BILD 2: Multicellular Life

UC San Diego – Winter 2019

Where and When

Lecture time: MWF 1:00-1:50pm
Lecture location: Sequoyah Hall 147
Website: UCSD TritonEd site for BILD 2, Winter 2019
Section information: See below for section information, including IA names and emails.

Basic Contact Information for BILD2 Professor

Melinda T. Owens, PhD
Assistant Teaching Professor, Neurobiology
Email: mtowens@ucsd.edu
Office: Bonner Hall 2230
Office Hours: Mondays 11:30am-12:30pm, Wednesdays 2:30-3:30pm. If you want to meet and these times don't work for you, please send me an email to schedule another time.

Required and Optional Materials

Required materials: **- iClicker or iClicker2.** *It must be registered on TritonEd. See more details below.*
- 1 pack of 3"x5" index cards
Optional materials: - Campbell Biology, 9th, 10th, or 11th editions.
Lecture slides and all required course readings will be posted on the class website. Many students find the textbook or the associated online resource *Mastering Biology* useful, but they are not mandatory.

Welcome to BILD 2: Multicellular Life!

BILD 2 is an introduction to the development and the physiological processes of animals and plants.
In this course, you will deepen your understanding of multicellular organisms, including yourself, by exploring the role of the molecules, cells, tissues, organs, and organ systems that underlie health and disease. This course aspires to support you in developing basic content knowledge and skills necessary to evaluate new discoveries in the life sciences and to continue to expand your knowledge of biology throughout your life. That requires going beyond memorization of facts to acquire an understanding of how and why organisms function as they do, and what happens when the components of organisms do not function properly.

Another goal of BILD2 is for you to gain **insight into the nature of scientific inquiry.** To this end, you will consider cases, experiments, and data that support our current understanding of biological systems and how they function.

Finally, the teaching strategies in this course will **engage all of you as a community of biologists in the classroom** to develop leadership and communication skills as well as support each other in understanding biological concepts. You will also have the opportunity to practice scientific writing skills through numerous writing assignments and in-class activities.

Prerequisite: BILD 1 or an equivalent course from another college (see http://web2.assist.org/web-assist/UCSD.html)

What We Will Learn in BILD2

We anticipate that you will learn many different things in BILD2! Because of the way we have designed the course, we anticipate that what you will be able to do by the end of the quarter includes, but is not limited to, the following:

- **Demonstrate an understanding of the physiology and basic regulatory concepts** related to the function of the organ systems discussed in this course and the mechanisms that allow organisms to carry out those functions.
- **Predict how a perturbation** of a molecule, cell, tissue, organ, or organ system (like through a disease or experimental manipulation) **will affect its function** and the function of the organism as a whole.
- **Demonstrate a mechanistic (how) and teleologic (why) understanding** of the physiological processes underlying multicellular organisms.
- **Discuss the significance of maintaining homeostasis** to the survival of organisms, and integrate knowledge of the major systems to outline how they interact to maintain homeostasis in people.
- **Develop critical thinking skills** to be able to think like a biologist and **solve physiologically-relevant problems**.
- **Increase your understanding of your own learning (metacognition)**, including recognizing what topics are easy or difficult for you to learn, learning what study strategies work best for you, and seeking help from instructors and colleagues at appropriate times.

All questions on quizzes and exams, as well as nearly all questions on homework and in-class and in-section activities, will be tied to at least one of these overall learning outcomes.

At the beginning of each unit, we will also provide you with specific biology-related learning outcomes to guide your learning of that material. The problems on the quizzes and exams will be tied to those specific learning outcomes.

How We Teach in BILD2 and Why

We have chosen the teaching strategies in this course to **promote everyone's learning.** Extensive educational research has shown that people learn best when they are **actively engaging with the material through thinking, writing, and discussing**.[1] To encourage that engagement, we will use class time to work on applying our knowledge, troubleshooting difficult topics, and practice solving problems. There will be pre-class assignments to prepare you for the material you will engage with in class.

