



Research Yearbook

2021 – 2022



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OVIEDO HIGH SCHOOL

Home of Champions & Scholars





Student Roster

2021 – 2022 Research Cohort





Current Year Research Cohort

Name	Class Standing	Category	Years in Research
Liam Swisher	Freshman	ANIM	1
Ella Pilacek	Sophomore	ANIM	2
Anaka Holmes	Sophomore	BEHA	1
Ayan Patel	Sophomore	EAEV	1
Grace DeCoursey	Junior	CHEM	2
Jenna Leiss	Junior	ANIM	3
Sophia Schmitz	Junior	EAEV	1
Kyra Henriques	Junior	CHEM	2
Ishika Nag	Junior	ENEV	3
Banmeet Singh	Junior	ENMS	1
Naman Doad	Junior	BEHA	3
Eleanor Duffy	Senior	EAEV	1
Katelyn Fry	Senior	MICR	2
Kenneth Phynn	Senior	ENMS	1.5
Kalash Patel	Senior	PLNT	3
Hayley Prete	Senior	BMED	1
Jordan Price	Senior	ENMS	3
Aleksander Sobik	Senior	PHYS	1
Victoria Woodcock	Senior	ENEV	1



GREEN LIGHT



GREEN LIGHT

Regional Science, Math, & Engineering Fair



GREEN LIGHT

Congratulations! Your paperwork has been reviewed and everything is in order. Your project is accepted for the fair! Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Price, Jordan
Oviedo HS
ENMS 853 Individual

Congratulations! Your paperwork has been reviewed and everything is in order. Your project is accepted for the fair! Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Leiss, Jenna
Oviedo HS
ANIM 151 Individual

Congratulations! Your paperwork has been reviewed and everything is in order. Your project is accepted for the fair! Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Leiss, Jenna
Oviedo HS
ANIM 151 Individual

Approvals!

Congratulations! Your paperwork has been reviewed and everything is in order. Your project is accepted for the fair! Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Patel, Kalash
Oviedo HS
PLNT 1353 Individual

Congratulations! Your paperwork has been reviewed and everything is in order. Your project is accepted for the fair! Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Pilacek, Ella
Oviedo HS
ANIM 152 Individual

Congratulations! Your paperwork has been reviewed and everything is in order. Your project is accepted for the fair! Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Phynn, Kenneth
Oviedo HS
ENMS 852 Individual

Congratulations! Your paperwork has been reviewed and everything is in order. Your project is accepted for the fair! Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Swisher, William
Oviedo HS
ANIM 153 Individual





Freshmen

Class of 2025



Liam Swisher

Freshman, Class of 2025



Mentor Name:

Dr. Sarah Barber

Associate Professor, Anthropology & Integrated Coastal Research, University of Central Florida

Location of Research:

University of Central Florida

Abstract

The experiment is on documenting the preferences of the Northern Curly-Tailed Lizard in Florida. This is because it is an invasive species that eats native species of lizards such as the green Anole. There is no major research that is on the lizard's preference of habitat type, temperature, and weather conditions in Florida. The method of the experiment is to create a path through an area known to have the lizard and record. Then go out research, record all needed information about the lizard and take a picture of the lizard to have documentation of the sighting. After experimentation take the data into a master data sheet to compile it into usable data. What is expected usage of the data is to be able to predict where the lizards could be at any point. For the future try to do more in depth research on a single section of the lizards based on where they are found the most abundant.

Awards & Accomplishments

2022

RSEF – Finalist, Animal Sciences

YELLOW FORM

Your paperwork has been reviewed and some corrections are needed. You must complete ALL revisions before your project can be accepted to the fair. Return the corrections to your teacher before the deadline listed in the attached letter.

Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is: _____

[illegible]

Description	
SPECIAL PROJECTS	
Continuation Project	
Form 1 (Continuation): a missing IRB letter	
Form 2 (Continuation): a missing Study ID/ Approval/ date	
Date After Expiration/ Project End Date	or date NOW
Missing previous year's Abstract for year(s)	
Missing previous year's Research Plan for year(s)	
Project is not a substantial difference from previous year - IRB not to accepted to fail	
Substantive differences expected: Testing a new variable, New Area of Investigation	
Unacceptable examples: Repetition of previous exp. even with increased sample size	
Other concerns with Continuation Project	
Human Participants	
Form 1B missing: SPIC/RS Other's signature - IRB not to accepted to fail	check 2
Form 2 (and/and Scientific) required for this experiment but missing: Data Refers	
Form 3 (Human Participants) missing or signed - IRB not to accepted to fail	check 3
Simple Human Informed Consent Form missing	
Copy of all survey questions, scripts, links, images for participants missing	
Reduced amount of human information forms missing (submit) referred to this date matches	
Actual Start Date on Form 3AL DIFFER After all approvals Link Approval dates	check 4
For online consent missing in online survey, printed list of first response (before turning in a missing table to inform Actual Start Date on form 3AL, date After approval	check 5
IRB's Verification of informed Consent Form missing or not signed/initial	
Date After IRB expiration/ Initial Date	or date NOW
University / All IRB approval/ approval does not fail students directly as researcher	
Other concerns with Human Participants projects	

Your paperwork has been reviewed and some corrections are needed. You must complete ALL revisions before your project can be accepted to the fair. Return the corrections to your teacher before the deadline listed in the attached letter.

Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is: **01460 HES**

Doad, Naman
Oviedo HS
BEHA 360

... and revisions.

[illegible]

Your paperwork has been reviewed and some corrections are needed. You must complete ALL revisions before your project can be accepted to the fair. Return the corrections to your teacher before the deadline listed in the attached letter.

Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is

<p>1. Score 1 Missing teacher signature, general or not applicable</p> <p>2. Score 2 Missing date: Date Prior to: Project Start Date</p> <p>3. Score 3 Missing location</p> <p>4. Score 4 Missing missing: Missing ALL of approved items (Points 5, 10, 15, 4, 6, SA, GA)</p> <p>5. Score 5 Missing date: Missing ALL of approved items: Date Prior to: Start Date</p> <p>6. Score 10 Missing for: Date Prior to: Project Start Date</p> <p>7. Score 15 Missing Student or Teacher signature or not: Date Prior to: Project Start Date</p> <p>8. Score 4 Missing for the project: Date of ALL project and: Date before: Date before</p> <p>9. Score 2 Missing: Date Prior to: Project Start Date</p> <p>10. Score 2 Missing (teacher explanation on any/which): Date before:</p> <p>11. Score 3 Missing both: Not and not signed: Not signed: Date before:</p> <p>12. Score 4 Missing for: Date of ALL approved signatures not applicable: Date before:</p>	<p>Value:</p>
<p>Other comments with required forms:</p>	

<p>Missing answers to questions 9 - an abstract form</p> <p>Missing student details. Date accurately</p> <p>Other concerns with SSF Abstract</p>	Yellow
<p>RESEARCH PLAN</p> <p>Research Plan is missing - Will not be accepted to file</p> <p>Concept/Problem, hypothesis, hypothesis, specific, data analysis is missing</p> <p>Major aims, specific or incomplete, Character of organisms involved, breeding and then it</p> <p>Subject specific, missing or incomplete, missing, Section needed</p> <p>Presubmission is missing - Will not be accepted to file</p> <p>Presubmission do not have enough detail. The plan should be written so that someone else could repeat your experiment and get the same. Always include specific locations.</p> <p>Research plan is missing specific detailed procedures for chemicals or organisms.</p> <p>Research plan is missing safety instructions</p>	Yellow
<p>Bibliography is missing or not a section that lists the references used</p> <p>Bibliography must have a list of references, not just a list of references</p> <p>Bibliography must have at least 3 references, not just a list of references</p> <p>Bibliography must have at least 3 references, not just a list of references</p>	Yellow

Seminole County
Regional Science, Math, & Engineering Fair


YELLOW FORM

Your paperwork has been reviewed and some corrections are needed. You must complete ALL revisions before your project can be accepted to the fair. Return the corrections to your teacher before the deadline listed in the attached letter.

Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is: CH6m 463

[illegible][illegible]


  **Seminole County**
Regional Science, Math, & Engineering Fair


YELLOW FORM


Your paperwork has been reviewed and some corrections are needed. You must complete ALL revisions before your project can be accepted to the fair. Return the corrections to your teacher before the deadline listed in the attached letter.

Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is:

Fry, Kaitlyn 11-002118 MBCR: 1151	
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Seminole County
Regional Science, Math, & Engineering Fair

YELLOW FORM

Your paperwork has been reviewed and some corrections are needed. You must complete ALL revisions before your project can be accepted to the fair. Return the corrections to your teacher before the deadline listed in the attached letter.

Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair.

Your project ID number is: 046M453

SRC Checklist
This checklist starts with any paperwork having discrepancies

Duffy, Eleanor	
David HS	
EAEV	862
	Individual

<p align="center">PROJECT NOT ACCEPTED</p> <p>Regional Review Committee has determined that this project is not qualified to compete in and has not been assigned to the Regional Fair</p>	
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RELEASE AND CONSENT FOR

Print out 'X'	Description	Form
	Everything's in order. This project is accepted for the Regional Fair!	Green
State it	<p>ABSTRACT</p> <p>S&T Abstract Form is missing.</p> <p>Abstract Form is not in the current page or not the S&T form.</p> <p>The text of your abstract must fit in the box and follow the (S&T words or box).</p> <p>Abstracts must include all new arguments, and your name or the organization.</p> <p>Do NOT write the research institution and/or number with you were working and avoid mentioning cities or homes (including including a parent) in the body of the abstract.</p> <p>Abstracts must be positive & in future form.</p> <p>Missing author signature. Date incorrect!</p> <p>Other authors with S&T Abstract.</p>	Yellow
	<p>RESEARCH PLAN</p> <p>Research Plan missing. - Will not be accepted for S&T.</p> <p>Questions: Problem, Hypothesis, Materials, and/or equipment missing.</p> <p>Materials list is missing or incomplete. Chemicals or equipment missing. Hand and feet.</p> <p>Subjects or topics are missing. Section needed.</p> <p>Procedures are missing. - Will not be accepted for S&T.</p> <p>Procedures do not have enough steps. The plan should be written so that someone else could repeat your experiment step by step. Answer the subject's questions.</p> <p>Research plan is missing specific details or answers for chemicals or equipment.</p>	

Your paperwork has been reviewed and some corrections are needed. You must complete ALL revisions before your project can be accepted to the fair. Return the corrections to your teacher before the deadline listed in the attached letter.

Please read all pages in this packet so you are ready for the Seminole County Regional Science, Math, & Engineering Fair

X
Missing and Corrected

Mailing permit, vehicle, phone signature, or emergency contact information.

Other comments with Release and Consent Form:

(SEE FORMS AND ATTACHMENTS (ALL PROJECTS))

This inconsistent throughout paperwork.

Title is not descriptive. Please add descriptive subtitle for judges.

Form 1 missing.

