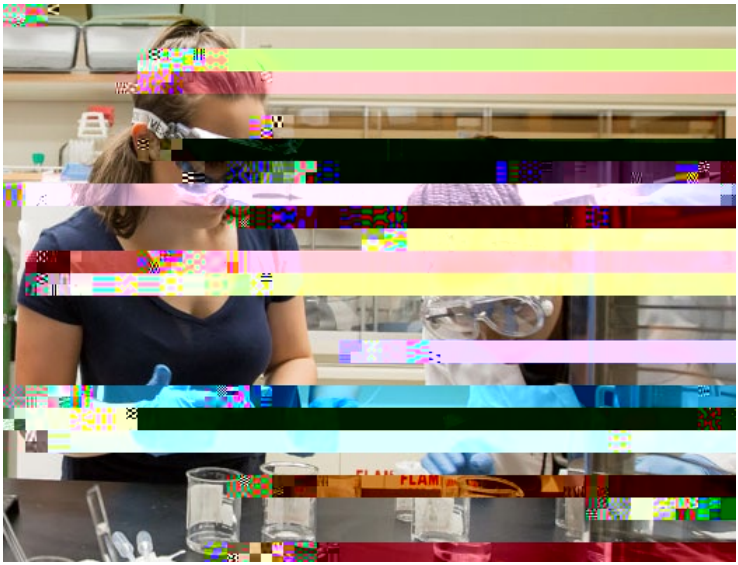
2022

NAMS Undergraduate Research Symposium



STOCKTON UNIVERSITY

School of Natural Sciences & Mathematics

Abstract #:1

Analysis and Comparison of Light Intensity Spectra Using Wavelet and Fourier Analysis

Buondonno, Gracie ; Ormond, KatieHaider, Amna; Weber, Courtney;Trout, Joseph ; Physics

This poster demonstrates our research on analyzing the light intensity spectra of stars with data provided by the Kepler Space Telescope. We analyzed the stellar light curves using Fourier Analysis and Wavelet Analysis. Continuous data of the light spectra intensities are used for the analysis of astronomical phenomena such as discovering the orbit of previously unseen planets. We are looking at various phenomena with stars and comparing the two techniques and seeing which one is more efficient and accurate. This poster presents the comparison of data collected and analyzed with Fourier Analysis and Wavelet analysis.

Faculty Mentor: Joseph Trout

Abstract #:2

Changes to the ***Neurospora crassa*** Metabolome as a Result of Defects in Arginine Catabolism

Urbanek, Alexandra; McCollum, Liam; Pollock, Elizabeth ; Biochemistry

Arginine is a secondary source of nitrogen in many plant and fungal species. Non-lethal mutations that impact arginine catabolism could cause secondary impacts on the metabolome as cells adjust to the lack of nitrogen availability via arginine. In this study, 1H nuclear magnetic resonance spectroscopy (NMR) was used to compare the metabolomes of Neurospora crassa (N. crassa). A strain deficient in the arginase enzyme responsible for catalyzing the first step of arginine catabolism was metabolically distinct from wild type (WT) or urease knockout strains grown under the same conditions of Vogel's minimal medium (VM). Therefore, arginase knock-out strains (ArgKO) were supplemented with arginine, which exacerbated the differences in ArgKO strains. This exhibited changes in the composition of the amino acid pool, particularly alanine in comparison to WT grown in the VM. High-Pressure Liquid Chromatography (HPLC) is currently being used to help further identify metabolites due to spectral crowding in 1H NMR.

Faculty Mentor: Elizabeth Pollock

pharmaceutical and commercial uses. Many transfer hydrogen catalysts exist; however, only a select view can function in the absence of a base under aerobic conditions. Using an imidazole-2-carboxamide ligand, we have synthesized a novel ruthenium-based complex and characterized it using NMR spectroscopy, combustion analysis, and single-crystal X-ray diffraction. We find that this complex can catalyze the base-free hydrogenation of ketones and aldehydes under aerobic conditions using 2-propanol as both a hydrogen donor and solvent. A substrate scope study was performed to better characterize the complex's catalytic capabilities. Current work is being done to identify viable intermediates in–situ to better understand the catalytic mechanism.