We also want you to be able to **apply what you learn about biology in whatever context you find yourself in your future**, including in your career and your personal life. Therefore, instead of memorization, we will focus on developing an understanding of fundamental concepts as they apply to different examples. Exams will include questions that are based on solving problems in new contexts.

Research has also shown that people generally learn best in **collaborative environments,** where they learn together and construct a shared understanding of the material.[2] While talking and working with your colleagues, you may identify gaps in your own knowledge, exercise the communication skills that are crucial in any career, and gain skills in working with colleagues as they learn to identify their confusions, ask questions, and think critically and skeptically about biology. Therefore, **active participation** both in class and discussion

section is crucial. To encourage collaboration, class and section activities will be done in groups and grades will never be assigned on a curve.

[1] Freeman *et al.* 2014. Active learning increases student performance in science, engineering, and mathematics. http://www.pnas.org/content/111/23/8410

[2] Smith *et al.* 2009. Why Peer Discussion Improves Student Performance on In-Class Concept Questions. http://science.sciencemag.org/content/323/5910/122

BILD2 Class Culture

BILD 2 is a **community of scientists** trying to increase their understanding of the biological world. The classroom culture is designed to engage you in collaborating and thinking like a scientist.

When people collaborate to work towards a common goal, in this case building our learning in BILD 2, we must **establish shared values** so that everyone understands acceptable ways of working together. In organizations, these are commonly called codes of conduct or ethics. In this course, we use the following statement, adapted from the International Center for Academic Integrity (https://academicintegrity.org/) and Dr. Tricia Bertram Gallant, to explicitly state our values and describe the behaviors that maintain and protect these values.

	As students we will…	As the teaching team we will…
Honesty	• Honestly demonstrate your knowledge and abilities according to expectations listed in the syllabus or in relation to specific assignments and exams • Communicate openly without using deception, including citing appropriate sources	• Give you honest feedback on your demonstration of knowledge and abilities on assignments and exams • Communicate openly and honestly about the expectations and standards of the course through the syllabus and in relation to assignments and exams
Responsibility	• Complete assignments on time and in full preparation for class • Show up to class on time and be mentally and physically present • Participate fully and contribute to team learning and activities • Take ownership of your own learning by using course and outside resources, including the BILD2 team, to clarify confusions and extend your knowledge	• Give you timely feedback on your assignments and exams • Show up to class on time and be mentally and physically present • Create relevant assessments and class activities • Providing selected resources and a helpful environment to help you address your confusions and extend your knowledge
Respect	• Speak openly with one another while respecting diverse viewpoints and perspectives • Provide sufficient space for others to voice their ideas	• Respect your perspectives even while we challenge you to think more deeply and critically • Help facilitate respectful exchange of ideas

Fairness	• Contribute fully and equally to collaborative work, so that we are not freeloading off of others on our teams • Not seek unfair advantage over fellow students in the course	• Create fair assignments and exams and grade them in a fair and timely manner • Treat all students and collaborative teams equitably
Trustworthiness	• Not engage in personal affairs while on class time • Be open and transparent about what we are doing in class • Not distribute course materials to others in an unauthorized fashion	• Be available to all students when we say we will be • Follow through on our promises • Not modify the expectations or standards without communicating with everyone in the course
Courage	• Say or do something when we see actions that undermine any of the above values • Accept the consequences of upholding and protecting the above values	• Say or do something when we see actions that undermine any of the above values • Accept the consequences of upholding and protecting the above values

Note on electronic devices

If necessary, you are welcome to bring laptops or other devices to lecture to take notes. However, research shows that **"multi-tasking" on computers is likely to decrease not only your grade but also the grades of people around you who can see your screen!**[3] For this reason, we ask that you do not flip between lecture notes and the internet unless as part of an in-class activity. The use of cell phones, computers, or any other electronic devices is not permitted during quizzes or exams; using such a device during a quiz or exam is grounds for receiving a failing grade.

