

## Week Twelve

### **The Cenozoic: Western United States and Alabama Stratigraphy, and a few left over fossils (including Reptiles, Mammals and Insects)**

**Background:** Okay folks, raise your hand if you are starting to get just a bit burned out with geology and the University of South Alabama. Us too! Right now the senior author of this lab manual is typing on his computer with one hand (and not for the reason you think) because he is exhausted from marking labs, tests and essays etc. So we really are just as happy as you that this is the last GY 112 lab assignment of the semester. For many of you, this may be your last Geology assignment EVER. But all is not good news; next week is the final lab exam.

As for today's lab, well it's kind of a mixed bag affair. We will finally finish off the vertebrates by looking at the reptiles and the mammals. Please remember that the vertebrates first evolved during the Paleozoic. The reptiles came to dominate the Mesozoic world and one group, the **dinosaurs** really typify that era. Unfortunately, we do not have very many dinosaur fossils for you to look at (nor do we have any mammal fossils). Complete fossil skeletons of these vertebrates generally go for much more money than we have in petty cash. So a lot of this lab is going to be done on the basis of your notes and the text book. Are you worried that you may not have any fossils to look at or that what we have will be "crap"? Don't be. We have a few left over fossils from various phyla that may serve as a partial review for next weeks lab. Yes - drawings are back, albeit in a limited fashion. You will also be introduced to a few of Alabama's and America's most important Cenozoic sediments and sedimentary rocks (including some from right here in Mobile). There is also a bit of paleogeography and even a bug or two. These are real bugs – AKA insects (phylum Anthropoda). All in all, this is a mixed bag lab as far as the fossils are concerned.

This is your last lab. Do the best job you can because you are not going to have any more opportunities to lift your marks after today.



## **The Vertebrates (Phylum Chordata)**

**Reptiles:** Time and space considerations do not permit a complete discussion about the evolution of the reptiles and their culmination into the "terrible lizards" of the middle Mesozoic. The **dinosaurs** were a huge group of animals in terms of diversity, range and size. They include the largest land animals ever to have existed on the Earth. They also include some of the smallest. The reptiles were an advance over the amphibians in several ways (see discussion in the Week 10 lab exercises). Most importantly, they could leave the water behind. They produced eggs that could be laid anywhere because they were surrounded by a hard non porous shell (amphibian eggs do not have this characteristic). The earliest known reptiles were Late Mississippian in age and they were small. Perhaps due to climatic changes (things were drying up and there was a major Permian glaciation), the reptiles began to really diversify in the later Paleozoic and into the Mesozoic. The Mesozoic is known as the "age of the reptiles" because they really did dominate most terrestrial (and a lot of aquatic) regimes. Biologists frequently cite the dinosaurs as a classic example of **adaptive radiation** of species.

Many reptiles died off at the Permian-Triassic boundary (it was the Earth's greatest extinction), but some groups survived into the Mesozoic. Classification of these beasts is primarily done on the basis of skull structure, walking manner and God only knows what else (see what happens when biologists get involved with geology!). The term **diapsid** refers to reptiles with a particular skull structure that is characterized by "*two upper and lower temporal fenestrae*." If you are a biologist, you may know what this means. Most geologists do not. This group of reptiles included the **thecodonts**, which were noteworthy for having teeth that were set in sockets ("*tooth in socket reptiles*"). They eventually gave rise to crocodiles, **Dinosaurs, Pterosaurs**, and the aquatic reptiles **Ichthyosaurs, Plesiosaurs** and **Mausosaurs**. Birds were probably also derived from this ancestral linkage.

Meanwhile, another group of reptiles called the **Therapsids** were also busy evolving. This group of reptiles first evolved in the Permian and largely died off in the Triassic (like the thecodonts), but they were unique as they possessed both reptilian and mammalian characteristics. The **mammals**, which include cute and fuzzy cats, dogs, monkeys and rodents as well as people, probably were derived from one of these beasts.

