Science 100

Questions for Discussion IV (be prepared to discuss these Friday, February 4)

Instructions: Same deal as before. Some of you are included in a group and are also turning in your own set of answers; **stop** doing this. If it persists, I will be forced to give you the lower grade of the two. Turn the answers in by midnight of the day of the discussion (it is okay to send them to me by e-mail).

Ward and Brownlee, *The Life and Death of the Planet Earth*

1. (page 132) The notion of the "**moist greenhouse effect**" and "**runaway greenhouse effect**" are mentioned here for the first time. Curiously, the authors never really explain them. **Define** both terms in the context of this chapter (i.e., that the moist greenhouse happens before the runaway greenhouse). Why does the moist one happen **before** the greenhouse one, and what **prevents** the greenhouse one from happening?

2. (page 133) The authors simplify this fascinating story of astronomy and human psychology. Lowell was not the first person to see **linear features** on the surface of Mars; who was? Why might the **language** he published his findings in affected Lowell's perception of Mars?

3. (pages 136 and 137) "But some are carried upward by **convecting** air to the top of the atmosphere..." We know what convection is in the Earth's mantle, but how does convection apply to the **atmosphere**?

4. (page 139) Is the evaporation of the oceans an example of **positive** or **negative feedback**? **Defend** your answer by citing the definition of the type of feeback you choose.

5. (pages 145 and 146) How are **oceans**, **plate tectonics** and **life** connected? From some observations of Jupiter's moon Europa, a hypothesis was developed that the surface of Europa has the equivalent of spreading centers (mid-ocean "ridges"). Explain how this hypothesis affects the chances for finding life of some sort on Europa.

6. (page 147) Cheer up! If plate tectonics ends earlier than the oceans evaporating, a whole new set of consequences occur. Explain if these consequences will result in **mass extinctions**, and, if so, will there be any groups of organisms left untouched to carry on after the extinctions?

7. (page 150) Well, we've killed off pretty much all life. Define **galaxy** and **solar system**, and specifically address which one of the two describes a **bigger** thing. Why won't a galactic collision, as hypothesized, *necessarily* affect our solar system?

8. (page 153) My goodness! There's a **black hole** with a mass of two million times our Sun at the center of the Milky Way Galaxy (ours). Why aren't we being sucked straight into it, if it's so large (this is one "ending" you *don't* have to worry about)? (Black holes, as you might recall, are the final stage of a massive star's life; the galactic center black hole did not form from the collapse of a single star. No one quite knows how such a large black hole might form.)

9. (page 158) The implications of this page are profound: what do the comments of this page suggest about the **size** a star should be if any orbiting planet were to have **animal** life? Does this **increase** or **decrease** the chance of finding ETs to talk to "out there"?

10. (page 159) It would be neat to be part of a **supernova**. However, it seems like that will not happen; the Sun is not massive enough, according to the book. Why is there a **minimum size limit** for a star to go supernova? Find an astronomy textbook or website that will tell you the answer and **cite the source**.

11. (pages 162 and 163) How does the **moon** literally end? How does the **Earth** end?