
BICD 112

Stem Cells and Regeneration

Spring 2020 Course time: TH 9:30 – 10:50 AM
Section times: W 9-9:50 AM; F 4-4:50 PM
All through Zoom at link in first Canvas announcement

Professors: Dr. Kim Cooper and Dr. David Traver

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Office Hours: Cooper – 10:30 AM Wednesdays
Traver – 11 AM Thursdays

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Course Description: Stem cells maintain homeostasis of nearly all organ systems and the regenerative capacity of certain organisms. Over the past decade, the study of stem cell biology has exploded, in part due to the remarkable discovery that adult somatic cells can be easily reprogrammed to become induced pluripotent cells, which are capable of differentiating into any cell type in the body. This finding has promise for a new field of regenerative medicine, where it will soon be possible to generate patient-specific cell types that can be used to remedy disease states without the complications of genetic mismatching that result using current cellular replacement therapies. It is therefore essential to understand the native characteristics of stem cells, their role in regeneration, and the natural barriers to regeneration in many species, including humans. This course explores the paradigm of the tissue-specific stem cell, the cellular mechanisms of tissue regeneration, the evolution of stem cells and regenerative capacity over time, the basis of induced pluripotency, and how these basic processes can inform new approaches to human health.

Class Structure and Philosophy: Evidence-based approaches to science and medicine are built on a foundation of understanding peer-reviewed literature. The state of a particular field is rapidly changing with new findings every year. This class is therefore based on review of the primary literature in order to stay current and to provide opportunities for you to learn to critically evaluate the literature.

Lectures and Review Article Discussions: The purpose is to provide essential background information for you to understand the state of the field and for an introduction to unfamiliar methods and concepts that will aid your understanding of the paper.

Papers and Discussions: Each lecture/review will be followed by one or two paper discussions. Online pre-discussion quizzes will guide your reading in preparation for the discussion. In addition, we will provide in-depth review articles before major course topics to prepare everyone on background information and the state of particular subfields within regeneration and stem cell biology. Several course meetings will feature discussions of these review articles, with question and answer periods. Papers will be annotated to help you understand challenging aspects. You are not expected to understand details of the entire paper - focus on understanding the questions and annotated concepts. During class discussions, you will be grouped into teams, and your team will be randomly assigned a figure or component of the paper to discuss and present to the class. After class, a post-reading quiz will be posted on Canvas that contains short answer questions (similar to what you will see on exams) that will be graded.

Attendance: Given the circumstances, we cannot require synchronous attendance without an alternative. **However, your peers need you to be present to have eight sizeable groups each week for discussion, and active participation in this class may be necessary for your learning.** For that reason, we will give you 3 points for being present for each class period starting Week 2. If you are unable to attend class in real time but would like to earn those points another way, you can submit a ~200 word summary with information specific to the content of recorded material for each session you missed.

Exams: There are three exams. You will be given a paper to read one week in advance of each exam and a series of questions during the exam. The exam is short free response (~100 words) and open note, and questions will be similar in style to your post-reading questions. Communicating with your peers in any format during exams is not allowed. Video proctoring will be mandatory during each exam.

Grading:

Attendance for 15 course periods or submission of 200 word summaries	45 points
Pre-discussion questions (multiple choice on Canvas, graded)	40 points
Post-discussion questions (short answer on Canvas, graded)	160 points
Exam I (4/28)	100 points
Exam II (5/19)	100 points
Final Exam (TBD)	<u>100 points</u>
	545 points

The class is graded on a “hybrid curve”. The top 5% of the class will be normalized to 100%, and letter grade cutoffs made at 12.5% point intervals, e.g. 87.5-100%=A, 75-87.5%=B, etc. Everyone in this course **could** therefore get an A....

Canvas: Lecture notes in PDF form will be available on Canvas (<https://tritoned.ucsd.edu>) by 10 pm the day preceding each lecture. Pre-discussion quizzes will be available on Canvas 48 hours before each discussion and will close at the start of each discussion. Post-discussion quizzes will be available on Canvas at the end of each discussion and will close at midnight on the second day (after 59 hours).

