Honors Biology Summer Assignment 2015
Midland School

If you are reading this you have enrolled in Honors Biology for the academic year of 2015-2016. Congratulations! I look forward to learning with you next year! Because the honors section moves at a faster pace and covers biological concepts in greater depth than the non-honors section, you are required to do some preparatory class work over the summer.

The intent of these assignments is to give you a solid foundation in evolution and genetics, two key elements of the course. It is my hope that by doing some independent learning during the summer it will allow additional time for hands on lab work and observational learning, as well as give you a basis of understanding to build upon throughout the year.

The two books you will be reading, along with a brief synopsis of each, are listed below. Both of the books have their own unique assignments, which can be found on the following pages, and are due on the first day of classes.

**SUMMER READING BOOKS:**

*The Violinist’s Thumb* - by Sam Kean (2012)

Did the human race almost go extinct? How does DNA cause people to have no fingerprints or be born with tails? And how did the right combination of genes create the exceptionally flexible fingers and thumbs of a truly singular violinist? Unravelling the genetic code hasn't always been easy - from its earliest days, genetics has been rife with infighting, backstabbing and controversial theories - but scientists can now finally read the astounding stories inscribed in our DNA. With a masterful combination of science, history and culture, in The Violinist’s Thumb Sam Kean untangles the secrets of our genetic code.


On a desert island in the heart of the Galapagos archipelago, where Darwin received his first inklings of the theory of evolution, two scientists, Peter and Rosemary Grant, have spent twenty years proving that Darwin did not know the strength of his own theory. For among the finches of Daphne Major, natural selection is neither rare nor slow: it is taking place by the hour, and we can watch.

If you have any questions do not hesitate to email Kyle Taylor at ktaylor@midland-school.org
Summer Reading Assignment: The Violinist's Thumb

This book is organized into four major parts:

- **Part I**: A, C, G, T, and You: How to Read a Genetic Score
- **Part II**: Our Animal Past: Making things that Crawl and Frolic and Kill
- **Part III**: Genes and Geniuses: How Humans Became all too Human
- **Part IV**: The Oracle of DNA: Genetics in the Past, Present, and Future

*For each part*, you will create your own version of a “Spark Notes” Study Tool. Each Study Tool will include the following sections:

A. **What was the point?** In this part of the assignment, you will determine the author’s overall purpose for each “part” of the book. What was the consistent theme? What were the “big ideas”? What was the purpose of this section of the book? **Support your response using evidence from the corresponding chapters.**

B. **Important “Character” List.** In this section, you should pick the most important individuals that the author discusses. The character list should be no more than **five people per section**. For each character, describe their major contributions to our understanding of biology.

C. **Explanation of Important Quotations.** For each section, pick **four quotes**. Explain why you found each quote essential in helping you develop an understanding of the biological concept being discussed or in helping you determine the “major point” of the section.

D. **Discussion Questions.** For each section, compose **three questions** that you would pose to your classmates or your teacher for further discussion. These questions should not have one correct answer. They should promote discussion by either allowing students to include their opinions and/or allowing students to describe their interpretation of a complex idea. (For example, “Who used peas in their genetics research?” is not a good discussion question.)

This assignment is due (typed) on the first day of school.
Summer Reading Assignment: The Beak of the Finch

Please read through the book and answer the following questions as you read. If you have neat handwriting you may turn this assignment in handwritten, otherwise, please type up your responses in complete sentences.

Chapter 1

1. What measurements do the Grants take on each finch?
2. How does Darwin describe natural selection?
3. Why did Darwin believe we could never "watch" natural selection in action?
4. Why are the finches on Daphne Island such an ideal population to study?

Chapter 2

1. How many species of finch are found in the Galápagos?
2. How did John Gould's discovery that there were 14 (13) species of finches on the Galápagos help spark Darwin's revolutionary ideas?

Chapter 3

1. What is Darwin's explanation for the lack of transitional forms between species?
2. How does the variation in populations of Darwin's finches compare with variation among populations of other birds, like sparrows?
3. Why is the study of variation so important to evolutionary biology?

Chapter 4

1. Why did 19th and early 20th century biologists fail to recognize the importance of variation in beak size among Darwin's finches in the Galápagos?
2. How did the finches' feeding behavior change during the dry season?
3. What are the three requirements of Darwin's theory of natural selection that are found in populations of Darwin’s finches?

Chapter 5

1. How did the drought of 1977 affect the feeding behavior of finches on Daphne Island?
2. How did natural selection change the morphology of the finch populations on Daphne Island from 1977 to 1978?

Chapter 6

1. Discuss the "costs and benefits" of black plumage among male Darwin's finches?
2. Describe Endler's "natural" selection experiments with guppies. What did he show?
Chapter 7

1. What was the selection response in the aftermath of El Niño on Darwin's finches?

2. How have biologists reconciled the apparent paradox of rapid evolution in the short term with much slower evolutionary rates measured in the fossil record?

3. Do the results on natural selection in Darwin's finches and British Columbian sparrows change your view of a species? If so, how?

Chapter 8


Chapter 9

1. Why does Peter Grant describe evolution as "change in variation?"

2. Why was there so much debate over whether natural selection could give rise to new species?

Chapter 10

1. What are Darwin's "incipient species?"

2. What is adaptive radiation?

3. How did Darwin imagine the "principle of divergence" would lead to new species?

Chapter 11

1. What are the "invisible coasts" described in this chapter?

2. In what ways are species more "fluid" than even 20th century biologists might have believed? To what extent was Darwin’s description of species as "convenient constructions" accurate? Are species real?

Chapter 12

1. Do Benkman’s and Lindholm’s research on crossbills support the notion that gradual evolution can lead to the appearance of complex adaptations? Explain.

Chapter 13

1. How have the finch populations on Daphne Major responded to the changing adaptive landscape?

2. How might hybridization aid in a species’ shift to a new adaptive peak in the landscape?

Chapter 14

1. What role does inductive reasoning play in science?

Chapter 15

1. What does Peter Boag hope to find by analyzing finch DNA?
Chapter 16

1. Does the observation of how flies and apple maggot flies support the notion of sympatric speciation? Explain.

Chapter 17

1. What is introgressive hybridization and what role might it play in evolution?

Chapter 18

1. Joshua Ledergerg said, "Our only real competition for domination of the planet remains the viruses." In what respect could you make a similar argument about insects?

Chapter 19

1. What affect would global warming have on the ground finches of the Galápagos? Explain.

Chapter 20

1. In what way(s) is cultural evolution similar to "regular" evolution? How is it distinctly different?