Form 3 missing Teacher signature. (Please have it reviewed by teacher to present)

Form 1 missing Date. Date Prior to Project Start Date

Form 1 missing Date. Date Prior to Project Start Date

Form 1 missing Date. Must be AFTER all approval dates (Forms 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12) location that requires immediate attention. Date Prior to Start Date

Form 1 missing for _____ Date Prior to Project Start Date

Form 1 missing Student or Parent signature and date. Date Prior to Project Start Date

Form 1 missing for this project. Date AFTER impact end _____ or date NOW

Form 1 missing. Date Prior to Project Start Date

Form 1 missing further explanation on question(s) _____. Date Before _____

Form 1 becomes box not filled out on question(s) _____. Date Before _____

Form 3 Experience or Training of Designated Supervisor not sufficient. Date Before _____

Other comments with Required Forms:

Form 3 of 4. Make less potential psychological damage to exposure to sensitive topics.

8. Signature that the survey is conducted confidentially and volunteers to make

[illegible]



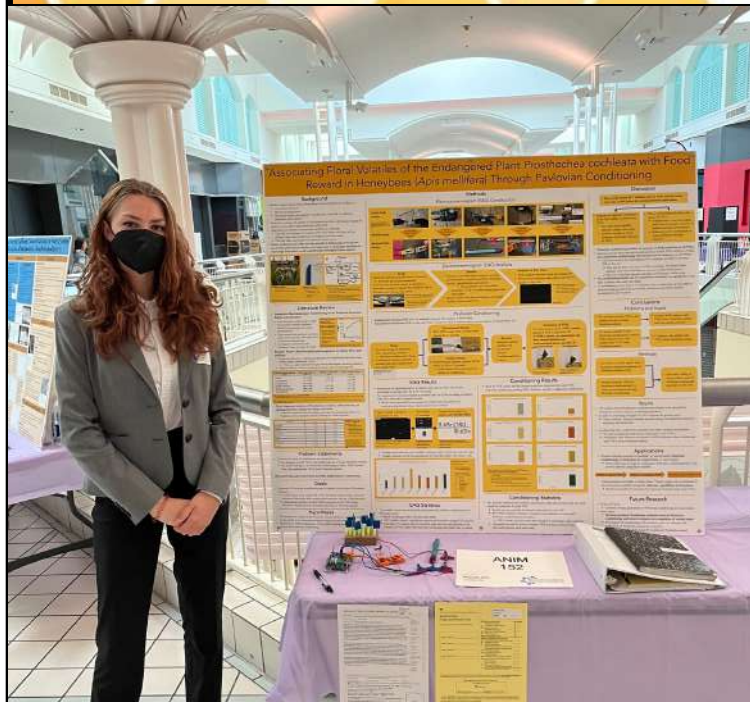
Sophomores

Class of 2024



Ella Pilacek

Sophomore, Class of 2024



Mentor Name:
Mr. William James Furiosi II
Research Instructor, Oviedo High School

Location of Research:
Oviedo High School



Abstract

Investigation of the potential for training honeybees (*Apis mellifera*) to associate the scent of the endangered clamshell orchid (*Prosthechea cochleata*) with food through Pavlovian conditioning. Successful Pavlovian conditioning could provide a basis for applications in conservation. It was expected that honeybee antennae would be able to detect volatile organic compounds (VOCs) from *Prosthechea cochleata* as olfactory stimuli during electroantennogram (EAG) analysis. Conditioning performed to create an association between sucrose and each VOC was expected to increase exhibition of the proboscis extension reflex (PER).

EAG analysis was performed on honeybee antennae to determine how electrical signals, sent through antenna as sensory input, are impacted by exposure to the VOCs. Filter paper alone, α -pinene, benzaldehyde, decanal, limonene, mesitylene, nonanal, and pseudocumene were all tested, but variation was too high to yield reliable results, so adaptations were made to the EAG design. All groups were retested, showing less variation and a significant difference between at least two of the groups in a one-way ANOVA (p -value=2.669E-14). A Tukey-Kramer test showed decanal, limonene, mesitylene, nonanal, and pseudocumene had significantly higher EAG responses than filter paper (p -value<0.01), but the α -pinene and benzaldehyde groups were not significantly different from filter paper (p -value>0.10).

Next, for each VOC, an experimental group of honeybees was exposed to a VOC and given a sucrose reward. Each control group was conditioned with hexane instead of a VOC. Both groups were then exposed to the VOC alone and occurrence of PER was recorded. A series of chi square tests for comparing conditioning results show a significant increase in PER in only the experimental groups (p -values<0.00001.)

Results encourage future research into using a synthetic scent to increase pollination of *Prosthechea cochleata* by creating a bias towards the plant as a food source.

Awards & Accomplishments

2022

GENIUS Olympiad, Silver Medal
Ying Science Competition, 1st Place
SSEF - 2nd Place, Animal Sciences
UFCALS - Florida Summer Institute FYI Camp Award
RSEF - 2nd Place, Animal Sciences
Craniometrix - Most Interesting Application of Technology
Florida Association of Science Teachers Recognition Award

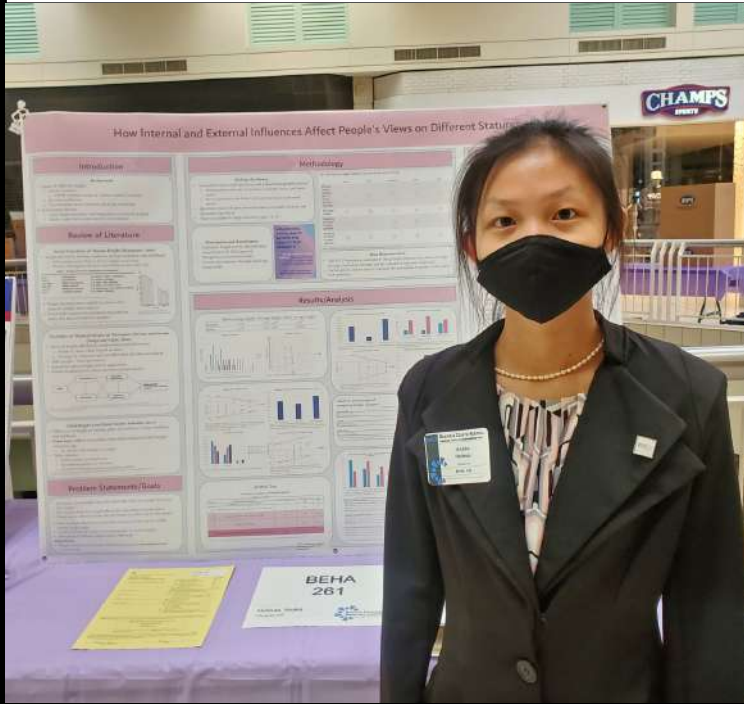
2021

SSEF - Honorable Mention, Behavioral & Social Sciences
RSEF - 2nd Place, Behavioral & Social Sciences



Anaka Holmes

Sophomore, Class of 2024



Mentor Name:

Mr. William J. Furiosi II

Research Instructor, Oviedo High School

Location of Research:

Oviedo High School

Abstract

This research project is a height study on how people's lives are affected by their statures. I am also analyzing how outside influences affect people's feeling about their own height. Past studies have shown that height can lead to people being treated differently or unequally. This is a survey-based study with most questions being in a Likert scale format. The survey was made using Survey Monkey. The initial survey created has a target population of just highschoolers. There will be more questions added to release another survey that adults can take. Expected results would be that based on people's heights, individuals do view each other differently, though to what extent and how much other's views on people of different heights is what this study is trying to find out.

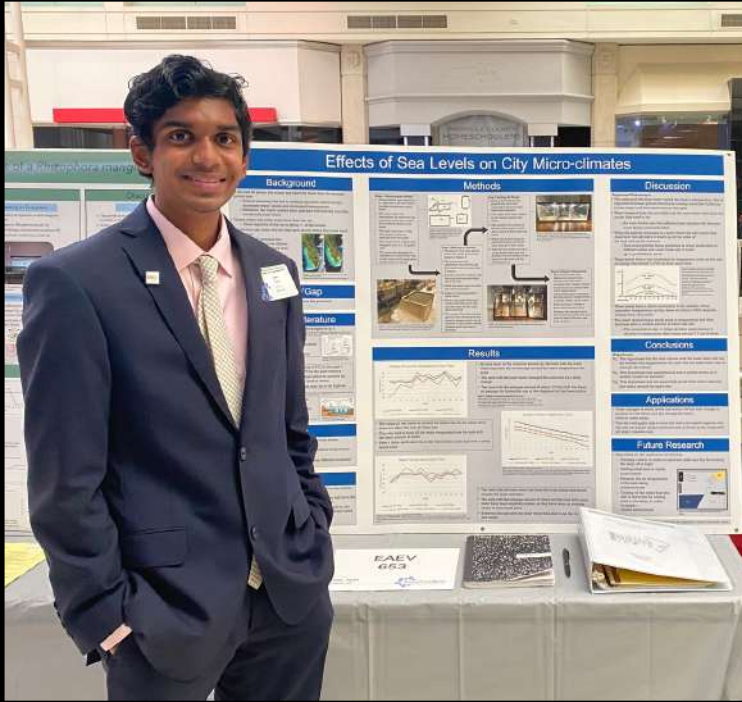
Awards & Accomplishments

2022

RSEF – 3rd Place, Behavioral and Social Sciences

Ayan Patel

Sophomore, Class of 2024



Mentor:

Mr. William J. Furiosi II
Research Instructor, Oviedo High School

Location of Research:

Oviedo High School

Abstract

As the world is heating up, the oceans are getting new sources of water and the levels are rising. With the rapid increase in ocean levels, the data that was previously collected has no use in predicting the future effects. In order to try to address this issue, the project is designed to simulate different water level effects through the use of micro-climates. This can help simulate data to create predictions on the effects of rising sea-levels. The tank with the water at the middle height, as kept the temperature the most stable. The tank with lowest amount of water has increased in temperature the most, however it varies the most on a day-to-day basis. So far the tank with the most water has lost the most water but has been cooler than the two other tanks. I expect the tank with the least amount of water to become the hottest, and lose all of it's water the fastest. I also expect all three tanks to increase in temperature. This is important because it shows how raised ocean levels can keep a climate more stable, up to a point where they become less stable. This can be used to help predict basic ocean effects for the future as global warming is occurring and oceans are rising.

