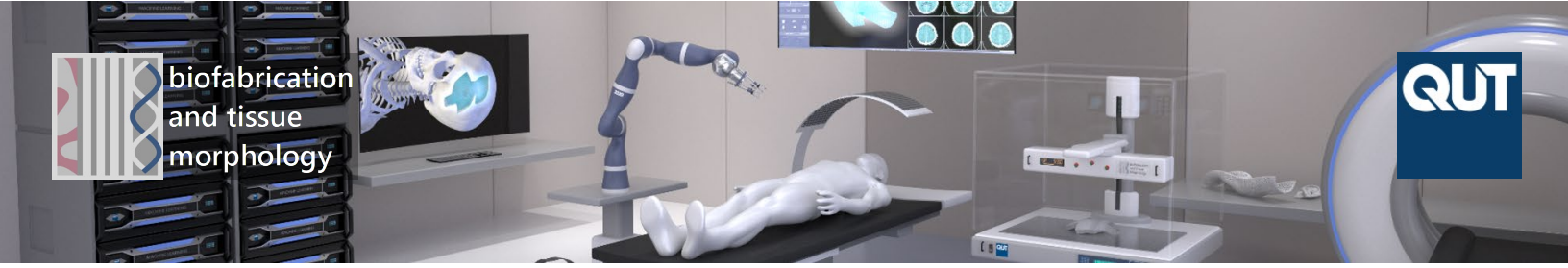

PhD Project Opportunity

Biofabrication & Tissue Morphology Group

27 August 2020

Supervisors: Dr Mark Allenby (mark.allenby@qut.edu.au), Prof Zhiyong Li, A/Prof Yi-Chin Toh, Prof Mia Woodruff

Project Title: **3D-printed soft robotics to simulate popliteal artery endovascular treatment**

Required skillset: Mechanical, medical or process engineering

Project Scope: Peripheral artery disease (PAD) is one of the most frequent cardiovascular diseases, affecting over 200 million people at an annual cost of $21 billion. PAD cases are predominately (80%) located within the popliteal artery, a highly flexible vessel behind the knee joint which twists, extends, and bends during standing, walking, and sitting. As a result, active or sedentary lifestyles play an important role in altering the biomechanics leading to popliteal diseases. Furthermore, surgical treatments within the popliteal artery have been inconsistent, with a 2% to 65% incidence of stent fracture depending on design, placement, and mobility, which have led to dismal long-term success of 50% at 5 years. An accurate simulation of popliteal biomechanics as well as peri- and postoperative treatments would aid in the design of improved therapies. This project has been granted ethical approval with access to patient data with some preliminary funding and outcomes indicating its feasibility.

Research Activities: This project will develop your skills in computational and experimental techniques. These skills are useful in a wide breadth of manufacturing industries. The aims of this project include:

- development of a medical imaging-to-robot design pipeline to digitally simulate patient anatomy and mechanics
- identification of printing processes and materials which recapitulate this simulated physiology
- development of a bioreactor tissue culture able to capture anatomical, biomechanical, and cellular aspects
- simulations of exercise and endovascular treatment to predict personalised patient outcomes.

This project won the inaugural Bionics Queensland Grand Challenge as a team comprising researchers Trent Brooks-Richards, Cody Fell, and Sabrina Schoenborn, and is backed by Advance Queensland support.

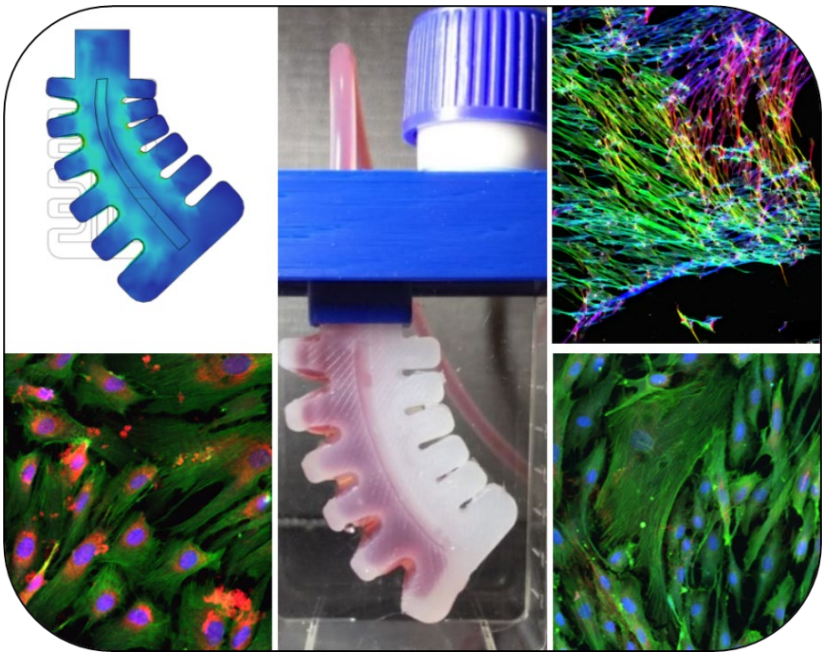

Figure (left): Computer aided design and biomechanics simulations, 3D printed soft robotic bioreactor platform, stem cell culture under various exercise regimes to produce vascular tissue models.

Contact the supervisors for more information.