Proposed Research Project for Naughton Scholars

**Topic:** Mechanical loading effects on gene expression in bone cells

**Description:** This project aims to understand how various cells in bone respond to mechanical loading at the gene level, and how this can translate into the normal adaptation of bone to mechanical loading. We will be studying bone cultured in a bioreactor subjected to mechanical compression as well as bones taken from mice that have had either overloaded or underloaded conditions. The genetic response will be quantified by RNA sequencing, and later by microscopic visualization of gene activation. Finite element modeling will be used to determine the mechanical stress or strain at specific locations where cells were responding.

**Student Responsibilities:** The student could be directly involved in any of 1) bioreactor culture of bone, including designing and tuning the loading of the system, 2) imaging and computational modeling of bone samples from the bioreactor or from mice, 3) screening of the candidate gene transcription data (bioinformatics), or 4) developing protocols for visualization of the gene expression and registration of the data to 3-d models.

**Preferred skills, experience:** Prefer biomedical or mechanical engineering students with background or course work in any of cell culture, image processing, controls, or finite element modeling.

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