

Cellular Stress: BISC 337 – Spring 2023

Lecture Instructor: Claire Riggs; email: cr113@wellesley.edu

Classroom: Science Center, N220

Class time: Wednesdays 1:30 pm - 4:10 pm

Office Hours: after class and by appointment (zoom or in-person)

Office: Science Center, E340

Course Description

Maintaining homeostasis in the face of environmental stresses is paramount to cell survival. In this course we will examine the effects of the cellular stress response (CSR) in eukaryotic cells at the levels of DNA, RNA, and protein, with consideration of organelle-specific responses. Topics will include heat shock, osmotic stress, hypoxia, starvation, and oxidative stress. We will examine studies using traditional models for the CSR (i.e. human and mammalian cells) and, where possible, consider research from non-traditional models. Throughout the course we will discuss the evolution and conservation of the CSR, as well as the challenges and future of CSR research. This course will consist of lectures, invited seminars from researchers in the field, and discussion of scientific review and primary articles. Articles will showcase classic CSR research and new methods in the field.

Course Goals

- Be able to define stress and the cellular stress response, and explain conserved mechanisms of the CSR
- Understand current research methods and challenges in the cellular stress response field
- Develop skills in searching, reading, discussing, and critiquing primary scientific literature
- Develop skills in science writing, including applying skills and knowledge to craft a grant proposal

Cellular Stress Response BISC 337 tentative schedule – subject to change

Week	Date	Topic(s)	Readings (prior to class)	In Class
Intro to the Cellular Stress Response				
1	1/25	Intro to course + cell biology and stress		<ul style="list-style-type: none"> • Introductions • Review syllabus • Cell stress discussion/activity
2	2/1	What is stress? Intro to the cellular stress response (CSR)	Kultz 2020, Kultz 2003, Welch 1993	<p><i>HW #1 due before class</i></p> <p>Student-led discussion of readings</p> <p>Jillian Amaral (Science Librarian): research strategies</p> <p>Instructor Presentation: translational arrest and the integrated stress response</p>

Translational Arrest and Common Cellular Stress Response Pathways				
3	2/8	Translational Arrest and the Integrated Stress Response (ISR) <ul style="list-style-type: none"> • ISR – translational arrest • tiRNA – transl arrest 	Spriggs et al. 2010 Yamasaki et al. 2008	<i>HW #2 due before class</i> <i>Grant topic/RQ possibilities due</i> Student-led discussion Instructor Presentation: heat shock response
4	2/15	Thermal Stress/Heat Shock Responses	Somero 2019 excerpt, Pincus 2018 chapter Agarwal & Ganesh 2020	<i>HW #3 due before class</i> Guest Speaker: Dr. Nupur Bhattar (tiRNAs) Student-led discussion Instructor Presentation: ER stress/Unfolded Protein Response QUIZ 1 OPENS (Fri 2/17)
5	2/22	ER stress response/Unfolded Protein Response	Karagoz et al. 2019, Chu et al. 2019	<i>HW #4 due before class</i> Student-led discussion Grant examples & in-class group work Instructor Presentation: hypoxia/HIF pathway QUIZ 1 CLOSES (Fri 2/22)
6	3/1	Hypoxia Response - HIF	Lee et al. 2020, Ho et al. 2016	<i>HW #5 due before class</i> Student-led discussion Guest Speaker: Chelsea Hughes (Killifish and histone modification) Instructor Presentation: nutrient deprivation and mTOR
7	3/8			<i>HW # 6 due before class</i> <i>Draft of specific aims due</i>

		Nutrient Deprivation	Altman & Rathmell 2012 Chen et al. 2014	Student-led discussion Instructor Presentation: Osmotic stress and apoptosis
8	3/15	Osmotic stress & Apoptosis	Burg et al. 2007 pgs 1441 – 1450 Tait and Green 2010 Saikia et al. 2014	<i>HW # 7 due before class</i> <i>Draft of specific aims due</i> Student-led discussion Instructor presentation: organelles in the stress response
Organelles in the Stress Response				
9	3/22	Mito-Nuclear Responses	Quiros et al. 2016 Nargund et al. 2012	<i>HW # 8 due before class</i> Student-led discussion Instructor presentation: intro to MLOs
10	4/5	Membraneless Organelles	Riggs et al. 2020 Wu et al. 2023	<i>HW # 9 due before class</i> <i>Draft of background due</i> Class discussion In-class peer review and grant workshop Instructor presentation: QUIZ 2 OPENS (FRI 4/7)
3/29 Spring Break – No Class				
Identifying Adaptive Responses				
11	4/19	Adaptive vs maladaptive responses	Lamech & Haynes 2015, Kabakov et al. 2002 Murray et al. 2022	QUIZ 2 CLOSSES (FRI 4/14) <i>HW # 10 due before class</i> Student-led discussion

