Analyzing Clinical Laboratories using Object-Oriented Hierarchies and Discrete-Event Simulation
Hao Wang, Senior, Industrial Engineering
Mentor: Joseph Heim, Industrial & Systems Engineering
Mentor: Zelda Zabinsky, Industrial & Systems Engineering

The process flow in clinical laboratories resembles that in a traditional manufacturing setting, but there are distinct differences between the former and the latter which make it difficult to directly reflect the essential functions of a clinical laboratory in a simulation model. Creating a simulation model enables us to analyze and determine the impact on key metrics such as turnaround time and utilization rates when we change the physical configuration of the laboratory and vary the input parameters of the model. We have adapted the object-oriented nature of SIMIO, a program commonly used in a manufacturing setting, to create a discrete-event simulation modeling language for clinical laboratories reflecting the technical knowledge of experts from the clinical laboratory domain. We organized critical aspects of the clinical laboratory into class hierarchies to clearly delineate their functions and relationships. We then developed specific modules using the class hierarchies to represent the unique behavior of instruments, equipment and processes in a clinical laboratory. Using these modules, we created a simulation model of the clinical laboratory. The domain-specific modules we have formulated provide clinical laboratory experts with a customized tool to understand and improve their own system from a modeling perspective.
The export of signals is a vital aspect of bacterial communication with its environment and it was recently found that Gram-negative bacteria can send signals directly to neighboring bacteria via the type VI secretion system (T6SS). The bacterial T6SS translocates antibacterial toxins into neighboring bacterial cells and provides a means for bacteria to compete in their environment. Bacteria can also target their own cells with the T6SS but are protected against self-intoxication by cognate immunity proteins that inactivate their partner toxins. For example, one T6-exported toxin found in Pseudomonas aeruginosa, Tse1, degrades the cell wall of the recipient cell. The cell wall provides structural support for bacteria, and degradation of this protective layer by Tse1 causes the target cell to lyse. P. aeruginosa is immune to this toxicity, however, because an immunity protein, Tsi1, in the cell wall layer of P. aeruginosa binds and inhibits T6-exported Tse1. Our lab has found that Tse1 and Tsi1 are members of a large superfamily of type VI amidase effector-immunity widely found in Gram-negative bacteria, suggesting that these T6 toxin-immunity pairs may play a major role in influencing the structure of polymicrobial communities in general. Because of the large influence the T6SS can have on polymicrobial environments, I predict the T6-toxin-immunity system could also be utilized as an antimicrobial strategy. My aim is to engineer a novel Tse1–Tsi1 toxin–immunity pair that escapes rescue by immunity proteins in naturally occurring bacteria, thus giving the engineered P. aeruginosa strain the ability to outcompete the natural wild-type strain. To do this I will use a structure-based approach in conjunction with a genetic directed evolution strategy to identify and mutate Tse1 and Tsi1 residues that play an important role in Tsi1–Tse1 recognition and inhibition.

**POSTER SESSION 2**
Commons West, Easel 17
12:45 PM to 2:15 PM

**Gestation Time and Post-Hatch Growth of the Swell Shark, *Cephaloscyllium ventriosum***
*Christina Jarvis, Junior, Biology (General)*
*Mentor: Joseph Sisneros, Psychology, UNIVERSITY OF WASHINGTON*

The swell shark, *Cephaloscyllium ventriosum*, is one of the most popular sharks in public aquaria on the west coast of the United States, but very little is known about the early growth and development of this species. Swell sharks, members of the catshark family Scyliorhinidae, are small oviparous sharks that lay semi-translucent egg cases which they attach to rocks and seaweed during egg laying. Limited data on post-hatch growth exists for this shark, but there is essentially no data available on the early growth and gestation time of this shark within the egg case. The goal of this study was to determine the gestation period and early growth of the Swell shark.

