**CSB 329H1S – STEM CELL BIOLOGY:**

**DEVELOPMENTAL MECHANISMS AND CELL-BASED THERAPEUTIC STRATEGIES**

24L

**Lecturer:**

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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 cnidarians 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 12 two-hour lectures over the 12-week period. In the first half of the course, Prof. Ringuette will focus on the stem cells in non-mammalian organisms and their contributions to several early developmental events. Prof. Mitchell will teach the second half of the course focused on the role of stem cells in mammalian embryonic and postnatal development, the latest research and cell-based therapeutic applications and challenges remaining.

**Topics:**

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

**2)** Role of stem cells in Cnidarian development and tissue regeneration.

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

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

**4)** Stem cells during neurogenesis*: D. melanogaster* and *Danio rerio* (Zebrafish).

**5)** Contribution of stem cells to newt limb regeneration.

**6)** Stem cell niches and extracellular matrix microenvironments.

**7)** Germ line stem cells: mammalian oogenesis and spermatogenesis.

**8)** Mammalian embryonic and induced pluripotent stem cells.

**9)** Mammalian blood stem cells.

**10)** Somatic stem cells: Muscle, cardiac and skin stem cells.

**11)** Cancer stem cells.

**12)** Stem cell-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 40%.

Cumulative final exam worth 60%.

**Course policies:** Lecture and other relevant course documents will be posted on blackboard. 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.