**Introduction**

- Cellular metabolism is an important indicator of a organism's health.
- With metabolic information a variety of personalized medicine options can be pursued.
- Combining a real-time metabolism sensors with a well plate would increase testing efficiency and accuracy.
- Pharmaceutical's efficacy can be evaluated on a patient's cells, instead of just guessing which medicine would work.

**Objectives**

- Create a sensor that can measure the metabolic factors: Oxygen consumption, Glucose, and hydrogen peroxide.
- Design a well system and microfluidics to contain the experiment.
- Create a printed circuit board (PCB) potentiostat for both a singular well and six well plate configuration.
- Design a power instrumentation PCB.
- Manufacture a programmable syringe pump.

**Laboratory Testing**

The goal for the laboratory testing team was to verify experimental procedures and equipment. The laboratory testing team has worked on sensor calibrations, oxygen consumption rates with bovine cells with collaborators, electrode design, and well design.

**Electrical**

The goal for the electrical team was to verify schematics/design and complete the layout and soldering of the PCB for both the single well instrumentation and internal PCB's of this project.

**Software**

The goal for the software team was to develop a working GUI for the user that is able to communicate with the hardware, load and unload wells, plot data, and save and load settings.

**Image Processing**

The goal of the image processing team was to develop autofocus, time lapse, and image stitching functionality for the microscope system.

**Mechanical**

The goal for the mechanical team was to design, manufacture and calibrate a programmable syringe pump, create a microfluidic that splits the fluid into four separate chambers and then recombines the fluid, and design a well to perform experiments in. The syringe pump [2] can be seen with the well [3] in a test fixture in the main image.

**Conclusion**

**Electrical:** Will continue debugging and verifying single well instrumentation board. Eventually move on to completing design of 6-well versions of the boards.

**Software:** Continue to test and debug the GUI on hardware and start developing the temperature sensor communication as well as multiple well communication.

**Image Processing:** Successfully developed autofocus and time lapse algorithms, and applied an open source image stitching algorithm for the biosbox microscope.

**Mechanical:** Successfully created syringe pump, well and microfluidic. Will continue calibration, testing, and mitigating well leaks.

**Laboratory Testing:** Continue collaborating with other laboratories and start testing cells with the integrated system.