BIO323 Topics in Developmental Biology:
“Regeneration”
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Smith College, Northampton, MA

Introduction:
“I already killed you once... And I bet you’ll come back again and again... No matter how many times I slaughter you. Your tendency to come back from the brink of death has nothing to do with your healing factor. Your mutant power isn’t regeneration. It’s popularity.” — Cullen Bunn, Deadpool Kills The Marvel Universe #3

The curiosity in regenerative power is at least as enduring as the phenomenon itself, and likely what has brought you to this class. Whether it's trying to make sense between the science fiction of characters like Deadpool and the legitimate science underlying regeneration or trying to understand the current status of today's regenerative medicines, I welcome you to this seminar. Regeneration has become its own scientific field; a field that is now grounded solidly in understanding the mechanisms of developmental biology as it relates to the creation and patterning of new structures in the adult organism. In this seminar we will both survey the different types of regenerative capacities and processes that exist, as well as dive deeply into the developmental mechanism driving and/or preventing regeneration. Course material begins with a single chapter on regeneration, and then quickly moves to primary literature, which will serve as a springboard to hold videoconferences with the researchers who conducted the work.

Pedagogy:

This course is based on a student-governed learning experience. Students are largely responsible for preparing the course content, reflecting deeply upon the material, and conveying their understanding to their peers. Course content will mainly be derived from primary research literature, and students are expected to master this material to a level where they are comfortable conversing with the scientists who carried out the research. As this is a class made up of students with diverse backgrounds, students are expected to do their own background studying to bolster those areas they are deficient. We will take advantage of the technology in the video conferencing room (Neilson Center for Media Production C/07) to interact directly with notable scientists. It will be your responsibility to be prepared to discuss the experiments, results, conclusions, and implications of the scientist’s research.

The main assessment for the course will be the creation of a documentary movie by student teams on the subject of regeneration. This course design will have significant flexibility to enable students to follow their interests, delve deeply into the material, and gain a personal connection that will foster a life-long retention of the subject matter. Making a movie offers many additional benefits that include learning a new array of technical skills for video recording and editing, as well as skills in how to write and visualize a story line for communicating complex scientific principles to a wider audience. Being able to conceptualize a complex topic in science in a way that others can learn from in an entertaining manner is a hugely valuable skill for all future careers. This movie making approach will prepare you to engage with experts in the field, by building confidence in direct communication and interviewing, while also staying objective and critical in your analysis of the science. In full disclosure, these are lofty goals that will demand committed time, ultimately you will get out of this course what you put into it. One of many exciting aspects of this course is that you will produce a tangible product that can be shared with the world, but more importantly shared with future employers as a shining example of your talents, skills, and potential. Previous class’ productions using this approach have provided students with new insights, opened career doors, and even resulted in direct employment after graduation. So get ready, this could quite possibly be the most fun you ever had in any class. That is our hope anyway!
Instructor Information:

Michael J.F. Barresi, Ph.D.
Associate Professor
Neurodevelopmental Biologist
Department of Biological Sciences & Neuroscience Program
Sabin-Reed 401A
Required Office Hours: To be determined for each group.

Kathryn Lee, (will provide supportive instruction on movie making process)
Senior Media Producer
Email: klee@smith.edu
Office Hours: To be determined throughout semester

Text Book: Chapter 22 Regeneration, Developmental Biology, 11th Ed. Gilbert and Barresi 2016
https://app.box.com/s/6pskks06w4ft2cogvkxpc2ivy4d3pqjx

Global Theme: Regeneration; a recapitulation of embryonic development?
1. Infinite Regeneration in Invertebrates
2. Swimming for Localized Regeneration
3. ‘Unlocking’ Regeneration in Mammals

