AP Biology Summer Assignment: Your Inner Fish

DIRECTIONS

1. Read *Your Inner Fish* by Neil Shubin, Vintage Books, Random House, New York, 2009 (ISBN 978-0-307-27745-9)
2. **All students** will answer the **5 Overview** questions listed below. Site specific information in the book in answering each statement. This will be worth **50** points and is due the first day of class.
3. The discussion questions for the chapters listed below may be answered for an **optional** grade equivalent to **100 point test**. This assignments needs to be typed and handed in the first day of class. No extensions and ALL questions must be answered for the test grade with the page number where you found the answer noted.
4. **On the first day of school-each student** will be assigned one chapter. The student will lead a discussion of the chapter using the questions below or other questions that the student finds relevant to the material. The student needs to have 4-6 PowerPoint slides prepared to enhance their discussion points. These should be original and focused on diagrams and pictures with minimal bullet points. At www.neilshubin.com you will find PowerPoint slides that can help you construct your original slides. Please use proper citations. **Discussions will be a maximum of 10 minutes per chapter.**

Rubric for Discussion:

category	5pt excellent	4pt Very good	3 pts fair	0-2 Poor/missing
PP slides-information				
PP slides-visual				
PP slides – added to discussion				
PP slides - citations				
Quality of questions				
Preparedness and timing				
Engaging other students				
Participating in all presentations				
total				

Overview questions (Keep these in mind as you are reading the book)

1. **Why should we care about evolution? Why is it important?**
2. **What does it mean to be human? Did your concept change after reading the book?**
3. **In what way do scientific explanations differ from other ways of knowing? What makes evolutionary biology a science?**
4. **What insights do we gain when we integrate molecular and fossil data?**
5. **Can we look to examples in the natural world to inform our conceptions of what is "normal" or ethical human behavior?**

DISCUSSION QUESTIONS(extra credit for TEST grade-ALL questions must be answered. Reference the page number where you found the answer)

Chapter 1 - Finding Your Inner Fish

1. Explain why the author and his colleagues chose to focus on 375 million year old rocks in their search for fossils. Be sure to include the types of rocks and their location during their paleontology work in 2004.
2. Describe the fossil Tiktaalik. Why does this fossil confirm a major prediction of paleontology?
3. Explain why Neil Shubin thinks Tiktaalik says something about our own bodies? (in other words – why the Inner Fish title for the book?)

Chapter 2 - Getting a Grip

1. Describe the “pattern” to the skeleton of the human arm that was discovered by Sir Richard Owen in the mid-1800s. Relate this pattern to his idea of exceptional similarities.
2. How did Charles Darwin’s theory explain these similarities that were observed by Owen?
3. What did further examination of Tiktaalik’s fins reveal about the creature and its’ lifestyle?

Chapter 3 - Handy Genes

1. Many experiments were conducted during the 1950s and 1960s with chick embryos and they showed that two patches of tissue essentially controlled the development of the pattern of bones inside limbs. Describe one of these experiments and explain the significance of the findings.
2. Describe the hedgehog gene.. Be sure to explain its’ function and its’ region of activity in the body.

Chapter 4 - Teeth Everywhere

1. Teeth make great fossils - why are they “as hard as rocks?”
2. What are conodonts?

3. Shubin writes that “we would never have scales, feathers, and breasts if we didn’t have teeth in the first place.” (p. 79) Explain what he means by this statement.

Chapter 5 - Getting Ahead

1. Why are the trigeminal and facial cranial nerves both complicated and strange in the human body?
2. List the structures that are formed from the four embryonic arches (gill arches) during human development.
3. What are Hox genes and why are they so important?
4. Amphioxus is a small invertebrate yet is an important specimen for study – why?

Chapter 6 - The Best Laid (Body) Plans

1. Early embryonic experiments in the 1800s led to the discovery of three germ layers. List their names and the organs that form from each.
2. Describe the blastocyst stage in embryonic development.
3. What is meant by “ontogeny recapitulates phylogeny?”
4. What type of gene is Noggin and what is its function in bodies?
5. Sea anemones have radial symmetry while humans have bilateral symmetry but they still have “similar” body plans – explain.

Chapter 7 - Adventures in Bodybuilding

1. Refer to the timeline on p.121 – what is most interesting to you about the timescale? Explain your reason.
2. What is the most common protein found in the human body? Name it and describe it.
3. Explain how cells “stick” to one another; give one example.
4. How do cells communicate with one another?
5. What are choanoflagellates and why have they been studied by biologists?
6. What are some of the reasons that “bodies” might have developed in the first place?

Chapter 8 - Making Scents

1. Briefly explain how we perceive a smell
2. Jawless fish have a very few number of odor genes while mammals have a much larger number. Why does this make sense and how is it possible?

Chapter 9 - Vision

1. Humans and Old World monkeys have similar vision – explain the similarity and reasons for it.
2. What do eyeless and Pax 6 genes do and where can they be found?

Chapter 10 - Ears

1. List the three parts of the ear; what part of the ear is unique to mammals?
2. An early anatomist proposed the hypothesis that parts of the ears of mammals are the same thing as parts of the jaws of reptiles. Explain any fossil evidence that supports this idea.
3. What is the function of the Pax 2 gene?

Chapter 11 - The Meaning of It All

1. What is Shubin's biological "law of everything" and why is it so important?
2. What is the author trying to show with his "Bozo" example?
3. This chapter includes many examples of disease that show how humans are products of a lengthy and convoluted evolutionary history. Choose one of the problems listed below and briefly explain how ancient ancestors' traits still "haunt" us:

• Obesity
• Heart disease
• Hemorrhoids
• Sleep apnea
• Hiccups
• Hernias
• Mitochondrial diseases

Afterword (new findings re: Tiktaalik)

1. Tiktaalik was a fish that lacked an operculum – what does this tell us about the animal?
2. Tiktaalik had a true neck – what did this allow the animal to do (advantages?)
3. How was Tiktaalik able to survive in the cold Artic environment?

Suggested preparation:

You will have your textbooks and you can begin reading. It will be helpful for you to read Chapter 18 (begins on page 391-408) which discusses Natural Selection in preparing for the above assignment. During the first couple weeks of school, we will be quickly reviewing the chapters on chemistry (Chapter 2). Reviewing this material during the summer will help you during the beginning of the school year. The first test will include both this assignment and the material on chemistry. All assignment sheets will be posted at the class wiki site: https://mrsgopie.wikispaces.com AND the Wilby High School website under the ACADEMICS tab by the middle of August. If you have any questions about this or the assignment, email me. I will answer you as soon as practical in the summer but I may be away for a few weeks at a time and not be responding to email.