UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 17, 2013 Mary Gates Hall

Online Proceedings

Poster Session 2

MGH 241, Easel 171

12:45 PM to 2:15 PM

Characterization of Replicate Evolved Populations of *S. cerevisiae* under Constant Nutrient-Limited Environments

Mei Huang, Senior, Public Health-Global Health
Anne Elisabeth (Annie) Young, Senior, Neurobiology
Mary Gates Scholar
Bryony Marie (Bryony) Lynch, Senior, Biology (General)
Mentor: Aaron Miller, Genome Sciences
Mentor: Maitreya Dunham, Genome Sciences

Chemostats are a continuous culture system in which cells are grown in a tightly controlled, chemically constant environment where culture density is constrained by limiting specific nutrients. Unlike batch cultures, the selective pressure imposed in a chemostat is constant. This has made them a desirable tool for evolution and competition experiments. Traditionally, chemostat experiments with *S. cerevisiae* have been constrained due to the limited number of cultures that can be run at once. In order to solve this problem our team is working with a new culturing system that allows 64 chemostats to be run simultaneously. In our experiment we evolved 96 biological replicates of haploid *MATa* yeast cells under either constant sulfur, phosphate, or glucose limiting environments for 300 generations. We are now using a variety of techniques including array-comparative genomic hybridization and whole genome sequencing of evolved populations to characterize mutations that have been selected for during the course of these evolution experiments. These techniques have revealed that amplification of genes that code for nutrient transporters are a common mutation that occur in the evolved populations over the course of the experiments. Therefore, we will also be experimenting with strains that have the most common amplified genes knocked-out in the hopes of identifying alternative pathways for nutrient-limited fitness increases. Changes in the genome can be correlated to changes in relative fitness, which we assayed through competition with a green fluorescent protein (GFP) expressing ancestral strain every 50 generations. Ultimately it is our hope that higher replicate number will better reveal the spectrum of genes important for adaptive growth in specific nutrient-limited environments.

Session 2G

Micro- and Nano-Materials in Action

Session Moderator: John Berg, Chemical Engineering

242 MGH

3:45 PM to 5:15 PM

* Note: Titles in order of presentation.

Battery-Free Gas Sensor Nodes Utilizing Ambient Radio Frequency Energy

Chen Shi, Senior, Bioengineering, Electrical Engineering
Mary Gates Scholar
Mentor: Joshua Smith, Computer Science & Engineering, Electrical Engineering
Mentor: Aaron Parks

Gas sensors are widely used in daily life and industry. An important application of gas sensing is the monitoring of environmental factors affecting health, such as the concentration of carbon monoxide, in populated areas. However, most conventional gas sensors are powered by batteries, which need periodic replacement. The goal of this project is to integrate a Wireless Ambient Radio Power (WARP) energy harvesting platform with a new class of amperometric electrochemical gas sensors, provided by KWJ Engineering, Inc, to create novel battery-free gas sensor nodes. The WARP sensing platform, developed in Dr. Joshua Smith's group, utilizes ambient radio frequency (RF) energy from common sources such as cellular towers and TV broadcast stations, which provide a reliable and pervasive 24-hour power source. The gas sensors manufactured by KWJ Engineering possess the advantages of low power, low cost, high sensitivity, and high selectivity. Particularly, the low power requirements of the gas sensors make it possible for them to be powered by the RF energy harvested by the WARP platform. Currently the potentiostat circuit needed to properly bias the gas sensor and acquire the gas concentration is being developed. The gas sensor circuitry will be integrated with the WARP platform to produce the battery-free RF-powered gas sensor nodes, followed by system optimization for reliable and efficient operations. With such gas sensor nodes, long-lived wireless sensor networks with zero maintenance cost could be deployed in continuous toxic gas monitoring applications, including air quality monitoring in cities and process control in industry.

POSTER SESSION 4

Balcony, Easel 118

4:15 PM to 5:45 PM

Behavioral Response of Marine Mammals to Flooding Tides in the San Juan Channel

Grace Elizabeth (Grace) Teller, Senior, Environmental Science & Resource Management (Wildlife Conservation)
Mentor: Aaron Wirsing, Environmental and Forest Sciences

The San Juan Archipelago is a unique cluster of islands supporting many marine mammals including the harbor porpoise (*Phocoena phocoena*) and harbor seal (*Phoca vitulina*). Use of the San Juan Archipelago by these two species is poorly understood, hindering effective management decisions. Accordingly, I use data from transect surveys to examine the effects of bathymetry over a flooding tide on harbor porpoise and harbor seal abundance. During the fall transition of 2012 my research group and I conducted 57 strip transects, 48 of which were usable, from the south end of Griffin bay (48 ?? 28,256'N, 122 ?? 57,517'W) to the north end (48 ?? 30,250'N, 122 ?? 57,837'W). The total length of the transect was 4km and the search area was 1.6 km^2. Bathymetry in the area studied contains a distinct feature where the depth changes from deep (˜165 m) to shallow (˜70 m). This report will examines densities along transects, assigning tidal states based on the tidal curve. Plankton and salinity/temperature data were collected at the start of each transect. Marine mammal point count data were also taken on one day close to the south end of the transect. On that day, numbers of harbor porpoises and harbor seals were recorded, along with temperature and plankton data, through the flooding tide. The results of this study can be used to reduce anthropogenic effects on marine mammals by enhancing our understanding of their space through behavior and distribution. This study also will underscore the value of small temporal scale studies for examining patterns of marine mammal habitat use.