Frontiers in Stem Cells and Regeneration
Advanced Training Course
October 3 - October 10, 2021
MBL • Woods Hole, MA

Course Directors:
Ina Dobrinski, DVM, MVSc, PhD (Univ. of Calgary)          Jennifer Morgan, PhD (MBL)

Organizing Committee: Diane Carlisle, PhD; Gloria Perez, DVM, PhD; Dorianne Mebane, MBA

All lectures are in Loeb G70, unless otherwise specified. Lab exercises are held in Loeb 306.
Meals are in the Swope dining room, 2nd floor. Breakfast: 7-8:30 AM; Lunch: 11:30 AM-1 PM; Dinner: 5-7 PM.
Coffee breaks will be served in the Loeb basement corridor adjacent to the lecture hall.

Sunday, October 3

3:00 PM  Optional Workshop: Basics of Cell Culturing
Glora Perez, Michigan State University
Meet in Loeb 306

5:00 PM  Dinner, Café Swope (first floor patio)

7:00 PM  EEO Information and Logistics:
Biosafety, Regulatory Restrictions, MOUs, and Team Assignments
Diane Carlisle, U. Pittsburgh

7:15 PM  Brief Overview of Stem Cells, Directed Differentiation and iPSCs
Diane Carlisle

8:00 PM  BIOETHICS LECTURE: Ethical and Social Aspects of Gene Editing
Vardit Ravitsky, U. Montreal

Monday, October 4

9:00 AM  MBL Welcome
MBL Orientation, MBL Staff

10:00 AM  Lecture: Stem Cells and Regeneration in Planarian Flatworms
David Forsthoefel, Oklahoma Medical Research Foundation / OU Health Sci. Ctr.

10:45 AM  Coffee Break
11:00 AM  **Lab Introductions:** mESC derivation  
Cal Simerly, U. Pittsburgh

11:15 AM  **Lab Intro:** Planarian regeneration  
Priscilla Avalos, University of Oklahoma Health Sciences Center

11:30 AM  Break (Visa holders to sign paperwork in HR with Dori)
noon  Lunch

1:00 PM  **Lab 1:** Deriving Mouse Embryonic Stem Cells by Immunosurgery  
*Instructors: Calvin Simerly & Gerald Schatten-Magee-Womens Research Institute, Pittsburgh, PA.* Students will learn how to isolate the inner cell mouse cells (ICM) from expanded blastocysts using the antibody: complement technique and transfer isolated ICMs for deriving mouse embryonic stem cells.

**Lab 2:** *Instructor: David Forthoefel; TA: Priscilla Avalos (OUHSC and OMRF).* Regeneration in planarians: Students will observe regeneration in living planarians, conduct colorimetric development of antibody-labeled samples to visualize cellular proliferation, and then design and conduct experiments to test planarians’ regenerative capacity and the necessity of proliferation.

**Pre-Lab Prep (<1 hour):** *Instructor: Diane Carlisle. TA: Emily Horoszko (U. Pittsburgh).* Students differentiate hESC into their cell lineage of choice. On Day 1, trainees will plate human iPSCs to be differentiated over the week as well as propagate a plate of iPSCs. This can be done flexibly during a break or in between the other labs. Medium will need to be changed on student’s own time on Tuesday and Wednesday using the instructions in the lab binder.

6:00 PM  Dinner

7:00 PM  **Lecture:** Introduction to Regeneration / Skin Regeneration  
Jeff Biernaskie, University of Calgary

8:00 PM  **Course Participants’ Introductions**

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**Tuesday, October 5**

9:00 AM  **Lecture:** Cell to Cell Signaling that Enable Salamander Limb Regeneration  
James Monaghan, Northeastern University

9:45 AM  **Coffee Break**

10:00 AM  **Lecture:** Bioengineering Human CNS Morphogenesis in 2/3D  
Randolph Ashton, University of Wisconsin at Madison
10:45 AM  Lecture: CNS Regeneration in Non-Mammalian Vertebrates  
Jennifer Morgan, MBL

11:30 AM  Break

12:00 PM  Lunch

1:15 PM  Lab 1: Instructors: James Monaghan and Kate McCusker; TA: Tim Duerr (Northeastern); Regeneration in Salamanders: limb regeneration

Lab 2: Instructors: Jennifer Morgan; TA: Elizabeth Wegman (MBL)  
Spinal Cord Regeneration in Lampreys

6:00 PM  Dinner

7:00 PM  Lecture: Large Animal Models for Germ Cell Research  
Ina Dobrinski, University of Calgary

8:00 PM  Course Participant Introductions

Wednesday, October 6

9:00 AM  Lecture: Picking Your Favorite - Cell Identification and Selection Strategies in Human Neural Stem Cell Biology  
Jan Pruszak, Paracelsus Medical University (PMU), Austria.

