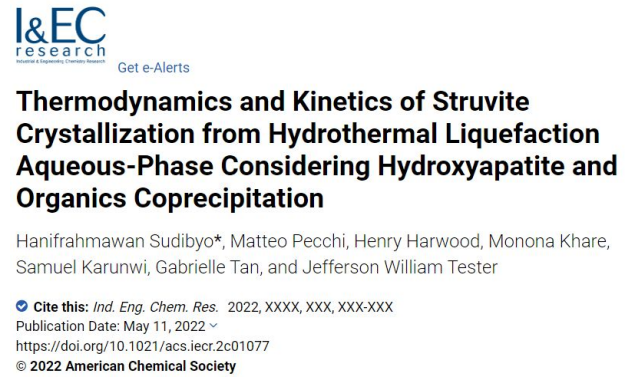
This semester, B&O also worked on expanding the newsletter to provide more detail on both ESW Biofuels and its various projects. In doing so, they hope to foster increased recruitment and connection with alumni. In addition to being posted to the website, the newsletter will also be sent to the new ESW Biofuels alumni listserv.

New Sponsorship Packet

Research & Development

This semester, R&D has concluded work on their previous project of Computationally Modeling Struvite Formation. R&D has modeled the formation of struvite, a slow release fertilizer, using the equilibrium modeling software Visual MINTEQ. They worked with the Tester research group in the Chemical and Biomolecular Engineering Department.

This paper has recently been published with our current members Monona Khare and Gabi Tan (and former members Henry Harwood and Samuel Karunwi) being listed as co-authors! The link to the paper is here: https://pubs.acs.org/doi/10.1021/acs.iecr.2c01077



I&EC research

Get e-Alerts

Thermodynamics and Kinetics of Struvite Crystallization from Hydrothermal Liquefaction Aqueous-Phase Considering Hydroxyapatite and Organics Coprecipitation

Hanifrahmawan Sudibyo*, Matteo Pecchi, Henry Harwood, Monona Khare, Samuel Karunwi, Gabrielle Tan, and Jefferson William Tester

Cite this: *Ind. Eng. Chem. Res.* 2022, XXXX, XXX, XXX-XXX
Publication Date: May 11, 2022
https://doi.org/10.1021/acs.iecr.2c01077
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Title for the published paper

Research & Development

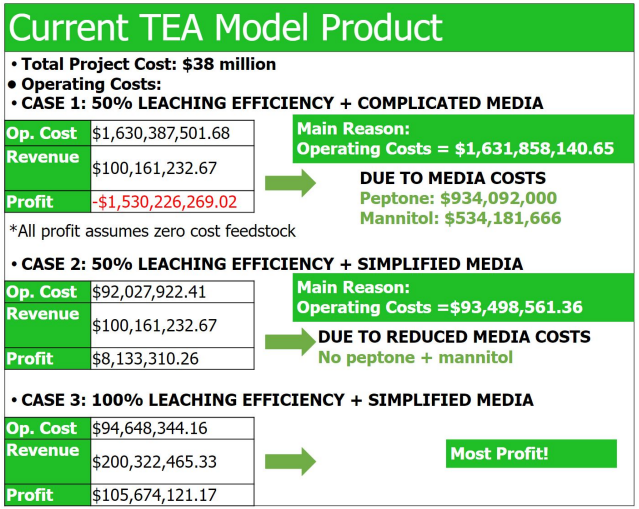
This semester, Research and Development has also been working on a project about the impregnation of biochar with ammonium phosphate. The team is now working on implementing this project in the lab, with the aim of demonstrating the practicality of forming ammonium phosphate in the pores of biochar using aqueous phase reagents.

The team has been working in the Olin Hall Unit Operations lab to generate the ammonium phosphate impregnated biochar, with long term goals of working with plant sciences labs to test the fertilizer efficacy and runoff.

Photo of the Unit Operations lab from the Cornell CBE website

Bioenergy Implementation

This semester, BioImp continued its work on its rare earth element techno-economic analysis (REE TEA). The main goal this semester was to develop a report to advise Barstow labs on the economic viability of rare earth element extraction via various bioprocesses. To start, they collected new data on estimated prices (feedstock prices, labor and capital costs, etc.) to update their spreadsheets, which were also simplified for ease of understanding. Overall, the total project cost was estimated to be about $38 million. The team also put together some process flow diagrams to fully understand the process and each unit operation. They are currently considering where the point of waste disposal should be, and will meet with Barstow to share results so far.



Summarized results, taken from BioImp's spring 2022 expo poster

Bioenergy Implementation

BioImp has also been discussing a number of new possible projects this semester, as the REE TEA project is coming to a close. One idea is a continuous biodiesel project, where the team would look into designing a process to continuously produce biodiesel from waste fats and oils with operations located on the Cornell campus. Other ideas have included projects with recycling sorting, biodigesters, algae ethanol, electricity-generating exercise equipment, and many more. BioImp will begin next semester by discussing the interest of their team members and researching the feasibility and general plans of the various ideas.