Awards & Accomplishments

2022

RSEF - 2nd Place, Earth & Environmental Sciences
American Meteorological Society Award
NOAA Taking the Pulse of the Planet Award



THE CLASS AND THE COMMUNITY





Juniors

Class of 2023

Grace DeCoursey

Junior, Class of 2023



Mentor:

Dr. Melanie Beazley

*Assistant Professor, Chemistry & UCF Coastal
University of Central Florida*

Location of Research:

Oviedo High School

Abstract

As we use more plastic, it accumulates and pollutes ecosystems. Looking at plastic in aquatic ecosystems, it can carry chemicals, compounds, and metals through the water. In this experiment, it focuses on adsorption of lead and phosphate onto plastics and how water movement and light exposure affects how much of the compounds are adsorbed. Two separate parts will be done, one focusing on shaking samples and the second focusing on light exposure. Each sample will have different combination of polystyrene or polypropylene and lead or phosphate. Then to remove compound off a plastic, a precipitation reaction and washing solution will be used to find how much of the compound got adsorbed onto the plastic. Expected results is that the polystyrene will have to most adsorbed overall, water movement will increase adsorption, and that light exposure will not affect adsorption

Awards & Accomplishments

2022

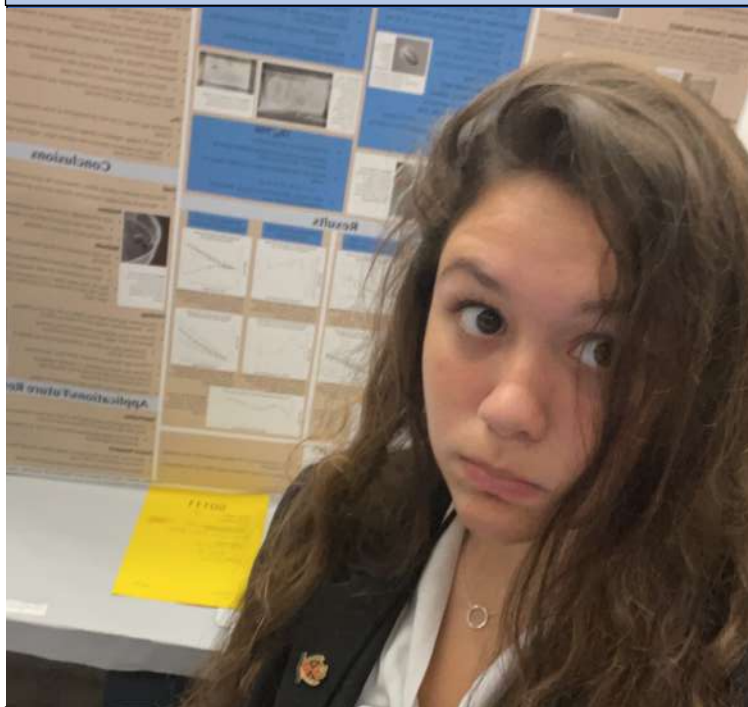
RSEF – Honorable Mention, Chemistry

2021

RSEF – 2nd Place, Environmental Engineering

Jenna Leiss

Junior, Class of 2023



Mentor Name:

Mr. William James Furiosi II
Research Instructor, Oviedo High School

Location of Research:

Oviedo High School

Abstract

Of the 27 million tons of plastics entering landfills each year, around 30% is comprised of polystyrene. Previous research showed that mealworms (*Tenebrio molitor*) were able to 3.4 – 3.9 mg of polystyrene per individual with limited negative effects. However, greater consumption yields are necessary to make a meaningful impact on the plastic pollution problem. In an adjacent field, the use of caffeine with honeybees has shown to improve their pollination work rate for agricultural purposes. However, it is still unknown if caffeine has the potential to do the same with mealworms regarding their consumption of polystyrene. This study expected to show caffeine increasing the rate at which polystyrene is consumed until the concentration reaches a maximum limit, where it becomes lethal to the mealworms. The experiment was designed to expose 10 mealworms per group to differing concentrations (0%, 1%, 5%, 10%, 20%) and masses (0mg, 1mg, 2mg, 5mg, 10mg, 20mg) of caffeine over the course of 30 days. At the end of 30 days, the mass of the mealworms, their frass secretion, and the remaining mass of polystyrene were recorded. After 5 mg caffeine and 5% concentration, mealworms exhibited deleterious effects with a decrease in mass, polystyrene intake, and frass. This data provides preliminary evidence showing the positive effects caffeine has on mealworm polystyrene consumption rate and as a promising avenue of continued research to address the plastic pollution problem.

Awards & Accomplishments

2022

Brevard County Intracoastal Award
SSEF – Finalist, Animal Sciences
RSEF – 2nd Place, Animal Sciences

2021

RSEF - 2nd Place, Animal Sciences

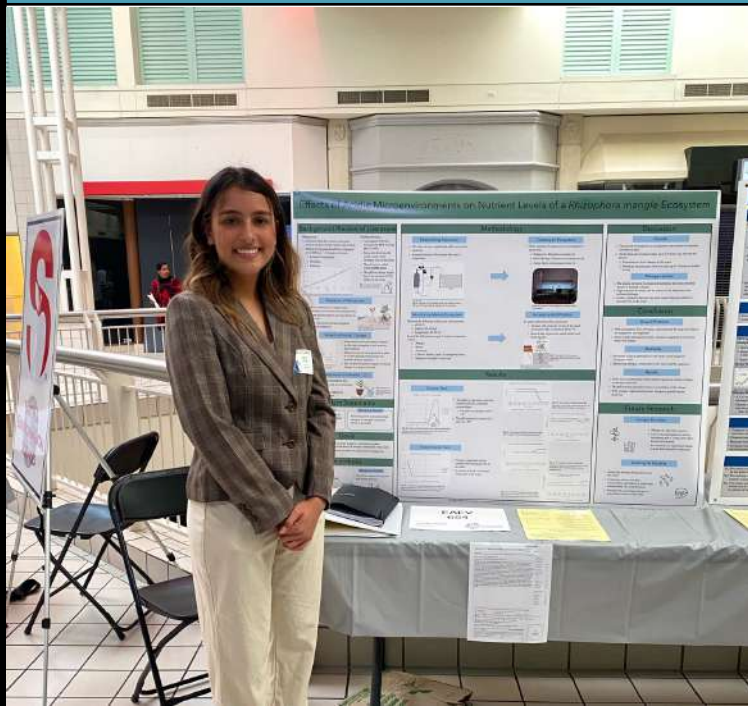
2020

RSEF - Honorable Mention, Engineering



Sophia Schmitz

Junior, Class of 2023



Mentor Name:

Mr. William J. Furiosi II

Research Instructor, Oviedo High School

Location of Research:

Oviedo High School

Abstract

Mangroves have an essential role in the coastal ecosystem. In the past decades, atmospheric CO₂ levels have been on the rise, leading to more CO₂ in the water, dropping the pH level. Nutrients, such as nitrogen, are important for growth and nourishment of mangroves. Nitrogen availability in the water determines the growth rate of plants. By studying the effects of elevated CO₂ in the water, future researchers can gain knowledge on our future outcomes. Two mock mangrove ecosystem aquariums were researched on, one that will represent our elevated CO₂ ecosystem & the other representing our current, controlled ecosystem. After increasing CO₂ levels in the water, there was no significant change the presence of nitrogen compounds, such as ammonia, nitrate, and nitrite in a short period of time. However, when the CO₂ controller in the control miscalculated and dropped the pH below 7 for a few days, the nitrate and ammonia levels greatly increased compared to the control period. In addition, all the ghost shrimp present died off. With more time, correlations between elevated CO₂ in the water and the effects on the amount of nitrogen compounds can be observed and acted upon. Future studies can analysis on the change of the number of nitrifying & nitrogen-fixing bacteria after CO₂ concentrations are elevated in the water.

Awards & Accomplishments

2022

RSEF - 2nd Place, Earth & Environmental Sciences

Stockholm Junior Water Prize Nomination

Banmeet Singh

Junior, Class of 2023



Mentor Name:

Mr. William J. Furiosi II

Research Instructor, Oviedo High School

Location of Research:

Oviedo High School

Abstract

There are around one billion visually impaired individuals in this world, and those with the most severe impairments face problems using the normal cane. It is important for blind individuals to be able to safely navigate with a cane as not all individuals are experienced enough to do this on their own. The goal of this project is to create a cane which can detect objects using an ultrasonic sensor that can inform the user according to the distance between the cane, the individual, and the object. The study began with the design of a circuit using ultrasonic sensors, vibration motors, and a circuit board. The coding was done in C/C++ language. The cane is powered by a 7.4v, 3000mAh rechargeable battery pack with two lithium-ion batteries. Vibration motor rotations per minute (RPM) and the distance calculated by ultrasonic sensor were evaluated in a series of tests to verify it could accurately detect objects at specific distances from the cane. The tests were conducted against various objects including a ball, wall, box, and moving objects. Results showed that the objects were detected with a high degree of accuracy up to 400cm. For example, when tested against a wall, there was a 0.75% error in the calculated distance by the sensor (397cm vs. 400cm). However, error increased as the object moved or grew smaller. The ball showed a 7.4% error when detecting a small ball at 400 cm. The initial output of this research is a functional cane, which can detect objects and can inform the person using it through vibration. Further improvements include using additional sensors for greater precision of smaller objects and sensor types for greater accuracy.

Awards & Accomplishments

2022

SSEF – 3rd Place, Engineering
RSEF – 1st Place, Engineering
Orlando Science Challenge Finalist

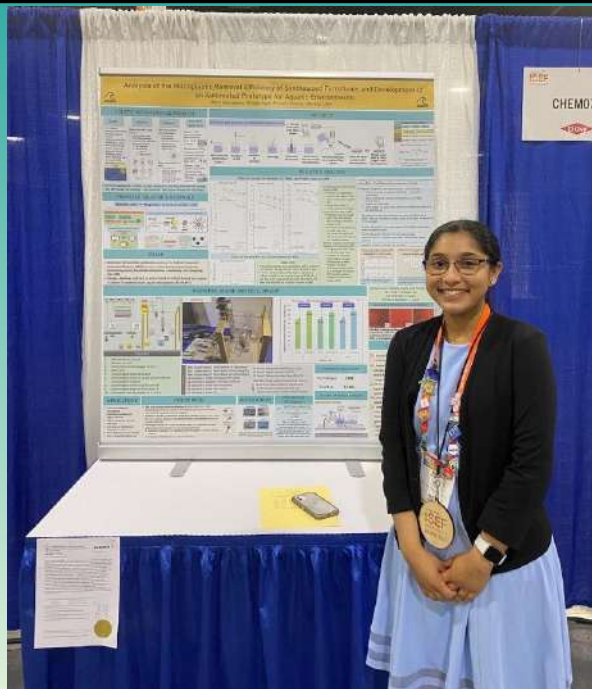
2019

Delhi Zonal Science Fair – 1st Place
India National Science Fair Finalist



Kyra Henriques

Junior, Class of 2023

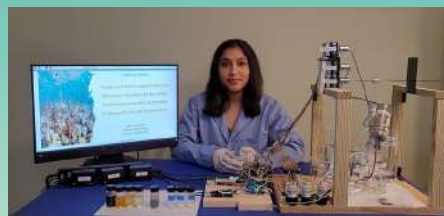


Mentor Name:

Dr. Kamesh Namuduri
Professor of Electrical Engineering,
University of North Texas

Location of Research:

Oviedo High School



Abstract

About 51 trillion microplastics (< 5mm size), which are proven to be harmful to living organisms, are present in water bodies worldwide. Filters, membranes, and nets, currently used to capture aquatic microplastics are costly and labor-intensive, limiting widespread usage. Ferrofluids (Fe_3O_4 and oil) are cheaper alternatives, which exploit the hydrophobic properties of microplastics and oil, allowing microplastics removal using magnets. In this research, varying volumes of used and unused, cooking oils and engine oils were combined with varying weights of Fe_3O_4 to synthesize ferrofluids to extract fixed amounts of PP, PE, and PET (< 2mm sized) microplastics and the magnetic removal efficiencies (MRE) were calculated. The results were used to understand the effect of different oils, oil volume, and Fe_3O_4 weight on microplastic removal efficiency with the goal of reducing cost and negative environmental impacts. An electromechanical prototype using Raspberry Pi was built to fully automate microplastic removal. Results indicate an inverse relationship between oil volume and MRE and a direct relationship between ferrite concentration and MRE. Unused cooking oil and used engine oil had the highest and lowest MRE respectively. Greater than 85% average MRE was observed for each tested plastic using the prototype. Laboratory and prototype investigations indicate that a high MRE is possible, illustrating that ferrofluids used to magnetically remove microplastics are a viable solution to the increasing aquatic microplastics problem.

