

**BIOL-108: Information Flow in Biological Systems  
Fall 2022**



**Class Schedule**

**Lecture** MWF 10:30-11:20am in RH 200

**Lab** one afternoon a week for 3 hours (1:30-4:30pm) in OH 154

**Instructors**

Prof. Justin Touchon

Office: Olmsted 163

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& Prof. John Long

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Office hours: MT, 1:00 to 2:30 p.m.

Prof. Tim Lampasona

Office: Olmsted

Email:

Phone:

Office hours:

& Prof. Jean-Nicolas Audet

Office: Olmsted

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Phone:

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**Laboratory Coordinator**

Prof. Mary Ellen Czesak

Office: Olmsted 154.1

Email: [maczesak@vassar.edu](mailto:maczesak@vassar.edu)

Phone: 845-437-7066

**Laboratory Interns** (Office hours TBA and will be posted on Moodle)

Monday lab: Alison Carranza ([acarranza@vassar.edu](mailto:acarranza@vassar.edu))

Tuesday lab: Sophia Choi ([sychoi@vassar.edu](mailto:sychoi@vassar.edu))

Wednesday lab: Zoe Shea ([zshea@vassar.edu](mailto:zshea@vassar.edu))

Thursday labs: Jack Silvera ([jsilvera@vassar.edu](mailto:jsilvera@vassar.edu))

Friday lab: Aidan Gallagher ([agallagher@vassar.edu](mailto:agallagher@vassar.edu))

**Course Overview**

The focus of this course is on the flow of information through different levels of biological systems, from within cells to the biosphere. But what is information, and what is its role in

biological systems? At a cellular level, we examine the flow of information within cells (e.g., gene expression) and between cells (e.g., hormones). We then shift to the population and community levels to explore how information is transferred between organisms (e.g., communication, trophic interactions). At an evolutionary level, we discuss the flow of information between (e.g., reproduction) and across generations (e.g., evolutionary mechanisms), as well as the implications for information flow in the biosphere under global change.

BIOL-108 has a 3-hour lab per week. The focus of the laboratory experience is on the process of studying energy flow and information flow in biological systems. In lab, you will acquire basic laboratory skills (e.g., microscopy, molecular techniques) by working with aquatic plant species and with soil fungi. You will learn about experimental design, how to collect and analyze data, and to connect your findings to a broader context.

### **Student Learning Outcomes**

- **Unit 1: Information Flow Within Cells.** Describe the flow of genetic information and explain how it is enabled by the structure and function of nucleic acids and proteins.
- **Unit 2: Information Flow Within and Between Organisms.** Explain how chemical information is transmitted, received and interpreted between cells. Explain how cells integrate and respond to this communication. Describe how organisms communicate and how this communication establishes relationships in the natural world.
- **Unit 3: Information Flow to the Next Generation.** Explain the mechanisms by which genetic information is transmitted to the next generation.
- **Unit 4: Information Flow Across Generations.** Describe the mechanisms that contribute to the evolution of populations. Explain how macroevolutionary changes are fundamentally driven by microevolutionary processes. Describe how evolutionary processes will be impacted by global change.

### **Text**

*Campbell Biology, 11<sup>th</sup> edition.* Used copies can be purchased or rented at the bookstore or online. You can use an older edition, but be aware that the page and chapter numbers will not correspond exactly to the assigned readings as listed. There are several copies available on loan at the library (4 hours loan period).

Other supplemental readings will be posted on Moodle.

**Textbook Affordability.** Vassar students often report challenges accessing and affording required course materials. The College is committed to ensuring that every student can participate fully in the curriculum, regardless of financial need. The [linked document](#), along with the [Movement for Affordable Textbooks \(MAT\)](#) website, highlight a variety of resources – financial, library, departmental, and peer-to-peer – that can help students navigate the costs of textbooks and other materials.

### **Communication**

We will use Moodle to centralize course information, assignments, announcements, etc. Please confirm that you have access to [Moodle](#) and let us know as soon as possible if you have any problems. We will use our Moodle site as an annotated syllabus and will communicate significant changes to the syllabus or any other announcements using Moodle announcements. Slides, handouts, and other useful links will also be posted on Moodle.

We will be available to answer your questions after class, at office hours or a scheduled appointment, and via email during normal working hours (9am to 5pm, Monday through Friday). If you email us outside these hours, you can expect a response within the next workday, but not immediately.