[3] Sana *et al*. 2013. Laptop multitasking hinders classroom learning for both users and nearby peers. https://www.sciencedirect.com/science/article/pii/S0360131512002254

Grading

The activities, requirements, and assignments that comprise this course are designed to **promote your learning** and facilitate your understanding of biology from different viewpoint and using many different teaching methods. In addition, these assignments (particularly in-class lecture activities and Biologist Journal assignments) give me highly valuable information that allows me to adjust the course to meet your educational needs.

How Your Letter Grade will be Assigned

Grade assignments will be based on the percentage of total points earned. We do not decide your grade, but rather **you as a student do the work to earn your grade**.

%	Grade	%	Grade	%	Grade	%	Grade	%	Grade
>97	A+	87-89	B+	77-79	C+	67-69	D+	0-59	F
93-97	A	83-86	B	73-76	C	63-66	D		
90-92	A-	80-82	B-	70-72	C-	60-62	D-		

How Your Grade will be Calculated

Course Component	Total Points	~% of Grade
Lecture Participation (Attendance and Homework)	**410**	**34%**
Attendance (18 @ 10 points each)	180	
Homework and Biologist Journals (21 @ 10 points each)	210	
Final Reflection	20	
Section Participation (9 @ 10 points each)	**90**	**8%**
Quizzes and Exams	**680**	**57%**
Highest scoring quiz	120	
Next highest scoring quiz	120	
Third highest scoring quiz	120	
Final Exam	320	
Professionalism	**20**	**2%**
TOTAL	**1200**	**100%**

Grades will be posted regularly on TritonEd.

A note on re-grading

We are always happy to meet with you **to discuss your learning.** If you believe that a grading error has been made, please contact me within one week of the assignment or exam being returned. With your returned assignment, please also attach a cover sheet with an explanation of the error. If you think your work deserves more points (i.e. it's not a transcription or arithmetic error), please include on that cover sheet a concise description of how your answer compares to the rubric and why you think it should have earned more points.

Explanation of Course Components

Lecture Participation

As stated above, **active participation in lecture is important for your learning.** Participation includes attending class and participating in in-class activities, including using iClickers; completing pre-class Biologist Journal assignments; and completing a Final Reflection at the end of the quarter.

Attendance and in-class Activities, including iClickers

Every day, we will engage in in-class activities and use our iClickers. In order for your iClicker to correctly be associated with your name, **you must register your own clicker on TritonEd** (not the iClicker website). That means you can use a used iClicker or even share an iClicker with someone in another class, but not someone who is also in this class. Please be aware that it is dishonest and does not represent your learning if someone else uses your iClicker in class when you are not there, so in that situation we cannot give you or the person using your iClicker participation points. (See the section on Academic Integrity and Originality below.)

We will start counting iClicker participation for points at the beginning of the second week of class. Also, we understand that everyone has different circumstances and life events. We also understand that sometimes

you might forget your iClicker, or it might run out of batteries. Therefore, to get full Attendance points, you only need to attend and click in during 85% (18/21) of lectures.

Homework and Pre-class Biologist Journals

To give you further practice, allow you to reflect on your learning, and prepare you for class, before most classes, there will be an assigned activity, called a Biologist Journal, posted on TritonEd. This activity may include a reading from online sources or primary literature, but it will always involve writing to a specific prompt. These Journals are not meant to be formal essays or finely polished documents for public view. Instead, they should reflect your own ideas and thought processes and should be as much for your own benefit as ours. Grades will be awarded for turning in these Journals on time, exceeding the word count, and writing thoughtfully on topic. Biologist Journal prompts will be posted on TritonEd at least several days before they are due. **They will be due NO LATER THAN 11:50pm the night before class.**

Because of the size of this class and to prepare you for hard deadlines later in your career, **we cannot award points for assignments submitted late.** Even if you miss the deadline for an assignment, we still highly recommend doing the work to prepare for class and exams. As with lecture attendance, you can submit 85% of Biologist Journals (21/24) and still receive full credit.