Awards & Accomplishments (2022)

ISEF – 2nd place, Chemistry

ISEF – Full-Tuition Scholarship to Florida Institute of Technology & 2nd place U.S. Patent & Trademark Office Award

International Spellman HV Clean Tech Competition – Top 10 Finalist

Genius Olympiad Science Competition – 3rd place

Stockholm Junior Water Prize – 3rd place

Dr. Nelson Ying Science Competition – Top 5 Finalist

SSEF – 3rd place, Chemistry

Lockheed Martin Science Challenge – 1st place, Chemistry

RSEF – 1st place, Chemistry & Top 5 in Fair

RSEF – Stockholm Junior Water Prize Award of Excellence & Orlando Reef Divers Certificate of Achievement



Ishika Nag

Junior, Class of 2023



Mentor Names:

Dr. Yang Yang

*Assistant Professor at the
Nanotechnology Center of the
University of Central Florida*

Dr. Tara Sabo-Attwood

*Professor and Chair of the
Department of Environmental
and Global Health of the
University of Florida*

Locations of Research:

*Oviedo High School
UF Emerging Pathogens Institute*

Abstract

During the COVID-19 pandemic, face masks have become a critical part of the personal protective equipment for front-line workers and the public, resulting in an acute shortage of effective and affordable masks. Recent studies also indicate a strong correlation between ambient air pollution and COVID-19 cases. Air pollution from particulate matter less than 2.5 microns (PM_{2.5}), is a significant contributor to cardiovascular and respiratory diseases. The goal of this study was to develop a mask with an optimized nanoparticle coating which has a dual capability of particulate matter and virus filtration, while being safe for human use. The nanoparticles were selected based on their filtration, virucidal, and non-toxic properties. Particle filtration efficiency (PFE), tested with PM_{2.5} from incense sticks measured by laser particle detectors, improved by ~60% with nanoparticle coatings on KN95 and surgical masks. Virus filtration efficiency, tested using nebulized NaCl particles as a virus surrogate, improved by 95% with coated masks. PFE for engineered masks, with dual-layer nanoparticle coatings, initially declined but was restored by recharging. The nanoparticle retention efficacy, improved by 70% with the dual-layer coating, was well within the permissible exposure limits per OSHA standards. An accelerated durability test demonstrated ~95% effectiveness maintained over 4 equivalent days of wear. This technology has several applications such as in personal protective equipment for virus protection, and in air-conditioning and car cabin filters for pollution abatement. In conclusion, the chosen combination of nanoparticles provides an effective and safe solution for both particulate matter and viral particle filtration.

Awards & Accomplishments

2022

- Regeneron ISEF Finalist
- Best in Fair, SSEF
- 1st place, SSEF ENEV
- 1st place, Lockheed Martin Science Challenge
- Best of Show, RSEF
- 1st place, ENEV, RSEF

2021

- Regeneron ISEF Grand Award Winner
- Grand Prize Winner, Ying Science Competition
- 1st place, Lockheed Martin Science Challenge
- 2nd place, SSEF Environmental Engineering
- 1st place, RSEF Environmental Engineering

2020

- SSEF Finalist – Environmental Engineering
- RSEF – 1st Place, Environmental Engineering
- Naval Science Award Recipient
- Lockheed Martin Science Challenge Finalist



Furiosi?!





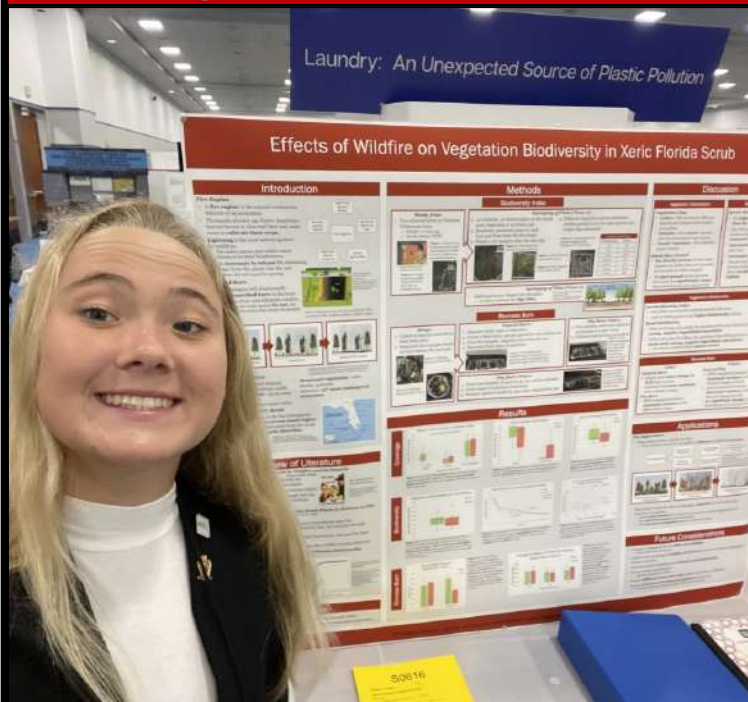
Seniors

Class of 2022



Eleanor Duffy

Senior, Class of 2022



Mentor Name:

Ms. Allegra Buyer
Natural Lands Program Coordinator,
Seminole County

Location of Research:

Chuluota Wilderness Area

University:

University of Florida

Intended Major:

Civil Engineering



Abstract

Fire in moderation is fundamental to the healthy existence of a habitat. Ecosystems that have been starved from fire can create major problems, like less frequent, but more intense and destructive fires. Many plants have adapted over millions of years to need the heat of fire to germinate their seeds. Land managers often use prescribed burning to intentionally control where and when they want a fire to burn; however, when fire isn't present for long periods of time, there is a buildup of debris and risks intense fires. Two adjacent plots in the Chuluota wilderness area were surveyed in this study to evaluate two extremes of fire history. One was burned in 2010 by wildfire and the other has not been burned for over 30 years. Species richness, species coverage, and vegetation class type were measured in 14 different quadrats in each of the two plots. Jost biodiversity index was calculated for each quadrat and compared. Ground debris from both plots were also collected and burned in lab. Mass percent change was calculated to evaluate an association between biomass, fire history, and biodiversity. The Jost biodiversity index (no fire history [NFH] (median: 0.345; 2010 Burn median: 0.221) and species richness (NFH mean: 4.571; 2010 Burn mean: 4.214) in the unburned plot was higher than in the burned plot. Three-quarters of quadrats in the unburned plot had higher Jost biodiversity value than that of the plot burned in 2010. This difference in biodiversity is likely because the unburned plot is transitioning into a hammock habitat and the ecotone between the habitats is expanding. Upon further data analysis, the unburned plot showed characteristics and species of both the hammock and the scrub. The Florida Scrub is an endangered habitat. Learning to better manage this area is a necessary step to help preserve this area for future generations to learn, appreciate, and enjoy.

Awards & Accomplishments

2022

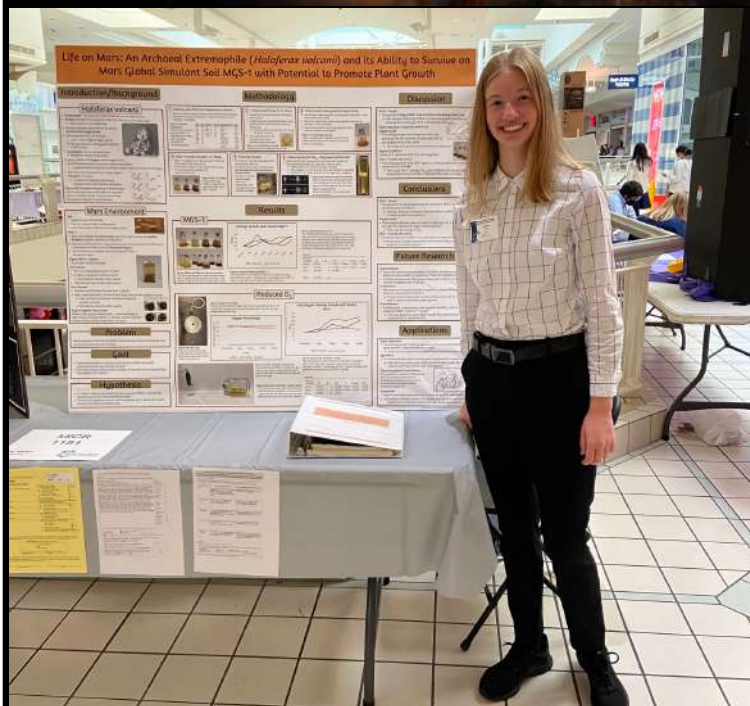
SSEF Finalist – Earth & Environmental Sciences
US Agency for International Development Award
Lockheed Martin – 1st Place, Earth & Environmental Sciences
RSEF – 1st Place, Earth & Environmental Sciences
NASA Earth Systems Award

Academics

Summa Cum Laude
Rank: 18th of 555
GPA: 4.57

Katelyn Fry

Senior, Class of 2022



Mentors:

Dr. Maupin-Furlow

*Professor, Microbiology & Cell Science,
University of Florida*

Dr. William Self

*Associate Director of Undergraduate Affairs &
Professor of Medicine, University of Central Florida*

Location of Research:

Oviedo High School

University:

University of Florida

Intended Major:

Biomedical Engineering



Abstract

Haloferrax volcanii, an archaeal extremophile, has potential to grow on Mars due to its ancient ancestry of living in harsh environments. *H. volcanii* has the potential provide carbon and amino acids to Mars regolith and remove toxic substances to promote plant growth. These toxic substances include perchlorates and heavy metals that *H. volcanii* has been shown to tolerate and/or metabolize. *H. volcanii* is known to use MgO, which is also found in Mars regolith, as a source for Mg ions necessary for cellular respiration. In this study, Mars regolith, Mars Global Simulant (MGS-1), was added to a growth media to determine whether the Martian regolith would promote or inhibit *H. volcanii*. Different amounts of MGS-1 (0g, 0.5g, & 5g) were added to the minimal media to determine the effects of increasing amounts of MGS-1 on *H. volcanii*. The regolith was found to neither promote nor inhibit growth with average growth over the 7-day period as measured via spectrophotometer at OD₆₀₀ (0.388, 0.228, 0.294, respectively). In addition, the *H. volcanii* was grown in a partially anaerobic chamber to mimic the atmosphere of Mars, using candles to consume O₂ and produce CO₂. In this environment, *H. volcanii* showed decreased growth. In a future study, the media will be tested before and after the addition of the *H. volcanii* using a NPK soil test to test its impact on nutrient composition and is expected to provide additional nitrogen and phosphorus to promote plant growth. Overall, *H. volcanii* has potential to grow on Mars with a supplement of MgO to metabolize instead of O₂ and make the MGS-1 less toxic to plants by metabolizing heavy metals.