### **Grading**

The breakdown of your course grade is as follows:

Exam 1	9%
Exam 2	12%
Exam 3	12%
Final cumulative exam	14%
Take Home Quizzes (4 quizzes, 3% each)	12%
Homework (4 assignments, 1.5% each)	6%
Attendance, participation, and collegiality	5%
Lab	30%
Lab assignments (~10 assignments, 1% each)	
Scientific writing assignment draft (5%) and final version (5%)	
Laboratory notebook (2 checks, 5% for each check)	

- **Exams** will be in person during class time. Since we learn a lot by correcting our mistakes, there will be an opportunity to do exam corrections to recapture some missed points. More details will be provided in class.
- The **final exam** will be cumulative and will be given during the final exam week.. It will cover Unit 4 as well as big picture concepts and common errors

from across the semester. More guidance for the final exam will be provided as we near the end of the semester.

- **Attendance Check-In Questions** will be administered randomly throughout the semester. These will be short questions answered and turned in during lecture. There will be no opportunity to make up check-in questions if you miss class for an unexcused absence. Excused absences will not be penalized.

Vassar has an established set of guidelines to determine grades in courses, and these standards are used in this course. According to Vassar's policies, excellence requires more than the ability to demonstrate that you have adequately learned the material. Students who do a reasonable job by applying a reasonable level of effort, time, and attention to mastering the material earn a "C." Students who demonstrate excellence in at least some aspects of the class earn a "B." Work that is "A" quality is truly outstanding and includes excellence in multiple aspects of the course (originality of thought, mastery of content, ability to integrate, synthesize, and analyze). Work that is passing, but overall is unsatisfactory (below the level of what a reasonably motivated student could achieve), will receive a C-, D+ or D. A grade of F is a failing grade and will not count toward graduation requirements. Consult the Vassar College Catalog for more details.

<b>% Points</b>	<b>Final Grade</b>	<b>% Points</b>	<b>Final Grade</b>
94-100	A	72-76.99	C
90-93.99	A-	70-71.99	C-
87-89.99	B+	67-69.99	D+
83-86.99	B	60-66.99	D
80-82.99	B-	0-59.99	F
77-79.99	C+		

### **Roadmap to Success**

This will be a challenging course and will require time for reading and processing of information. Much like learning a new language, there will be vocabulary and concepts you need to learn, which will give you a strong knowledge base to build on as you take

additional courses in Biology. Your instructors and lab interns are here to help you learn this material, and we encourage you to take advantage of their office hours and to ask questions. We will calculate your grade as stated without curving, and then assign your grade in accordance with college policy (see below).

### **Make Up Policy for Exams and Labs**

Unavoidable, excused absences from an exam or lab **can be made up with confirmation from the Dean of Studies office that you have a health advisory or some other extenuating circumstance.** This includes if you are quarantined due to a positive COVID-19 test or exposure. Should you have an excused absence, it is your responsibility to obtain the appropriate confirmation and to arrange to make up the exam or lab work. For labs, making up a laboratory requires extra time and effort on the part of faculty, technical staff, and interns, so please plan ahead if you are aware of an unavoidable conflict. Do not assume that you can attend another lab without prior arrangements. If you are unable to attend lab due to COVID-19 or another health advisory, please contact Mary Ellen Czesak ([maczesak@vassar.edu](mailto:maczesak@vassar.edu)) as there may be alternative versions of lab assignments you can complete remotely.

***A penalty of 5% deduction of the final course grade will result from an unexcused absence from lab.***

### **Late Policy for Assignments**

Late assignments will lose 5% of the assignment value for each day (24 hours) that the assignment is late.

### **Accommodations**

Academic accommodations are available for students registered with the Office for Accessibility and Educational Opportunity. Students in need of ADA/504 accommodations should schedule an appointment with your instructors early in the semester to discuss any accommodations for this course that have been approved by the Office for Accessibility and Educational Opportunity, as indicated in your AEO accommodation letter.

### **Q-Center**

All Vassar students have access to free peer-to-peer quantitative tutoring at the Quantitative Reasoning Center (Q-Center). Q-Tutors are available to help you with STEM related questions or to direct you to someone else who may be better able to help. Schedules and other important information can be found at <https://ltrc.vassar.edu/qrc>

**A statement about academic integrity:**

You may certainly consult with classmates, instructors and interns about assignments, but make sure that your assignment is **written entirely in your own words**. In laboratory, you must keep an **independent record** of your work in your own notebook. Lab assignments will contain descriptions of ideas and experiments from other people's written work. (e.g., from the primary articles). In preparing a description of others' work or ideas, you must paraphrase, using your *own* words, and you must cite that work and provide the reference information.

In science writing, it is *rare* to quote others. Instead, we paraphrase and cite the author.