Faculty Mentor: Steven Kahlman

Abstract #:5

Analysis ofeDNA data for Characterizing the Finfish Population of a NJ Coastal Dredge Hole

Ozoria, Lizbeilyn; Harmer Luke, Tara ; BCMB

As part of a larger ecosystem characterization of finfish usage, this study uses environmental DNA (eDNA) data to help characterize the faunal community of Dredge Hole #90 in Atlantic County. Water samples containing eDNA were collected in the spring, summer, and autumn of 2020, filtered, and frozen for future analysis. Complete genomic DNA was extracted from these samples, further analyzed, a total of seven eDNA samples were sent out for Whole Genome Next Generation Sequencing.These files were analyzed separately and together using the web-based bioinformatics platform, Galaxy. Data reliability was assessed and adaptor sequences were removed for further analysis. Figures and basic data analytics were produced, collected, and analyzed. When analysis is complete, these data will be ground-truthed with results collected via traditional survey methods, and could potentially result in a less-invasive method for identifying faunal use of an ecosystem that is not dependent on invasive sampling techniques

Faculty Mentor: Tara Luke

Abstract #:6

Food Waste Recycling Bill A2371 Compliance Determination for the Sea Girt National Guard Training Center Dining Facility

Shank, Cassandra ; ENVL

Stockton University's Environmental Internship Program was tasked with developing and implementing a study to monitor food waste generation and management by the New Jersey Department of Military and Veterans Affairs Environmental Management Bureau in response to the Food Waste Recycling Bill (A2371). A2371 requires that all sites that generate more than 52 tons of waste annually and are within 25 road miles of an authorized food waste recycling facility must have their food waste sourced to those authorized facilities. To determine if the meal operations at Sea Girt National Guard Training Center were subject to A2371 food waste recycling requirements, we developed and implemented an experiment to quantify food waste generation for one day. Based on our data, we calculated that each diner generated about 0.0003 tons of food waste per day. Knowing that approximately 141,819 meals are served annually, we determined that the facility would generate approximately 12.68 tons of food waste annually. Based on these results, we determined that 539,137 meals would need to be served in one year to reach the 52-ton regulatory threshold. Additionally, we determined that there are currently no authorized food waste recycling facilities within 25 road miles of the site. Therefore, meal service operations at this facility are not currently subject to A2371 food waste recycling regulations. These results, as well as waste item observations and trends, waste minimization strategies, and various composting options, were included in a formal report, and provided to the facility superintendent for record.

Faculty Mentor: Dr. Tait Chirenje

Abstract #:7

Chemical Analysis of Newly Discovered Antibiotics from Soil Bacteria

Patel, Rani; Shah, Jairaj; York, Karen ; Biology

The increase in antibiotic-resistant bacterial infections is a growing health concern. To address this ongoing crisis, it is essential to discover new effective antibiotics. In this research project, we cultivated antibiotic-producing soil bacteria that inhibited the growth of known laboratory bacteria. We extracted chemical metabolites from these bacteria using ethyl acetate and confirmed antibiotic activity wasl present in the extract. We then used gas chromatography-mass spectrometry (GC-MS) to chemically characterize the metabolites by comparing fragmentation patterns to known compounds in the NIST library. The candidate compounds were assessed to determine if any were

effectively in the spring when water temperatures are low, compared to late summer and fall when thermoregulatory opportunity is greater.

Faculty Mentor: Craig Lind

Abstract #:9

Lamprophyres: A unique volcanic rock type from Cortlandt and Beemerville

Gulya,Matthew, Castle,Evans, Severs,Matthew ; Geology

The Cortlandt and Beemerville complexes and trend within Southeast NY to Northwest NJ are large igneous rock bodies that are thought to be related to one another. Within this trend are also dikes are primarily made of volcanic rocks called “lamprophyres” and are better characterized by an abundance of sodium, potassium, carbon dioxide and water along with lower silica content. The origin and association of these volcanic rocks is poorly understood and only those in the immediate vicinity of the Beemerville complex have been properly identified. A major goal of this project is to obtain a better understanding of these lamprophyres and their geochemical/mineralogical characteristics in order to understand their relationship to either/both the Beemerville or Cortlandt complexes and the source of these magmas. Field observations showed that the 29 sampled dikes show a great amount of diversity in their chemistry and mineral composition. The results of lab analyses show that these lamprophyres have a wide variety of crystal sizes and thus encompass a wide