Awards & Accomplishments

2022

SSEF - 4th Place, Microbiology
Office of Naval Science Research Award
RSEF - 1st Place, Microbiology

2021

SSEF - 4th Place, Cellular Biology & Biochemistry
Lockheed Martin Science Challenge Finalist
RSEF - 1st Place, Cellular Biology & Biochemistry
Innovative Research in Space Exploration Award

Academics

Summa Cum Laude
Rank: 17th of 555
GPA: 4.579



Kalash Patel

Senior, Class of 2022



Mentor Name:

Dr. Andrew Dickerson

Assistant Professor, Mechanical Engineering,
University of Tennessee

Location of Research:

Oviedo High School

University:

University of Florida

Intended Major:

Aerospace and Mechanical Engineering



Abstract

Pesticides are widely used in agriculture across the United States and the amount used is increasing yearly. However, their usage has been linked to environmental problems, such as bioaccumulation and chemical leaching. One way to lower the use of pesticides is by improving efficiency and efficacy of their application. Opportunities for improvement include not only how the pesticide is applied onto the plant surface, but also with the interaction between the liquid and the surface. This deposition of pesticide depends on the liquid surface area in contact with the leaf, which is also reflective of its surface wettability. Consequently, the goal of this experiment is to evaluate the relationship between the different surface wettabilities of plants and how that affects the deposition of the pesticide glyphosate into the plant. Three different plant surfaces were applied with water and a 7% glyphosate solution. Results show that the contact angle was reduced by 7 degrees on average when the glyphosate solution was used ($p < 0.01$). Microscopy images were also taken to show the effect of the pesticide on the plant leaf after 6 hours of glyphosate application. The images indicate that the higher the contact angle produced by the droplet on the leaf surface, the lower the deposition of the pesticide. Since the pesticide was less effective as the average contact angle increased, the hypothesis was supported. These results reveal opportunities for creating a more efficient and effective pesticide. Different surfactant solutions can be tested to see which contact angle is optimum for the deposition of the pesticide, thereby reducing the need for the current quantities used in practice.

Awards & Accomplishments

2022

SSEF – 4th Place, Plant Sciences

RSEF – 1st Place, Plant Sciences

2021

RSEF – Honorable Mention, Earth &
Environmental Sciences

Stockholm Junior Water Prize Nominee

2020

RSEF – 2nd Place, Cellular and Molecular
Biology and Biochemistry

Academics

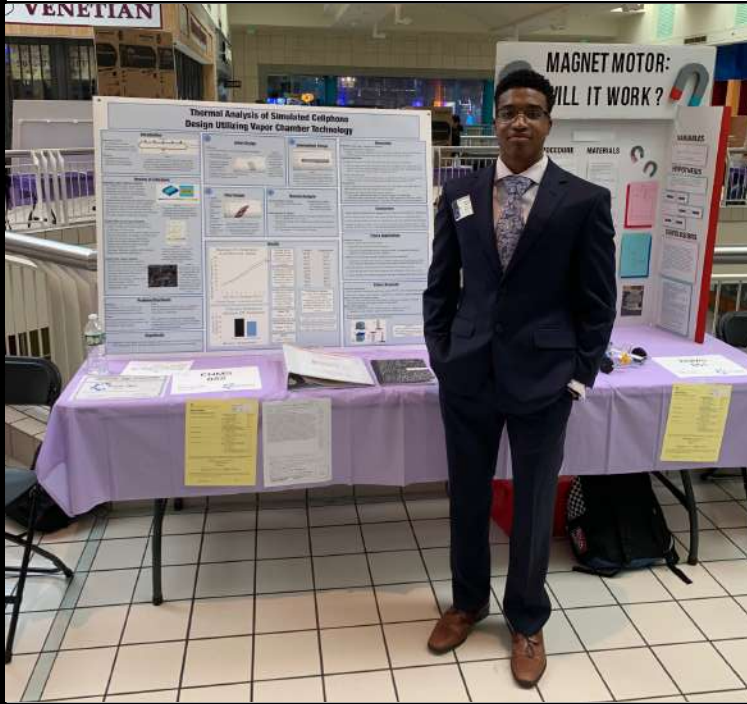
Summa Cum Laude

Rank: 23rd of 555

GPA: 4.5

Kenneth Phynn

Senior, Class of 2022



Mentor Name:

Dr. Raj Vaidyanathan

*Professor, Materials Science & Engineering,
University of Central Florida*

Location of Research:

Oviedo High School

University:

University of Central Florida

Intended Major:

Aerospace Engineering



Abstract

The demand to fit more powerful electronic systems into smaller packages has led to miniaturization and consequently higher thermal energy densities. High thermal energy densities can compromise system reliability and performance. Thermal management is the ability to control the temperature of system via energy interactions and this technique has been applied to nearly all modern electronics. There is insufficient analysis of vapor chamber technology in terms of their thermal performance in practical application of high-end smartphones. Two models in Solid Works and importing those models into ANSYS Workbench for thermo-structural analysis. The control and experimental models are identical, but the experimental has an integrated vapor chamber. The two models were assessed on the maximum temperature across the CPU. It was predicted that the experimental phone will have a lower maximum CPU temperature due to the vapor chamber's capability as a thermal spreader. The experimental model exhibited an 8% reduction in maximum CPU temperature; there was also a trend that shows greater residuals as the local heat flux density increases. These results suggest the vapor chamber can increase the thermal performance of the system and possibly permit the use of higher-powered microelectronic chips capable of using the full potential of 5G technology. Future research can look to characterize the relationship between thermal management of batteries and longevity since lithium-ion batteries naturally degrade over time.

Awards & Accomplishments

2022

SSEF – Finalist, Engineering
UCF Gold Pegasus Scholarship Awardee (\$14,000)
RSEF - 2nd Place, Engineering
Office of Naval Research Award

Academics:

Magna Cum Laude
Rank: 47th of 555
GPA: 4.27

Hayley Prete

Senior, Class of 2022



Mentor Name:

Dr. Rachel Prete

Pediatric Hospitalist &

Chief Quality Officer of Newborn Care

Winnie Palmer Hospital

Location of Research:

Oviedo High School

University:

University of Florida

Intended Major:

Biological Sciences



Abstract

Lack of knowledge on proper booster seat safety can pose a huge risk to the livelihoods of children, being that motor vehicle accidents are the number one killer of children in the U.S. However, there must be other factors that influence the low widespread use of booster seats in the U.S. A multi-format survey was created in order to test parents on their knowledge of their state's law on proper child restraint and the American Academy of Pediatrics (AAP) recommendation for booster seat use. Then in a subsequent section, participants answered Likert scale questions to determine factors that could possibly influence booster seat use. Participants were obtained at elementary schools, pediatric offices, and through social media. Initial survey responses showed that some parents felt peer pressures from other parents to use/not use booster seats, valued their child's opinion regarding booster seat use, and children feeling embarrassed and not wanting to be seen in a booster seat. By the outcome of this experiment, many factors have been reported to influence booster seat usage, whether negatively or positively. A high percentage of understanding for proper booster seat positioning was reported but a low percentage regarding the AAP recommendation; therefore, the knowledge gap and the factors of influence pose a potentially dangerous risk to the safety of young children. Moving forward, greater action needs to be taken to educate parents and families in the U.S. about the importance of keeping children in a booster until they reach 4'9". Factors such as diversifying demographics and relative severity of injury for each area still need to be addressed; however, the data collected is a good start to protecting the future generations of America.

Awards & Accomplishments

2022

RSEF – 2nd Place, Biomedical Sciences

\$1500 Orlando Health Grant Recipient

2021

AP Capstone Award Winner

AP Scholar with Distinction

2019

Founder, Child Safety Seat Awareness Team (CSSAT)

\$1500 Orlando Health Grant Recipient

Academics:

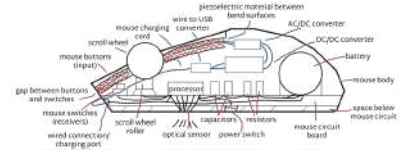
Summa Cum Laude

Rank: 25 of 555

GPA: 4.5

Jordan Price

Senior, Class of 2022



Mentor Name:

Mr. William J. Furiosi II

Research Instructor, Oviedo High School

Location of Research:

Oviedo High School

University:

University of Florida

Intended Major:

Mechanical Engineering



Abstract

There is a demand for energy harvesting systems, and piezoelectricity may provide an answer for low power needs. Energy harvesting from mouse clicks is an underresearched topic, yet clicking a mouse is a common motion carried out regularly by many people. This form of pressure can be applied to a piezoelectric material to produce voltage. In this study, a piezoelectric energy harvesting circuit was designed to convert mouse clicks into usable electric energy. Testing was conducted to determine the impact of click force, click duration, and surface bending on output voltage. Initial data from a simplified circuit with varying click forces showed that voltages of 0.4037 Volts are achievable. Voltage was shown to have a positive linear relationship with click force, having a correlation coefficient of 0.866. Based on the outcome of this testing, results are expected to show maximum output voltages greater than 0.5 Volts. With further testing, greater clicking force, shorter click durations, and the use of a bend surface are all expected to increase the output voltage. This amount of voltage is likely too low to be able to provide charge to a rechargeable wireless mouse. Typically, around 4 Volts are required. As technology improves, piezoelectric materials, energy harvesting circuits, and rechargeable batteries will become more efficient and effective. Consequently, it is still promising that a computer mouse may be able to run entirely off clicks performed by the user.

Awards & Accomplishments

2022

SSEF – Finalist, Engineering
RSEF – 2nd Place, Engineering
Office of Naval Research Award

2021

RSEF – 2nd Place, Engineering

2020

RSEF – 2nd Place, Behavioral Sciences

Academics

Summa Cum Laude

Rank: 32nd of 555

GPA: 4.5

Aleksander Sobik

Senior, Class of 2022



Mentor Name:

Mr. William J. Furiosi II

Research Instructor, Oviedo High School

Location of Research:

Oviedo High School

University:

University of Florida

Intended Major:

Undecided



Abstract

Evaluating fatigue and stress in materials, such as concrete, can frequently involve the use of expensive electron microscopes and other sophisticated imaging techniques. Furthermore, the failure of a concrete structure is not only dangerous for people, but it is costly for the environment too. Concrete production makes up 8% of worldwide carbon dioxide emissions, so there is incentive to maximize concrete's longevity while minimizing its overproduction. This study focuses on the use of the Leidenfrost effect as an alternative to expensive petrographic analysis for evaluating fatigue and stress in concrete. Concrete blocks of 2"x2"x4" dimensions were cyclically stressed with a hydraulic press. A cross-section was cut in each and then heated to 288°C. It was found that when concrete was uni-axially cyclically stressed, its cross-section's Leidenfrost point was notably higher. This change is due to micro-cracking which causes ratchet like protrusions in the concrete, and when revealed by taking a cross section, it penetrates the vapor film that normally prevents liquid droplet contact.

