

Biology 202 Organismal Biology (Spring 2023)

Instructor: Dr. Robert Laport, Boone 221A, 208-459-5292, rlaport@collegeofidaho.edu
Office Hours: M 2:00p-3:00p, W 2:00p-3:00p, F 2:00p-3:00p and by appointment

Lecture: M, W, F 1:00p-1:50p, Boone 103

Lab instructors (Boone 208):

Dr. Mark Gunderson T (AM)
Wendy Harvey T (PM), Th (AM)
Dr. Anna Himler: W (PM)
Dr. Robert Laport Th 1:40p-4:20p

Prerequisites: BIO 201/210 Molecules to Cells or consent of instructor

Co requisite: A lab section (BIO 202L) must be taken with BIO 202 for credit to be earned in BIO 202.
The grade for both BIO 202 and 202L will be the same grade, which will be a composite of lecture section (~74%) and lab section (~26%) grades.

Course Objectives:

- Broaden and extend the student's base of knowledge to include the major concepts and current trends in organismal biology.
- Construct a framework of concepts, theories, and facts which begins to describe and explain the structure, function, development, and evolution of plant and animal (mainly vertebrate) organisms.

Upon finishing this course, a student should be able to:

- Understand the experimental basis for current concepts in organismal biology;
- Be more self-confident in his/her abilities as a scientist;
- Develop curiosity about living organisms;
- Comprehend the relationship of organismal biology to broader aspects of biology.

Evaluation:

Note: The grade for the course and laboratory are combined according to the following weights. A single grade will be reported twice on your transcript—once for the course and separately for the laboratory.

Final Exam: Monday, 22 May 12:30p-3:00p

Exams (2 + final) (100 pts each; cumulative final 200 pts)	400
Lecture quizzes (4 in class) (50 pts each, lowest dropped)	150
Concept quizzes (10 on Canvas, 10 points each)	100
Seminar Summaries (2 on Canvas, 24 points each)	48
Laboratory (~25%)	240

Total	938 pts

Grade Scale (% scores):

92-100	A	82-87	B	72-77	C	62-67	D
90-91	A-	80-81	B-	70-71	C-	60-61	D-
88-89	B+	78-79	C+	68-69	D+	0-59	F

Course Textbooks:

- Raven et al. 2020. Biology, 13th ed. McGraw Hill, New York, NY.
- Smith and Schenk. 2001. Dissection Guide to the Rat. Morton Publishing Co.
- Lab Manual - purchase a copy in the Biology Office for the cost of copying (\$6)

If you need assistance obtaining the texts, please reach out to me confidentially so that I can help ensure you can access the materials you need for the course.

Canvas: We will use Canvas for this course (canvas.collegeofidaho.edu). The syllabus/policy, learning objectives, handouts, assignments, article readings, lecture slides, and announcements will be posted here. Check Canvas often, particularly to ensure that you are aware of upcoming due dates and exams, but you may also keep track of your grade in the course.

Plickers: We will use Plickers (“Paper Clickers”) as a classroom response method in this course. You will use your assigned barcode to respond to formalized in-class questions and quizzes. Responses will count toward your final grade, so be sure to take note of your barcode number and bring your barcode every class and lab period. You may download a replacement barcode on Canvas or at www.plickers.com.

Evaluation Details

Exams: Exams are one hour in length and will cover information from lectures, homework, and readings. Question formats may include matching, fill in the blank, short answer, and multiple choice. Each exam focuses on all the material covered since the previous exam, but there will necessarily be a cumulative aspect, a carry-over of basic concepts, from one exam to the next. The final exam is cumulative and comprehensive, and could include questions related to the course themes. Absence from an exam that is not cleared in advance of the exam will result in a zero on the missed exam.

Lecture quizzes: Quizzes will cover concepts discussed since the last exam or quiz. The lowest of your four quiz scores will be dropped. No makeup quizzes will be given. If a quiz is missed, that will be the quiz score that is dropped.

Concept quizzes: Each week a Concept Quiz will be posted on Canvas. You may use the text book, powerpoint slides, and notes to answer the questions, although you must work alone. Questions are intended to quiz you on topics covered in class and in the textbook. Late quizzes will not be counted.