construction phases only may exhibit negative modified behavior during initial pile-driving operations. Pinniped auditory thresholds, along with frequencies related to wind farm construction and maintenance will be summarized. Suggested positive impacts will also be discussed, including the creation of artificial reef communities, increased prey biomass, and increased foraging opportunities. This review of pinniped populations co-occurring alongside varying stages of wind farm operations will increase awareness of potential impacts (positive, negative, neutral) to these important apex predators. As wind farm development becomes common in coastal environments, understanding outcomes from prior studies will help inform monitoring and impact assessments for future wind farm construction and operation.

Faculty Mentor:

acquired due to mutation, specifically indels, in the gene causing poor oocyte fertilization, small progeny numbers, and longer gestation periods.

Faculty Mentor: Guy Barbato

Abstract #:13

Oyster recruitment and species richness and abundance on a living shoreline at Reeds Beach in Delaware Bay, New Jersey

Renna, Kylie ; MARS

Oysters are considered “ecosystem engineers,” filtering water and creating a stable habitat for many species of invertebrates as well as some vertebrates. They also create living shorelines, limiting the process of erosion, and protecting local communities. This study focuses on how artific 27.1578 ( )]TJRee,em gef1

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CRISPR-Cas9 was discovered as a bacterial defense mechanism and is currently researched as a genome editing tool, enabling scientists to change an organism's DNA. Genome editing involves adding, removing, or altering DNA. This revolutionary approach is currently being investigated for gene therapy to treat diseases including sickle cell anemia and cancer. CRISPR-Cas9 can specifically target DNA sequences that will be cut by endonucleolytic cleavage. Once the DNA is cleaved, it needs to be repaired by the cell for continued cell divisions. Gene editing leverages endogenous DNA repair mechanisms and can be used to introduce any new DNA sequence of choice. In this project, we are implementing CRISPR-Cas9 for genome editing in the budding yeast Saccharomyces cerevisiae. Our goal is to optimize the CRISPR system in yeast so that we can apply it to biochemically dissect multiprotein enzymatic complexes and determine their roles in regulating cell divisions. The current investigation is aimed at disrupting the yeast gene ADE2 since inactivation of this gene results in a change in phenotype, turning the yeast red. Using bioinformatics, we have designed a targeting vector and repair template, which we have cloned for transformation into yeast. Yeast transformations will be performed on both diploid and haploid strains to determine the efficiency of generating homologous mutants. Future studies will include dissecting the complex of proteins associated with Set1 (COMPASS), which is a major focus in the Law laboratory.

Faculty Mentor: Michael Law

Abstract #:15

Petrogenesis of lamprophyre dikes in Great Falls Park, Virginia and Maryland

Caccamesi, Dylan D., Steup, Kadie J., and Severs, Matthew J. ; Geology

Several igneous dikes were identified over 50 years ago that cut through the Potomac River along the border of Maryland and Virginia within Great Falls Park (George Washington Memorial Parkway and the Chesapeake and Ohio Canals National Historical Monuments). Originally identified as lamprophyre dikes, these differ from other mafic rocks (such as basalt or diabase) due to their high-alkali and volatile contents, which is reflected by an abundance of the minerals biotite and/or amphibole. Lamprophyre formation can occur in a variety of different tectonic settings such as subduction zones and continental rifts, and from melting a variety of source rocks such as an enriched mantle or metamorphosed lower continental crust rocks among others. This study aims

Cells constantly survey their intracellular and extracellular environment to interpret signals that regulate life and death. When grown in nutrient-rich conditions, the budding yeast Saccharomyces cerevisiae will replicate via mitosis. However, in nutrient-poor conditions, yeast undergo nutrient foraging also known as filamentous growth. To achieve this switch from miotic to

primers that target regions of the mitochondrial DNA from animal samples, in order to evaluate the effectiveness of each primer set. This work provides a foundation for further analysis of these samples using Next Generation Sequencing techniques

