**WPC 2019 ABSTRACT TEMPLATE**

Sample Abstract:

**EFFECTS OF VERY HIGH CO2 ATMOSPHERES ON PHOTOSYSTEMS I AND**

**II OF COMMON CYANOBACTERIA**

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The oxygen in the present-day atmosphere was produced by cyanobacteria and similar organisms 2.5-3.5 billion years ago. Early photosynthetic organisms evolved in an atmosphere rich in CO2 and poor in O2. We are currently investigating the tolerance of several cyanobacterial species to very high (>20%) concentrations of atmospheric CO2. Cultures of Synechococcus, Synechocystis, Plectonema boryanum and Anabaena were grown in liquid culture and bubbled with CO2-enriched air. Culture growth was monitored by measuring optical density at 750 nm. Damage to photosystems I and II was monitored by redox-dependent differential absorbance (delta A830 nm) and variable fluorescence (FV/FM), respectively. Synechococcus, Plectonema, and Anabaena tolerated CO2 concentrations up to 100% when the CO2 content was gradually increased from ambient by 10-15% per day. However, Synechocystis did not tolerate high CO2. Strains that were sensitive to high CO2 were also sensitive to low initial pH (pH 5-6), indicating that the formation of carbonic acid was partially responsible for the inhibited growth in high CO2 environments. Cyanobacteria that were sensitive to high CO2 environments (e.g., *Synechocystis*) exhibited rapid inhibition of photosystem II as indicated by decreased FV/FM. The results of photosystem I experiments (in progress) will also be presented. In addition to providing insight as to the adaptations necessary on the early Earth, this research has applications for Mars exploration (e.g. a martian exploratory base or greenhouse). Also, this research provides insight into the possibilities, however remote, of forward-contamination of Mars by robotic and human exploration, and the survival of such contaminants. (Supported by grants from the Arkansas Space Grant Consortium.)