Awards & Accomplishments

2022

SSEF Florida – 1st Place, Physics & Astronomy

Robert & Judy Kryger Family Award

United States Air Force Award

RSEF – 2nd Place, Physics & Astronomy

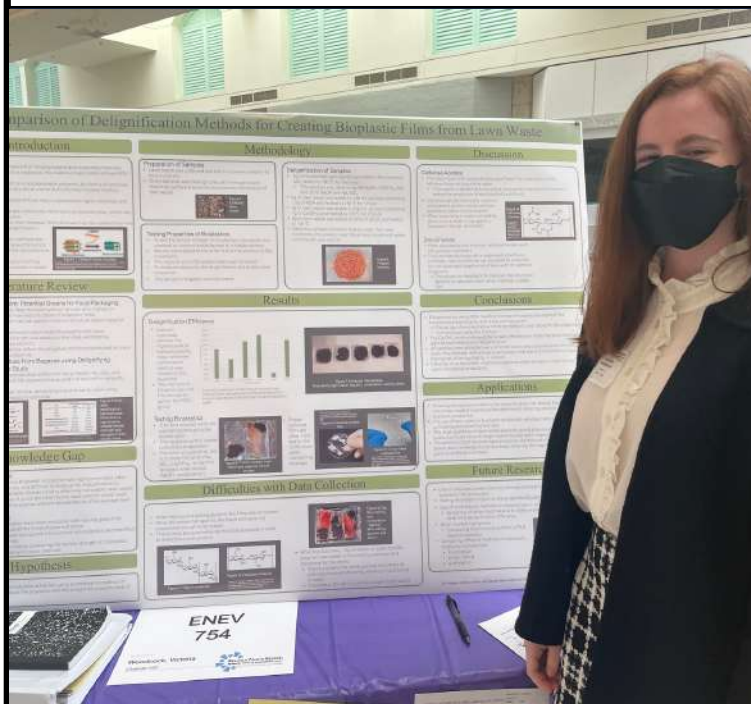
Academics

Cum Laude

GPA: 4.15

Victoria Woodcock

Senior, Class of 2022



Mentor Name:

Mrs. Kathy Savage

Biotechnology Instructor, Oviedo High School

Location of Research:

Oviedo High School

University:

University of Central Florida

Intended Major:

Microbiology



Abstract

As environmental concerns rise, an alternative to traditional petroleum-based plastics is in high demand. This demand has the potential to be met through the production of bioplastics- plastics created from biodegradable and renewable resources. One source of bioplastic polymers is holocellulose which, along with lignin, is a main component of plant cell walls. This project aims to compare various methods of holocellulose extraction on the tensile strength of bioplastic films created from holocellulose extracted from lawn waste. The methods used for delignification consist of the exposure and heating of alkali hydroxides and combination methods to the holocellulose source. The solutions were then filtered and rinsed to remove lignin and any residual chemicals. The holocellulose is then exposed to water and boiled. After this solution boiled, glycerin was added as the plasticizing agent. The bioplastics were cooled and the tensile strength was measured by recording the mass the plastic held at tear.

Awards & Accomplishments

2022

RSEF - 2nd Place, Environmental Engineering

Academics

GPA: 3.60



Accomplishments Summary



Regional Fair Awards

Out of 19 project entries, Oviedo student researchers earned...



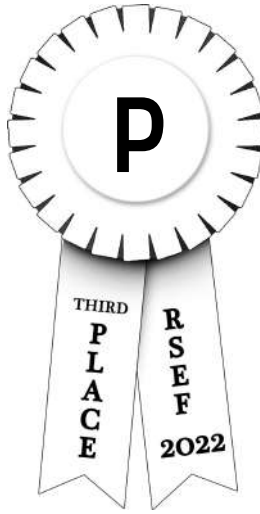
7

(37%)



8

(42%)



2

(11%)



1

(5%)

Percentages based on total number of Oviedo Research project entries.

SEMINOLE COUNTY REGIONAL
SCIENCE, MATH, & ENGINEERING FAIR
2022



**95% of Oviedo projects
earned an award!**

Oviedo Science Research continues to
be the strongest and the most
represented school in Seminole County!



Competition Summary



1 out of **20**
in ALL OF FLORIDA

Ishika Nag



4 out of **8**
in ALL OF SCPS

Ishika Nag
Eleanor Duffy
Kyra Henriques
Banmeet Singh

Bold indicates category winner.



11 out of **15**
in ALL OF SCPS

Ishika Nag
Kyra Henriques
Ella Pilacek
Eleanor Duffy
Katelyn Fry
Jordan Price

Kalash Patel
Kenneth Phynn
Jenna Leiss
Banmeet Singh
Aleksander Sobik

Bold indicates category winner.



2 out of **4**
in ALL OF SCPS

Ishika Nag
Kyra Henriques
Ella Pilacek*
Katelyn Fry*

*Indicates ISEF alternate.



Jenna Leiss
Kalash Patel
Kyra Henriques
Ella Pilacek
Katelyn Fry

Bold indicates Grand Award winner.





Florida State Science & Engineering Fair

MOST SUCCESSFUL GROUP EVER

An incredible **ELEVEN** students out of Seminole County's fifteen nominations came from Oviedo High School, marking a record year for Oviedo Research. All students also successfully made it through the Scientific Review Committee (SRC) without much fuss, but Display & Safety (D&S) was another matter. Regardless, nine of the Oviedo's students came away with a trophy, plaque, and/or prize money (or even all three!) during the awards ceremony.

EARLY BIRDS. Boarding the bus bright and early on the trip to Lakeland.



GROUP PHOTO! After project setup, the Seminole delegation poses for a group photo as they await the start of the opening ceremony.



BEST IN SHOW. Ishika Nag (Junior) becomes Oviedo High School's fifth Ying Scholar (best-in-show) in the past seven state competitions (left). The base of one of the four Life Sciences Ying Scholar trophies, showing Oviedo's dominance. Oviedo is the only school to have three students represented on a single trophy (below).



HIGH FLIERS. With the judging portion open and time to kill before the awards ceremony in the evening, the Lions researchers enjoy the thrills of Busch Gardens.

International Science & Engineering Fair

Ishika Nag
Oviedo HS

REGENERON
ISEF | FINALIST | 2022
SOCIETY FOR SCIENCE

Ishika engineered a dual-layer face mask coated with an optimized nanoparticle combination to improve its filtration of particulate pollutants and respiratory viruses. In addition, she verified that the engineered masks would be safe, durable, and even rechargeable.

Check out Ishika's virtual booth at **ENEV 0071**

#STEMinoleCounty



Kyra Henriques
Oviedo HS

REGENERON
ISEF | FINALIST | 2022
SOCIETY FOR SCIENCE

Kyra used ferrofluids to extract microplastics from water. She completed a factorial experiment to analyze the interactions between plastic types, ferrite concentrations, surfactant oil types, and oil concentrations. She used the most effective combinations to develop a prototype for automated microplastic removal at higher efficiency over commonly-used sieves.

Catch Kyra's virtual booth at **CHEM 0751**

#STEMinoleCounty



WELCOME BACK TO IN-PERSON ISEF!

With Ishika Nag earning one of the eight Ying Scholar awards at the Florida State Science and Engineering Fair, Seminole County had four bids to the Regeneron International Science & Engineering Fair (ISEF). Ishika and Kyra Henriques both represented Oviedo High School and half of Seminole's nominations. This year's ISEF marked the first competition held in Atlanta in over a decade and the first in-person competition since 2019.

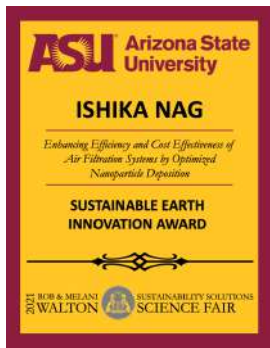


AND THE AWARD GOES TO...Kyra Henriques (above)! Kyra received an award from the U.S. Patent & Trade Office valuing \$500 during the special award ceremony only to follow it up the next day with a 2nd Place Grand Award in Chemistry valued at \$2000.

PRESENTATION TIPS. Mr. Furiosi was accepted to speak about poster and speaking presentation tips to a standing-room only crowd (upper left). Ishika, Kyra, and Mr. Furiosi pose for a photo with the ISEF logo (lower left).



Other Recognitions



ISHIKA NAG

Ishika Nag became the **first** Oviedo Science Research Junior Science & Humanities Symposium Speaker Finalist since 2019 and was the **first ever** student to earn an award in the competition (3rd Place, \$1000)! She also won the **Interdisciplinary Award** at the **Sigma Xi Student Research Showcase** (\$250), the **Sustainable Earth Innovation Award** at the **Rob & Melani Walton Sustainability Solutions Science Fair** (\$2500), and was awarded the **STEM in Action Award** from **Society of Women Engineers**.



Oviedo sophomore all the buzz after bee, plant conservation project wins science center competition

Orlando Science Center holds annual Dr. Nelson Ying Science Competition for high school students



ELLA PILACEK

Ella Pilacek was named as the winner of the 2022 Dr. Nelson Ying Science Competition (\$5000 and \$1000 for each her teacher and school). The rigorous competition names only five finalists from across Central Florida, and this year Ella was joined by fellow classmate Kyra Henriques. Ella's project focused on endangered species conservation by exploring whether or not honeybees could be Pavlovian conditioned to pollinate unfamiliar plants. Her research and accomplishment was covered by Channel 6 News' Julie Broughton.



Other Recognitions



Oviedo High student, bone marrow transplant survivor places at international STEM competition



Updated: 3:40 PM EDT Jan 5, 2022

Infotopia Asset Studio



Kyra Henriques

Kyra Henriques became Oviedo's highest placing student at the Regeneron International Science & Engineering Fair in at over 8 years when she earned **second in the world in Chemistry** (\$2000 & \$500 for her U.S. Patent & Trade Office special award). Her tremendous accomplishment was covered by WESH 2 News' reporter Anika Hope. Furthermore, she was named at **one of five Ying Finalists at the Dr. Nelson Ying Science Competition** (\$500) marking the first time Oviedo had ever had more than one competitor in the competition (alongside Ella Pilacek). Kyra also earned **third place** in the **Stockholm Junior Water Prize, Florida State Competition** (\$250).



GENIUS Olympiad International Fair

For the first time in school history, Oviedo had **five** competitors apply to the GENIUS Olympiad and **three** were accepted as finalists. Furthermore, *all three finalists* were awarded medals. This result is the most successful Oviedo has *ever* been in this competition.

