

## Faculty of Engineering

### Summer Research Program 2022-2023

Project Title: Dynamic microfluidic cell culture platforms

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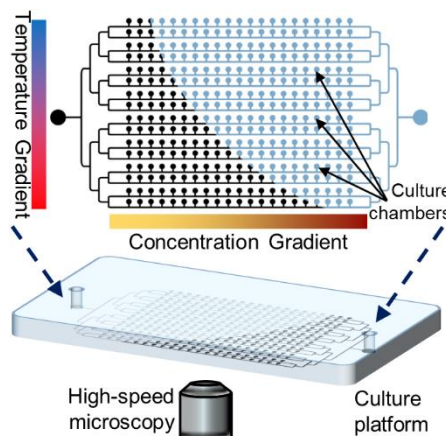
Website profile of project supervisor: <https://www.monash.edu/engineering/adrianneild>

### Objective

This project aims to develop a dynamic microfluidic cell culture platform that closely mimics the geometry and physiochemical features of the *in vivo* environment, including fluid flow and peristaltic motions. The platform will be applied to study embryo and epithelial cell culture conditions, to identify stage-specific conditions for the optimal cell health and growth as well as embryo development.

### Project Details

A network of branching microchannels, each with multiple culture chambers, will be interfaced with thermal, optical, and chemical controls to provide a multiplexed and highly parallelized microfluidic culture system – enabling over 20 treatments at a time. Pressure driven deformation of the device structure will give rise to time-dependant flow variation. The platform will be equipped with an environment chamber to provide a well-controlled incubated gas mixture, temperature and humidity enclosure. The device will be loaded with culture media and cells will be placed in culture chambers. The functionality of the platform will be optimised with respect to media composition, oxygen level, CO<sub>2</sub> concentration, flow velocity, and peristaltic motion. High-speed optical microscopy methods will be used for real-time morphological assessment and monitoring of cells in the device. Such a platform is capable of closely mimicking the geometry and physiochemical features of the *in vivo* environment, while providing a quantitative tool for monitoring the culture microenvironment.



### Prerequisites

Background in fluid mechanics (MEC2404 or CHE2161), and interest in fluid mechanics, experimentation, microscopy, and cell biology.

### Additional Information

Applicants may be required to attend an interview, and for more information please contact Prof. Adrian Neild ([Adrian.Neild@monash.edu](mailto:Adrian.Neild@monash.edu)).