Faculty Mentor: Tara Luke

Abstract #:20

Microbial Diversity of Sourdough

Ellis, Kaelie ; Biology and Sustainability

Sourdough is known for its diverse microbiome with yeast and various species of lactic acid bacteria. Even though wheat has been used for thousands of years to produce bread, the microbial diversity of sourdough bread starter remains not fully characterized. This research was conducted to identify whether there is a difference in microbial diversity based upon (1) location and (2) what variety of wheat is used. For our starter material, grains of Emmer wheat and Hard Red Winter Wheat were threshed and winnowed. The grains were then milled and sifted into flour. During a week long period, three samples of each species of wheat were distributed into campus woods, Stockton Sustainability Farm, and Lake Fred. Portions of the samples deployed outside were transferred sequentially into additional dough samples to provide microbes with additional nutrients. This transfer process occurred every week under sterile conditions. DNA isolation was performed and successfully completed for the six samples. DNA samples will be sent to a separate laboratory for 16S rRNA sequencingi (do-o5a)2.1 (l)5.1 3.5 (N)-8.20 J04 (f)]TJ-0.004 (fey)-8.8 Shiere oceur tddir

intensely blue solution becoming abruptly colorless as iodine disappears. A detailed mechanistic understanding of clock reactions lagged their discovery by about a century. Today, we can apply modern techniques to further our understanding of their complex nature. We have reinvestigated a mechanism of the bromite-iodide reaction made up of 15 species and 22 reactions. The bromite-iodide reaction is a subsystem of the bromate-iodide reaction, a clock

Abstract #:24

Isofemale lines of ***Drosophila melanogaster***: Phenotypic and genetic variation of natural populations in NJ

Walsh, Andrew: Williams, Dominique: Dougan, Colleen: Berardo, Caitlyn: Haralampoudis, Nicole ; Biology

Drosophila melanogaster, the common fruit fly, has been a staple of the scientific community for many decades. We have begun collecting wild

settlement and recruitment were calculated from biweekly spat bags (settlement) as well as seasonal bags (recruitment) from 10 sites within the Mullica River from 2014-2021. This data was collected each year from July to September and water quality data was obtained for May to September from the Chestnut Neck monitoring station within the Jacques Cousteau National

sampling is sufficient to detect trends in climax species, such as Z. marina. However, this misses trends in R. maritima, the opportunistic species that has a more stochastic boom-bust population structure. Thus, yearly sampling should be conducted in order to fully understand all seagrass trends within Barnegat Bay.

Faculty Mentor: Elizabeth lacey

Abstract #:30

Characterization of Fertility-related yolk proteins in ***Anas platyrhynchos domesticus***

Rajput, Divya & Richards, Paige; Dr. Barbato, Guy; ; Biology

Determining a method to detect high fertility in commercial avian species would be beneficial as it could improve environmental practices while meeting

Recent reports in the Drosophila literature have suggested that the fly can be used as a model of diet induced obesity. In this study drosophila were fed high fat diets from either coconut or olive oil. Olive oil is high in monounsaturated fat by 74%, while coconut oil is high in saturated fat by 65%. Each was added to the flies standard diet in portions of 20% by weight. The progeny of the exposed flies were mated in vials with normal (i.e., nonfat) media diet. Drosophila fed coconut oil died, however the flies fed olive oil survived. The progeny of the olive oil-fed parents had significantly heavier offspring than the controls. Showing a 25.96% difference, and an average increase of weight by 29.83% in the females. In males a 18.18% difference was observed, and an average increase of weight by 20%. Thus exhibiting significant sex-diet interactions. That is, females had a 69.62% greater increase in body weight than males (due to the high fat diet).

Faculty Mentor: G. F. Barbato

Abstract #:32

Snakes outperform turtles and a crocodilian on functional assays of innate immune performance