APPLICANTS

Jenna Leiss
Kalash Patel
Kyra Henriques
Ella Pilacek
Katelyn Fry

FINALISTS

Kyra Henriques
Ella Pilacek
Katelyn Fry

WINNERS



Kyra Henriques



Katelyn Fry



Ella Pilacek





Publications



Utilizing Molecular Docking and Mutagenesis of Lys-233 into Ala-233 to Analyze the Effect on the Binding of the Morphinian Antagonist to the μ -Opioid Receptor

Samika Agarwal, **Kyra Henriques***, & Reine Halaby
November 11, 2021

About TechGirls

TechGirls connects and supports the next generation of women leaders in science, technology, engineering, and mathematics by providing them access and opportunities to advance their skills and pursue their dreams... and to increase mutual understanding between the people of the United States and the people of other countries by means of educational and cultural exchange.



Enhancing Efficacy and Cost Effectiveness of Air Filtration Systems by Optimized Nanoparticle Deposition

Ishika Nag*
December 13, 2021



Development of a combinatory filtration system for pollution and virus abatement by optimized nanoparticle deposition

Ishika Nag*
March 31, 2022 | doi: 10.1371/journal.pone.0264991

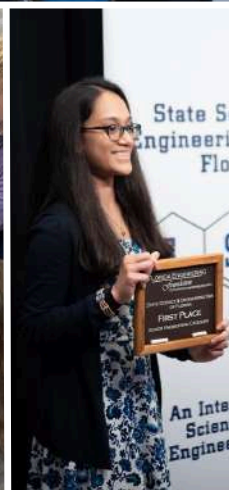


Air pollution abatement by selective nanoparticle deposition on filtration systems

Ishika Nag*
June 22, 2022 | doi: 10.17159/caj/2022/32/1.11389



STATES!





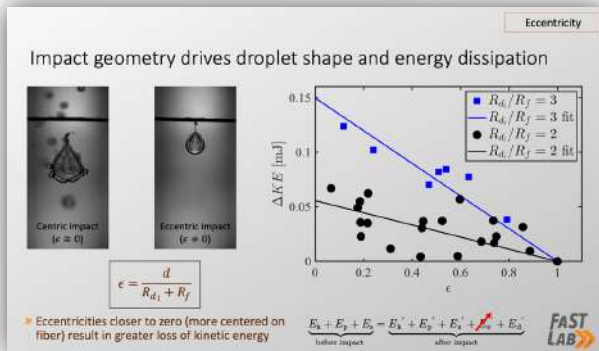
Expressions of Gratitude



Fluids and Structures
Laboratory

Dr. Andrew Dickerson

A continued thanks to Dr. Andrew Dickerson and his FaST Lab at the University of Tennessee for his continued partnership with Oviedo Science Research. Dr. Dickerson has continued to be an advocate for high school involvement in collegiate research since his time at UCF and has continued that partnership in his transition to Knoxville. His partnership has been supported through the funding of a Faculty Early Career Development Program (CAREER) Grant via the National Science Foundation. We always value your time and effort, and you have been described as hands-down the most influential and helpful judge and mentor.



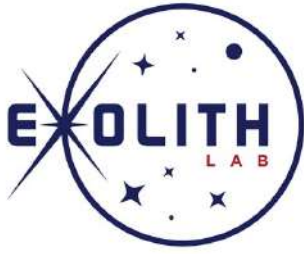
T THE UNIVERSITY OF
TENNESSEE
KNOXVILLE



Dr. Andrew Dickerson

Thank you so much Dr. Dickerson for your support over the last two years for my research projects. You have taught me a lot about how to flesh a idea properly and use software that is commonly used in analyzing high-speed videos. I truly appreciate all your advice and guidance over the past 2 years.

- Kalash Patel, Class of 2022



Ms. Ana-Paula Dovali

thank you

A huge thank you to Ana-Paula Dovali (c/o 2019) for coming in and speaking to Oviedo Science Research about Exolith Lab! In high school, Ana-Paula conducted a team project involving exercise science and earned 2nd place at the Seminole County Regional Science, Math, and Engineering Fair and recognition award at the Florida State Science and Engineering Fair. She was accepted into UCF in Fall 2019 to study molecular and microbiology with special interests in virology. However, she quickly joined the Students for the Exploration and Development of Space (SEDS) providing a biological perspective for the team as they worked towards competing in the Revolutionary Aerospace Systems Concepts – Academic Linkage (RASC-AL) competition. Ana-Paula eventually went on to become an officer of internal affairs and was named vice president of the organization in August 2021. As she continued to be involved with SEDS, she also began volunteering with Exolith Lab, moving her way up to the title of Simulant Engineer, Lead Simulant Engineer, and now Education Outreach Director.

Rarely do undergraduate students have the opportunity to engage in meaningful research in a university lab, let alone high school students. Ana-Paula seized the opportunity as soon as she got on campus and made these opportunities accessible to high school students as well. Thank you for paving a way for more inclusion and access, and for sharing these opportunities with our student researchers!



Exolith Lab

Ana-Paula Dovali
Simulant Engineer
Oviedo Science Research '19

"Exolith Lab enables space exploration, science, and education by making high-fidelity regolith simulants available to researchers and students around the globe."





Mentor Appreciation



NanoScience Technology Center

UNIVERSITY OF CENTRAL FLORIDA



Dr. Yang Yang

I would like to thank my mentor, Dr. Yang, for all of his support and advice in the field of nanotechnology. His encouragement gave me the confidence to follow through with my project when I first began, and his feedback has helped me grow my research past its original foundations over the past four years.

- **Ishika Nag**, Class of 2023



Department of Environmental & Global Health COLLEGE of PUBLIC HEALTH AND HEALTH PROFESSIONS



Dr. Tara Sabo-Attwood & Mrs. Sarah Bisesi

I would like to thank Dr. Sabo-Attwood and Ms. Bisesi for allowing me access to the Emerging Pathogens Institute's facilities and their labs. Their encouragement and support allowed me the amazing opportunity of being able to test my masks with live viruses, something I wasn't able to do back home. I was able to explore new techniques for virus testing thanks to their coaching. I had an amazing experience at the UF labs, and am grateful for their guidance throughout.

- **Ishika Nag**, Class of 2023



Department of Chemistry

UNIVERSITY OF CENTRAL FLORIDA



Dr. Melanie Beazley

Thank you for your continuous support in my project. I could not do my project without your guidance and your extensive knowledge made me feel less overwhelmed with unknown information. You were truly kind to me, and I am extremely thankful for your criticism, guidance and understanding.

- **Grace DeCoursey**, Class of 2023





Mentor Appreciation



Ms. Allegra Buyer

I sincerely thank you for your extensive guidance and knowledge while completing my project. Thank you for accompanying me in the field and providing me with your advice. You made a profound impact on me and my research.

- **Eleanor Duffy**, Class of 2022



Dr. Julie Maupin-Furlow

I would like to thank Dr. Maupin-Furlow for her support in furthering my project. You were generous in sending numerous *H. volcanii* samples and giving advise on how to properly culture the archaea. Your feedback changed the way I approached my project and helped me succeed.

- **Katelyn Fry**, Class of 2022



LUND UNIVERSITY



Dr. Margarida Soares

I would like to thank Dr. Soares for her through explanation of sonication and other bacterial extraction methods. Your feedback allowed me to accurately conduct NPK testing to improve my research.

- **Katelyn Fry**, Class of 2022



Mentor Appreciation



Burnett School of Biomedical Sciences

UNIVERSITY OF CENTRAL FLORIDA



Dr. William Self

I would like to thank Dr. Self for his open review of my methodology. I was able to learn more about the techniques and chemistry behind the culturing of bacteria. This knowledge helped improve the success of my project.

- **Katelyn Fry**, Class of 2022



Materials Science and Engineering

UNIVERSITY OF CENTRAL FLORIDA



Dr. Raj Vaidyanathan

Thank you, Dr. Raj Vaidyanathan. I met you as a judge at the RSEF, you offered me feedback on my project and software recommendations before SSEF. You will always have my gratitude and I look forward to being your student in college.

- **Kenneth Phynn**, Class of 2022



Mechanical and Aerospace Engineering

UNIVERSITY OF CENTRAL FLORIDA



Dr. Luigi Perotti

Thank you, Dr. Luigi Perotti. As my category judge at RSEF, you offered me feedback on my project, as well as a long dialogue on where I should take my research in the future when I go off to college. You will always have my gratitude and I look forward to seeking your council on my future engineering endeavors.

- **Kenneth Phynn**, Class of 2022



REGENERON ISEF

A PROGRAM OF
SOCIETY FOR SCIENCE

ATLANTA | 2022





Alumni Updates



Alumni Updates

Isolation and Identification of Effective Polyethylene Degrading Bacterial Species from *Galleria mellonella*

16:30 BST



Rishika Podarala

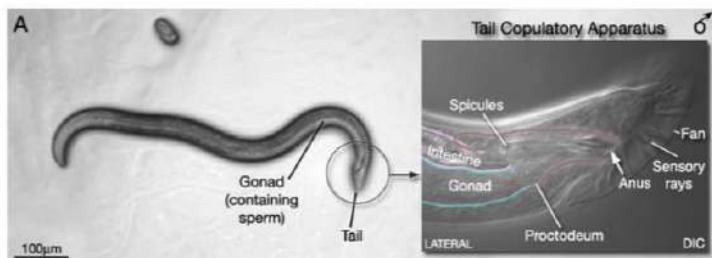
Research Enthusiast and Microbiology Undergraduate

Rishika is an undergraduate student majoring in microbiology and cell sciences, with an avid interest in biological and genetics research. Rishika has published research about COVID-19 and won regional and state science fair awards on plastic degradation research. She engage in community service as a member of the Indian Red Cross, and is bioscience MVP, pharmacy technician certified, and bilingual. Rishika enjoys hobbies of swimming, Indian classical dance, and traveling.

undergraduate student at the University of Florida, she was accepted into the Choe Lab with work on stress signaling pathways through the use of *C. elegans*.

Rishika Podarala

Congratulations for Rishika Podarala and her continued research involvement and advocacy for student research! In the summer of 2021, Rishika presented her work at the **Youth STEM Matters Research Conference** and has since joined the conference team as Science Communication Editor. As a freshman



Keith P. Choe, Principal Investigator



Dr. Choe received his PhD from the University of Florida in 2005 studying physiological and molecular mechanisms of stress and acid-base homeostasis in *Drosophila*. He later did his postdoctoral training at the Vanderbilt University Medical Center where he studied physiological, molecular, genetic, and biochemical mechanisms of stress resistance in *C. elegans*. He has been a principal investigator at Florida since 2008.

Luke Chandler, Graduate Student

Umeshchander Bhatnagar

Michael Rodriguez, Technician

Rae Schaefer, Undergraduate Student

Rishika Podarala, Undergraduate Student

Ana-Paula Dovali - Outreach Director



Ana-Paula Dovali is an undergraduate researcher studying Molecular Microbiology and Cell Science with a focus on Astrobiology at the University of Central Florida. When not working at the lab, Ana-Paula plays for the UCF Women's Rugby team, walking her dogs, and watching movies. Ana-Paula also actively participates in Students for the Exploration and Development of Space (SEDS) as a project lead for RASC-AL, an internal affairs officer, and mentor for new members. As she progresses in her career, she hopes to focus her research on terraforming using microorganisms for Mars and study extraterrestrial life. Here at Exolith, Ana Paula loves working with all kinds of regolith and studying their chemical properties. At the lab, she loves working with her coworkers and bringing a smile to their faces. She hopes to implement her experience here into her future projects.