Final Reflection

A final reflection on your experiences in this course is due at the end of the quarter on **Monday, March 25th, at 5pm**. The prompt for this reflection will be: "What did you learn in BILD2 that will continue to influence you for many years to come? How did you learn these things?"

Section Participation

Weekly discussion sections are designed to **engage you in applying your knowledge and exercising your skills** in collaborative problem solving, data analysis, and forming scientific arguments. Therefore, part of your score will depend on attendance and participation in section. The first sections will meet the 1st week of class. Similar to lecture participation and attendance, attending at least 85% of sections (9/10) will award you full section participation scores.

To prepare you for meaningful participation in section, **for some days of section, material will be posted for you to complete before you attend section.** It is very important that you genuinely attempt the exercises before section so you can meaningfully contribute in section and be awarded full points. These will typically be posted on TritonEd by Tuesday before section.

You should already be enrolled in a section, and **you must attend the section which you are enrolled** to receive credit. We are not able to change the number of students in a section, so if a section is full you must choose another one.

Quizzes and Exams

To facilitate developing useful knowledge and skills for the long term, tests in this course will focus on **applying knowledge to assess and solve novel problems** and **forming scientific arguments.** Questions will be in a variety of formats, including multiple-choice and short answer. Any material covered in or closely related to the learning outcomes discussed in lecture, homework, or section may be tested.

Quizzes

There will be 4 quizzes in this course. Your lowest quiz grade will be dropped. If you miss one of the quizzes, that will be the quiz dropped.

Final Exam

Everyone must take the final exam. **If you need to miss the final exam due to a verifiable, unplanned emergency, you MUST notify me (by phone or e-mail) of the problem as soon as it is reasonable to do so. You must also provide adequate documentation (doctor's note, copy of death certificate, etc.).** Contact me immediately to discuss your best options given your circumstances.

Professionalism

This portion of the course grade is intended to motivate you to **consider the impact of your actions on your own learning and the learning of others** in the course. Unprofessional interactions consume time yet have no meaningful benefits to you, your fellow students, and/or the teaching team. Analogously in the workplace, being unprofessional to your colleagues or supervisors will only discount you. When you are discounted, you will not be invited for new opportunities that you may or may not be aware of.

Professionalism can be demonstrated through individual (30pts described here) and community efforts (10pts extra credit described below). The individual component is to account for you personally demonstrating maturity and professionalism.

By default, everyone is assumed to be professionally mature, so this component is automatically awarded to you at the beginning of the quarter. During the quarter, based on observations by the teaching team, including but not limited to one-on-one interactions, electronic communication, and follow-up conversations on grades, **your professionalism credit may be deducted** in steps of 5pts.

Examples of interactions with meaningful benefits:

- Developing deeper insight into course material, concepts, biology, and/or society in general
- Working collaboratively to improve in skill building and future opportunities
- Clarifying course material that facilitates deeper learning
- Learning conceptually and meaningfully why full credit was not awarded for an assignment
- Reporting errors or problems in class, on assignments, or other course material

Examples of interactions that have no meaningful benefits and thus should be avoided:

- Contributing inequitably to team work in class, in discussion section, or on exams
- Harassing and/or bullying the instructional team or other students, either in person or online
- Ignoring the directions or requests from the instructional team
- Being disruptive to fellow students in class, in discussion section, or on exams

Extra Credit Opportunities

You have several opportunities for extra credit. Extra credit questions will be offered on each exam to make up for exam points missed. In addition, there are two other opportunities for extra credit:

- 5 points for **meeting with Prof. Owens** during office hours or another scheduled meeting

- 10 points for **community professionalism**. This can be earned by completing course evaluations and related surveys. If 90% or more of all students complete CAPEs, instructional assistant evaluations, and other course-based evaluation surveys in a mature and professional fashion (taking them seriously and providing timely and constructive feedback), 10 points will be awarded to everyone in the course.

