

## **Kenia Whitehead**

**Title:** *A systems biology perspective of UV acclimation in the polar environment: understanding global patterns of gene expression and regulation in response to UV radiation and low temperature stress*

### **Abstract:**

The investigator will study how elevated ultraviolet-B due to anthropogenically induced decreases in stratospheric ozone affects numerous vital cell functions in photoautotrophic organisms such as photosynthesis, motility, pigmentation, nitrogen fixation and growth. The effects of UV-B may be augmented at cold temperatures by decreased metabolic rates for cellular processes such as DNA repair mechanisms. Although the impact of increased UV-B on aquatic polar ecosystems is reasonably well known, a basic understanding of the genetic and cellular regulation of photoprotective mechanisms in photoautotrophs is still lacking. This investigation will specifically investigate acclimation at a systems level by examining the effect of UV-B radiation on patterns of gene expression and regulation of the photoprotective compounds, mycosporine-like amino acids (MAAs) and scytonemin. This work will be conducted using a model organism, the cyanobacterium, *Nostoc punctiforme* whose genome has recently been sequenced. The photoprotective value of MAAs and scytonemin will be tested by assessing changes in survival in strains depleted in these compounds followed by assessing the combined effects of UV-B radiation and low temperature stress on gene expression and photoprotection. This genomic approach will utilize systems biology tools such as high density microarray analysis with the goal of building an integrated regulatory and metabolic network model providing a comprehensive view of the roles played by MAAs and scytonemin in UV acclimation.