The gestation time of 10 egg cases and the post-hatch growth rates of 39 swell sharks were recorded over a 23-month period. Juvenile swell sharks were reared from egg cases deposited in laboratory aquaria during July 1990 by eight female swell sharks previously caught off Santa Barbara Island, California. Mean gestation time for the eggs (n = 10) maintained at 13.5-17.5 C with a constant photoperiod (12 hrs light, 12 hrs dark) was 264.4 ± 18.106 SD days. Newly hatched sharks had a mean total length (TL) of 15.3 ± 0.7 cm SD (n= 42) and had a mean weight of 15.0 ± 1.4 g SD (n= 27). The average percent growth of sharks approximately one year old (n=21) was 38.74 ± 7.66 % SD. The gestation time of *C. ventriosum* is significantly longer than that of a similar catshark, *Hemiscyllium ocellatum*, which has a gestation period of just 140.3 ± 4.6 days. However, TL at hatching was very similar to this species and the average neonate length of *H. ocellatum* was 16.5 ± 0.5cm and average weight was 19.9 ± 2.1 g.

**SESSION 2U**

**STEREOTYPING AND PREJUDICE**
*Session Moderator: Allison Master, Psychology*
175 JHN
3:45 PM to 5:15 PM

*Note: Titles in order of presentation.*

**Contemporary Representations and Perceptions of Disability**
*Riley TaiTingfong, Junior, Communication*
*Mentor: Ralina Joseph, Communication*
*Mentor: Christy Ibrahim, School Of Law*

Approximately 54 million Americans have some form of cognitive or physical disability. This minority status crosses lines of age, gender, race, ethnicity, sexuality, and socioeconomic status. We are all subject to becoming disabled, should we experience illness, an accident, genetic difference, or the effects of aging. Despite such large prevalence, we are faced with limited and stereotypical images of disability as a problem that should ideally be fixed or eliminated. Such a view is the medical model, which contrasts with a more inclusive view of disability, the social model. The social model holds that being disabled is a neutral form of human difference. Problems come from the lack of accessibility for disabled individuals in a society built predominantly for people without disabilities. My project uses the social model framework; first,
I will analyze representations of disability in contemporary media. This uncovers marginalizing portrayals of disability that manifest in television today, such as pitying attitudes, “supercrip” depictions, and disability as a burden. Second, I will use focus group methods to examine perceptions of disability among UW students with and without disabilities. I will ask students to interpret various media portrayals of disability and examine salient patterns among their responses. I hypothesize that students will tend toward stereotypical generalizations consistent with the medical model of disability. I predict these results will demonstrate a need for students to develop skills for critical media consumption. With the results of this project, we can identify points for intervention and reframing of harmful stereotypes about disability.

**POSTER SESSION 3**  
Commons West, Easel 40  
2:30 PM to 4:00 PM

**How Politics Shaped Seattle Jazz**  
*Rachel Marie Donahue, Senior, Communication*  
*Mentor: Ralina Joseph, Communication*  
*Mentor: Melanie Hernandez, English*

This research examines the cultural climate that existed in Seattle’s Central District and on Jackson St. in the 1940’s-1960’s and the music produced at the time, jazz music. I examine Seattle’s changing laws (like racial restrictive housing covenants and prohibition), newer freedoms in the Black community (like desegregation), the influence of the Great Migration, and changing national attitudes toward racism and equality. I parallel those changes with evolutions in the styles of jazz produced throughout this period, and the social, political and economic landscape becomes evident in the music, to the extent that the way jazz sounded at a certain time reflected the social, political and economic atmosphere. I look at these issues through the lens of Floyd Standifer, a well-known Seattle trumpet player, who began his career in the 1940’s and was active in the Seattle jazz community until his death in 2007. Standifer witnessed some of the most radical changes in the socio-political landscape of Seattle throughout the ‘40’s through ‘60’s that I examine. The malleability he demonstrated in his music is testament to the changing social climate, population increases in the Black community, new freedoms, and the changing desires of community members and music venue patrons. In the shift from “rags” to jazz to rock ‘n’ roll, I demonstrate how jazz can be seen as political and reflects how music lies at the heart of the African American resistance to oppression during this period.