Course Policies

Students with Disabilities

Any of you with a disability is strongly encouraged to contact me early in the quarter to work out reasonable accommodations to support your success in this course. To ensure fairness and proper supports, anyone who requests accommodations for this course because of a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD). The AFA letters must be presented to faculty and to the OSD Liaison in the Division of Biological Sciences in advance so we can arrange for appropriate accommodations. **Here is how to contact the OSD**: http://disabilities.ucsd.edu/, osd@ucsd.edu, 858-534-4382.

Whenever possible, we strive to use universal designs that are inclusive. If you have feedback on how to make the class more accessible and inclusive, please get in touch!

Podcasts and Lecture Recording

Whenever possible, **classes will be recorded and made available online** as a resource for learning (http://podcast.ucsd.edu). However, remember that active participation and contribution are highly encouraged, and many important concepts and ideas will be developed collaboratively by doing in-class activities, which cannot be replicated by watching a video. In addition, I may record class in order to study my own effectiveness as an instructor.

Academic Integrity and Originality

Integrity of scholarship and learning is fundamental to creating our classroom community and the academic community at large. The University expects that both students and faculty will honor this principle and in so doing protect the validity of University intellectual work.

For you, this means that all academic work you submit for this course should be **your own new original work.** We emphasize this for several reasons. First, **using your own thoughts and putting things in your own words helps you learn.** There is no better way to discover quickly what you understand and what you don't than to explain a concept to someone else. Second, in professional settings, trying to hide dishonest behavior or pass someone else's words off as your own can lead to trouble.

To encourage original thought and writing in this class, we take precautions. For example, exams are scanned before being graded, and we may route written submissions through Turnitin, an originality checking service. **Our goal is not to *catch* anyone** (although we can't give credit for dishonest work or plagiarized material), **but to help everyone make a habit of using their own thoughts and voice.** Take this opportunity to practice original thought and writing. It may be challenging at first, but it will get easier, and the payoff will be huge.

In addition, part of being a good member of a community **is not facilitating dishonest behavior by others**. No course materials, particularly homework and exams, may be posted online, submitted to private or public repositories, or distributed to unauthorized people outside of the course.

To hold everyone accountable for their actions, any suspected instances of a breach of academic integrity will be reported to the Academic Integrity Office for review. For more information on academic integrity, please visit https://students.ucsd.edu/academics/academic-integrity/index.html.

Helpful Resources at UCSD

College is a time of great stress for everyone, including stress from academics, social pressures, and living away from home. **If you are experiencing anxiety, depression, or worse, you are not alone.** On top of facing these stressors, many college students are in their late teens or early twenties, which is when many mental illnesses emerge for the first time because of brain maturation. In addition, you may be experiencing the effects of trauma or violence. Or, you might be one of the 19% of UC students who report not being able to access adequate food[4] or who do not have to access a safe, stable place to live.

Whatever your situation, or whether your problems feel big or small, we on the BILD2 instructional team encourage you to seek help and support. You are welcome to discuss these issues with us instructors. We also encourage you to connect with professional resources on campus, some of which are listed in the table below.

Help and Resources		
Academic Support	**Psychology and Physical Safety***	**Basic Needs**
OASIS **http://oasis.ucsd.edu** The Office of Academic Support & Instructional Services (OASIS) offers Math and Science Tutorial Programs for everyone. They also have services and scholarships for those of you who have overcome significant obstacles to become successful (like are first in your families to go to college or from communities with fewer resources). **Teaching + Learning Commons** **http://commons.ucsd.edu** The Teaching + Learning Commons offers tutoring, consultations, and workshops on learning strategies as well as assistance with writing in the Writing + Critical Expression Hub.	**CAPS** **http://caps.ucsd.edu** CAPS offers free, confidential counseling. They can help with urgent crises, such as an assault or thoughts of self-harm. They offer drop-in and group workshops and forums. They can also talk if you are worried about a friend or classmate. **CARE at SARC** **http://care.ucsd.edu** Campus Advocacy, Resources, and Education at the Sexual Assault Resource Center (CARE at SARC) offers support for those of you who have experienced sexual violence or violence from a partner. They have free confidential counseling, including on nights and weekends.	**Triton Food Pantry** **http://basicneeds.ucsd.edu/triton-food-pantry/** The Triton Food Pantry discreetly offers food for current UCSD students. Its goal is to ensure that each of you has enough energy and nutrition to get through the day. **The Hub** https://basicneeds.ucsd.edu The Hub connects those of you who have trouble accessing basic needs, including food or stable housing, or who have financial emergencies. They can help you connect with a variety of on-campus and off-campus programs, including the Food Pantry, CalFresh, emergency loans, emergency housing, or changes to your financial aid, depending on your situation.