				Grant proposal workshop Instructor presentation: Intro to emerging models
12	4/12	Emerging Models for the Cellular Stress Response	Riggs et al. 2019 Hashimoto et al. 2015 “An homage to unusual creatures” – Nat. Editorial	<i>HW # 11 due before class</i> Student-led discussion
	4/26	Ruhlman Conference – No Class		
13	5/3	Proposal Presentations		Grant proposal presentations
14		Finals week		<i>Grant due by end of finals week</i>

Resources:

Assigned readings: In this class we will be reading scientific literature and some popular science articles. Assigned readings will be on the Google Drive associated with our Google Classroom site.

Learning management platforms: Google Classroom will be used for sharing readings and submitting weekly homework assignments. Sakai will be used for the quizzes.

Optional background reference:

Alberts B, Johnson A, Lewis J, Morgan D, Raff M, Roberts K, Walter P. Molecular Biology of the Cell, 6th or 7th Ed. Norton & Company

This is a helpful resource for background information. There will be one copy available on reserve at the library. I *do not* recommend you purchase the book new – you may want a cheap used copy (older editions will still be useful) or to occasionally borrow it from the library.

Science Librarian: Jillian Amaral is the Science Librarian at Wellesley who is available to meet with you individually about any aspect of your research. She can assist with literature searches, strategies for assessing materials, etc. You can reach her at: ja102@wellesley.edu or by making an appointment on her [calendar](https://bit.ly/meetwithJillian) (<https://bit.ly/meetwithJillian>).

Communication/Office Hours: Between classes, I will communicate with you (as necessary) by email. If you have any questions or would like to speak with me between classes, please stop by my office hours or contact me by email. I am happy to arrange another time to meet (either in-person or on zoom) if you are not able to come to my scheduled office hours.

Activities and Assessments:Weekly Reading Homework Assignments:

- Readings are assigned for each class. Prior to class, you will need to carefully read (may require multiple times through) the assigned material. You are expected to look up terms you are unfamiliar with and understand the paper to the best of your ability so that we may have a fruitful discussion in class.

- Each week there will be a short assignment pertaining to the readings. The details may differ week-to-week. I will post the assignment instructions on Google Classroom. Assignments should be submitted via Google Classroom prior to the start of the class.
- I encourage you to work together outside of class to understand the material, however weekly assignments must be your own work and written in your own words.
- There are 11 weekly reading homework assignments throughout the term. The lowest two scores are dropped.

Discussion Leading:

- In a group of 2-3, you will be responsible for leading the class discussion on assigned readings two times during the term.
- Your plan for the discussion (questions for group work, any slides you will use, or any other materials, etc.) is due to me 24 hrs prior to class (Tuesday at 1:30 pm) via email.
- I am happy to meet with you in the weeks prior to discuss your plan for class.

Grant Proposal:

- Throughout the term you will work on an independent grant writing project. This will be on a topic of your choosing. I am so excited to see what you come up with!
- There will be several assignments and in-class activities to facilitate your progress and success with this project throughout the term.
- The last day of class, each student will give a short (~ 5-8 min) presentation of their proposal.
- More details to come!

Participation and collegiality:

- As a small seminar-style class, engaging and actively contributing, both in class and outside of class, are central to this course. We all have so much to learn from each other! Your attendance and active participation and engagement are expected and eagerly anticipated. At the end of the term, I will give you a survey to reflect on your participation level in the course, which I will weigh in assigning your participation points, however the final decision is up to me.
- There are 100 points total.
 - 50 points are based on in-class engagement and participation at 5 points for class.
 - Includes preparation for class, asking and answering questions during lecture, participating in discussions and in-class activities, etc.
 - After two absences, points will start to erode
 - 50 points are self-assessed community member participation:
 - Such as: sharing notes with a peer, reaching out to peers for support, being a productive group member, building community, helping to uphold community norms.

Quizzes: There will be two 'take-home' quizzes during the term, administered via **Sakai**. Quizzes will be based on readings and material from class. You may use your notes from class during the quiz, but no other resources (internet, friends, etc.) are permitted. Quizzes are timed (60 min), however you can complete them anytime within the week that they are open.