Assessment:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component Description</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>Final 15-min. Documentary Movie</td>
<td>400 points</td>
</tr>
<tr>
<td>12.5%</td>
<td>Drafts of Movie Progress (4 items, 25 pts each)</td>
<td>100 points</td>
</tr>
<tr>
<td>12.5%</td>
<td>Oral Presentation</td>
<td>100 points</td>
</tr>
<tr>
<td>12.5%</td>
<td>Questions for Speakers (20 pts x 5 sets)</td>
<td>100 points</td>
</tr>
<tr>
<td>12.5%</td>
<td>Participation to group (two periods of evaluation)</td>
<td>100 points</td>
</tr>
</tbody>
</table>

Total points = 800

The Movie: Students in this course may have widely varying interests in biology as well as skillsets they are bringing to the team. In light of this range of motives and background knowledge, the main assignment for this course involves the creation of 2-3 short documentary movies all focused on the central theme of the developmental mechanisms underlying regeneration. Logistically, each movie-making team will consist of 3-4 students, grouped according to their interest and to establish complementary backgrounds and skill sets. Each team will create a 15-minute movie on a particular topic. This movie will require filming interviews with prominent scientists, physicians, and others (i.e., whoever can supply the key information to support your movie in a factual and entertaining way) as well as collecting footage from research labs and relevant environments/locales. To help with the acquisition of content and to begin to build confidence and the skills to communicate with prominent scientists, a significant portion of footage will come directly from captured in-class videoconferences.

With the help of the Smith IT staff, we will provide hands-on training on all aspects of movie making. From storyboarding to video editing and from panning to interviewing dos and don’ts, you will gain all the skills you need to generate a professional documentary. At least one of four trainings will occur during a class, but the remaining three will be offered at night. Note: due to the added time of these workshops and other time required out of class, this seminar is worth 4 credits. Most other science seminars are all at 3 credits. So this added effort is being compensated.

Oral presentation: There will be ~6 sessions where students will have to present specific research articles with the appropriate background information to put the research in context and facilitate discussion. Every student will have to participate directly in one presentation either on their own or in groups of 2-3 depending on the enrollment of the class. The original research articles for each session will be posted on the schedule once participating scientists are confirmed. PowerPoint (or google) presentations are required as this software has become the universal mode of presenting research talks. Students should plan to lecture for no more than 30 minutes, leaving ~10 minutes for discussion and questions. Each lecture will be followed by a videoconference or in-class meeting with the main investigator of the articles for a Q&A to last the remainder of the class.
**Questions for Speaker:** Prior to each scheduled presentation, ALL students are required to submit 4 critical questions or comments about the article and/or topic. The presenting students and instructors will look over these questions and select a limited number for a special Q&A with the main investigator of the study. Videoconferencing will bring a very personal perspective of their work to our discussion, and the investigator’s presence will enable us to ask questions that would not otherwise be possible. Because this is a rare opportunity, students must treat these video visitors’ precious time very seriously: students must put in significant time to read these articles thoroughly and generate critical questions that push the science to its limits – even for the principle investigator! Take advantage of these questions as they also represent important opportunities to elicit key responses for your documentary (i.e., some team coordination about key questions should be discussed and even prioritized prior to submission).

**Group participation:** The only way these documentaries will be professionally made is if each student is responsible for her role in the team. A significant amount of outside class time will be required to complete filming and editing of the documentary. Instructors will assess individual participation on your team two times during the semester through the use of self- and group-surveys and the instructors’ observations.

**Late work:** Penalties will be given for any assignment handed that is not handed in by the end of class on the listed due date. 5% will be deducted from the final grade of that assignment for that day and each subsequent day late.

**Special Accommodations:** Any student requiring additional privileges during or out of class must provide formal written documentation of the requested accommodations.
### Topics in Developmental Biology (BIO 323)

**“Regeneration”**

Global Theme: Regeneration; a recapitulation of embryonic development?

