

# BIO43: Developmental Biology

Class #/Date	Topic	Readings
[1] Mar 30 T	- Course Introduction - Concepts and History - Genomic Equivalence - Yamanaka Factors	Pgs. 1-13 (Wolpert 6 <sup>th</sup> Ed)
[2] April 1 Th	- Fertilization - Germ cells - Intro to Drosophila - Drosophila Oogenesis, germline stem cells	Pgs 13-35 Milestone 5. Wallingford: We are all developmental biologists
[3] April 6 T	- The Heidelberg Screen - Maternal vs. Zygotic - Pole cell transplantation	Pgs 37-44 Introduction to Mutants by Leroi
[4] April 8 Th	- Epistasis and D/V patterning	Pgs 55 - 66 Milestone 22
[5] April 13 T	- Frohnhof background - Cytoplasmic Polarity	<b>Frohnhof (1986)</b> Milestone 16 Lipshitz Review (optional)
[6] April 15 Th	- Gap genes - Pair rule genes	Pgs 66-75 Milestone 13
[7] April 20 T	- Segment Polarity genes - Hox genes, collinearity - Hox genes, posterior dominance	Pgs 90-95. Milestone 11 Meyerowitz, Science 295:1482
[8] April 22 Wed	- Nellen background → <a href="#">Nellen problem set</a>	<b>Nellen (1996)</b> Milestone 17 Pgs 436 – 451
Exam 1 released April 22, due April 25		
[9] April 27 T	- Asymmetric cell division - Maternal effect lethal screen in worms - Asymmetric division of the worm zygote	Readings TBD after exam 1
[10] April 29 Th	- Vertebrates: A/P and D/V Axes	
[11] May 4 T	- Gastrulation and the Germ layers - Gastrulation II	

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	- Neurulation	
[12] May 6 Th	- Palmereimin background	<b>Palmereimin (1997)</b> Pgs 207-222.
[13] May 11 T	Early mouse and human development	<b>Paper TBD</b>
[14] May 13 Th	Early mouse and human development	
[15] May 18 T	Organoids	<b>Clevers</b>
[16] May 20 Th	Limb Development	
Exam 2 released May 20, due May 23		
[17] May 25 T	- Regeneration Gurley paper	Pg 594-612. <b>Gurley (2008)</b> Tanaka and Reddien (optional)
[18] May 27 Th	Regeneration II	
[19] June 1 T		

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**Faculty:**

Professor Erik Griffin  
Room 348 LSC  
erik.e.griffin@dartmouth.edu

**Meeting times:**

This course will be a mixture of asynchronous lectures and synchronous meetings  
Classes Tuesday and Thursday 10:20am – 12:10 pm (Zoom link on canvas page)  
Office hours Friday from 4-5pm (Zoom link on canvas page)

**Pre-Requisites:** Biol 012 or Biol 013.

**Course Description:** This is an intermediate level Biology course that will examine the fundamental processes that mediate embryonic development. This course will emphasize conserved molecular, cellular and genetic mechanisms that underlie embryogenesis in animals.

**Textbook and Readings:**

- The primary text for this course will be Principles of Development, by Wolpert and Tickle (5<sup>th</sup> or 6<sup>th</sup> edition). Textbook readings are intended to reinforce and contextualize material covered in class.
- We will read several primary literature articles throughout the term. These articles will provide a basis for 6 problem sets.
- I will post a series of short reviews (“Milestones”) that were recently published by Nature magazine. These reviews place important advances in developmental biology within a scientific, historical and biomedical context.
- There will be several additional supplemental articles posted on the course Canvas site. I will indicate whether these articles are required or optional. Optional readings may help you understand and contextualize the course material and provide an entry point for further independent study.
- I will post links to a number of online videos that relate to various aspects of developmental biology. These videos are intended to emphasize how our understanding of developmental biology relates to other areas of inquiry, including evolution, disease pathogenesis and biomedical research and ethics.

**Class meetings:**

This class will be a mixture of asynchronous lecture material and synchronous meetings. Because zoom fatigue is real and pernicious, most classes will not run the full 2 hours. Classes will feature a mixture of lecture, problem sets and discussion. I am open to feedback about how the structure of the class works for you.

**Assessment:**

Midterm Exam I (20%)  
Midterm Exam II (20%)  
Final Exam (20%)  
Class Participation (25%)  
Pre-class questions on papers (5%)  
Organoid poster (10%)

**Exams:**

The lecture schedule shows the date and time for the exams. Exams will focus on material covered in class. The exams will not cover material from the readings that are not discussed in class. Barring illness, failure to take the exam at the scheduled time will result in a grade of zero. Exams will be open note, taken remotely and timed (midterms will be 90 minutes). They must be uploaded to gradescope by the set due date/time. You may neither solicit, receive or offer help to anyone on the exams.

Graded exams will be returned to the students approximately one week after they are taken. Exams are graded not only for content but also for clarity and conciseness. The exam key will be posted on the course Canvas site. If, after reading the key, you feel there was an error in the scoring of your exam, you may submit a regrade request. Include a typewritten explanation stapled to your exam detailing the mistake made in the grading. Do not write or alter the exam prior to handing it in for regrading. The regrade request must be submitted within one week of the distribution of the graded exam.

While I encourage you to keep up with the course work in a timely manner, I recognize that this may be a particularly challenging and unpredictable term for many of us. You should contact me if there are circumstances that make meeting these deadlines in this course problematic.

Paper Evaluations:

- We will read approximately 6 papers from the primary literature. Students will answer one or two questions regarding the paper (less than 1 page) and these answers will be turned in prior to the class in which we discuss the paper.

Organoid poster:

Each student will read a paper on the development of an organoid, and will create either a poster or video presentation based on the paper. You will be provided with guidelines for the format and critical components of the presentation.

