Ian LaCroix: Chemistry & Biochemistry
Mentor: Tomas Gedeon -- Mathematical Sciences
Real Time Metabolomics and Applied Dynamics

Metabolite Extraction Chip Mass Spectrometry (MEC-MS) is an emerging technique that allows near real-time monitoring of complex fluids. Here, we show that MEC-MS can be used to monitor the metabolism of an E. coli culture grown in a chemostat bioreactor. Periodic samples of live E. coli cells were automatically pulsed through the MEC-MS, over the course of twenty-four hours. The significance of the data produced by MEC-MS was that; it provided a continuous description of how the metabolic profile of E. coli changed during the sample period. This type of data has previously lacked in metabolomics studies. We used the data to develop a continuous model of differential equations, with the goal to explain the dynamics of metabolism in E. coli. The next step will include; using MEC-MS to monitor E. coli under oxidative stress conditions, and then to analyze the metabolic dynamics. With an aim to detect biomarkers of oxidative stress in a predictive fashion. Future work will include; application of this methodology to the analysis of human biofluids in order to detect novel biomarkers of disease.