It is also important to find a community of like-minded people around you. You may be interested in the following resources: the Black Resource Center (brc.ucsd.edu), the Cross-Cultural Center (ccc.ucsd.edu), the LGBT Resource Center (lgbt.ucsd.edu), the Raza Resource Centro (raza.ucsd.edu), the Student-Parents Resource page (students.ucsd.edu/well-being/wellness-resources/student-parents), the Student Veterans Resource Center (students.ucsd.edu/sponsor/veterans), the Women's Center (women.ucsd.edu).

[4] Martinez *et al.* 2016. University of California Global Food Initiative: Student Food Access and Security Study. https://www.ucop.edu/global-food-initiative/best-practices/food-access-security/student-food-access-and-security-study.pdf

*Please note that while we on the BILD2 instructional team are here to support you, instructors are obligated by law to notify UCSD's Title IX coordinator if a student (or any person at UCSD) discloses to us a personal experience of sexual harassment, sex or gender discrimination, domestic violence, or stalking. This is so that the University can properly address the issue. If you do not want your experiences to be reported, please contact CAPS or CARE, which can talk to you confidentially.

Section Schedule

Section Meeting Times

You must attend the section to which you are assigned.

Section	Day	Time	Location		IA	IA email
B01	F	11-11:50am	YORK	4050A	Brenda Hug	yuh176@ucsd.edu
B02	F	12-12:50pm	YORK	4050A	Ale Felix-Campos	afelixca@ucsd.edu

IA Office Hours

You are encouraged to attend any IA's office hours.

IA	Day	Time	Location
Brenda	F	10-11am	Galbraith Hall active study room
Ale	T	2:30-3:30pm	Middle of Muir Coffee Shop (MOM)

Class Calendar Overview

More specific information will be provided weekly on TritonEd. We may adjust the schedule, assignments, and readings as necessary while still focusing on the foundational concepts listed below.

Date	Guiding Questions	Assignments and Suggested Readings Due 11:50pm Night Before Class
Class #1 Jan. 7	Welcome! Who are we? How do I think like a biologist?	
Class #2 Jan. 9	What are the benefits and challenges of multicellular life?	**Biologist Journal #1 Due!** Reading: Syllabus
Class #3 Jan. 11	What are the basic structures and principles of regulation underlying multicellular life?	**Biologist Journal #2 Due!** **More about YOU Survey Due!** Reading: Ch 40.1 (Animal Form and Function), 40.2 (Feedback Control)
Class #4 Jan. 14	How does one cell become many? (Development)	**Biologist Journal #3 Due!** Reading: Ch. 47 (Animal Development)
Class #5 Jan. 16	How does one cell become many? (Development)	**Biologist Journal #4 Due!** Reading: Quiz 1 study guide
Class #6 Jan. 18	**Quiz 1**	
Jan. 21	*Happy Martin Luther King Jr. Day!*	
Class #7 Jan. 23	What happens when multicellularity fails? (Cancer)	**Biologist Journal #5 Due!** Reading: (on TritonEd)
Class #8 Jan. 25	How do multicellular organisms reproduce themselves? (Reproduction)	**Biologist Journal #6 Due!** Reading: Ch. 46 (Animal Reproduction)
Class #9 Jan. 28	How do multicellular organisms reproduce themselves? (Reproduction)	**Biologist Journal #7 Due!** Reading: Ch. 46 (Animal Reproduction)
Class #10 Jan. 30	How do multicellular organisms get food energy to all of their cells? (Nutrition and digestion)	**Biologist Journal #8 Due!** Reading: Ch. 36.1 (Shoots and roots), 36.3 (Xylem), 36.5 (Phloem), Ch. 41 (Animal Nutrition)
Class #11 Feb. 1	How do multicellular organisms get food energy to all of their cells? (Nutrition and digestion)	**Biologist Journal #9 Due!** Reading: Quiz 2 study guide
Class #12 Feb. 4	**Quiz 2**	
Class #13 Feb. 6	How do multicellular organisms get oxygen to all of their cells? (Respiration and circulation)	**Biologist Journal #10 Due!** Reading: Ch. 42 (Circulation and Gas Exchange)
Class #14 Feb. 8	How do multicellular organisms get oxygen to all of their cells? (Respiration and circulation)	**Biologist Journal #11 Due!** Reading: Ch. 42 (Circulation and Gas Exchange)