Participation:

Students are expected to attend class and to engage with the course material, in class projects and discussions on a regular basis. Students will be evaluated on their participation during class and not on the accuracy of their contributions.

**Information about recording:**

Dartmouth Policy:

(1) Consent to recording of course meetings and office hours that are open to multiple students.

By enrolling in this course,

a) I affirm my understanding that the instructor may record meetings of this course and any associated meetings open to multiple students and the instructor, including but not limited to scheduled and ad hoc office hours and other consultations, within any digital platform, including those used to offer remote instruction for this course.

b) I further affirm that the instructor owns the copyright to their instructional materials, of which these recordings constitute a part, and my distribution of any of these recordings in whole or in part to any person or entity other than other members of the class without prior written consent of the instructor may be subject to discipline by Dartmouth up to and including separation from Dartmouth.

(2) Requirement of consent to one-on-one recordings

By enrolling in this course, I hereby affirm that I will not make a recording in any medium of any one-on-one meeting with the instructor or another member of the class or group of members of the class without obtaining the prior written consent of all those participating, and I understand that if I violate this prohibition, I will be subject to discipline by Dartmouth up to and including separation from Dartmouth, as well as any other civil or criminal penalties under applicable law. I understand that an exception to this consent applies to accommodations approved by SAS for a student's disability, and that one or more students in a class may record class lectures, discussions, lab sessions, and review sessions and take pictures of essential information, and/or be provided class notes for personal study use only.

If you have questions, please contact the Office of the Dean of the Faculty of Arts and Sciences.

(3) My recording policy for Bio43.

I will record and post recordings of our Tuesday and Thursday classes. The posted material will include the text within the Chat. I will not record any one-on-one or small group Zoom meetings held outside of

the regularly scheduled classes. If I feel discussions from office hours would benefit the entire, I will prepare a separate video and post it on Canvas.

### **Technology Expectations:**

Given the online nature of this course, it is required that students have the ability to stream ~1 hour of video content each day. Please let me know what barriers you have to completing the online course as soon as possible.

### **Health Addendum**

While the COVID-19 pandemic has already disrupted this course, it has the potential to result in further personal impact which may prevent you from continuing engagement in the class. This may be due to contraction of the disease by you or a loved one, increased familial responsibilities, financial difficulties, or impacts on your mental/emotional health.

In the event that you are directly or indirectly impacted by COVID-19 in such a way that will affect your performance in the course, it is imperative that you reach out to me as soon as possible. You may also reach out to your undergraduate Dean if that would make you more comfortable. My first priority is your health and security and I will work to put you in touch with appropriate resources to assist you. In addition, appropriate accommodations (for example: deadline extensions and/or extra office hours) will be implemented.

### **ACADEMIC HONOR PRINCIPLE:**

The Dartmouth College Student Handbook (page iii) states "Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth." The complete text of the Dartmouth Academic Honor Principle is given in the Dartmouth College Student Handbook.

Honesty is the foundation of the academic pursuit of knowledge. In recognition of this, I will not overlook any violations of the Academic Honor Principle. Indeed, the Faculty Handbook of Dartmouth College states explicitly that College Faculty members are obligated to report potential violations of the Academic Honor Principle to the Dartmouth College Committee on Standards. Should the Committee on Standards find the student to be in violation of the Academic Honor Principle, punishments usually involve suspension for multiple terms or separation of the student from the College.

### **Note to Students with Physical or Learning Disabilities:**

Students requesting disability-related accommodations and services for this course are encouraged to schedule a phone/video meeting with me as early in the term as possible. This conversation will help to establish what supports are built into my online course. In order for accommodations to be authorized, students are required to consult with Student Accessibility Services (SAS; [student.accessibility.services@dartmouth.edu](mailto:student.accessibility.services@dartmouth.edu); SAS website; 603-646-9900) and to email me their SAS accommodation form. We will then work together with SAS if accommodations need to be modified based on the online learning environment. If students have questions about whether they are eligible for accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

### **Religious Holidays:**

Some students may wish to take part in religious observances that occur during the academic term. If you have a religious observance that conflicts with your participation in the course, please speak with Prof. Griffin as soon as possible to discuss appropriate accommodations.

### **Title IX Policy:**

At Dartmouth, we value integrity, responsibility, and respect for the rights and interests of others, all central to our Principles of Community. We are dedicated to establishing and maintaining a safe and inclusive campus where all have equal access to the educational and employment opportunities Dartmouth offers. We strive to promote an environment of sexual respect, safety, and well-being. In its policies and standards, Dartmouth demonstrates unequivocally that sexual assault, gender-based harassment, domestic violence, dating violence, and stalking are not tolerated in our community.

The Sexual Respect Website ([sexual-respect.dartmouth.edu](http://sexual-respect.dartmouth.edu)) provides a wealth of information on your rights and obligations with regard to sexual respect and resources that are available to all in our community. As a faculty member, I am obligated to share disclosures regarding conduct under Title IX with Dartmouth's Title IX Coordinator.

Should you have any questions, please feel free to contact Dartmouth's Title IX Coordinator ([Kristi.Clemens@Dartmouth.edu](mailto:Kristi.Clemens@Dartmouth.edu)) (and deputies if appropriate).

**Wellness:**

I recognize that the academic environment at Dartmouth is challenging, that our terms are intensive, and that classes are not the only demanding part of your life. There are a number of resources available to you on campus to support your wellness, including: your undergraduate dean (<http://www.dartmouth.edu/~upperde/>), Counseling and Human Development (<http://www.dartmouth.edu/~chd/>), and the Student Wellness Center (<http://www.dartmouth.edu/~healthed/>). I encourage you to use these resources and come speak with me to take care of yourself throughout the term.