Summer 2023
BIO 318 Developmental Biology Lecture and Lab

Dr. Larimore
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Class Time: Asynchronous and Online. Dr. Larimore is available for zoom meetings to answer any questions. Just make an appointment.

Required Texts: *Principles of Developmental Biology* by Sarah Hake and Fred Wilt. ISBN 978-0393974300 (any format or version is fine).

Course Objectives:
This course is an elective in the Neuroscience, BMB and Biology majors. The course is designed to enhance the scientific maturation of all STEM majors taking the course. The course objectives are based on skills that are required by scientific employers, medical school and graduate school: critical thinking, scientific skills, team work, motivation, integrity, and scientific communication (both written and oral).

This is an upper-level **scientific writing and reading course**.

- read chapters in the textbook **each week**
- read assigned articles
- complete chapter HW **each week**
- work on your final project each week
- Final Written Project in lieu of a final.
- No late work is accepted without permission of the instructor.

Course Description:
This course explores how developmental mechanisms are orchestrated to guide an egg to produce a particular animal body plan. Specific topics covered include fertilization, induction and cell differentiation, organizing the body plan, pattern formation, regeneration, the role of the environment in development, how evolution works through development to create biodiversity and, finally, development in health and disease (birth defects, endocrine disruptors and cancer).

For each assigned chapter, you will need to do the following:

1. Read the assigned chapter
2. Read the assigned article (link and title below in the schedule)
3. Listen to the lecture that is linked below
4. Complete the Chapter HW form (pasted below as well as on Canvas)

Skill Objectives:

- Critical thinking/Problem Solving – through weekly article analysis, students will be able to critically read and evaluate scientific literature. Through designing experiments, students will sharpen their ability to think critically about neuroscience.
- Written Communication – through weekly assignments and the review paper, students will demonstrate their ability to write scientifically.
- Research Skills – as a result of this course, students can design an experiment, analyze results, draw conclusions, and critically analyze the overall conclusions.

Grading Policy: The final grade for this course will be based on the following.

Chapter HW formAnalysis Form	245 points (7 assignments x 35 points each)
Tests	100 points (2 tests x 50 points)
Draft #1 final Project	35 points
Final Project	105 points

*** additional points/assignments may be added by the professor*
No late work is accepted without approval of the professor.

Academic Policies

E-mail: Instructors will make announcements regularly via e-mail. *It is your responsibility to check your Agnes Scott email account daily*. When responding to a professor over email, ensure your email is professional. Examples here: https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087#.jldd3bxes

Plagiarism and Citations: In your review article at the end of this class, you will need several outside sources. At no point can you copy work from another student. If you do so, you will receive a 0 on the assignment. If you use an outside source, you MUST reword the content from that source in your own words. If you do not reword the content from the outside source, you will receive a 0 on the assignment. If you use an outside source as a reference, make sure you use the first occurrence (first person to describe a mutation/animal model, etc. – don't simply cite a review that mentions the first mutation). All work performed in this course must be in accordance with the Agnes Scott College Honor Code.

***ADA*:** If you have a disability that may have some impact on your work in this class and for which you may require accommodations, please the Office of Academic Advising to register for services. Students that receive accommodation checklists, please meet with me to discuss the provisions of those accommodations as soon as possible.

Title IX: For the safety of the entire community, any incidence of or information about sexual misconduct must be reported immediately to Title IX Coordinator Karen Gilbert (kgilbert@agnesscott.edu, 404-471-6435) or Deputy Title IX Coordinator Kristian Contreras (kcontreras@agnesscott.edu, 404-471-6394).

Inclusion: This course adheres to the principles of diversity and inclusion integral to the Agnes Scott community. We respect people from all backgrounds and recognize the differences among our students, including racial and ethnic identities, religious practices, and gender expressions. We strive for our campus to be a safe space in which all students feel acknowledged and supported. At the same time, we understand that course content, critical inquiry, and classroom dialogues give us opportunities to examine topics from a variety of perspectives. Such discourse is a defining feature of a liberal arts education, and can compel debates that challenge beliefs and positions, sometimes causing discomfort, especially around issues related to personal identities. While we uphold and preserve the tenets of academic freedom, we request and invite your thoughtful and constructive feedback on ways that we can, as a community of learners, respectfully assist and challenge one another in our individual and collective academic work.