Class #15 Feb. 11	How do multicellular organisms maintain a stable environment around all their cells? (Renal function)	**Biologist Journal #12 Due!** Reading: Ch. 44 (Osmoregulation and Excretion)
Class #16 Feb. 13	How do multicellular organisms maintain a stable environment around all their cells? (Renal function)	**Biologist Journal #13 Due!** Reading: Quiz 3 study guide
Class #17 Feb. 15	**Quiz 3**	
Feb. 18	*Happy President's Day!*	
Class # 18 Feb. 20	How do cells in a multicellular organism communicate through hormones? (Endocrine)	**Biologist Journal #14 Due!** Reading: Ch. 39.2 (Plant hormones), Ch. 45 (Hormones and Endocrine)
Class #19 Feb. 22	How do cells in a multicellular organism communicate through hormones? (Endocrine)	**Biologist Journal #15 Due!** Reading: Ch. 39.2 (Plant hormones), Ch. 45 (Hormones and Endocrine)
Class #20 Feb. 25	How do cells in a multicellular organism communicate through electrical signals? (Nervous system)	**Biologist Journal #16 Due!** Reading: Ch. 48 (Neurons and Synapses), Ch. 49.1 (Nervous Systems)
Class #21 Feb. 27	How do cells in a multicellular organism communicate through electrical signals? (Nervous system)	**Biologist Journal #17 Due!** Reading: Quiz 4 study guide
Class #22 Mar. 1	**Quiz 4**	
Class #23 Mar. 4	How do multicellular organisms detect stimuli? (Sensory system)	**Biologist Journal #18 Due!** Reading: Ch. 39.3 (Plant response to light), Ch. 50.1 (Sensory receptors)
Class #24 Mar. 6	How do multicellular organisms respond to stimuli? (Motor system)	**Biologist Journal #19 Due!** Reading: Ch. 50.5 (Protein filaments), 50.6 (Skeletal muscle)
Class #25 Mar. 8	How do multicellular organisms respond to stimuli? (Motor system and behavior)	**Biologist Journal #20 Due!** Reading: Ch. 51.1 (Sensory inputs drive behaviors), 51.2 (learning)
Class #26 Mar. 11	How do multicellular organisms respond to microbial threats? (Immune system)	**Biologist Journal #21 Due!** Reading: Ch. 43 (Immune System)
Class #27 Mar. 13	How do multicellular organisms respond to microbial threats? (Immune system)	**Biologist Journal #22 Due!** Reading: Ch. 43 (Immune System)
Class #28 Mar. 15	How will you use BILD2 in the future? How can make BILD2 better?	**Biologist Journal #23 Due!** Reading: Final Exam study guide
Mar. 22	**Final Exam, 11:30am-2:29pm** ***Note unusual time***	
Mar. 25	**Final Reflection due at 5pm**	