Cheating: Don't do it. I rely on you to be honest, to work hard, and to accept the grade that is the outcome of your hard work. Students are expected to do their own work, as outlined in the UCSD Policy on Academic Integrity. **Academic misconduct** is broadly defined as any prohibited and dishonest means to receive course credit, a higher grade, or avoid a lower grade. Academic misconduct misrepresents your knowledge and abilities, which undermines the instructor's ability to determine how well you're doing in the course. Please do not risk your future by cheating. Those caught cheating will be reported to the Academic Integrity Coordinator, which reports directly to the Dean of the student's college. For the Academic Integrity policy at UCSD, see here: <http://senate.ucsd.edu/Operating-Procedures/Senate-Manual/Appendices/2>.

Exams will be timed in such a way to make it difficult to use resources outside of your own understanding, and we will utilize video proctoring. We will also periodically check websites known to support ‘contract cheating’ for evidence that assignments have been posted, and we will report findings to the Office of Academic Integrity. Students suspected of AI violations on exams will be invited to Zoom follow-up meetings where they will be asked to (in real time and recorded on video) justify their answers before the graded exams or solutions are released. If we are not convinced during the meeting that the student has achieved a level of understanding that matches their performance on an exam, or if the student refuses to participate, we will report the student for AI violations.

OSD students: If you need testing accommodation for this class, please work with the Office for Students with Disabilities (OSD). Students requesting accommodations and services due to a disability for this course need to provide a current Authorization for Accommodation (AFA) letter issued by the Office for

Students with Disabilities (OSD), prior to eligibility for requests. Receipt of AFAs in advance is necessary for appropriate planning for the provision of reasonable accommodations. OSD Academic Liaisons also need to receive current AFAs. For more information, contact the OSD at (858) 534.4382 (V); (858) 534-9709 (TTY); osd@ucsd.edu, or <http://osd.ucsd.edu>. **You will need to coordinate scheduling of exams with the instructors. All of these arrangements should be made within the first two weeks of the quarter.**

Enrollment questions: Administrative, advising, or registration questions, including questions about registering P/NP, should be submitted via the Virtual Advising Center (vac.ucsd.edu).

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Tuesday/Thursday 9:30-10:50 am, ZOOM

SESSION TOPICS

#	DATE	PRESENTER	TOPIC	PAPERS
1	03 / 31	COOPER & TRAVER	Welcome to the course, logistics, how to read a paper	-
2	04/ 02	COOPER LECTURE	History of Regeneration	
3	04/ 07		Planaria Regeneration Review Article	
4	04 / 09	PAPER 1 DISCUSSION	Regeneration of planarians with a single cell.	Wagner, Wang and Reddien, Science 2011.
5	04/ 14		Vertebrate Regeneration Review Article	
6	04/ 16	PAPER 2 DISCUSSION	Axolotl Limb Regeneration	Kragl et al., Nature 460: 60-65, 2009.
	04/ 21	PAPER 3 DISCUSSION	Regeneration of the zebrafish heart.	Kikuchi et al., Nature 464: 601-5, 2010.
	04/23	TRAVER LECTURE	History of Stem Cells	
	04/28		MIDTERM 1	TBD Regeneration Paper
	04/ 30	PAPER 4 DISCUSSION	Hematopoietic Stem Cells	Taya et al., Science 354: 1152-5, 2016.
	05/ 05		Niche Review Article	
	05/ 07	PAPER 5 DISCUSSION	Drosophila Germline Stem Cells	Yamashita et al., Science 301: 1547-50, 2003.
	05/ 12		Adult Stem Cells Review Article	
	05/ 14	PAPER 6 DISCUSSION	Intestinal Stem Cells	Sato et al., Nature 459: 262-5, 2009.
	05/ 19		MIDTERM 2	TBD Adult Stem Cell Paper
	05/ 21	WILERT LECTURE	Embryonic Stem Cells and Pluripotency	
	05/ 26	PAPER 7 DISCUSSION	Yamanka iPSC Paper	Takahashi and Yamanaka, Cell 126: 663-76.
	05/ 28	PAPER 8 DISCUSSION	Replacement of pancreatic cells	Kobayashi et al., Cell 142: 787-99, 2010.
	06/ 02	COOPER LECTURE	Course Recap and Stem Cell Fraud	
	06/ 04		Review Session	
	06/ 09		FINAL EXAM	