Laboratory: See Organismal Biology Laboratory Manual.

Policies

Class Attendance: Students must be registered by the end of the Drop/Add period to attend class (see academic calendar: <https://iq2prod1.smartcatalogiq.com/en/Catalogs/College-of-Idaho/current/Undergraduate-Catalog/The-College-of-Idaho-s-2022-2023-Academic-Calendar>). Regular attendance is integral to success in this course and is expected of every student. In the event of an absence, in-class handouts and slides will be provided. Notes must be obtained from a classmate. Students requiring accommodation for conflict(s) (e.g., major religious holidays, health issues) should notify me privately at the beginning of the semester or as soon as possible. Non-accommodated absences from more

than two class periods is considered excessive and experience shows decreased course performance with increasing absences.

Commitment to Diversity: The College of Idaho and The Biology Department are committed to creating an academic climate that is safe and respectful of all students, staff, and faculty regardless of race, ethnicity, sexual orientation, gender identity, age, size, socioeconomic background, religion, spirituality, physical ability, mental ability, or any other aspect of one's identity. A climate of mutual respect allows us to ask difficult questions and to participate in honest discussions, even in the context of strong disagreement. Creating this kind of open, honest, and respectful climate is our mutual responsibility. The Biology Department is continually seeking to understand how students and faculty—particularly those from historically excluded groups—experience our classrooms, and to provide actionable resources to support teaching approaches that promote equity and foster a sense of belonging. I encourage you to reach out to me or other Faculty in the Biology Department with any concerns or ideas you may have.

Accessibility Resources and Services: My goal is to create an accessible, equitable, and inclusive classroom. The College of Idaho seeks to provide an educational environment that is accessible to the needs of students with disabilities. The College provides reasonable services to enrolled students who have a documented permanent or temporary physical, psychological, learning, intellectual, or sensory disability that qualifies the student for accommodations under the Americans with Disabilities Act or section 504 of the Rehabilitation Act of 1973. Students that have, or think they may have, a disability that will impact their performance as a student in this class are encouraged to arrange support services and/or accommodations through the Department of Accessibility and Learning Excellence (DALE) located in Hendren Hall. Reasonable academic accommodations may be provided to students who submit appropriate and current documentation of their disability. Accommodation can be arranged only through this process and are not retroactively applied. More information can be found on the DALE webpage: <https://www.collegeofidaho.edu/academics/support/learning-disability-services>

Accommodations: Reasonable accommodations and flexibility will be afforded to students who must be absent from class or lab because of religious holidays, college-sponsored activities, etc. Students are asked to privately identify all course conflicts at the beginning of the semester or well in advance of known absences.

Sexual Misconduct Disclosure: I will do my best to help any student who comes to me with concerns. For emergencies, call 911 and/or Campus Safety at x5151 or (208) 459-5151. All faculty members are mandated to report any incidents of sexual misconduct that comes to their attention. The College has specific confidentiality and anti-retaliation protections in place. Health and Wellness Center Staff and the College Minister can advise you confidentially. Also, the Title IX Coordinator (Jodi Nafzger; titleix@collegeofidaho.edu; (208) 459-5139) can help you access other resources on campus and in the local community. The Sexual Misconduct Policy and other Title IX information can be found on the College website at: <https://www.collegeofidaho.edu/about/offices/human-resources/sexual-misconduct>.

Grievances: A student who has a grievance with any aspect of this course should meet with me to discuss the problem. If an honest and sincere dialogue cannot resolve the grievance, the student may make an appointment to discuss the problem with the Biology Department Chair as the appropriate next step.

Talking in class and distractions: This is a large class and it is easy for distractions including talking, cell phones, alarms, etc. to disrupt the learning environment. Please refrain from talking with your neighbors during lectures and make sure your cell phone ringers are turned off. You will be asked to leave class for disruptive behaviors and receive a zero on assignments for that day.

Campus Closures, Internet Outages, and other Barriers to Normal Instruction: In the event that the College is closed unexpectedly for inclement weather, or any other reason, students should expect a missed exam to be given during the next regularly scheduled class period. Similarly, widespread power or internet outages may also result in adjustments to the course and exam schedule. No oral presentations or exams will be administered prior to the scheduled times.