Ana-Paula Dovali

Congratulations on Ana-Paula Dovali for being named Education Outreach Director at Exolith Lab and for earning an internship at SpaceX where she will help to build Starship in Fall 2022!





Alumni Updates

Benjamin Shirey

Congratulations to Benjamin Shirey (c/o 2016) for admission into a Masters in Environmental Science at Florida A&M University after graduating with his Bachelors of Science in Marine Science: Biology in 2021. He successfully defended his undergraduate thesis titled *Understanding the Breeding Population of Limulus polyphemus on Florida's Gulf Coast* where he argued that this unique population has unconventional breeding patterns which the species flexibility and adaptability across environmental conditions. Ben was also named a Gilbraith-Wardman Fellow where he studied gross photosynthesis and daytime respiration – diurnal and seasonal patterns in Bermuda.



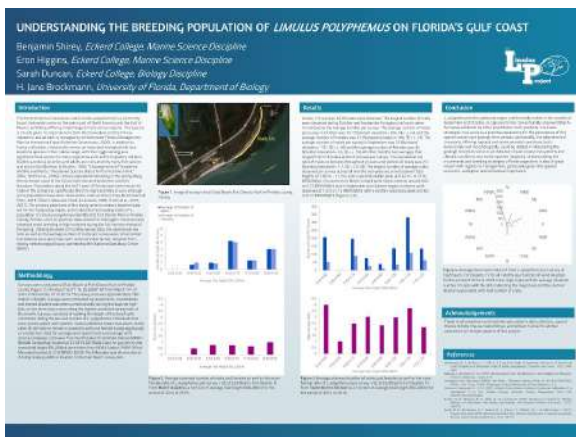
NAME: Benjamin G. Shirey

DEGREE: Marine Science: Biology Concentration (BS) Eckerd College (2021)

DEGREE SEEKING: Master's in Environmental Science with a concentration in Coastal and Marine Ecology

THESIS/DISSERTATION TITLE: Foraminiferal and Microbial Indices as an Effective Measure of Ecosystem Health in Prominent Puerto Rican Bays

Since 2016 at Florida A&M University, Dr. Martínez-Colón's laboratory is engaged in research addressing questions related to foraminiferal micropaleontology, environmental micropaleontology, heavy metal pollution, bioavailability, microbiomes, experimental culture work, coastal ecology, fate and trophic transfer of pollutants, microplastics, and recent foraminiferal assemblages in coastal ecosystems.



Four NOAA CCME Students Conduct Research Aboard R/V Hogarth



Letter from a Lion

This last year has been simultaneously the most successful and worst year of my life. While those things may sound like complete opposites, they're not. I was accepted into USF's 7-year medical program with over \$19,000 in scholarship money awarded from the Lawrence Medeiros Scholarship Fund, the Seminole County Medical Society and the USF Gold award. I spoke at the Council of Scientific Society Presidents Winter Leadership Conference, where I told my story in front of national scientific leaders and members of the white house cabinet. And I won the Genshaft-Greenbaum Global Explorers award which is fully funding a 5-week research trip through Western Europe during Winter 2022 where I will be studying how societal perceptions of disabilities have changed as medical advancements have been made.

Despite, all of that success, I was barely making it through each day. After the sudden passing of my younger sister at the start of this last year, I was diagnosed with Post Traumatic Stress Disorder, that coupled with the grief left my mental health in shambles. I write this to say that while life can look successful and perfect, behind the scenes it can be a completely different story. Life is often times a story of hardship and success. And if you happen to fall into a hardship, I hope that you take my story as a lesson that you can still be wildly successful despite it.

In Oviedo's Experimental Science program, I established research as my safe place.



A place where I could find a community that inspired me daily to be better. A world where nothing outside mattered and my opportunities seemed limitless. My ask for all of you, is to find that safe place, and no matter how much life throws at you, continue returning there, continue to put your best foot forward. Each and every one of you is capable of changing the world, and I believe that we all do will just that, despite anything that life throws our way.



- **Grace Thompson**, Class of 2019
2019 RSEF & SSEF Award Winner & ISEF Finalist
Lawrence Medeiros Scholarship Award Winner
Genshaft-Greenbaum Global Explorer



Senior Advice

What are you going to miss most about Oviedo Science Research?

I am going to miss the amazing learning environment Mr. Furiosi facilitates. It is welcoming and he always makes sure to use constructive words to help and not break down.

What did you appreciate most about Experimental Science?

I appreciate how I was upper nervous about taking this class, but my confidence in the class grew exponentially this year. This was mainly due to the great relationships that I build with other students in the class.

What comments and advice do you have for prospective students?

Don't compare your project to other people's projects. Each project is different and unique in its own way. Build your confidence in your project's area.



In the words of a future Gator, **Eleanor Duffy**



What did you appreciate most about Oviedo Science Research?

I appreciated the unique environment and opportunities presented by the class to work on something you're passionate about in an independent and in-depth manner

If you could go back and change history, what would you have done differently in the class?

In retrospect, I would have stayed on top of my workload and been more proactive to allow me to investigate and research further and more efficiently.

What are you going to miss most about Experimental Science?

I am going to miss the constructive environment and the feedback from my peers



In the words of a future Knight, **Victoria Woodcock**



What are you going to miss most about Oviedo Science Research?

What I am going to miss most about Experimental Science is the people in the class and the sense of community (definitely not a cult.....) that we have. I always enjoyed talking to everyone about just whatever really. Whether it is related to our research, something random, or just some pointless argument or crazy hypothetical scenario, it was a good group to converse with :)

If you could go back and change history, what would you have done differently in the class?

I would probably try and procrastinate less on doing the experiment for my project. I could have had a lot more significant data if I were to just focus on getting it done. Although, the idea of sitting there for hours clicking a mouse is not the most appealing in my defense.



In the words of a future
Gator, **Jordan Price**



What did you appreciate most about Oviedo Science Research?

Even though I was guilt tripped into taking this class and it was one of the most stressful classes I've taken at times, I really am so glad I did. This class has taught me a work ethic like no other and a passion for doing things I care about. I feel like now I have an elevated research mentality that gives me an edge over others. Research has also given me exposure to opportunities I never knew I had. Exolith has given me experience that will help me get into labs at UF and I have learned how to build relationships with people above me.

What advice do have for future students and their projects?

I have loved the community this class has given me. I have made some really awesome friends that I never would've met anywhere else. Also, I'm really going to miss the outlandish intellectual debates in this class, usually over things I know nothing about lol, but they are so entertaining.



In the words of a future
Gator, **Hayley Prete**



What did you appreciate most about Oviedo Science Research?

I appreciated the times spent with Furiosi and my peers the most during all of our struggles over the year.

What advice do have for future students and their projects?

I'm going to miss my peers the most. Coming to class knowing we were all in the same boat in regard to paperwork and experimentation was like nothing else. I'd like to think of it as communal suffering,

What comments and advice do you have for prospective students?

Be prepared to take criticism. Nothing will make you better than criticism. I attribute the majority of my success in both RSEF and SSEF simply because I could present my project in an appealing manner for engineering folks. Had Kalash never pointed out my presentation flaws early in the year, I probably would not have been nearly as successful.



In the words of a future Knight, **Kenneth Phynn**

What did you appreciate most about Oviedo Science Research?

What I appreciated the most was the community. Also, [I appreciated] how my public speaking skills improved.

If you could go back and change history, what would you have done differently in the class?

I would have tried to plan out the timing for conducting my research better to incorporate when we were out of school and had long weekends. For future students, my main advice is to flesh out your research plan early in the year so you can focus on your project.

What comments and advice do you have for prospective students?

Put in your best effort. It will be difficult at times, but it is definitely worth it.



In the words of a future Gator, **Katelyn Fry**



If you could go back and change history, what would you have done differently in the class?

I would have been timelier and more tried to get an ISEF bid so I could put more awards on the wall and make more money. It's upsetting to see my science fair stuff end, but I'm still excited to continue developing on my idea and save lives in the future.

What advice do have for future students and their projects?

Be smart with deadlines but before that make a strong project before you get too deep into it. You don't need to be a perfect student and perfectly disciplined to go far if you give yourself the time and effort to make a novel project that can make money and save lives.

Also, put effort into every assignment for this class. If you signed up for it, just commit to doing things right. [It's] not worth other option[s, like cheating or slacking off] that might work in most other classes.



In the words of a future Gator, **Aleksander Sobik**



What comments and advice do you have for prospective students?

I would've focused more on the deadlines set by Mr. Furiosi instead of waiting until the last moment or past the deadline to complete tasks. A lot of the deadlines are set to alleviate the stress from students, but by not following lead to the ultimate amount of stress in periods of days, and weeks before and leading up to fair. So keep up with his deadlines.

What are you going to miss most about Experimental Science?

I'm going to miss this family so much. It feels like I am losing a part of my life. The laughs, the hot-crazy scale, the weird stories and quirks about everyone in the class. Walking into the class was just such a rejuvenating experience even on the bad days. Shoutout to Jenna for dealing with me for 3 years and the bond we have built is irreplaceable. Shoutout to Furi for dealing with the stress I put on him for 3 years, but also helping me bring out the best in myself. I love you guys.

In the words of a future Gator, **Kalash Patel**





Getting Involved



Getting Involved

Student Research

With Oviedo Science Research, high school students can...

- Carry out high level research on a topic they are passionate about.
- Present at regional, state, and international competitions, including places like **Pittsburgh, PA** and **Phoenix, AZ** often with most or all expenses paid.
- Recognition for your work in terms of scholarships, prize money, and publications in journals.
- Improve coveted professional skills in use of technology, time management, critical thinking, organization, work ethic, and communication.

Since 2017, students have earned...

\$356,500
IN
**COLLEGE
SCHOLARSHIPS**

\$48,014
IN
**CASH
PRIZES**

Students succeed **MOST** when they continue for **two or more** years in high school research.

Judging & Mentoring

Become a judge or a mentor for...

- Speaking opportunities for sharing research and ideas that inspire.
- Outreach and advisement working with independent, driven, and capable students.
- Satisfying community involvement responsibilities for grants, employers, and tenure.
- A sense of accomplishment and reward for helping someone pursue a similar journey to yourself.



Donations & Sponsors

We are always looking for community support in a variety of ways, including...

- Equipment can be expensive, so anything going to surplus or donated are highly welcomed.
- Perishables given their uniqueness for each project and difficulty in procuring.
- Aiding visibility in the community by supplying students with class polos, pens, and business cards.

Become involved in **Oviedo Science Research** to set yourself apart.

Email Mr. Furiosi at william_furiosi@scps.k12.fl.us if you are interested!



Thank you!