*The following information is from the Vassar College Regulations, 21/22*

#### **“IV. INTEGRITY OF ACADEMIC WORK**

The Vassar degree should represent not only a high quality of intellectual achievement but also the performance of all work in the pursuit of that achievement in accordance with the highest standards of academic honesty and integrity. The basic principles inherent in such honesty and integrity are as follows:

1. Each student's work shall be the product of the student's own effort.
2. Each student shall give due and appropriate acknowledgment of the work of others when that work is incorporated into the writing of papers.
3. Materials used in the preparation of academic work must be obtained in a manner that is consistent with the standards of Vassar's Institutional Review Board and with the policies of any laboratory setting, including the Wimpfheimer Nursery School, community agencies, or field work positions.
4. No student shall infringe upon the rights of others to have fair and equal access to library or other academic resources.
5. No student shall submit the same work to more than one instructor without prior approval of the instructors involved.

In accordance with these principles the following regulations have been set up concerning:

#### **... B. Plagiarism**

Any form of plagiarism violates the integrity of the student's work. Students should consult *Originality and Attribution: A Guide for Student Writers*, which discusses these matters. In cases of doubt, students should ask instructors, and instructors are requested to be definite and explicit in explaining the proper procedure for the work involved. The following are, however, general rules which apply in all cases:

1. Quotations\* must be clearly marked and sources of information or of an idea or opinion not the student's own must be indicated clearly on all written work, including examinations. This applies to paraphrased ideas as well as direct quotations. \*or in-text citations

2. Unless otherwise directed, every student working in a laboratory is expected to make all necessary measurements, drawings, etc., independently, from her or his own observations of the material provided. All records, including numerical data for working out results, are to be used by the student independently and as initially recorded. Unless otherwise indicated, all laboratory materials are to be kept in the laboratory.
3. Collaboration in preparation of written work may take place only to the extent approved by the instructor. This applies to prepared examinations as well.”

Please consult the following resources if you have any doubts:

Vassar Library: [Going to the Source](#)

The Visual Communication Guy: [Did I plagiarize?](#) and [Can I use that picture?](#)

### **Campus Resources**

Vassar College is committed to providing a safe learning environment for all students that is free of all forms of discrimination and sexual harassment, including sexual assault, relationship abuse, and stalking. If you (or someone you know) has experienced or experiences any of these incidents, know that you are not alone. Vassar College has staff members trained to support you in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware all Vassar faculty members are “responsible employees,” which means that if you tell a faculty member about a situation involving sexual harassment, sexual assault, relationship abuse, or stalking, your instructors must share that information with the Title IX Coordinator. Although your instructors have to make that notification, the Title IX office will only provide outreach by email. You will control how your case will be handled — you don’t have to read or respond to the email, and it is completely up to you whether to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone privately, you can contact any of the following resources:

- Counseling Service ([counselingservice.vassar.edu](mailto:counselingservice.vassar.edu), 845-437-5700)
- Health Service ([healthservice.vassar.edu](mailto:healthservice.vassar.edu), 845-437-5800)
- Rachel Gellert, SAVP (Sexual Assault and Violence Prevention) director ([savp.vassar.edu](mailto:savp.vassar.edu), 845-437-7863)
- SART (Sexual Assault Response Team) advocate, available 24/7 by calling the Campus Response Center at 845-437-7333 and asking for SART

The SAVP website ([savp.vassar.edu](http://savp.vassar.edu)) and the Title IX section of the EOAA website ([eoaa.vassar.edu/title-ix](http://eoaa.vassar.edu/title-ix)) have more information, as well as links to both on- and off-campus resources.

### Lecture Schedule

Date	Topic	Readings in Campbell Biology
M Aug. 29	<b>Unit 1: Info Flow within Cells</b> What is Information? Unifying Themes Proteins (review on your own) and Nucleic Acids	Ch. 1.1-1.2 Ch. 5.4-5.5, 6.3
W Aug. 31	Genotype to Phenotype: Transcription	Ch. 17.1-17.3
F Sept. 2	Genotype to Phenotype: Translation	Ch. 17.4
M Sept. 5	<b>Labor Day, No Class or Lab</b>	
W Sept. 7	Effects of Mutations on Proteins	Ch. 17.5
F Sept. 9	Genome Structure <b>Take Home Quiz 1 due Sept. 10</b>	Ch. 15.1, 21.2-21.4
M Sept. 12	Cell Cycle and DNA Replication	Ch. 12.1, Ch. 16.1-16.2
W Sept. 14	Mitosis	Ch. 12.2
F Sept. 16	Cell Cycle Control	Ch. 12.3
M Sept. 19	<b>Synthesis Day</b>	TBA
W Sept. 21	<b>Exam 1</b>	Covers Unit 1



