



FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE

EVOLUTION OF SEX DIFFERENCES

FIRE 166 - FIRE SEMESTER 2: Evolution of Sex Differences

Instructor: Dr. Ashley Nazario-Toole, Ph.D.
Location: ATL 2339 (Lecture) / BPS 2213 (Lab)
Lecture Time: Thursday, 2:00pm – 2:50pm
Lab Time: Tuesday – Friday: 9:00am - 5:00pm
Phone: (301) 405-6949
Office: BPS 2246
Office Hours: By appointment

Course Description

Differences between males and females of the same species – whether morphological, physiological, or behavioral – are referred to as sexual dimorphism. Examining the origin and genetic basis of sexual dimorphism in model organisms can provide valuable insight into human sex differences – such as differences in disease susceptibility. This stream is a collaborative research engagement focusing on the characterization of developmental and immunological sex differences in two insect species. Computational and molecular research methods will be employed to investigate the genetic and environmental factors that influence the development and evolution of sexual dimorphism.

This is the second course in the FIRE (First-Year Innovation & Research Experience) program sequence and is for students participating in the Evolution of Sex Differences innovation and research stream.

This course will focus on the concepts related to the process of independent research, including collaboration with peers, communication of ideas, troubleshooting unexpected outcomes and discipline-specific methodologies. Scheduled class meetings will focus on the discussion of primary literature, troubleshooting research issues and continual review of individual and group research progress. The course requires each student to commit 6 additional hours of independent research per week.

Course Organization

Students will work as both individuals and in small groups on projects related to the continually evolving research agenda of the stream. The dedicated research space will be open and available with the Research Educator and/or peer mentors present to provide guidance at specific times each week.

Students will build expertise in the following areas:

Collaboration and discussion of data:

Owing to the increasingly collaborative nature of research, students, working within the framework of small groups and the stream, will learn to discuss data, troubleshoot problems encountered during the course of their work, and otherwise gain confidence and capacity with the collaborative nature of research.

Review of primary literature and discipline understanding:

Students will gain experience researching the background of an experimental hypothesis. This will include understanding the proper methods required to approach a question, what has been done already within the field, and what questions still remain. Through analysis of published articles, students will gain an understanding of the expected format and tone of discipline-specific research articles, which will prepare them for the production a manuscript presenting the findings of their own research. Aggregate guided review of contemporary literature will facilitate broad understanding of the discipline engaged.

Record keeping and professional writing:

The maintenance of proper records is critical for research credibility and experimental reproducibility, thus students will be responsible for maintaining a notebook of their experimental procedures and data. Students will also prepare a final written manuscript in the form of a Research Report to outline their specific studies. Data may be collected and prepared for publication, dependent on results.

Practical methodological experience:

Students will be responsible for conducting experimental research and will be trained in the theoretical background and practical execution of basic methodological techniques needed to further stream research goals.

Required Reading

- Lab Research Guides providing background information, protocols, primary literature, and review material are in the FILES folder on Canvas.
- Students will review scientific articles related to the research being conducted, which will be provided through Canvas.
- We will cover biological concepts and protocols that are relevant to the stream during class lectures. You will be given the lecture slides, background reading materials, and videos to watch prior to each lecture.

Recommended Reading

- Current Protocols: Essential Laboratory Techniques 2nd Edition by Sean R. Gallagher and Emily Wiley. A copy of this book is kept in the lab.

Attendance

Due to the independent nature of research, in addition to scheduled weekly class meetings, students will be required to work in the dedicated stream research setting for **a minimum of 6 hours each week**. Students will be required to sign in and out to ensure that research hours are correctly noted. Course-related policies follow standard University guidelines and may be found here: <http://www.ugst.umd.edu/courserelatedpolicies.html>.

Evaluation

Evaluation of student research progress will be based on participation in discussions and evidence of work rather than research results.

#	Assignments	Course Objective	%
1	Research Guide I	RG #1 – Safety Training and Introduction to ESD. Includes online safety modules and an intro reading assessment.	10
2	Research Guide II	RG #2 – Lab Safety, Fly Husbandry and Basic Lab Techniques. Includes ELMS Discussion Posts #1 & #2 and laboratory work.	10
3	Research Guide III	RG #3 – Sample collection thru Gel Electrophoresis. Includes Class Prep Quiz #1 (ELMS) and laboratory work.	10
4	Research Guide IV	RG #4 – RNA isolation and RT-PCR. Includes Class Prep Quizzes #2 & #3 and laboratory work.	10
5	Flybase and Gene-tree worksheet	The student will become proficient with Flybase, an online bioinformatics database for <i>Drosophila</i> and insect genomes. The student will utilize bioinformatics techniques to create a phylogenetic tree for a gene of interest.	5
6	Research Guide V	RG #5 – Real-time PCR and Data Analysis. Includes Class Prep Quizzes #4 & #5 and laboratory work.	10
7	Research Poster & Presentation	Students will work as a group to design and present a scientific poster.	12.5
8	Research Guide VI	RG #6 – RNA-sequencing Preparation.	5
9	Notebook checks	The student will keep an organized notebook that contains up-to-date data and experimental protocols. 2, random checks will be conducted during the semester	10
10	Research Setting & Class Attendance**	Students will attend lab an average of 6 hours per week for a total of 72 hours for the semester. Students will also attend and be on time for scheduled class meetings.	15
11	End of semester survey	The student will complete an online survey at the end of the semester.	2.5

****Research Setting and Class Attendance** – The student must demonstrate an active engagement in the research project, thus time in the lab will be logged and accounted for. An average of 6 hours/week for **a total of 72 hours over the course of the semester** is required to achieve full credit for the cumulative grade. **1 point** will be lost **for every 4 hours** students fall short of the required time. Students are also to attend scheduled class meetings – attendance will be logged after the drop-add period. **1 point** will be lost **for every unexcused absence** (See Attendance policy.)