Professionalism: It is expected that students adhere to the Honor Code and display a professionalism in class similar to that expected in the workplace. This pertains to attendance, respect for others, engagement, organizational skills, initiative, responsiveness to feedback, personal responsibility, interpersonal skills, independence, quality of work, and communication.

Academic Honor Code System and Academic Dishonesty: I aim to create a supportive, collegial, and intellectually encouraging environment in my courses. The College of Idaho maintains that academic honesty and integrity are essential values in the educational process. Operating under an Honor Code philosophy, the College expects conduct rooted in honesty, integrity, and understanding, allowing members of a diverse student body to live together and interact and learn from one another in ways that protect both personal freedom and community standards. Violations of academic honesty are addressed primarily by the instructor and may be referred to the student Judicial Board:

<http://collegeofidaho.smartcatalogiq.com/current/Undergraduate-Catalog/Policies-and-Procedures/Academic-Misconduct>

Academic dishonesty is defined as the use of unauthorized assistance with intent to deceive, or to misrepresent the work of another as their own, in meeting course and degree requirements. Academic dishonesty consists of plagiarism, cheating, fabrication and falsification, multiple submission of the same work, misuse of academic materials, and complicity in academic dishonesty (see below). All work in this class is to be completed independently, unless otherwise indicated. Non-compliance will result minimally in a grade of zero for that effort, documentation of the episode, and disciplinary action as set forth by College policy, with penalties ranging from failure of this course to dismissal from the College.

Examples of academic dishonesty include, but are not limited to:

A. Plagiarism: Plagiarism is the use of another person's distinctive words or ideas without acknowledgment. Examples include:

1. Word-for-word copying of another person's ideas or words
2. The mosaic (interspersing of one's own words here and there while, in essence, copying another's work)
3. The paraphrase (rewriting of another's work, yet still using their fundamental idea or theory)
4. Fabrication of references (inventing or counterfeiting sources)
5. Submission of another's work as one's own, including AI-generated responses (e.g., ChatGPT)
6. Neglecting quotation marks on material that is otherwise acknowledged

NOTE: Acknowledgment is not necessary when material used is common knowledge.

NOTE: Use of AI utilities is becoming common. **If you do utilize an AI resource, it must be acknowledged/cited, and you will be responsible for inaccuracies or incorrect information provided by the AI resource (which are well-documented to occur!).**

B. Cheating: Cheating involves the possession, communication, or use of information, materials, notes, study aids or other devices not authorized by the instructor in an academic exercise, or communication with another person during such an exercise. Examples include:

1. Copying from another's paper or receiving unauthorized assistance from another during an academic exercise or in the submission of academic material
2. Using a calculator or other electronic device when its use has been disallowed
3. Collaborating with another student or students during an academic exercise without the consent of the instructor.

C. Fabrication and Falsification: Fabrication involves inventing or counterfeiting information, i.e., creating results not obtained in a study or laboratory experiment. Falsification, on the other hand, involves the deliberate alteration of results to suit one's needs in an experiment or other academic exercise.

D. Multiple Submissions: This involves submitting work for which academic credit has already been earned, when such submission is made without instructor authorization.

E. Misuse of Academic Materials: The misuse of academic materials includes, but is not limited to:

1. Stealing or destroying library or reference materials or computer programs
2. Stealing or destroying another student's notes or materials, or having such materials in one's possession without the owner's permission
3. Receiving assistance in locating or using sources of information in an assignment when such assistance has been forbidden by the instructor
4. Illegitimate possession, disposition, or use of examinations or keys to examinations
5. Unauthorized alteration, forgery, or falsification
6. Unauthorized sale or purchase of examinations, papers, or assignments

F. Complicity in Academic Dishonesty: Complicity involves knowingly contributing to another's acts of academic dishonesty. Examples include:

1. Knowingly aiding another in any act of academic dishonesty
2. Allowing another to copy from one's paper for an assignment or exam
3. Distributing test questions or information about test materials before the assessment
4. Taking an exam or test for someone else
5. Signing another's name on attendance roster or on an academic exercise

Example Strategies for Success: Following are suggestions that students have found useful in the past for ensuring success in this course:

- Review your notes shortly after each lecture or lab—the sooner the better. Rewrite them, or at least annotate them. Write down all questions and have them addressed during the next class period.
- Read assignments promptly. Each week you will be responsible for substantial readings. Set aside one or two hours each week to complete the readings. Interact with your texts. Write in them! Highlight them!
- Email Dr. Laport before the second meeting of class with “Wallace” in the subject line once you have read the syllabus for two bonus points.
- Form a study group of your peers for regular, if only brief, meetings.
- Utilize visiting hours and appointments. Come prepared with questions.