F Sept. 23	<b>Unit 2: Info Flow within and between Organisms</b> Cell-to-Cell Communication	Ch. 11.1-11.2
M Sept. 26	Signal Transduction	Ch. 11.3-11.4
W Sept. 28	Plant Hormones	Ch. 39.1-39.2
F Sept. 30	Plant Responses to External Stimuli <b>Take Home Quiz 2 due Oct. 1</b>	Ch. 39.4-39.5
M Oct. 3	Animal Hormones	Ch. 45.1-45.2
W Oct. 5	Neurons	Ch. 48
F Oct. 7	Interactions among Organisms: Plant Communication	Ch. 54.1, Figure 39.27 Ch. 37.3 ( <i>Rhizobia</i> )
M Oct. 10	Interactions among Organisms: Animal Behaviors	Ch. 51.1-51.2
W Oct. 12	<b>Synthesis Day</b>	TBA
F Oct. 14	<b>Exam 2</b>	Covers Unit 2
<b>Fall Break</b>		
M Oct. 24	<b>Unit 3: Info Flow to the Next Generation</b> Review mitosis on your own Meiosis	Review Ch. 12 Ch. 13.1-13.4
W Oct. 26	Mendelian Genetics Part 1	Ch. 14.1-14.2

F Oct. 28	Mendelian Genetics Part 2	Ch. 14.3-14.4
M Oct. 31	Non-Mendelian Genetics	Ch.15.2-15.3 (linkage, except mapping)
W Nov. 2	Chromosomal Level Mutations	Ch. 15.4, 21.5
F Nov. 4	Examples of Animal Life Cycles and Reproductive Strategies <b>Take Home Quiz 3 due Nov. 5</b>	Ch. 46.1
M Nov. 7	Examples of Plant Life Cycles and Reproductive Strategies	Ch. 38.1-38.2
W Nov. 9	Species Concepts	Ch. 24.1
F Nov. 11	<b>Synthesis Day</b>	TBA
M Nov. 14	<b>Exam 3</b>	Covers Unit 3
W Nov. 16	<b>Unit 4: Info Flow Across Generations</b> Sources of Variation	Ch. 23.1
F Nov. 18	Natural Selection Part 1	Ch.22.1-22.3
M Nov. 21	Natural Selection Part 2 and Sexual Selection	Ch. 23.4, Ch. 51.3-51.4
W Nov. 23	Genetic Drift and Gene Flow	Ch. 23.3
F Nov. 25	<b>Thanksgiving break</b>	

M Nov. 28	Speciation	Ch. 24.2, 24.4 (pg. 521)
W Nov. 30	Phylogenetic Trees <b>Take Home Quiz 4 due Dec. 3</b>	Ch. 26.1-26.3
F Dec. 2	Genome Evolution	Ch. 21.6, 26.4-26.6
M Dec. 5	Global Change and Implications for Info Flow	Ch. 56.1-56.4
W Dec. 7	Last Class, Synthesis Day <b>(Friday class schedule)</b>	TBA
TBA	Final Exam	Covers Unit 4 in detail and major concepts in Units 1-3

**Lab schedule starts on the next page**

#### Lab Schedule

Week	Date	Lab activity
1	Aug. 29 – Sept. 2	Laboratory Safety and Skills, Library Workshop
2	Sept. 6 – Sept. 9*	Introduction to Study Organisms: Duckweed and <i>Elodea</i> <b>* No lab on Monday Sept. 5 due to Labor Day. Make-up lab activities will be scheduled.</b>

3	Sept. 12 – Sept. 16	Population Growth of Duckweed
4	Sept. 19 – Sept. 23	Measuring Photosynthetic and Respiration Rate of Duckweed
5	Sept. 26 – Sept. 30	Visible Spectra of Plant Pigments in Duckweed
6	Oct. 3 – Oct. 7	Cellular Structure and Cytoplasmic Streaming of <i>Elodea</i>
7	Oct. 10 – Oct. 14	Nature Walk on Vassar Farm and Ecological Preserve <b>Lab Notebook Check # 1</b>
Fall Break		
8	Oct. 24 – Oct. 28	Data Analysis and Presentation
9	Oct. 31 – Nov. 4	Overview of DNA Barcoding; Soil Collection and Plating
10	Nov. 7 – Nov. 11	Fungal Colony Morphology; DNA Extraction and Polymerase Chain Reaction (PCR) <b>Scientific Writing Assignment Draft due on your lab day</b>
11	Nov. 14 – Nov. 18	Gel Electrophoresis
	Nov. 21 – Nov. 23	<b>No labs</b>
12	Nov. 28 – Dec. 2	Analyze Trace Files from DNA Sequencing and Bioinformatics <b>Lab Notebook Check # 2</b>
	Dec. 5– 7	<b>No labs</b> <b>Scientific Writing Assignment Final Version due Dec. 7</b>