

AP Biology Summer Assignment 2017-18

Hello and welcome to AP Biology! This course is designed to be the equivalent of a two-semester introductory biology course usually taken as a prerequisite to upper level college biology courses. Over the course of this year, you will become familiar with major recurring themes that persist throughout all topics and material in the study of biology. The major themes (also known as “Big Ideas”) are:

BIG IDEA 1: The process of evolution drives the diversity and unity of life.

BIG IDEA 2: Biological systems utilize energy and molecular building blocks to grow, to reproduce, and to maintain homeostasis.

BIG IDEA 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.

BIG IDEA 4: Biological systems interact, and these interactions possess complex properties.

We are here to explore, learn, and think critically about life and the world in which we live. You will learn to think like a scientist and demand evidence to back up claims. If we are successful, you will never see the world the same way again. Some things to think about:

- You might not make an A in here. The material is hard, the tests are hard; it’s not like anything you’ve done so far.
- I don’t want to hear about how this class is “killing” your GPA. Your GPA isn’t what you think it is anyway. The 5pt scale will be readjusted to 4 by all the colleges to which you apply.
- I will treat you like a people who are capable of making decisions for themselves. I hope you choose to participate 100% but, if you don’t, I will respect your decision to disengage. Just don’t whine to me about not understanding things later.
- I will give you my all – you are not alone, we are in this together.

To successfully complete the course and meet all of the required objectives, **you will be expected to do independent work both during the summer and throughout the school year.** Your Summer Assignment will address seven (7) very critical Science Skills/Practices that we will be utilizing throughout the year. To introduce these Science Practices, you will be reading a book, *How Dogs Love Us* that follows the research of a neuroscientist at Emory University as he and his team develop a research project.

The first topic we will cover this year is Homeostasis and Animal Behavior. These topics are interwoven into the biology content for the entire year, and will allow us to explore a number of scientific questions. With that topic as the focus for the beginning of the year, you will also have a case study to read, evaluate, and analyze. The case study is titled, “My Brother’s Keeper: A Case Study in Evolutionary Biology and Animal Behavior”

If you have any questions regarding any part of the summer assignment, do not hesitate to e-mail me. My e-mail is pedgerton@gsgis.k12.va.us

There are two parts to this assignment. BOTH parts will be due **the first day of class in September 2017.**

Part 1 – *How Dogs Love Us* Summer Reading Assignment

Guided Reading questions, primary research/research articles, and a TED Talk

Part 2 – Animal Behavior Case Study

“My Brother’s Keeper: A Case Study in Evolutionary Biology and Animal Behavior”

Part 1 - AP Biology Summer Reading Assignment 2017-18

Introduction:

I know the words “reading assignment” tend to send chills down any high school student’s spine, but I think that you will find that this assignment will be very beneficial to you as we begin the school year. I am asking you to complete this reading assignment to explore science practices that capture important aspects of the work that scientists carry out in the course of a research project.

A “practice” is a way to coordinate knowledge and skills in order to accomplish a goal or task. Practices develop habits of mind that enable students to establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. Content, inquiry and reasoning are equally important in AP Biology, therefore it is necessary for students to develop advanced inquiry and reasoning skills, such as designing a plan for collecting data, analyzing data, applying mathematical routines, and connecting concepts in and across domains. The result will be readiness for the study of advanced topics in subsequent college courses — a goal of every AP course.

Science Practice 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems.

Science Practice 2: The student can use mathematics appropriately.

Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.

Science Practice 4: The student can plan and implement data collection strategies appropriate to a particular scientific question.

Science Practice 5: The student can perform data analysis and evaluation of evidence.

Science Practice 6: The student can work with scientific explanations and theories.

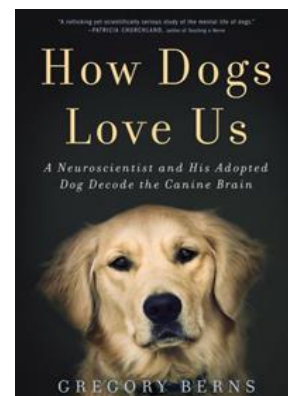
Science Practice 7: The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

I want you to explore the science practices in the context of an actual research project with published, primary documentation. With that goal in mind, I was excited to discover the following book – *How Dogs Love Us*.

