1145-92-1568 **Ting Hao Hsu** (thhsu296@gmail.com), **Tyler Meadows** (tm09ts@gmail.com), **Lin Wang** (lwang2@unb.ca) and **Gail S.K. Wolkowicz*** (wolkowic@mcmaster.ca), Hamilton, Ontario L8S 4K1, Canada. *Growth on Two Limiting Essential Resources in a Self-Cycling Fermentor.*

In this talk a system of impulsive differential equations with state-dependent impulses to model the growth of a single population on two limiting essential resources in a self-cycling fermentor is considered. Potential applications include water purification and biological waste remediation. The self-cycling fermentation process is a semi-batch process and the model is an example of a hybrid system. In this case, a well-stirred tank is partially drained, and subsequently refilled using fresh medium when the concentration of both resources (assumed to be pollutants) falls below some acceptable threshold. We consider the process successful if the threshold for emptying/refilling the reactor can be reached indefinitely without the time between successive emptying/refillings becoming unbounded and without interference by the operator. We derive necessary and sufficient conditions for the successful operation of the process that are shown to be initial condition dependent. We show that the fraction of the medium drained from the tank at each impulse plays a crucial role with respect to maximizing the output of the process. (Received September 23, 2018)