Questions:

1. On p. 143 it is stated "The evidence linking deep time events to climate is controversial for a number of reasons: chronologies and mechanisms are obscured by an incomplete and biased geological record; there are no experimental controls or alternate treatments for comparison; deciphering causation and mechanism from observed correlations is difficult; there are often many other candidate explanations."

   Which do you think is/are the most controversial and/or problematic, and why? Do you think it is important to try and clear up any of these controversies (if at all possible), or just focus on the problems at hand today?

2. Ch. 9 discusses the history of past extinctions, possible causes, and various controversies associated with mass extinctions. From the information provided in this chapter do you think looking at extinctions from deep time is legitimately useful in predicting the consequences of our current climate change problems? Why or why not? Furthermore, at the very end of the chapter, the author leaves us with some questions...one is, "How can we use the past to model the future?"

3. In Ch. 10 it is stated that PETM is a favorable focus of research in how biogeochemical cycles may respond to rapid climate changes similar to what may occur in our future. While there are plant and mammal fossils available for study, other terrestrial groups are not well represented in the fossils for this time period. What do you think having other specimens (such as insects or herps) available could mean for research?

4. We know how difficult it can be to predict how species may react to climate change, and over what period of time. Evidence from the PETM time period suggests that animals and plants responded differently to the changing of climates: mammals tended to react as a community, while plant taxa reacted individually. Do you think one response (community vs. individually) is a better tactic over the other? What are the advantages and disadvantages? (This may be very dependent upon the species, but try to think generally.)

5. Both chapters 9 and 10 seem to indicate that while climate change was influential in various extinctions, it *alone* was not responsible for the mass extinctions discussed, and that many other factors made a contribution as well. Though, is that not the case now? We have been discussing how difficult it is to blame the climate for species extinctions, or to prove that climate was the ultimate cause for a given species that went extinct. Do you think climate change will truly ever be the sole cause for species extinctions? Or will there always be many factors? And if there are always going to be many factors involved, let us return to the question: should climate change be a *primary* focus for conservationists in working to protect and conserve species?