Geo 302D: Age of Dinosaurs

Lab 6: Texas Memorial Museum

This lab gives you the opportunity to examine some of the fine fossil specimens on display at the Texas Memorial Museum (TMM). Up until now you have seen diagrams, figures, photos, and illustrations of various organisms. But paleontologists deal with real remains of extinct creatures, and now so do you. Apply your knowledge to answer the questions below.

Museum Hrs: M-F 9am–5pm; Sat 10am–5pm; Sun 1pm–5pm

Main Hall (entrance level)

1. *Quetzalcoatlus northropi*. The huge skeleton suspended from the ceiling is a reconstruction of the largest flying animal known to science.

a.) What are some of the bones that you recognize in this animal?

2. Pterosaurs under glass. In the cases before you are a number of casts of pterosaurs, extinct flying reptiles.

a.) How does the flight mechanism of pterosaurs differ from that of birds?

3. *Bison alaskensis*. This stop is more for information than questions. Take a look at the pattern of temporal openings in the *Bison* skull. There is only a single temporal opening on each side of the skull, the infratemporal fenestra. This is a synapomorphy of the monophyletic group Synapsida. Synapsida is a long-lived lineage encompassing many smaller monophyletic groups. The monophyletic group Mammalia (composed of the ancestor of all living mammals and all of that ancestor's descendants) lies within Synapsida. Think about the temporal openings in your own skull. You and the *Bison* are both members of the synapsid lineage.

Geo Hall (basement level) – note this section is arranged by time period.

4. *Prosaurolophus maximus*. This is a euornithopod from the Cretaceous.

a.) Draw a sketch of this skull and label all the openings you recognize.

5. *Edaphosaurus* and *Dimetrodon*. These two are from the same Permian rocks of north Texas.

a.) Examine the skulls of these two animals. What temporal openings are present in each?

b.) Based upon the pattern of skull openings, are these two more closely related to dinosaurs or to humans?

c.) Look at the sail on the back of the *Dimetrodon*. What were possible functions of this sail? Be sure to compare it to a similar structure in *Edaphosaurus*.

6. Look at the differences between the skeletons of the primitive tetrapods *Eryops* and *Cacops* (both from the Permian), and the skeleton of the giant fish *Xiphactinus* (located on the back wall).

a.) What adaptations to life on land are visible in *Eryops* and *Cacops*?

7. Primitively, tetrapods held themselves up and walked with a **sprawling stance**. *Eryops* and *Cacops* illustrate this sort of limb posture very nicely. Some more derived tetrapods, such as modern crocodilians, evolved a **semi-erect stance**. This means they hold themselves further off the ground when walking. Their limbs are straighter than the primitive tetrapods, but they are not yet fully erect. At least two major tetrapod groups evolved a **fully erect stance**, with the limbs held directly beneath the body. NOTE: FULLY ERECT DOES **NOT** MEAN THE SAME AS BIPEDAL! An animal can have a fully erect stance and walk about on all four limbs (quadrupedal).

a.) Find the skeletons of the following six animals and determine if they possess a sprawling or fully erect stance.
Dimetrodon (Permian) -

Acrocanthosaurus (Cretaceous) -

Homotherium (Ice Age) -

Equus (Tertiary) -

Buettneria (Triassic) -

Trilophosaurus (Permian) -

b.) In what two monophyletic groups (not the individual taxa listed above) has the fully erect stance evolved?

c.) Examine the sauropod femur (*Diplodocus* from the Cretaceous) on display. What adaptation for fully erect, upright stance is visible in this bone?

8. *Longosuchus meadi*. From late Triassic rocks of northwest Texas.

a.) Sketch the skull of this animal and label the dark brown-filled skull openings. (hint: the back of the top of the skull is hidden by the first row of armor plates.)

9. *Mosasaurus maximus*. From the banks of Onion Creek, south of Austin in Cretaceous rocks.

a.) This animal is closely related to living monitor lizards and snakes. What "snake-like" adaptations are visible in the skeleton?

10. Animals that do not share recent common ancestry sometimes evolve similar morphology (= form) and fill similar roles in their environments. This is known as **convergence**, and it is an example of **homoplasy** (= similarity not a result of common ancestry). A modern example is birds and bats. Both evolved wings for flight, but each lineage developed its wings independently.

a.) Examine the skull of the phytosaur *Angistorhinus*, an archosaur from late Triassic beds of northwest Texas. What modern animals share similar morphology and probably a similar lifestyle?

b.) Examine the Shoal Creek plesiosaur. With which other animals you've seen today does this specimen show some level of convergence? In what part of their anatomy, and how?