Content Warning*:* This course will explore the human brain and behavior, which might raise issues of racism, sexism, classism, heterosexism, cissexism, ableism, and other kinds of privilege. I invite you to come see me if want more information. If you feel you will be unable to fully participate in the course requirements, set up a meeting with the course instructor to determine appropriate accommodations.

Deadlines: It is your responsibility to keep up with the class material. It is also your responsibility to stay on top of presentation, quiz and exam deadlines. No late work is accepted without approval of the professor.

Academic Honesty for scientific work:
You are responsible. Review each course syllabus for the professor's expectations regarding course work and class attendance. Violations of the honor code can result in failure of the assignment, failure of the course, to expulsion from the college. You speak with your professors if you need clarification about any of these policies.

By placing your name on ANY assignment, you are stating that you completed that assignment with academic honesty. Cheating in this class may keep your grade where you want it, but it will not help your career long term – you cannot cheat the GRE or the MCAT.

You must learn this material in order to succeed in science. Additionally, academic dishonesty is reported to medical schools and graduate schools as per their request. Finally, anyone caught cheating relinquishes the privilege of asking for a letter of recommendation from the professors and will receive a o on the assignment. **Acts of academic dishonesty will be turned over to Honor Court.**

Plagiarism: Do attribute all ideas taken from other sources; this shows respect for other scholars. Plagiarism can include portraying another's work or ideas as your own, buying a paper online and turning it in as if it were your own work, or not citing or improperly citing references on a reference page or within the text of a paper. Passing off someone else's work as your own represents intellectual fraud, theft, and violates the core values of our academic community.

Plagiarism is passing off any work that is not yours as your own work ** EVEN WITH A CITATION***. If you are using a source and citing the source, the information from that source STILL must be reworded in your own voice.

Putting a citation behind a statement gives ownership to that source, but, if you do not reword that information, it is plagiarism. Do not cut and paste from the slide, your book, your neighbor, Wikipedia, or the internet. To further your science education, you need to be able re-word science in your own voice. If your answers are not your own, you will receive a o for the assignment.

All cases of academic dishonesty will be turned into Honor Court.

Intellectual Fraud: Do not falsify or create data, resources or alter a graded work without the prior consent of your professor. This includes making up a reference for a works cited page or making up statistics or facts for academic work.

Cheating: Do not allow another party to do your work/exam or submit the same or similar work in more than one course without permission from the course instructors. Cheating also includes taking an exam for another person, looking on another person's exam for answers, using exams from previous classes without permission, or bringing and using unauthorized notes or resources (i.e., electronic, written, or otherwise) during an exam. Cheating also includes when you help another student complete a take home exam, give answers to an exam, talk about an exam with a student who has not taken it, or collaborate with others on work that is supposed to be completed independently.

	Date	Chapter Reading	Article reading	Lecture to Listen to:	Assignment to Complete
M	7/3	Chapter 1 “Getting Started”			
T	7/4	No Class			
W	7/5	Chapter 2 “Gametogenesis, Fertilization, and Lineage Tracing”	Transcriptional control of human gametogenesis: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9071081/	https://youtu.be/fzySWfYTP8U	
TR	7/6	Chapter 2 “Gametogenesis, Fertilization, and Lineage Tracing”	5 figures, 3 tables		Chapter HW Form
M	7/10	Chapter 3 “Oogenesis and early Development of Drosophila”	Bidirectional communication in oogenesis: A dynamic conversation in mice and Drosophila: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8917990/	https://youtu.be/qTehjodXPZg	
T	7/11	Chapter 3 “Oogenesis and early Development of Drosophila”	2 figures, 2 tables		Chapter HW Form
W	7/12	Chapter 4 “Amphibian Development”	Do hormone-modulating chemicals impact on reproduction and development of wild amphibians? https://onlinelibrary.wiley.com/doi/10.1111/brv.12147	https://youtu.be/OPTmFxtivHI	
TR	7/13	Chapter 4 “Amphibian Development”	3 figures, 2 tables	https://youtu.be/MHAhel2tjg0	Chapter HW Form
M	7/17	Work on your lab manuscript			
TU	7/18	Test #1 (50 points)			
W	7/19	Chapter 5 “Amniote Development”	Development of the amniote ventrolateral body wall. https://anatomypubs.onlinelibrary.wiley.com/doi/10.1002/dvdy.193	https://youtu.be/01mMBDEthV8	
TR	7/20	Chapter 5 “Amniote Development”	12 figures, 1 table	https://youtu.be/PedajVADLGw	Chapter HW Form
M	7/24	Chapter 6 “Development of Ectodermal derivatives in Vertebrates”	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6421567/	https://youtu.be/dAOWQC-OBv0	
TU	7/25	Chapter 6 “Development of Ectodermal derivatives in Vertebrates”	3 figures	https://youtu.be/QPvhl66QCq0	Chapter HW Form
W	7/26	Chapter 7 “Development of Mesodermal and Endodermal derivatives in vertebrates”	Single cell transcriptomics identifies a signaling network coordinating endoderm and mesoderm diversification during foregut organogenesis. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7453027/	https://youtu.be/Az6yzmeI4fU	
TR	7/27	Chapter 7 “Development of Mesodermal and Endodermal derivatives in vertebrates”	7 figures		Chapter HW Form