Course Schedule (Spring 2017); Neilson Center for Media Production C/07, 1:00-4:00

#### January 31

**Overview of Regeneration – Part 1**

**Required Readings**

  [https://app.box.com/s/6pskks06w4tt2coqvzpc2iyv4d3pqjx](https://app.box.com/s/6pskks06w4tt2coqvzpc2iyv4d3pqjx)

**Suggested readings as resource if needed**

You need to do your own background research.

#### Feb. 7

**Overview of Regeneration – Part 2**

**Required Readings**

  [https://app.box.com/s/6pskks06w4tt2coqvzpc2iyv4d3pqjx](https://app.box.com/s/6pskks06w4tt2coqvzpc2iyv4d3pqjx)

**Suggested readings as a resource if needed**

You need to do your own background research.

#### Feb. 14

**Lesson 1: Making a documentary – Video Conferencing room.**

**Required Readings**

- Look at guidelines for producing video and watch video tutorials.
  [http://media.smith.edu/smithvideo/](http://media.smith.edu/smithvideo/)

**Assignment Due**

Nothing due, but you need to be working with group to research movie focus.

#### February 21

**Lesson 2: Filming how to’s and Interviewing Practices – TV studio room**

**Assignment Due**

First Draft of Script outline and rough sketched Story Board due – Email to profs.

#### February 28

**SIGMA XI (noon). Dr. Catherine McCusker, How to Regenerate New Organs from Old Cells: The Lessons Learned from Regenerating Amphibians**

**February 28**

**In Studio discussion with Dr. McCusker**

**Moderators:** Carla Velez, Emilie Jones, Brigit McDannell

Send questions by Thursday Feb 23rd at 5PM to Michael and the 3 moderators

**Review:**


**Assignment Due**

Finalized list of potential talents to contact. Provide list of identified art, animations, and other tangibly obtainable materials.

#### March 7

**Web Conference OR Lesson3: Video Editing with “Final Cut” – Digital Video Lab**

**Required Readings**

#### March 14

**NO Class: Spring Break**

#### March 20

**LIFE SCIENCE COLLOQUIUM: Michael Levin** Bioelectric Regulation of Regeneration

#### March 21

**In Class Discussion with Dr. Michael Levin, in Studio**

**Moderators:** Morgan Schwartz, Jessica Chung, Joanna Kim

Send questions by Thursday March 9 to Michael and Moderators


**Reviews:**

**Research Articles:**

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**March 28**

**Web Conference with Dr. Elly Tanaka**

**Presenters:** Jessica Chung and Brigit McDannell

Send questions by Thursday March 23 to Michael and Moderators

**Spinal Cord:**


**Limb:**


**Tail, Muscle, and Segmentation:**

**Math Modeling of Regeneration:**

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**March 28: 6:30PM**

**Lesson4: Advanced Video Editing and Exporting – Digital Video Lab**

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**April 4; 2:00PM**

**Web conference with Dr. Alejandro Sánchez Alvarado**

**Presenters:** Carla Velez and Morgan Schwartz

Send questions by Thursday March 30 to Michael and Moderators

**Reviews:**
### Research:


### April 11

**Round table discussion on Story boards.**  
**Remainder is whole class editing session**

### April 18

**Web conference with Dr. Ellen Heber-Katz**  
**Presenters:** Emilie Jones and Joanna Kim  
**Send questions by Thursday April 13 to (Michael) and Moderators**

### Reviews:


### Research:


**Assignment Due**  
Filming is to be completed. Editing begins. **Schedule group visit to show me footage.**

### April 25

**5 min verbal Group presentations of movies to date.**  
**Remainder is whole class editing session**

**Required Readings**

**Assignments Due**  
Michael sign off on your movie status.

### May 2

**Final Class Editing Session**

**Assignments Due**  
Final edited and exported movies due no later than **May 2 11:59:59 P.M.**

### FINALS PERIOD (Time and day TBD)

**BRING YOUR POPCORN AND CANDY, IT'S MOVIE TIME!**

**Assignments Due**  
-Reflective write up and group assessments due.