***Bio Auto-sampler for Yellowstone Research***

*Objective*: To build a robust automated sampling platform flexible enough to monitor microbial cell growth in Yellowstone acidic hot springs and simulated hot springs within the laboratory setting.

*Background*: Growth curves are essential tools for microbiology and virology. They are used to optimize culture conditions for microorganisms and to monitor the progress of viral infections. Furthermore, they are often a first level of screening to determine the biological impact from changing an experimental parameter. For example, lytic viruses cause cell lysis which can be detected from a growth curve. The simplest method for determining cell growth is with a spectrophotometer because as the number of cells increase in a solution so does the ability of cells to scatter light causing visual solution turbidity.

The most difficult part of obtaining growth curves is the need to monitor solution turbidity over the course of hours to days with frequent sample collection. This difficulty is further complicated by the need to sample Yellowstone hot spring samples at temperatures up to 90C (190F) and pH values <1.0. This process has been greatly simplified with the introduction of automatic sampling devices which operate at ambient temperatures (<40C), however these devices lack flexibility to sample from high temperature environments. We have a need to build a robust automated sampling platform flexible enough to suit most foreseeable microbiology applications and compact enough for field use Yellowstone. Ideally the instrument will be able to collect samples of adjustable volume at defined time intervals from high temperature samples. Sensors will need to record optical density and temperature. After measuring these parameters, the instrument will should have the options to: 1. Return the sample to the original culture vessel. 2. Send the sample to a collection device. 3. Dispose of the sample as waste. Mechanistically, the components of the system will consist of collection tubing, liquid pumps, multiposition valves, a spectrophotometer, and a fraction collector. Construction of this instrument will greatly aide research on non-traditional organisms that grow at elevated temperatures.