

Advanced Special Topics in Biology:

Modern experimental approach in zebrafish to study human-relevant biology and disease

Fall 2020

Dr. Celia Shiau

TIME: Wednesday 1:25 PM- 2:15 PM

LOCATION: virtual over Zoom (synchronous remote teaching)

COURSE TYPE: 1-credit hour interactive learning course

This course will survey and delve into the methods, experiments, and unique strengths of the zebrafish model system to investigate a wide range of important vertebrate biology for advancement of scientific knowledge, technology, and possible biomedical applications.

Instructor:

Dr. Celia Shiau

Email: shiauce@unc.edu

Office Hours: by appointment, please email me

Sakai Site:

You must have your onyen to log on. Lecture materials, required readings, homework assignments, and announcements mentioned in class will be posted here. *It is your responsibility to check it regularly.*

Required Reading and Homework (50% of your final grade):

See syllabus and check Sakai site for posting. There are no required textbooks. Book chapters, primary literature, and review papers will be assigned for homework to be read ***prior*** to each class. You will be given guided reading assignments (posted on Sakai) to help guide you through the assigned readings, which you will complete and submit by email to Dr. Shiau (shiauce@unc.edu) before the start time of each class for credit. Please name your submission files as "LastName_FirstName_GRA#"; for example, it would be named as "Shiau_Celia_GRA1.doc". Completing the assigned readings and guided reading assignments will be essential for participating in-class activities and your success in all class projects. No make-up work will be allowed!

Required Prerequisite:

Strong academic knowledge of molecular and cellular biology as demonstrated by a B- or above in BIOL 205, or with instructor's permission. Course is designed for graduate students and upper level undergraduate students.

Participation (30% of your final grade):

A mix of different types of discussions, group activities, and Poll Everywhere questions can be expected during each class meeting. IMPORTANT NOTE: missing just 1 class can quickly affect your participation grade!

Presentations and papers (20% of your final grade):

There will be one midterm and one final paper in addition to student presentations that will account for this portion of the grading. No make-up exams except in special medical or family emergencies documented by the dean's office in writing prior to missing exam.

How is your grade determined at the end of the semester?

Total Grade % = (0.50 x required reading/homework) + (0.30 x participation score) + (0.20 x presentations/papers)

Digital etiquette:

This course will require you to use your laptop and/or cell phone during class time. Please be respectful of your classmates and restrict your use of digital devices to course content. You will learn more if you concentrate on the course while you are here and your classmates will thank you for not impeding their ability to learn.

What you should bring to each class:

1. Printed or digital version of the assigned reading articles
2. Outlines from Sakai when available (either printed or on laptop)
3. Extra blank paper for drawings, notes, and activities (or tablet computer for drawing)
4. POLLEVERYWHERE device: electronic device with internet access
5. Your open and curious mind!

Diversity statement: The Department of Biology values the perspectives of individuals from all backgrounds reflecting the diversity of our students. We broadly define diversity to include race, gender identity, national origin, ethnicity, religion, social class, age, sexual orientation, political background, and physical and learning ability. We strive to make this classroom and this department an inclusive space for all students.

Honor code: All work done in this class must be carried out within the letter and spirit of the UNC Honor Code. You are expected to maintain the confidentiality of all exams by divulging no information about any exam to a student who has not yet taken that exam. No plagiarism allowed in any work related to this course. You are also responsible for consulting with your professors if you are unclear about the meaning of plagiarism or about whether any particular act on your part constitutes plagiarism. Please talk with the professor if you have any question about the Honor Code.

Copyright policy: All course materials including your class notes and in-class assignments are covered by University Copyright Policy @ <http://www.unc.edu/campus/policies/copyright%20policy%2000008319.pdf>. ***This means it is illegal and an honor code offense to share your notes or any other course materials items with anyone not directly affiliated with this particular class. No uploading to non-class sharing sites.***

Special note: Be safe, act responsibly, and stay informed about COVID-19 and matters as we adapt to life under the pandemic. The following 5 websites are recommended resources for staying up-to-date on COVID-19. (Remember: the only way to flatten the curve of the virus transmission is to wear your mask and follow social distancing guidelines!)

For UNC-CH Covid-19 status:

<https://carolinatogether.unc.edu/dashboard/>

Frequently-updated and comprehensive wikipedia page:

https://en.wikipedia.org/wiki/2019-20_coronavirus_pandemic

Current and recent past meetings about response around the world; timeline; international expertise:

<https://www.who.int/blueprint/priority-diseases/key-action/novel-coronavirus/en/>

CDC info on SARS-CoV-2 in the US:

<https://www.cdc.gov/coronavirus/2019-nCoV/index.html>

Worldwide and US maps of Covid-19 cases and statistics from JHU coronavirus resource center:

