“Every man is a valuable member of society who by his observations, researches, and experiments procures knowledge for men.”

-James Smithson (1765-1829), a British natural historian whose legacy of over $500,000 was given to the government of the United States of America for the creation of “an Establishment for the increase and diffusion of knowledge”: the Smithsonian Institution.

The Smithsonian Institution’s National Museum of Natural History (NMNH) has one of the largest collections of fossils in the world. The Smithsonian museums are free; hours for the NMNH are 10 am to 5:30 pm 7 days a week. You can take the Metro from the College Park Station to any of a number of stations near the Museum. The quickest route is the Green Line from the UMd-College Park Station to Archives/Navy Memorial/Penn Quarter: you don’t have to change trains, and the NMNH is just on the other side of the Archives Building.

You may work in teams and discuss your answers; however ALL WORK YOU TURN IN MUST BE YOUR OWN. (I have caught and reported a number of students in the past you have cheated by copying each other’s work: please don’t make me do that again…). To comply with University Senate regulations, please sign the following so that you may receive credit for this assignment.

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment

________________________________________________________________________________________________________________________
Signature   UID   Date

There are several halls of fossil specimens. You should investigate most (if not all) of these. Several of these are interconnected, but some are in separate areas of the museum. Fossil specimens are featured in the following galleries:

- David H. Koch Hall of Human Origins (First Floor)
- Sant Oceans Hall (First Floor: the west gallery within this three-gallery hall is concerned with fossils)
- Hall of Early Life (First Floor)
- Hall of Fossil Plants (First Floor; actually is concerned with the conquest of land)
- Hall of Dinosaurs (First Floor)
- Hall of Ancient Seas (First Floor)
- Hall of Tertiary Mammals (First Floor)
- Hall of Ice Age Mammals (First Floor)
- Butterflies + Plants: Partners in Evolution (Second Floor: note, the paleontological component is outside the pay-for-entry live butterfly hall)
In this project, you’ll be going to various halls to look for evidence of different phenomena that is demonstrated by fossils. Unlike many such museum trips, what we are asking you to look for is often \textit{NOT} on the labels and signage: you have to figure it out yourself. In some cases we’ll give you hints for good places in the museum to look for the answers; but otherwise you are on your own to figure this out.

1) Many aspects of evolution involve lineages of organisms interacting with the changing environment around it. Find an example of the interaction of a fossil lineage with changes in the physical and living environment. (The Halls of Human Origins, Tertiary Origins, and Sant Ocean Hall all have good cases of these.) In the space below, indicate:

- The taxa concerned (give the species names of the specimens on display at the Smithsonian)
- Where you found them in the museum (which hall: possibly more than one)
- The environmental change to which they are responding
- And the morphological changes they evolved in response to that change
2) Mass extinctions are an extremely significant phenomenon in the fossil record. Find a display discussing a major mass extinction (the easiest way to do this is in the Sant Ocean Hall, which deals with two of these in great detail.)

In the space below, discuss:

- The mass extinction displayed (its name and age)
- Where you found it in the museum (which hall: possibly more than one)
- Some of the victims of that extinction (give the particular species names of at least three victims on display at the Smithsonian)
- Some of the survivors of that extinction (give the particular species names of at least three survivors on display at the Smithsonian)
- The environmental/geological phenomenon suggested to have caused that extinction event
- What effect of that phenomenon is discussed which likely produced the actual die off (i.e., the proximate rather than the ultimate cause of the extinction)
3-5) Several macroevolutionary patterns are documented from the fossil record. Choose three (3) (with extra credit for a fourth) of the following macroevolutionary patterns, and find examples of these documented by fossils in the museum. Choose from the following:

- Convergence: independent origin of a trait or suite of traits in different lineages, often due to similar ecology. (Special note: you may use a living species as one of the examples, but the other(s) must be fossil ones, and all must be represented by specimens in the museum)
- Correlated Progression: succession of adaptations within a single lineage towards some particular mode of life
- Display structures: features of the anatomy reasonably speculated to have been used to intimidate rivals or predators; attract potential mates; and/or identify membership in a particular species.
- Divergence: descendants of a common ancestor with rather different ecologies and adaptations
- Exaptation: transformation of a body part or behavior originally used for some other function to an entirely different function
- Heterochrony: evolution by changing the timing of development rather than the origin of new traits as such

In each case, the specimens discussed must not be examples used in other questions in this packet. For each example, identify:

- The macroevolutionary pattern chosen
- The fossil(s) used to document (list the species examined and the halls in which they are found)
- What features you used to demonstrate this evolutionary pattern

3) Macroevolution pattern:_____________________________
4) Macroevolutionary pattern: ________________________________

5) Macroevolutionary pattern: ________________________________

Extra Credit) Macroevolutionary pattern: ________________________________