Assessment	Points
Weekly Homework (10 points each, drop 2)	90
Discussion lead x 2 (50 pts ea)	100
Participation/collegiality	100
Quizzes, two each worth 30 points	60
Grant	150
• Topic/research question ideas	(5)
• Specific aims draft	(5)

• Background draft	(5)
• Complete draft	(15)
• Revised final grant	(100)
• Mini-proposal presentation	(20)
Total	500

Grading policies: Assignments are due as indicated on the schedule. Weekly homework assignments must be completed prior to each class. Since the assignments are meant to prepare for class and your two lowest scores will be dropped, I will not accept late work. For all other assignments, there will be a 5%/day deduction for late work, and no credit for assignments submitted after they are returned to students.

Attendance: Attending and contributing to in-class discussion and exercises is an important part of this course (see participation above). Your presence is expected in each class (see participation above). Please contact me if you anticipate missing class for any reason.

Honor Code: Students are reminded that the college Honor Code applies to all work in this course. The honor code stipulates that:

A) the work you submit is your own work. It is not the work of another student, a paper-writing service or website (including AI platforms). material from other texts is only included with appropriate and complete attribution and citation.

B) assignments are fulfilled under the terms of the specific assignment. In other words, you will only collaborate with others or reference other sources when allowable.

In this class you will be graded on assignments as individuals, but we will frequently work together in groups during class and I also encourage you to work together outside of class. Expectations for each assignment will be communicated. If expectations are unclear, please ask.

A word about AI: AI has slowly been creeping into our lives. Assignments/assessments are meant for you to demonstrate how you think and are processing information. Use of AI interferes with this goal. Therefore, the use AI (ChatGPT and other platforms) is not permitted in this class and constitutes an honor code violation. In addition, given the [immense environmental costs associated with use of AI](#) it's a good idea to steer away from it.

Please do not cheat. If you are struggling, please come meet with me so we can set up a plan to help you succeed.

Departmental Inclusion Statement: We in the Wellesley College Department of Biological Sciences, including all faculty, staff and students participating in the department, are devoted to improving equity and enhancing student experiences of community, engagement and belonging. We believe that the diversity of our community is central to intellectual growth and development. We are committed to being a learning community that embraces and supports the identities, abilities, life experiences, and aspirations of every member of our community.

Additional Campus Resources:

Class deans: <https://www.wellesley.edu/advising/classdeans> (any issues, health/financial hardships/family issues etc)

Office of Student Success: <https://www.wellesley.edu/studentlife/intercultural/studentSUCCESS> (any issues, health/financial hardships/family issues etc)

Stone Center: <https://www.wellesley.edu/counseling> (mental and emotional wellbeing)

Wellesley College's Accessibility and Disability Services: If you have a disability or condition, either long-term or temporary, and need reasonable academic adjustments in this course, please contact Wellesley

College's Accessibility and Disability Resources (ARD) to get a letter outlining your accommodation needs, and submit that letter to me. You should request accommodations as early as possible in the semester, or before the semester begins, since some situations can require significant time for review and accommodation design. If you need immediate accommodations, please arrange to meet with me as soon as possible. If you are unsure but suspect you may have an undocumented need for accommodations, you are encouraged to contact ADR. They can provide assistance, including screening and referral for assessments. ADR can be reached at accessibility@wellesley.edu, at 781-283-2434, by scheduling an appointment online at their website www.wellesley.edu/adr, or by visiting their offices on the 3rd floor of Clapp Library, rooms 316 and 315.

Office of the Ombuds: Provides confidential and neutral meetings, either in person or virtual, in order to assist students, faculty and staff in exploring options for resolving problematic issues on campus between individuals or due to other college-related factors. <https://www.wellesley.edu/administration/ombuds>

Discrimination and Harassment: Wellesley College considers diversity essential to educational excellence, and we are committed to being a community in which each member thrives. The College does not allow discrimination or harassment based on race, color, sex, gender identity or expression, sexual orientation, ethnic or national origin or ancestry, physical or mental disability, pregnancy or any other protected status under applicable local, state or federal law. If you or someone you know has experienced discrimination or harassment, support is available to you:

Confidential reporting:

- Students can report their experiences to Health Services (781.283.2810); Stone Center Counseling Service (781.283.2839); or Religious and Spiritual Life (781.283.2685). These offices are not required to report allegations of sexual misconduct to the College.

Non-confidential reporting:

- You can let me know. As faculty members, we are obligated to report allegations of sex-based discrimination to the Nondiscrimination/Title IX Office.
- You can report directly to the Nondiscrimination/Title IX Office (781.283.2451) to receive supports, and to learn more about your options for a response by the College or about reporting to a different institution."