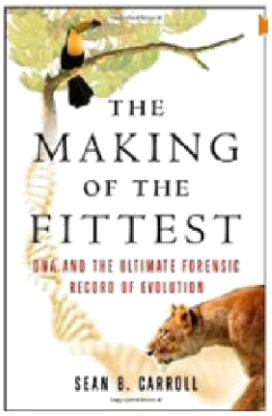
Honors Biology Extra Credit Opportunity: Spring Semester 2013

The Making of the Fittest

DISCUSSION QUESTIONS



DUE DATE: turn in by May 14th - no exceptions!

A. To earn up to 1% extra credit to be added to the semester grade (actual % awarded based on quality):

Respond to each of these prompts completely and accurately (based on the book). Your grade will be based on your ability to elaborate and provide thoughtful, reflective answers. This is important if you wish to receive the full 1% from this option.

In general…

1. **What is the author's purpose in writing this book? What literary devices (tone, characterization, voice, simile, metaphors, etc) does the author employ to achieve that purpose? Provide several specific examples that support your answer.**
2. **For what audience is this book intended? What challenges or obstacles do you think the author had to overcome in order to clearly convey his ideas? (you may wish to consider the characteristics of this audience or the concepts presented)**
3. **Pick out a passage from the book that meant something to you in a scientific, philosophical, religious, or other way that was truly striking to you. a. Explain why you chose this passage. b. What might it mean to our understanding of how life changes through time, to science methodology, to society's perception of science, to your faith, to our personal or social lives? (whatever is appropriate for your response)**

Specifically…

Chapter 1: Introduction: The Bloodless Fish of Bouvet Island

1. **How does DNA aid in our understanding of the evolution of the icefish?**
2. **What does the author mean when he says that the theory of evolution presented by Darwin is "cumulative selection"?**
3. **Sir Peter Medawar stated *"the reasons that have led professionals without exception to accept the hypothesis of evolution are in the main too subtle to be grasped by laymen"*. How will the author, Sean Carroll, address this issue?**

Chapter 2: The Everyday Math of Evolution: Chance, Selection, and Time

4. **The author uses the analogy of compound interest to evolution to open the chapter. Why does he make this analogy?**
5. **What are two examples of selection working in the wild that are discussed in the reading? Describe how selection altered evolution in both cases.**
6. **What occurs to the time needed for a mutation to spread through a population as the selection pressure increases?**

Chapter 3: Immortal Genes: Running in Place for Eons

7. **What is an "immortal" gene? Are immortal genes susceptible to mutations like other genes?**

8. **Look at the chart on p. 77. What is the surprising information that the author is trying to illustrate? Look at the chart on p. 81. What is this chart presenting?**
9. **If one looks at the DNA sequence of an immortal gene from two different species, one finds that they are more dissimilar than after it is translated into protein. (Meaning the protein sequences are more similar than the DNA sequence). Why is this so?**
10. **What does the author mean when genes are "running in place"?**

Chapter 4: Making New from Old

11. **What major question does the differences of vision in mammals and differences in digestion in apes create? (Hint: What is the chapter about?)**
12. **What is the importance of gene duplication?**
13. **What does Figure 4.4 tell us about our evolutionary relationship with chimps? Do SINES tell us we evolved from chimps? Why or why not?**
14. **Looking at the chart on p. 105, how many amino acids account for the differences in our red and green light detection?**
15. **How has the colobus monkey "created" more digestive enzymes in their intestine?**

Chapter 5: Fossil Genes: Broken Pieces of Yesterday's Life

16. **The SWS opsin gene has been fossilized in the coelacanth's and cetaceans. What does this mean? How were these genes fossilized independently?**
17. **What other species has the SWS opsin gene been fossilized in? Why did the gene become fossilized in these species?**
18. **Why do humans have only 5 out of 200 olfactory genes functional (therefore 195 are fossilized)?**

Chapter 6: Déjà vu: How and Why Evolution Repeats Itself

19. **How does evolution repeat itself due to environmental pressures? What is Figure 6.2 on p. 144 showing us?**
20. **What does DNA demonstrate to us about the steps taken in the evolution of howler vision and olfaction versus the Old World primates?**
21. **Why does the author revisit the antifreeze protein when discussing "different means to similar ends"?**

Chapter 7: Our Flesh and Blood: Arms Races, the Human Race, and Natural Selection

22. **What is an evolutionary arms race?**
23. **Why do the "bad" copies of the disease sickle cell anemia persist in human populations?**

Chapter 9: Seeing and Believing

24. **Why was Darwin's theory of evolution difficult to show people?**
25. **Evolution is doubted, in much of the same way that the need for vaccinations is/were doubted by chiropractors. How are these same six arguments against vaccinations used against evolution?**
26. **How does Dr. Carroll refute Dr. Behe's argument?**

Chapter 10: The Palm Trees of Wyoming

27. **What does the example of the bighorn sheep show us about "unnatural selection"?**
28. **Why has the cod fishing industry been destroyed?**
29. **Look at p. 259, Figure 10.6. What is each of these graphs showing us? Why is this occurring? Why do we care?**
30. **What three factors are contributing to the "perfect storm" to destroy our world's ecosystems?**

What example does the author give where this has already occurred?