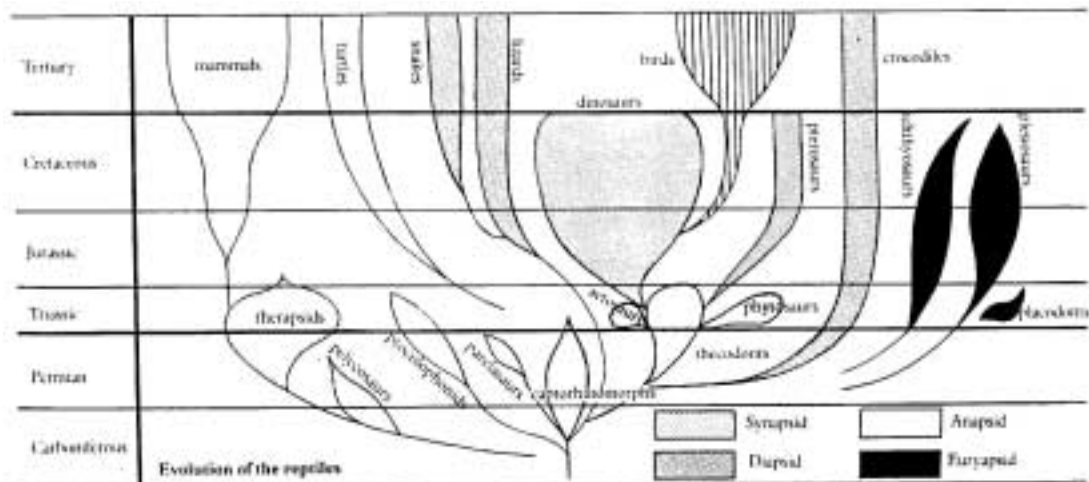
It should be noted that the turtles and snakes and lizards that we associate with the reptiles today did not directly evolve from the thecodonts. With the exception of the birds (which separated off very early in the evolution of the dinosaurs), the "terrible lizards" did not leave any real descendants. Kind of sad if you think about it, because they were among the most successful of the animals ever. But you know, if we could get some dinosaur DNA, and use experimental cloning techniques, we could grow new ones. Wow! What a great idea. We could put them in a park and charge people to see them. Maybe I'll write a book about this one day....

The dinosaurs died off relatively suddenly 65 million years ago, a time which today

marks the end of the Mesozoic era and the start of the Cenozoic era. The extinction of the dinosaurs preceded the advance of the mammals and it is safe to say that mammals characterize the Cenozoic in the same way that the reptiles characterized the Mesozoic. The evolutionary development of the two vertebrate groups are also similar. For example, the first mammals in the Mesozoic were small, but once the dinosaurs died off, they quickly evolved to fill in all of the available niches. Mammals ultimately moved into the oceans (e.g., whales and dolphins) and took to the air (e.g., bats). Some ate plants (**herbivores**), some ate animals (**carnivores**) and some ate anything (**omnivores**). Some walked on four legs, some walked on two. There was also a similar increase in size over time within the mammals. The horse is a perfect example of this. From a very small beginning in the Eocene, horses gradually became bigger and bigger until now, most varieties are big enough to be ridden by humans. An Eocene horse was about the size of an Irish Setter. You know, one of these days some geneticist is going to engineer an Eocene-sized horse and make millions selling it to little old ladies who are tired of a house full of cats. Better yet, it might make an interesting substitute for yappy little lap dogs.

**Final words.**

Enjoy the last lab. Lee and Doug both hope that you have enjoyed these exercises (Ha!). If you didn't always enjoy the labs, at least we hope that you learned something about geology, Earth history and the world around you. If past comments can be used in a predictive manner, none of you will ever look at an outcrop of rocks in the same way again. Spectacular mountain vistas are not only nice to look at, they record the history of this planet. Next time you visit the Rockies, or the Alps, or the Grand Canyon, or even just a road cut close to home, see if you can unravel part of the story that it contains.