<https://coronavirus.jhu.edu/map.html>

Class Schedule

Date	Class meeting #	Assignments to be completed BEFORE this class (email Dr. Shiau your assignment before the beginning of class to receive full credit) (Note: all materials are posted on sakai.)	Topics covered
Wed 8/12	1	Welcome to your first class!	-Review syllabus -Overview: Zebrafish as an experimental model to study disease biology -Overview: Virology and Covid-19
Wed 8/19	2	Complete Guided Reading Assignment (GRA#1) for: Virus Explorer worksheet from HHMI on sakai: 4 pages and use the following website. https://www.biointeractive.org/classroom-resources/virus-explorer Research article: Zhang et al., 2020. PNAS. "Identifying airborne transmission as the dominant route for the spread of COVID-19."	-Special module: Virology and Covid-19 continues
Wed 8/26	3	Complete Guided Reading Assignment (GRA#2) for: Book Chapter: read pages v-x of the "Prelude" section in the book "Cancer and Zebrafish Mechanisms, Techniques, and Methods" edited by David Langenau 2016 and complete the GRA. Research article: Ignatius et al., 2018 Elife. "tp53 deficiency causes a wide tumor spectrum and increases embryonal rhabdomyosarcoma metastasis in zebrafish."	-Overview: Zebrafish as an experimental model for cancer -Case study: How zebrafish makes a powerful model to study disease biology (using cancer as an example) - Techniques: genetics, functional genomics, transplantation, histology, flow cytometry, transgenics.
Wed 9/2	4	Complete Guided Reading Assignment GRA#3 for: Biography profile: https://www.the-scientist.com/profile/the-father-of-autoimmunity-a-profile-of-noel-rose-67567	-Overview: Autoimmunity and biography of Noel Rose who established that autoimmunity exists -Case study: How zebrafish makes a powerful model to study autoimmune diseases

		<p>“The Father of Autoimmunity: A profile of Noel Rose” (Dr. Rose died of a stroke at age 92 on July 30, 2020) Speaking to The Washington Post in 1995, Noel Rose called autoimmune diseases “one of the big three, meaning cancer, heart disease, and autoimmune disease.”</p> <p>Research article: Early et al., 2018 Elife “An automated high-resolution in vivo screen in zebrafish to identify chemical regulators of myelination”</p>	<p>(using the study of myelination as basis for understanding multiple sclerosis as an example)</p> <ul style="list-style-type: none"> - Techniques: use of zebrafish at a large-scale using automated high-resolution imaging and chemicals screen <p>>80 known autoimmune diseases: including multiple sclerosis, lupus, type 1 diabetes, rheumatoid arthritis, and AIDS.</p>
Wed 9/9	5	<p>Complete Guided Reading Assignment GRA#4 for:</p> <p>Book Chapter: Chapter 2 in Methods in Cell Biology- Pages 31-54 “Innate immune cells and bacterial infection in zebrafish” Astin, Keerthisinghe, Du, Sanderson, Crosier, Crosier, and Hall 2017</p>	<ul style="list-style-type: none"> -Overview: Zebrafish as an experimental model -Case study: How zebrafish makes a powerful model to study infections - Techniques: use of zebrafish to study innate immunity
Wed 9/16	6	<p>Complete Guided Reading Assignment GRA#5 for:</p>	<p>TBD</p> <ul style="list-style-type: none"> -Vote on GRA paper for paper critique -Go over paper critique guidelines
Wed 9/23	7	<p>Write a 1-page critique on the primary paper that the class has voted for from the three previous GRAs (#2-5)—bring this to class for a group exercise to discuss the critique and how to best write one—you will be turning in a revised and polished one as your “Midterm paper critique” before next class.</p> <p>Follow given guidelines for paper critique *** Email Dr. Shiau your 1-page critique before class for full credit</p>	<p><u>Student exercise on composing a concise and effective 1-page research paper critique</u></p>
Wed 9/30	8	<p>Complete Guided Reading Assignment GRA#6 for:</p> <p>Midterm paper critique due before the beginning of class Strictly 1-page length and Arial 11 as the smallest font Follow given guidelines for paper critique</p>	<p>TBD</p>

Wed 10/7	9	Complete Guided Reading Assignment GRA#7 for:	TBD
Wed 10/14	10	Complete Guided Reading Assignment GRA#8 for: <i>Email your choice of a primary research literature for your Student Presentation before class on Wed 10/21 for Dr. Shiau's approval.</i>	TBD
Wed 10/21	11	Prepare a 15-minute presentation that summarizes and critiques a biology research paper that uses zebrafish as its main experimental model. You will have a 2-minute Q&A session following your talk. Practice your talk timed as you will be graded on content as well as staying on time (13-15 minutes total). Follow given guidelines for presentation. <i>Email your slides for your presentation by 10 am Wed 10/21 to Dr. Shiau.</i>	<u>Student presentations</u> The order of all presentations will be determined by a random draw of student names on Wed 10/21. All students must turn in their presentation slides before class and be prepared to present on Wed 10/21. Each week, 3 students will present.
Wed 10/28	12	Students' presentations continued	<u>Student presentations</u>
Wed 11/4 Last day of class	13	Complete Guided Reading Assignment GRA#9 for: Choose one article from GRA #6-9 as the subject for the Final paper critique.	Summary of course material Class votes for an article to be used for the Final paper critique.
FINAL TBD—Paper due (1-page paper critique)			

Classes end: Tues Nov 17

Final exam days: Wed- Tues Nov 18-24