Final Grade Percentage Determination

Final grade percentages will be calculated using the following assignment weights:

ASN	1	2	3	4	5	6	7	8	9	10	11
%	10	10	10	10	5	10	12.5	5	10	15	2.5

Final Letter Grade Determination

Final letter grades will be determined using the following guidelines:

+	97%	+	87%	+	77%	+	67%		
A	93%	B	83%	C	73%	D	63%	F	< 60%
-	90%	-	80%	-	70%	-	60%		

Research Setting Policies

The following policies are strictly enforced within the research setting.

- No eating or drinking in the research setting, including gum or candy.
- All safety procedures and clothing requirements must be strictly adhered to.
- Be respectful. This includes but is not limited to:
 - Listening to instructions from the RE, mentors and/or fellow researchers
 - Behaving civilly to those in the research setting
 - Keeping conversation to a volume so as not to disturb others that are working
- Headphones are allowed during periods of independent work, so long as instructions can still be followed and the music is not disruptive to others.
- All efforts to troubleshoot should be made amongst fellow group members and the class as a whole before the instructor becomes involved.

Class Cancellations and Emergencies

In the event of an emergency, follow all UMD announcements, guidelines and policies. Class will not be held when the university is closed due to emergency, weather or other unforeseen event. Any other cancellations will be communicated through the course website.

Academic Integrity

The University of Maryland, College Park Code of Academic Integrity is strictly enforced in this class. Assignments and classwork must reflect your own, original work and must including proper citation and attribution for work that is not your own.

Academic dishonesty includes:

- “Cheating: Intentionally using or attempting to use unauthorized materials, information or study aids in any academic exercise.
- Fabrication: Intentional and unauthorized falsification or invention of any information or citation in an academic exercise
- Facilitating academic dishonesty: Intentionally or knowingly helping or attempting to help another to violate any provision of this Code
- Plagiarism: Intentionally or knowingly representing the words or ideas of another as one’s own in any academic exercise.”

For information concerning the Code of Academic Integrity see:

<http://www.shc.umd.edu/SHC/Default.aspx>

Academic Accommodations

If you require academic accommodation, please provide proper documentation by the second class period and contact Disability Support Services so that we can arrange an appropriate accommodation for your needs: DSS Phone: (301) 314-7682 & DSS Web:

<http://www.counseling.umd.edu/DSS/>

Spring 2018 FIRE ESD Schedule

This schedule is subject to change.

All assignments are due by 2pm on the day of class.

**Indicates a quiz or discussion post is due.

Week	Class Topic & Date	Content	Assignment Due
1	Introduction & Record Keeping 1/25	1. Introduction to People, policies & the lab 2. How to keep a lab notebook	
2	Lab Safety 2/1	1. Safety Training Course (UMD DES)	ASN1 – Research Guide I
3	Male and female differences 2/8	1. Form research group 2. Sexual selection & trait evolution	**
4	Gene expression 2/15	1. Eukaryotic genes and regulation of expression	ASN2 - Research guide II **
5	DNA isolation, PCR, and Gel electrophoresis 2/22	1. DNA and RNA isolation 2. Polymerase chain reaction 3. Gel electrophoresis	**
6	RNA isolation & Nanodrop 3/1	1. RNA stability and isolation 2. Nucleic acid quality analysis	ASN3 - Research guide III **
7	RT-PCR and qrt-PCR 3/8	1. Reverse transcription PCR 2. Quantitative real-time PCR	**
8	Techniques to analyze gene expression 3/15	1. RNA-sequencing 2. Relative expression calculations	ASN4 - Research guide IV
Spring Break (March 18-25)			

9	Second half of the semester overview 3/29	<ol style="list-style-type: none"> 1. Innate immunity review 2. Discuss RG#5 3. Introduction to ASN5 and ASN8 	**
10	In-class activity 4/5	<ol style="list-style-type: none"> 1. qPCR review 2. Data analysis 3. Group work - Poster Introduction 	**
11	In-class activity 4/12	<ol style="list-style-type: none"> 1. Group work – Poster Materials and methods 2. Data analysis 	ASN5 – Flybase and gene tree worksheet
12	In-class activity 4/19	<ol style="list-style-type: none"> 1. Research Troubleshooting 2. Group work – Poster Results section 	ASN6 - Research Guide V
13	In-class activity 4/26	<ol style="list-style-type: none"> 1. Group work – Poster Conclusions & Abstract sections 	
14	Course Survey and Poster Presentations 5/3	<ol style="list-style-type: none"> 1. Complete FIRE Course Survey 2. Poster Presentations 	ASN7 - Final Research Poster & Presentations ASN8: Research Guide VI
15	Semester Wrap-up 5/10	<ol style="list-style-type: none"> 1. Spring semester reflection 2. Overview of Fall Semester 	ASN9: Lab Notebook Checks ASN10: Semester Lab hours ASN11: End of Semester Survey (In class)