Department of Biological Sciences

Aurora MacRae-Crerar

Mentor: Jeanne S. Poindexter

The Significance of rRNA Operon Copy Number on Growth Rate in *Caulobacter crescentus* and its Implications for Ecological Strategies of Bacteria

Bacteria, having mastered the art of ubiquitous existence through their capacities for rapid growth and for facultativeness, generally have very efficient genomes containing only single copies of each of their genes. An exception to this rule is found in rRNA operons. The working hypothesis in this area of research is that a bacterium's ability to respond rapidly to a sudden influx of resources increases with rRNA operon copy number. From the ecological perspective, the hypothesis predicts that high rRNA copy number should correlate with environments of high, fluctuating nutrient fluxes, while low copy number is correlated with environments of low and steady supplies of nutrients.*Caulobacter crescentus*, a bacterium that can be isolated from freshwater, has only two rRNA operons (A and B), making it an especially suitable model system for rRNA-based growth studies. Inactivating ("knocking out") one of its operons could result in a 50% change in growth rate. In this experiment, we are attempting to knock out the B operon in the *C. crescentus* genome by selecting *C. crescentus* exconjugants that have received a constructed plasmid from *Escherichia coli*. Once a single-copy isolate has been obtained, growth rates will be determined in finite (batch) cultures, and the one-operon strain's ability to compete with the two-operon parent strain will be evaluated in perpetual nutrient-limited (chemostat) cultures. By comparing the growth rates and competitiveness of these two strains for a limited supply of nutrients, we hope to elucidate the role of rRNA operon copy number in the ecologic strategies of these aquatic bacteria.