

PRESENTATION TIME - 11:00am

The Consistency of Fiber Bragg Grating (FBG) Signal With Varying Angles Of Impact

Author(s):

Ashley Crickard, Mechanical Engineering (College of Engineering)

Mentor(s):

Kara Peters, College of Engineering

In structural health monitoring (SHM) application, fiber Bragg grating (FBG) optical fiber sensors are often utilized as a transducer for detecting ultrasound, such as ultrasonic acoustic emission (UAE). One of the major advantages of using FBG is due to its multiplexing capability, where numerous FBG sensors can be serially connected along a single optical fiber. The UAE signal is generated from a burst of energy due to a sudden structural failure, and the signal is then transferred to a surface-mounted FBG sensor. However, due to the cylindrical geometry of an optical fiber as compared to conventional omni-directional sensors (such as piezoelectric discs), the FBG output signal may vary depending on the origin of the UAE signal with respect to the FBG sensor location. Therefore in this work, we investigate the output response of a surface bonded FBG sensor to UAE signals generated from different locations. We demonstrate the repeatable excitation of UAE through the Pencil Lead Break (PBL) method at a specific angle of impact. Such a technique was used to produce UAE signals at 0 degrees, 45 degrees, and 90 degrees on an isotropic aluminum plate. We examine the amplitude of the FBG output response with incident UAE angle, demonstrating that the waveforms produced due to the 0 degree angle of impact had the highest amplitudes, indicating they were at the highest stress states. Waveforms produced by the 90 degree angle of impact had the lowest amplitudes, indicating they were at lower stress states. These results are consistent with the structure and function of FBG sensors from previous literature. The goal of this study is to better understand the FBG response to UAE signals for the improved analysis of measured signals for damage identification in SHM applications.

Proliferation Assays of 33 and 81 LNCaP

Author(s):

Malone Hanis, Biochemistry (College of Agriculture and Life Sciences)

Mentor(s):

Melanie Simpson, College of Agriculture and Life Sciences

Prostate cancer has made up about 20% of new cancers in 2020. The treatment for prostate cancer is typically chemical castration using anti antigen treatments. This treatment has about a 9 in 10 chance of success but some patients can develop castration resistant prostate cancer. Castration resistant prostate cancer is lethal and in results in a horrible quality of life for the remaining time. Dr. Melanie Simpson's lab has been working to find a biological marker for castration resistant prostate cancer. This project is using proliferation assays of prostate cancer cell lines to find a correlation between UGDH expression and response to anti antigen treatment. So far there is only preliminary data which shows that the knockdown expression of UGDH in 81 LNCaP behaves similarly to the 33 LNCaP line. This is a good sign since LNCaP 33 mimics regular prostate cancer cells and LNCaP 81 mimics castration resistant prostate cancer cells. So far we have only done treatments of enzalutamide on the cell lines which is an anti antigen. In the future we plan to investigate the effect of 4-MU which is a scavenger of the reactants of glucuronidation on the proliferation of the different cell types.

Sidewalk Symposium

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Artifact-led Textile Design at the Textile Heritage Museum, Burlington, North Carolina

Author(s):

Lara Rabinowitz, Fashion Textile Design (Wilson College of Textiles) and Anthropology (College of Humanities and Social Sciences)

Mentor(s):

Traci Lamar, Wilson College of Textiles

My research project will build upon previous studies that have examined the utilization of archives and journaling for textile design inspiration. I will visit the Textile Heritage Museum in Burlington, North Carolina and identify artifact(s) of interest. By exploring the cultural history of these textile artifacts, and documenting the ideas and inspiration elicited from the objects, I will use qualitative methods to answer the following research questions: 1) What meaning can be elicited from the process of artifact-led creative expressions in textile design? 2) What can the selected artifacts tell us about the culture that produced them? 3) How can artifact-led creative expressions inform us about our past? 4) Does utilizing a CPJ (Creative Process Journal) lead to enhanced creative expression in textile design? If so, how? A major output will be to design and produce woven, knitted, or printed textile products based on my creative process.

Increasing the Online Presence of Delftia acidovorans Through an Interactive, Accessible, and Engaging Web Hub

Author(s):

Lauren Ramilo, Biological Sciences (College of Sciences)

Mentor(s):

Carlos Goller, College of Sciences

Online, accessible, scientific materials can be used to engage the public and improve scientific literacy. This approach to open access science is a solution to paywalled and inaccessible literature, and is needed to drive public interest, catalyze research, and develop applications. Novel or understudied topics, such as microbes with unique survival strategies, can especially benefit from these practices. To measure the effectiveness of online content, the Delftia Hub was created. The Hub focuses on creating content to foster casual learning about *Delftia acidovorans*, a bacterial species that biomineralizes gold. Blog posts, graphics, social media activity, and collaborative annotation of research literature is being leveraged as a multifaceted approach to science communication and engagement, and we hypothesize that similarly broad approaches are needed to address scientific mistrust and institutional barriers.