Tan, Xin Rou "Natalie" ; Biology

Disease is one of the primary threats to reptile populations, leaving them imperiled globally. However, modern immune research on these ectotherms has lagged behind endothermic birds and mammals. This imbalance leaves conservation biologists to act without a full understanding of reptile host-pathogen dynamics. Innate immunity involves cellular and acellular responses, including natural antibodies (NAbs) and the serum complement cascade. The acellular innate immune system is responsible for eliciting a nonspecific, fast-acting response against microbial infections. The goal of this experiment was to examine interclade variation in acellular innate immune function amongst three major exta.1 (e)-3 (m)8.8 (e-0.9 (o)-4.2 (n)-6.1 (i7 (t)-6.426.1 (i7 (t)-6.426.1 (i7 (t)-6

the classical and lectin-mediated pathways. Erythrocyte hemolysis assesses complement-mediated cell lysis via the classical and alternative assays, and erythrocyte agglutination reflects the activity of NAbs. Complement performance of squamates was significantly better than turtles and crocodilians, which did not perform differently from each other. Our results support the hypothesis that the major reptile clades differ in complement performance and that differences may reflect broad phylogenic relationships among clades, therefore, highlighting the need for f hr4. (h)e (eer c)wa1 (er)-4.4 16.5 (r)

Abstract #:34

Detection of Decomposition Volatile Organic Compounds from Decaying Tissue

Lago, Jessica ; Biochemistry and Molecular Biology

Determination of a post-mortem interval (PMI), or time since death, is useful for forensic investigations as it develops a time frame for the occurrence of the crime. Current PMI determination methods are based on visual changes which separate corpses into immediate, early or the late post-mortem interval. Due to high variation caused by environmental factors, the estimation of PMI based on visual changes alone remains challenging. However, a novel approach is emerging which considers the release of volatile organic compounds (VOCs) at each stage of decomposition. In this study, a method for the sampling and analysis of the headspace gases above decaying tissue was developed for use in undergraduate research labs. Headspace samples were collected using a vacuum pump with a mass flow controller to measure flow through an in-line activated carbon Sep-pack cartridge (Waters corporation). Cartridges were extracted using methylene chloride, samples were filtered, and analyzed by gas chromatography-mass spectrometry (GC-MS). The tissue sample included a veal heart that consisted of cardiac muscle with congealed blood. Analysis of a sample collected after 8 days of decomposition showed polysulfide compounds including dimethyl trisulfide, dimethyl tetrasulfide and dimethyl pentasulfide. These results are consistent with VOC compounds detected in vertebrae decay studies found in the forensic literature. This methodology is now being used to test whether changes in type and amounts of VOCs are detectable at later points of decomposition.

Faculty Mentor: Dr. Kristen Hallock-Waters and Dr. Margaret Lewis

Abstract #:35

Effect of advanced glycation end products (AGE) on fetal mouse bone growth.

Havrylyuk, Valentina and Mili, Momota ; NAMS

Advanced glycation end products (AGEs) are molecules that are formed as a result of elevated levels of sugar in the bloodstream for long periods of time and have been found to have detrimental effects to health. High levels of AGEs are prevalent in individuals with Type I and Type II diabetes. AGEs are associated with several degenerative diseases, such as heart disease, kidney failure, and has been shown to negatively impact bone healing. In this study,

our aim was to observe a link between elevated AGE levels and the development of bone from cartilage templates in murine embryos. Fetal mice were obtained on day 14 of gestation and incubated with various doses of control and AGE proteins for 48 hours. The procedure required staining the cartilage of the embryos with Alcian blue stain and calcified bone with Alizarin red, and measuring the growth of bone in the forelimb skeleton with ImageJ, a software from NIH. Area of bone growth in the humerus, radius, and ulna was expressed as a percent of the total bone size. A comparison of treatment means (t-test) indicates that the lowest dose of AGE marginally reduced bone area in the humerus ($P < 0.2$), but this difference was not observed at the high dose. A high variability within treatment groups was observed and may be attributed to the small sample size currently available for this study. Increasing the N for each treatment group may reveal a link between AGEs and diminished bone growth in future studies.

Faculty Mentor: David Burleigh

Abstract #:36

Salt Marsh Sediment Accumulation Over a Small Spatial Area

Kelly, Sarah ; Geology

Salt marshes depend on sediment deposition and accumulation in order to survive through times of sea level increase. Sediment deposition in tidal salt marshes is well studied, but research typically focuses on larger areas, which could be less accurate for an entire mash surface. The goal of this research was to determine the spatial variability of sediment deposition and accumulation in a New Jersey salt marsh over a very small area. Sediment traps were placed in the mash at increments of 5 and 10 meters ranging over a 2800m2 squared

Abstract #:37

Dissolved Inorganic Carbon in New Jersey