Themes in Organismal Biology - Five major themes.

A. Adaptation is how organisms uniquely solve the problems they face in making a living.

Adaptations are heritable features of a species that confer a fitness advantage, i.e., enhance survival, competitiveness, and reproductive success of organisms and their offspring. Adaptation also refers to the process by which populations (groups) of one species change through generations by natural selection giving rise to adaptations in a species. Adaptations may be anatomical/morphological, physiological, biochemical, or behavioral. Adaptations often occur together, forming a **suite**. In evolutionary terms, behavior appears to be the most changeable or plastic, followed by physiology, and finally anatomy, which is the least plastic. Thus, anatomy is generally the most conservative indicator of phylogenetic relationships. Adaptations represent the evolved solutions to problems that organisms face in living their lives under the unique circumstances (e.g. environments) that they encounter.

B. Adaptations are constrained and only some solutions are possible = evolutionary tradeoffs! *There are many solutions to the problems that organisms face* (e.g. getting enough oxygen, surviving harsh conditions, maintaining the composition of body fluids). However, an organism cannot optimize all of its traits simultaneously, and so there are **tradeoffs** in the design, construction, and function of an organism. Each organism's unique set of “solutions” to problems posed by life reflects i) the physical limits imposed on it, ii) its evolutionary history, iii) its ecological niche, and iv) developmental limitations.

Any solutions are constrained by four major factors:

- Physical and chemical laws experienced in the life of an organism (**physical constraints**)
- Evolutionary history of the taxonomic group to which that organism belongs (**phylogenetic constraints**)
- The environment of the organism (all of its life stages) affecting its ability to nourish, build, maintain, respond, repair, and reproduce itself (**ecological constraints**).

- The genetic program affecting development of the organism (**developmental constraints**).

The above categories of constraints are not the only useful ones to consider. For example, an animal's body size is one of the most important biological parameters. Size is clearly related to development (most adult stages are bigger than their embryos) and size is a major determinant of surface to volume ratio, which in turn affects the rate of physical processes like diffusion. Thus, constraints may be interrelated in complex ways.

C. Organisms maintain homeostasis. Many organisms must maintain a relatively constant internal environment while living in a fluctuating external environment. **Homeostasis** is the set of mechanisms by which organisms maintain a “steady state” or dynamic equilibrium to cope with fluctuations around them. They establish and maintain gradients, and this requires input of energy (e.g., active transport). To control passive exchange (of heat, water, solutes, etc.) along a gradient, organisms control their permeability. Maintenance of homeostasis is a complex example of adaptation.

D. Unity and diversity of life is explained by evolutionary theory. Underlying the vast diversity of life (approximately 1.5 million species are named and estimated to be less than 1% of all organisms that have existed) is a striking unity (e.g., the universality of the genetic code, cell structure) among different organisms. Evolution (descent with modification, change through time) explains the diversity and unity of life. Evolutionary relationships among taxa are best identified and analyzed by the *comparative method*. Critical to this method is the identification of shared, recently evolved (“derived”) traits. The taxonomic hierarchy (classification) is set up to reflect this evolutionary history. Also apparent across taxonomic groups (species, genus, family, etc.) are evolutionary trends in structure and/or function. Two examples of **evolutionary trends** are given below:

- As organisms **increase in size, specialized structures** allow the organisms to overcome physical problems associated with large size. This trend is observed in both evolution and development.
- As an organism's complexity increases, systems of **coordination** and **communication** among cells, tissues, organs, and organ systems also increase in complexity.
- Other examples of evolutionary trends will be encountered in the course.