9:45 AM  Lecture: Investigating Mitochondrial Mechanisms of Sporadic ALS using Patient-Specific Motor Neurons  
Diane Carlisle, UPitt

10:30 AM  Coffee Break

10:45 AM  Lecture: Neuroprotective and Regenerative Stem Cell Therapy in a Pig Stroke Model  
Franklin West, U. Georgia

11:30 AM  Break

Noon  Lunch

1:00 PM  Lab 1: Instructor: Jan Pruszak (Paracelsus Medical College). “Isolating and Characterizing Neural stem cells using FACS strategy.” In this laboratory, trainees will learn the techniques for isolating specific PSC-derived subsets of therapeutic and scientific relevance using flow cytometry.
Lab 2: Instructor: Chas Easley. TAs: Katherine Watkins, Beth Waters (UGA). In this lab, students will learn procedures for deriving and culturing human induced pluripotent stem cells. Additionally, students will learn how to use CRISPR/Cas9 genome editing tools to edit a house keeping gene in human pluripotent stem cells. Students will also learn to validate CRISPR-mediated gene editing using prepared DNA samples.

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<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>6:00 PM</td>
<td>Dinner</td>
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<tr>
<td>7:00 PM</td>
<td>Lecture: <strong>Germline Regeneration in Annelids</strong>&lt;br&gt;Duygu Özpolar, MBL</td>
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<td>8:00 PM</td>
<td><strong>CAREER MENTORING DISCUSSION</strong> (Q&amp;A panel facilitated by Jennifer Morgan and other course faculty)</td>
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**Thursday, October 7**

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<tr>
<td>9:00 AM</td>
<td>Lecture: <strong>Stem Cell and Regeneration Research Funding</strong>&lt;br&gt;Ravi Ravindranath (NIH/NICHD)</td>
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<td>9:45 AM</td>
<td>Coffee Break</td>
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<td>10:00 AM</td>
<td>Lecture: <strong>Translating Spermatogonial Stem Cell Transplantation to the Clinic</strong>&lt;br&gt;Kyle Orwig, U. Pittsburgh</td>
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<td>10:45 AM</td>
<td>Lecture: <strong>Derivation of Functional Spermatids from Pluripotent Stem Cells</strong>&lt;br&gt;Chas Easley, U. Georgia</td>
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<td>11:30 AM</td>
<td>Break</td>
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<td>Noon</td>
<td>Lunch</td>
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<tr>
<td>1:00 PM</td>
<td><strong>Lab 1</strong>: Instructor: Diane Carlisle. TA: Emily Horoszko (U. Pittsburgh)&lt;br&gt;We will check the pluripotency of hESC using a live cell stain and also determine the quality of our week-long directed differentiation using immunofluorescent staining.</td>
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<td>6:00 PM</td>
<td>Dinner</td>
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<td>7:00 PM</td>
<td>Lecture: Goro Toshizaki, Tokyo University of Marine Science and Technology</td>
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Friday, October 8

9:30 AM Lecture: The Genomics of Regeneration in the Salamander  
Randal Voss, Univ. of KY

10:15 AM Coffee Break

10:30 AM Lecture: Gut Regeneration in Echinoderms  
Jose García-Arraras, University of Puerto Rico

11:15 AM Break or Lab Intro

11:30 AM Course Photo (Wear your T-shirts!)

Noon Lunch

1:00 PM Lab 1: Instructor: Jose García-Arraras; TA: TBD; Echinoderm gut regeneration.

Lab 2: Optional Tour of MBL’s Marine Resources Center or Free Time

3:30 PM Same as above, but switch groups.

6:00 PM Dinner

7:00 PM Founder’s Lecture:  
Jerry Schatten, University of Pittsburgh

Saturday, October 9

8:50 AM SCARE ALUMNI MINISYMPOSIUM  
Introduction: Jen Morgan, MBL

9:00 AM Lecture: Genetic Dependencies in Pediatric Low-Grade Gliomas  
Larisa Condurat, Harvard (SCARE 2016)

9:30 AM Lecture: Size Regulation During Axolotl Limb Regeneration  
Kaylee Wells, UMass-Boston (SCARE 2018)

10:00 AM Lecture: Reenergizing Regeneration  
Mimi Sammarco, Tulane (SCARE 2017)

10:30 AM Coffee Break
10:45 AM  **KEYNOTE ALUMNUS LECTURE:**  **Bottom Up Islet Engineering**  
Quinn Peterson, Mayo Clinic (SCARE 2011)

11:45 AM  Break

Noon  Lunch

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1:15 PM  *Finish all ongoing experiments*  
**Lab 1:**  **Instructors:**  Cal Simerly: Check on mESC derivation.  
**Lab 2:**  **Instructors:**  David Forsthoefel, Priscilla Avalos: Evaluate blastema formation

2:00 PM  **Lab 3:**  **Instructors:**  James Monaghan, Kate McCusker: Image blastemas.  
**Lab 4:**  **Instructor:**  Chas Easley.  **TA:**  Katherine Watkins, Beth Waters: Analysis of iPSCs using microscopy.

3:00 PM  Free Time

5:00 PM  **PIioneer Lecture:**  **Deconstructing and Reconstructing the Patient**  
Linda Griffith, MIT

6:15 PM  Break

6:30 PM  **Course Banquet:**  Café Swope

8:00 PM  Presentation of Student Certificates  
Ina Dobrinski, Jennifer Morgan

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**Sunday, October 10**

Check out of rooms before 10:00 AM

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Thank you to the following course sponsors who have contributed to the course by loaning equipment and/or donating reagents and supplies:

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