How Dogs Love Us

The powerful bond between humans and dogs is one that is uniquely cherished. Loyal, obedient, and affectionate, dogs are truly “man’s best friend.” But do dogs love us the way we love them? Emory University neuroscientist Gregory Berns had spent decades using MRI imaging technology to study how the human brain works, but a different question still nagged at him: *What is my dog thinking?* In the fascinating book *How Dogs Love Us*, he recounts the methods his team employed, and how their pet dogs made these groundbreaking studies possible.

Remember, you will be reading this book to examine science practices and the scientific process - how a researcher develops a question/observation into an investigation, how data is collected and analyzed within that investigation, and what conclusion(s) can be drawn from the data. Through the process, we will also explore the logistical issues that must be dealt with when developing a research project. These are all factors you will have to consider when developing your OWN investigations this year.



You will have questions to guide you in reading this book, supplemental articles to read that were published as a result of Dr. Berns' research, and a TED Talk to view. Use the hyperlinks provided to access the material.

Supplemental Articles to accompany *How Dogs Love Us* (hyperlinks):

- [A review of domestic dogs' \(*Canis familiaris*\) human-like behaviors](#)
- [Functional MRI in awake unrestrained dogs](#)
- [One pair of hands is not like another-caudate BOLD response in dogs depends on signal source and canine temperament](#)
- [Scent of the familiar-an fMRI study of canine brain responses to familiar and unfamiliar human and dog odors](#)

TED Talk to accompany *How Dogs Love Us*

How Dogs Love Us Guided Reading Questions:

1. Scientific research is framed by a researcher's collective experiences. **Discuss** the role that Dr. Berns' personal experiences with his dogs Newton, Callie, and Lyra played in his goal to investigate how dogs feel about people in the Dog Project.
2. Magnetic Resonance Imaging is the technology Dr. Berns and his team used for the Dog Project. **Describe** how MRI generates an image of the brain and **discuss** the significance of using fMRI for the Dog Project.
3. Laboratory logistics – **summarize** how each of the following factors or events impacted the development and implementation of the Dog Project.
 - a. Route of investigators to Dr. Berns' lab – Andrew, Lisa, Monica, Gavin, Jan
 - b. Type of scientific experiments – fishing expedition vs. hypothesis driven
 - c. History of human & animal research – *The Belmont Report*, Animal Welfare Act
 - d. IRB and IACUC
 - e. Acclimating dogs to MRI
4. **Identify** and **evaluate** the research contributions of four (4) other scientists that Dr. Berns utilized **OR** referenced in developing *his* research model for The Dog Project. You may choose from the list below.

Darwin	Thorndike	Lorenz	Panksepp
Pavlov	Skinner	Berridge	Schultz
5. For the following chapters, **evaluate** how the science practices listed are demonstrated. **Provide** evidence from the book **AND** the supplemental articles to support the evaluation in the form of a T-chart. Use the format demonstrated below for the T-chart.
 - a. Chapter 14 – Science Practice #3
 - b. Chapters 18 & 19 – Science Practices #5 & #6
 - c. Chapter 20 – Science Practice #7

T-chart format:

Science Practice	Evidence

6. For the remaining science practices (#1, 2, & 4), **discuss** points in the book/chapters where those practices are employed. **Provide** evidence to support your claim in the form of a T-chart. Use the same format as Question #5.
7. How did the Dog Project help Helen to overcome her difficulties in learning "science"? What **science practices** did she employ or observe while attending early fMRI sessions?

Part 2 – Animal Behavior Case Study (hyperlinks):

["My Brother's Keeper: A Case Study in Evolutionary Biology and Animal Behavior"](#)
[Textbook chapter as an added resource – Behavioral Ecology](#)