

**Title:** Towards Regenerative Medicine for Heart Failure: *in vitro* Cardiovascular Model Systems using Biomedical Engineering Approaches

Abstract: Heart failure is the number one cause of death. Currently available treatment options have little effect on disease progression for conditions such as myocardial infarction followed by coronary artery occlusion. Regenerative medicine holds the promise of a cure for diseased cardiac tissues and organs by stimulating organs to heal or by replacing the damaged cells or tissues. The realization of regenerative medicine is dependent on establishing reliable models that effectively mimic cardiac development and disease. However, the large number of parameters that guide cardiac development, and predictive strategies to screen these parameters, needs to be fully elucidated in order to develop robust tissue models. This incomplete understanding of cardiac development hinders the ability to both differentiate stem cells into the required cardiac cell types and to engineer therapeutic tissues. My research is focused on unraveling cardiovascular development and disease processes, as well as screening different factors involved in differentiation of various cell types in regenerative medicine using *in vitro* model systems. These model systems will be used to generate specific cardiac cell types that can be organized into functional tissues, as well as to yield insights into the mechanisms of cardiac development and disease processes.