M	7/31	Chapter 12 “cellular Associates, Environments and Behaviors”	Brain Organoids: Human Neurodevelopment in a Dish. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7397826/	https://youtu.be/-cJZn-HcqcY	
TU	8/1	Chapter 12 “cellular Associates, Environments and Behaviors”	3 figures, review paper		Chapter HW Form
W	8/2	Test #2 (50 points			
TR	8/3	Final Exams			
	8/10	Grades Due			

Chapter Homework
Developmental Biology
35 points

INSTRUCTIONS: Answer the questions below based on the assigned chapter reading, the assigned article and the assigned video.

Each answer needs to show critical the information and should be in your own words – no quotes.

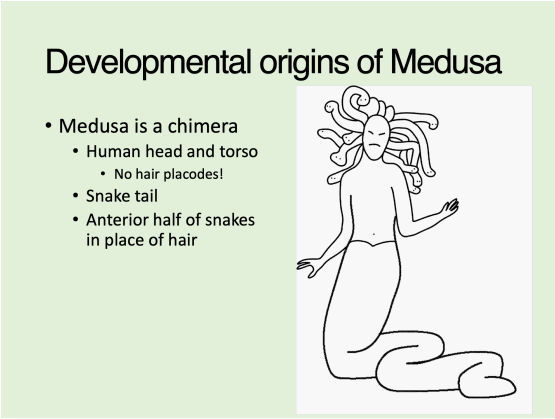
Answer the questions in a different color font. Failure to follow directions will result in a loss of points.

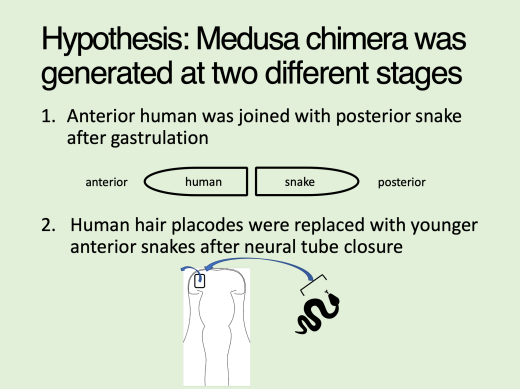
1. (10 points) In your chapter, there are sectional topics. List the section topics. Name 10 key pieces of information from the chapter - but list them under the section topic they came from. (Not 10 items per section - 10 items total, but listed under the chapter section they came from)
2. (5 points) In the assigned article, list 5 key pieces of information from the introduction.
3. (5 points) With the assigned video, list 5 key pieces of information.
4. (10 points) In your assigned article, pick 2 figures. For each of the figures, answer the following: What technique was used to generate this figure? What does the data conclude from this figure? How does the data from this figure support the hypothesis?
5. (5 points) In the discussion, list the key results. Do these results support the hypothesis – why or why not?

The lab: Making Chimeras

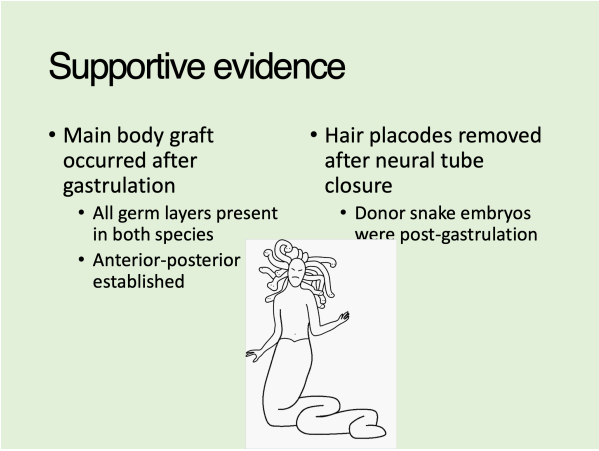
For Lab, we are going to discuss the potential origins of the mythological creatures. You are going to put together a three slide presentation similar to what you will observe in this part of the syllabus as we discuss Medusa.