E. Adapted organization of biological structures is uniquely suited to perform biological functions. Organisms are highly structured and organized. A consequence of this is that **structure and function are integrally related**. This phenomenon reflects the fact that adaptations often exist as suites of many characteristics). Organisms require both energy and materials to build (develop), maintain, repair, and reproduce. Thus, living organisms oppose the natural tendency to lose energy and become less ordered (entropy). They do this by taking in much more energy than they use. The relationship between structure and function is evident throughout the hierarchy of biological organization, from molecules to cells to organisms. Study of structure in the absence of its function is the study of corpses, and study of functions in the absence of structures is the study of ghosts. In Organismal Biology we will seek to study neither corpses nor ghosts, but rather life.

Tentative Schedule

Week	Date	Day	Lecture Topic	Reading
1	2/6/2023	M	Introduction, Natural Selection, and Adaptation	Ch. 1, Ch. 4 (62-63)
		W	Evolution: Cells to Organisms: Multi-cellularity and Reproduction	Ch. 28
		F	Colonization of Land: From Algae to Seedless Vascular Plants; (Concept Quiz #1)	Ch. 28 (594-604)
2	2/13/2023	M	Colonization of Land (Continued)	
		W	Colonization of Land (Continued)	
		F	Evolution of Seed Plants: Gymnosperm; (Concept Quiz #2)	Ch. 30 (625-630)
3	2/20/2023	M	Evolution of Seed Plants (Continued)	
		W	Lecture Quiz #1 ; Plant Anatomy: Design of the Plant Body	Ch. 35
		F	Plant Growth: Primary and Secondary Growth	Ch. 35; Ch. 40 (891-894)
4	2/27/2023	M	Primary and Secondary Growth (continued)	
		W	Plant Sexual Reproduction: Flowers and Fruit	Ch. 30 (630-639); Ch. 40 (866-881)
		F	Seeds: Development, dispersal, and germination; (Concept Quiz #3)	Ch. 30 (636-639); Ch. 40 (882-890)
5	3/6/2023	M	Transport: Water movement in plants	Ch. 36
		W	Exam #1	
		F	Transport: Water movement in plants; (Concept Quiz #4)	
6	3/13/2023	M	Transport: Water movement in plants	
		W	Soils and plant nutrition	Ch. 37
		F	Soils and plant nutrition; (Concept Quiz #5)	
7	3/20/2023	M	Photosynthesis	Ch. 8
		W	Lecture Quiz #2 ; Photosynthesis	
		F	Photosynthesis	
Spring Break (March 27-31, 2023)				
8	4/3/2023	M	The Animal Body; Animal Metabolism	Ch. 41 (899-911)
		W	Animal Metabolism, Bioenergetics and Energetic Strategies	Ch. 41 (899-911); Ch. 46 (1033)
		F	Homeostasis, Feedback and Modes of Heat Exchange; (Concept Quiz #6)	Ch. 41
9	4/10/2023	M	Homeostasis, Feedback and Modes of Heat Exchange (continued)	
		W	Exam #2	
		F	Digestive System : Animal Nutrition and Digestion; (Concept Quiz #7)	Ch. 46
10	4/17/2023	M	Animal Nutrition and Digestion (continued)	
		W	Respiratory System : Animal Gas Exchange	Ch. 47
		F	Circulatory Systems and their Functions; (Concept Quiz #8)	Ch. 48
11	4/24/2023	M	Urinary System : Nitrogenous waste, osmoregulation and excretion	Ch. 49
		W	Lecture Quiz #3 ; Mammalian Kidney	Ch. 49
		F	Mammalian Kidney (continued); (Concept Quiz #9)	
12	5/1/2023	M	Mammalian Kidney (continued)	
		W	Nervous System : Coordination of Responses	Ch. 42
		F	Nervous system (continued); (Concept Quiz #10)	
13	5/8/2023	M	Skeletal and Muscular Systems : Support and Movement	Ch. 45 (1003-1016)
		W	Skeletal and Muscular Systems: Support and Movement (continued)	
		F	Skeletal and Muscular Systems (continued); (Concept Quiz #11)	
14	5/15/2023	M	Endocrine System: Chemical Messengers in Animals	Ch. 44
		W	Lecture Quiz #4 ; Animal Development	Ch. 52
		F	Animal Development (continued)	

Final Exam: Monday, 22 May 12:30p-3:00p