Geo 302D: Age of Dinosaurs

Lab 11: Texas Memorial Museum

You have now been introduced to different applications of paleontology, as well as the role of field work, preparation, and collections management to paleontology. Today, you will explore another important aspect of vertebrate paleontology: display at a museum and public education. This lab also gives you the opportunity to examine some of the fine fossil specimens on display at the Texas Memorial Museum (TMM). Apply your knowledge to answer the questions below.

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.) Compare and contrast this Cretaceous pterosaur to the Jurassic specimens (found in the glass cases).

2. How does the flight mechanism of pterosaurs differ from that of birds? In other words, how does the structure of their wings differ?

Geo Hall (basement level) Note: this section is arranged by time period.

3. Meteorite impacts devastate the ecosystems where they occur, and in some cases they can affect the entire planet. While there are just 3 confirmed impact structures in Texas, hundreds of meteorite fragments have been found throughout the state.

a) On the north wall in the meteorite display room, there is a map of locations where meteorite samples were found. Why are most of the finds located in the western part of Texas?

b) What are the major types of meteorites in the collection?

4. On the back wall there is a display showing many of the different types of fish that lived throughout the Paleozoic Era. Those fish with bony plates covering their bodies are called placoderms, and lived only in the Devonian Period (about 417-354 million years ago). What can the physical characteristics on some of these placoderms tell us about their diet and defense mechanisms?

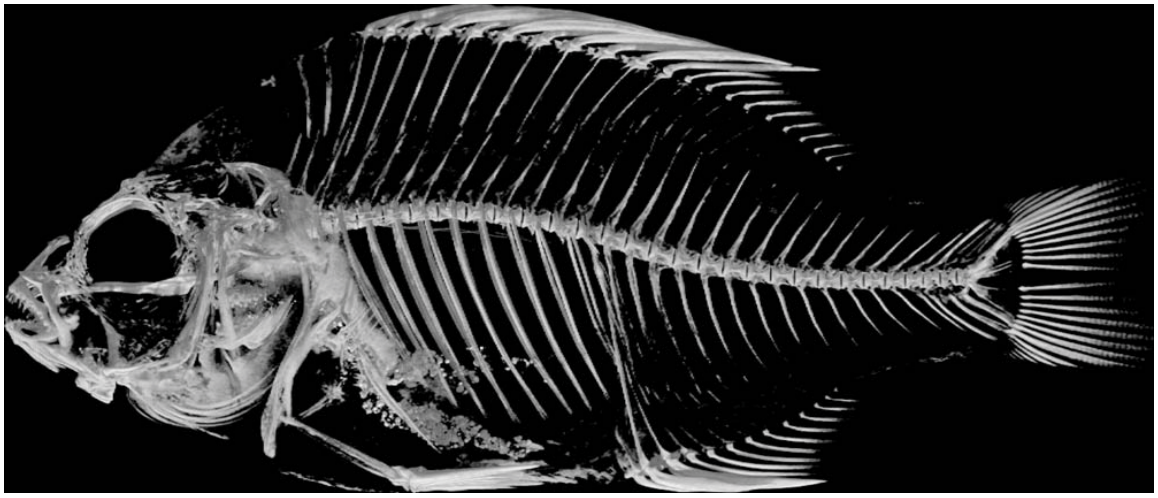
4. *Edaphosaurus* and *Dimetrodon*. These two taxa are from the same Permian rocks of north Texas.

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*.

5. Look at the differences between the skeletons of the primitive tetrapods *Eryops* and *Cacops* (both from the Permian), and the skeleton of the bluegill sunfish (*Lepomis macrochirus*) below.



a.) What adaptations to life on land are visible in *Eryops* and *Cacops*, but not *Lepomis*?

6. Primitively, tetrapods held themselves up and walked with a **sprawling posture**. *Eryops* and *Cacops* illustrate this sort of limb posture very nicely. Some more derived tetrapods, such as modern crocodilians, evolved a **semi-erect posture**. 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 an **upright posture**, with the limbs held directly beneath the body.
NOTE: UPRIGHT DOES **NOT** MEAN BIPEDAL! An animal can have an upright posture and walk about on all four limbs (quadrupedal).

a.) Find the skeletons of the following Permian and Triassic animals and determine if they possess a **sprawling** or **upright** posture.

Trilophosaurus (Permian) -

Buettneria (Triassic) -

7. *Longosuchus meadi*. From the Late Triassic of northwest Texas.

a.) **Sketch** the skull of this animal and **label** the skull openings.

8. 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 the Late Triassic of northwest Texas. What modern animals share similar morphology and probably a similar lifestyle?

9. Examine the sauropod femur (*Diplodocus* from the Cretaceous) on display.
a.) What adaptation for upright posture is visible in this bone?

b.) What limitations does this place on movement?

10. Cretaceous display. List the taxa which have a pleurokinetic hinge.

11. Theropod track. How was this track assigned to Theropoda?

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

a.) This animal is a member of the monophyletic group Varanoidea, which includes living monitor lizards and snakes. What "snake-like" adaptations are visible in the skeleton?

b.) What environmental adaptations are visible in this skeleton?

13. 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?

14. Examine the fossil *Equus* (horse) skeleton from the Tertiary Period. Does this animal have a sprawling, semi-erect, or upright posture?

15. a.) In what monophyletic groups (not individual taxa) has the upright posture evolved?

b.) Is an upright posture in these groups the result of common ancestry (**homology**), or convergence (**homoplasy**)?

16. The island in the center of the room contains various animals from the Quaternary Period –animals around during the ice age.

a.) Examine the big set of armor in the center of the island. The bones making up the armor came from a large, extinct mammal. What animal do you think is this fossil's living relative?