**CSB 329H1S – STEM CELL BIOLOGY:**

**DEVELOPMENTAL MODELS AND CELL-BASED THERAPEUTICS**

24L, 12T

**Lecturers:**

Prof. J. Mitchell [ja.mitchell@utoronto.ca](mailto:ja.mitchell@utoronto.ca)

**Course Administrator:**

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**Prerequisite:** BIO 230H1

Stem cells provide the basis for cellular diversity in multicellular organisms and have enormous therapeutic potential in regenerative medicine. The course will introduce third year students to the differences and similarities between stem cells from sponges to mammals, compare their diverse contributions to development, the molecular and genetic mechanisms that regulate them, and potential clinical applications.

**Course format:** There will be 10 two-hour lectures with two term tests over a 12 week period. The first half of the course will focus on the stem cells in non-mammalian organisms and their contributions to several early developmental events. The second half of the course is focused on the role of stem cells in mammalian embryonic and postnatal development, the latest research in cell-based therapeutic applications and challenges remaining.

**Topics:**

**1)** Properties of stem cells: division self-renewal and differentiation

**2)** Porifera (sponges), Cnidaria (hydra) and Platyhelminthes (flatworm) stem cells.

**3)** Germ line stem cells in invertebrate genetic models:

*Caenorhabditis elegans* (nematode), *Drosophila melanogaster* (fruit fly*)*.

**4)** Stem cells during embryonic neurogenesis (Drosophila) and retinal development *(Danio rerio*, Zebrafish)

**5)** Mammalian intestinal stem cell and their extracellular matrix microenvironment and intestinal organoids

**6)** Mouse embryonic stem cells

**7)** Human Induced pluripotent stem cells

**8)** Human hematopoietic stem cells

**9)** Human adult stem cells

**10)** Regenerative therapies: progress and challenges as well as the ethical and political issues.

**Marking scheme (subject to change):**

In class assignments and tests worth a total of 60%.

Cumulative final exam worth 40%.

**Course policies:** Lecture and other relevant course documents will be posted on Quercus. No text book is required, but the 5th edition of Molecular Biology of the Cell, Alberts et al. is a recommended text to review cell and molecular biology concepts discussed in the course.