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PRESENTATION TIME - 11:30am

Exploring Demodex Mites on Lemurs

Author(s):

Michelle Mayakis, Biological Sciences (College of Sciences)

Taeim Kwon, Biological Sciences (College of Sciences)

Mentor(s):

Lisa Paciulli, College of Sciences

Mites are small arthropods belonging to the class Arachnida. Mite proliferation in mammals can either cause or exacerbate diseases. However, almost nothing is known about mite proliferation in lemurs. In this study, we examined lemur hair for the presence of mites under the Duke Lemur Center (DLC) protocol. We hypothesized that some lemur species would have more mites than others, and that lemur sex/age would affect mite presence. Hair from six facial and eight limb regions of captive lemurs that differed by genus and species was examined under a light microscope. The results showed that crowned lemurs had more mites than the other species with no statistical associations between lemur sex/age and mite presence. It is unclear why crowned lemurs would have more hair mites than the other species sampled. Future research should examine the genetic profiles of the suspected mites to confirm that they are indeed mites.

PRESENTATION TIME - 12:30pm

Genetic Variation Between Workers and Queens During Colony Introduction

Author(s):

Gaven Bell, Biological Sciences (College of Sciences)

Mentor(s):

David Tarpy, College of Agriculture and Life Sciences, NC State University

Lauren Rusert, University of California - Davis

Honey bee queen health is crucial for colony survival, but there has been little research looking at interactions between genetics for queen quality and their acceptance rates. This research investigates how genetic differences between worker honey bees and a newly introduced queen impact the colony's behavior towards the queen. Queens from five different stocks were introduced to five observation hives with Italian stock worker bees. The colonies were then observed for up to 10 days to see if the newly introduced queen was accepted or rejected by the colony. Next, DNA samples from the Italian stock workers will be analyzed to determine genetic distance and inbreeding coefficients. From this research, we hope to determine if genetics plays a role in queen acceptance. If so, this knowledge can be used to mitigate queen loss during colony introduction.

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PRESENTATION TIME - 1:00pm

WikiEdu

Author(s):

Rabeya Tahir, Biological Sciences (College of Sciences)

Mentor(s):

Carlos Goller, College of Sciences

Our project this semester plans to use awarded funds exclusively for sequencing so that we may provide our participants with raw data to study differences between Delftia strains. Although we are again creating materials to inform and engage the public in Delftia research, we have not yet taken advantage of a platform like Wikipedia that is commonly consulted for scientific information. This project will allow us to engage new audiences with our work, further public knowledge of Delftia, and collectively draw new conclusions from genomic information.

PRESENTATION TIME - 2:00pm

Aye-Aye Mother-Infant Vocalizations

Author(s):

Caroline Diehl, Zoology (College of Sciences)

Anna Pannick, Biological Sciences (College of Sciences)

Colin Hadley, Zoology (College of Sciences)

Mentor(s):

Lisa Paciulli, College of Sciences

The mother-infant (M-I) bond is perhaps the strongest bond in nature, and was likely selected to keep offspring alive, which increases the likelihood of getting the parents' genes into the next gene pool. In this study, a mother aye-aye lemur's responses to her infant's vocalizations were examined. Duke IACUC approval was given to use microphones to record a mother and her newborn aye-aye. Audio-files were coded for the time, caller, duration, type of call, and whether it occurred within five minutes of another vocalization. Listening to 22 hours of audio revealed that like what is known about other mammalian newborn, the M vocalized more than the I. The most frequent call for both was the "huff." Limitations are newly trained coders, and the lack of synced visual data. Nonetheless, results showing trends in aye-aye vocal communication can contribute to future focused conservation plans, and greater awareness of this critically endangered primate.

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The Relationship Between Instagram Use and Anxiety/Depressive Symptoms: A Daily Diary Study

Author(s):

Emily Leister, Psychology (College of Humanities and Social Sciences) and Biology (College of Sciences)

Mentor(s):

Lynne Baker-Ward, College of Humanities and Social Sciences

As the popularity of social media continues to grow, researchers have shown an increased interest in the impact that social media use has on mental health. Today's college-age population has unprecedentedly high levels of anxiety and depressive symptoms compared to previous cohorts, and this study examines whether social media use, specifically Instagram use, is a contributing factor to this phenomenon. Participants, consisting of PSY 200 students at NC State University, will report daily social media interactions and indicate daily fluctuations in moods over a span of one week. These reports will include information about the severity of emotions, purpose and duration of Instagram use, and feelings related to the COVID-19 pandemic and other news-worthy events. These daily fluctuations will be compared against long-term traits, including self-esteem and neuroticism, to analyze the relationship between Instagram use, anxiety and depressive symptoms, and other related variables.

On Tight 9-Cycle Decompositions of 3-Uniform Hypergraphs

Author(s):

Megan Pryor, Mathematics (College of Sciences) and Math Education (College of Education)

Mentor(s):

Saad El-Zanati, Illinois State University

Ryan Bunge, Illinois State University

This project is in hypergraph theory, a more generalized form of graph theory where edges (or connections between vertices) can include more than two vertices. A 3-uniform hypergraph is a graph in which every edge contains 3 vertices. We define a complete 3-uniform hypergraph of order v as a graph with a vertex set V of size v and an edge set defined as the set of all 3-element subsets of V . We can decompose hypergraphs, or partition their edge sets into subgraphs. One such subgraph is a tight 9-cycle. A tight 9-cycle in a hypergraph has a vertex set $\{v_1, v_2, \dots, v_9\}$ contained in the vertex set V , and an edge set defined $\{\{v_1, v_2, v_3\}, \{v_2, v_3, v_4\}, \dots, \{v_7, v_8, v_9\}, \{v_8, v_9, v_1\}, \{v_9, v_1, v_2\}\}$. This research project determined the necessary and sufficient conditions for the existence of a decomposition of the complete 3-uniform hypergraph of order v into isomorphic copies of a tight 9-cycle.