

A short-term (4 months) undergraduate co-op or academic assistant research position is available in the Zandstra Stem Cell Bioengineering laboratory, which is in the School of Biomedical Engineering located within the Biomedical Research Centre, and is affiliated with the Michael Smith Laboratories, at the University of British Columbia's Vancouver campus. The successful candidates will join our world-class research team to **conduct experimentation that will further our understanding of the relationship between the cytoskeletal activity and cellular energetics**. Our highly successful multidisciplinary program integrates researchers in stem cell biology, biological computation, microfabrication, developmental biology, and regenerative medicine, with the goal of developing in vitro and in silico representations of complex tissue and organ development. Our research program is based on understanding how individual cells form complex functional tissues and organs by studying multiscale interactions between cells, their internal regulatory networks, and the external microenvironment, and then mobilizing our findings to generate therapeutically relevant blood cells from stem cells.

Details on the project and position:

Title: Understanding the impact of mitochondrial activity on epithelial-to-mesenchymal transition (EMT)

The human pluripotent stem cell (hPSC) micropatterning technology created in the Zandstra lab leads to gastrulation-like patterns in vitro. This is observed as radially segregated cell populations displaying ectoderm, mesoderm, and endoderm associated fates from the colony centre to the edge. The mesodermal-associated markers represent cells that have undergone EMT. Besides the emergence of Brachyury (TBXT), the mesoderm-associated marker, EMT is also characterised by changes in cytoskeletal activity. Our pilot data indicates increased cytoskeletal and mitochondrial activity in the regions where EMT is observed in these hPSC colonies. Despite a detailed understanding of how dynamic biochemical events lead to the emergence of these germ-layer markers, we still do not fully understand the contribution of cellular mechanics and energetics towards this phenomenon. Here, we intend to answer how the emergence of gastrulation-like patterns, especially TBXT+ cells, is mediated by cytoskeletal energetics and mechanics. We will further ask whether emergence of spatially segregated germ-layer markers lead or lag the mitochondrial and cytoskeletal activity.

The candidate will conduct micropatterning-based experiments using reporter cell lines with mitochondrial and cytoskeletal tags. Under the guidance of the supervisor, the candidate will be expected to conduct rigorous literature review and design & conduct novel experiments to achieve proposal objective. For example, this will include identifying suitable small molecule inhibitors of mitochondrial or cytoskeletal activity with minimal off-target effects. They will also play a key role in generating confocal images (on Zeiss LSM 800 Confocal Microscope) and analyse this data via ContextExplorer (an in-house software). The candidate will be expected to keep meticulous notes of their work.

Relevant literature:

- <https://pubmed.ncbi.nlm.nih.gov/24973948/>
- <https://www.ncbi.nlm.nih.gov/pubmed/28870989>

- <https://pubmed.ncbi.nlm.nih.gov/31634368/>
- <https://pubmed.ncbi.nlm.nih.gov/29795348/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7407978/>

- 1) This position is suitable for an independent, resourceful, highly self-motivated candidate ideally with some experience in mammalian cell culture.
- 2) Position will initially be up to 4 months duration, to start ASAP in Sept 2020 and end Dec 24, 2020. A short extension to Jan 31, 2021 may be considered where possible.
- 3) No vacation time is provided as vacation pay is provided in lieu; however if the candidate wishes to minimally alter the start or end dates, please discuss with us
- 4) We encourage applicants to also apply for external award funding as appropriate.
- 5) The salary will be \$2500/month full-time (based on 35 hours work/week), pro-rated if any partial months worked; inclusive of any award funding received.

Ideal candidates would have experience in some or all of the below, however we will provide training as required:

- Mammalian cell culture (particularly human pluripotent stem cells)
- Confocal microscopy - image acquisition and analysis
- Photolithography
- Reading scientific literature

Individuals must also:

- Work well in a goal-oriented team environment;
- Be highly self-motivated and engaged in research
- Possess excellent communication skills – both verbal and written;
- be open to instruction and constructive criticism on the project and their capabilities
- Have the ability to work semi-independently and organize own workload under supervision
- keep meticulous records of experiments and data, report on research progress and outcomes openly
- Demonstrate an ability to design and analyze experiments, review experimental methodologies in response to feedback
- Have the ability to acquire and update knowledge in their specialized area and implement relevant technologies to advance the project

For further information about these projects and to apply, please also send us your application package *as one PDF file* via email at **zandstra.lab@ubc.ca** to include

- Email subject line: Energetics of EMT 2020 student application
- Brief cover letter
- dates of your availability
- CV
- copy of all university transcripts (require English translations where applicable; originals must sent prior to acceptance of offer)
- contact information for 3 references

For further information on our research and team, please visit our website and Twitter account:

<https://www.stemcellbioengineering.ca/>

<https://twitter.com/StemCellBioEng>

We will consider applications on a rolling basis until the position is filled, at which time we will note this on the job posting on our lab website here -

<https://www.stemcellbioengineering.ca/careers/>

We regret that we can only contact those applicants who are selected for further consideration.