Ms. Thayer
AP Biology
Summer Assignment #1
Discussion Questions: 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) and then answer the discussion questions listed below.
2. Include your name, course (AP Bio) and title on top of the assignment as your heading.
3. The assignment may be typed or hand-written. Answer completely and in full sentences. Use good grammar and spelling, but be clear and concise; discussion questions should be in your own words even if page numbers are referenced.
4. The assignment will be collected on the **FIRST DAY OF CLASS** and you will also take part in a graded discussion of the book during the first week of school.

## 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?)

## Your Inner Fish - 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?

## Your Inner Fish - 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** at least one of these experiments and **explain** the significance of the findings.
2. **Descibe** the *hedgehog gene* using several animal examples. Be sure to **explain** its' function and **identify** its' region of activity in the body.

## Your Inner Fish - Chapter 4: Teeth Everywhere

1. Teeth make great fossils. **Why** are they "as hard as rocks?" **What** are conodonts?
2. 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**? Be sure to **include** characteristics that you share with this critter!

## Chapter 6: The Best Laid (Body) Plans

1. Early embroyonic 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** this by **comparing** and **contrasting**.

## Chapter 7: Adventures in Bodybuilding

1. Refer to the timeline on p.121 of *Your Inner Fish* – **what** is most surprising to you about the timescale? **Explain** your choice.
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** at least one example.
4. **How** do cells (generally) 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? Include any environmental conditions that might have favored their evolution.

## Chapter 8: Making Scents

1. Briefly **explain** how we perceive 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 the 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** three of the problems listed below and briefly **explain** how ancient ancestors' traits still "haunt" us:
    - **a.** Obesity
    - **b.** Heart Disease
    - **c.** Hemorrhoids
    - **d.** Sleep apnea
    - **e.** Hiccups
    - **f.** Hernias
    - **g.** 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 Arctic environment?