When examining Medusa, the individual has regions that are clearly human and regions that are snake, making Medusa an example of a chimera. Based on this image, Medusa's anterior body is predominantly human, and the posterior body is predominantly snake. Additionally, the expected human hair placodes of the scalp have been replaced by the anterior portion of snakes.





Together, these observations suggest that Medusa was formed by chimeric surgeries at two different stages of development. To generate the main body, the anterior portion of a post-gastrulation human was joined to the posterior portion of a post-gastrulation snake. This chimera would then be allowed to develop until hair placodes would arise. At this time, the hair placodes would be removed and replaced by the anterior portions of post-neurulation snake embryos.



These specific ages are necessary because the torso itself has components of all three germ layers (ectoderm-derived epidermis, mesoderm-derived musculature, and endoderm-derived digestive system lining). Because Medusa presumably displays coordinated movement between the anterior and posterior portions of the body, neurons and blood vessels needed to connect between the two tissue grafts; additionally, the endoderm must have connected to allow for transport of digestive materials from anterior to posterior. Gastrulation sets up the anterior-posterior axis in humans and snakes, so using post-gastrulation embryos would account for the limbs that are present (human forelimbs and no snake hindlimbs). The hair placodes begin forming after neurulation (~week 12 for lip hair follicles), so the ectoderm that could generate hair placodes had to be removed after neural tube closure and as close as possible to cranial placode formation to avoid unintentional damage. More flexibility is available when preparing

the donor snake embryos, as a variable amount of the embryo could be grafted onto the human head. As with the original graft, these snake embryos would have to be post-gastrulation so they could generate all germ layers.

Above - the 3 slides and the writing about Medusa - this is what you will be doing with your creature.

Presentation Description and guidelines

This semester, your project is identifying what happened during development to lead to your mythological creature. During the semester, you will create a 3 slide presentation with a script similar to what you see above for Medusa.

The goals of your presentation are to

1. Introduce your mythological creature. What is atypical about your creature? (Slide 1)
2. Propose your hypothesis: How did your creature arise? (Slide 2)
    - If you have a chimera, where did its parts come from?
3. Present your evidence: Relying on the labs we do this semester, what labs help explain the developmental anomaly? (Slide 3)

You can use up to three slides (no animations, gifs, transitions, etc.) to address those three points. Formatting of the slides is up to you!

You will turn in a draft of your final presentation - slides and script only. This is to allow some feedback before the final draft.

How will you be graded on your Draft Work? Content

Content	5 - 3 points	3 - 2 points	2 - 0 point
Introduction	Correctly identified your creature's anomaly	Incorrectly identified your creature's anomaly	No attempt to identify the anomaly
Hypothesis	Correctly identified how the anomaly could have arisen	Attempted to identify how the anomaly could have arisen	No hypothesis or aim
Evidence	Well-established evidence and scientific evidence supporting the hypothesis	Good evidence and good science with decent support for the hypothesis	No attempt at finding evidence or not enough of a good support for the hypothesis
Slides	Well-formatted, easy to follow	Somewhat well formatted, a bit hard to follow	Distracting visuals, hard to follow
Oral presentation	Well-paced, with appropriate volume	A little rushed or too slow, or perhaps too loud/soft	Rushed or very slow, or inaudible/shouted
Transitions	Clear transitions between slides	Some transition between slides	No transitions between slides

Your Final Project will be submitted to canvas and include a recording. You should also include any feedback from the draft. You will submit your presentation, your slide and the script.

How will you be graded? Content + presentation skills

Content	15 - 11 points	10 - 6 points	5 - 0 point
Introduction	Correctly identified your creature's anomaly	Incorrectly identified your creature's anomaly	No attempt to identify the anomaly
Hypothesis	Correctly identified how the anomaly could have arisen	Attempted to identify how the anomaly could have arisen	No hypothesis or aim
Evidence	Well-established evidence and scientific evidence supporting the hypothesis	Good evidence and good science with decent support for the hypothesis	No attempt at finding evidence or not enough of a good support for the hypothesis
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