**Figure 12-1:** Evolution of the reptiles and mammals. From Moody, R., 1980. *Prehistoric World* Chartwell Books. New Jersey, 320p.



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Notes

Name: \_\_\_\_\_ Grade \_\_\_\_\_/100 +5 bonus Percent: \_\_\_\_\_

## GY 112 Lab Assignment 12

### Cenozoic Rocks and Fossils

**Note:** This is the first and only one of the GY 112 labs that deals with the Cenozoic Era. The lab is broken up into three parts. Part 1 deals with fossils, Part 2 focuses on Cenozoic surface rocks from Alabama, Florida and Colorado, and Part 3 is about Alabama Cenozoic paleogeography. There are several book questions spread throughout the lab. Refer to Chapters 10, 13, 14 and 15, and Appendix A (page A1) of your textbook for answers to the fossil and Cenozoic components of this lab.

In particular, you will find pages 372-377 in your textbook helpful in answering the questions about the reptiles and mammals.

**Part One: Fossils**  
**Reptiles and Mammals**

**Specimen 12-1a (PI 2040) and Specimen 12-1b (PI 2041);** Unknown vertebrate fossils, Pleistocene, sample location unknown.

a) What parts of the skeleton are represented by the two bone fragments? **[4 points]**

12-1a: \_\_\_\_\_ 12-1b: \_\_\_\_\_

b) How are they preserved (careful observation is needed here)

\_\_\_\_\_ **[2 points]**

**Question 12-2;** There may or may not be a fossil example of an Avian Ichnofossils (AKA bird foot prints) to illustrate this question.

Hey want to freak out a friend or family member? The next time you go with them for a walk along the beach, keep your eyes open for bird tracks. When you find some, run around screaming "Oh my God! Dinosaur footprints! Run for your life!"

Paleontologists have determined that birds may be descended from some dinosaurs. What common features link the two groups of beasties together?

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\_\_\_\_\_ **[4 points]**

**Question 12-3:** What, in your own opinion, killed off the dinosaurs?

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[4 points]

**Question 12-4:** With the exception of my wonderful GY 112 instructor, the one person that I would most like to see eaten by *Tyrannosaurus rex* is

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because .... \_\_\_\_\_

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[2 points]

**Question 12-5:** What characteristic(s) typify the mammals?

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[3 points]

**Question 12-6:** In which way(s) do monotremes and marsupials differ from placental mammals?

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[3 points]

**More annoying fossils.** This is a mixed bag of Cenozoic fossils from Alabama and Florida.

**Specimen 12-7: Scleractinian Coral (Pleistocene; South Florida)**

a) This group of corals really got started in the Mesozoic (refer to chapter 12 of your textbook for the details), and they are the only remaining group today. In fact, it is primarily because of these beasts that we have the Florida Keys, the Great Barrier Reef (Australia) and the Bahamas. They grow fastest and best in tropical, very shallow marine environments. Why?

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**[4 points]**

**Specimen 12-8: Gastropods: a) *Oliva* sp. (Eocene to Recent); b) *Busycon* sp (Oligocene to Recent)**

a) Remember these beasts? To which Phylum do they belong?

\_\_\_\_\_ **[1 points]**

b) The olive shells and welks (e.g., *Busycon*) are rather attractive groups of snails. Draw any one of them (and don't forget your scale!) **[10 points]**

c) Why are some of the shells colored by pigment and others are not? (Think alteration)

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[2 points]

**Specimen 12-9:** Gingko (modern), south side of Life Sciences Building, University of South Alabama Campus

a) Alright, so it isn't a fossil yet, but it is still a geologically significant plant. How did this plant propagate?

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[2 points]

b) To which division do the ginkgos belong and when did they evolve?

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[3 points]

c) Draw one of the ginkgo leaves below. [5 points]



**Specimen 12-10 (PI 2063 and/or PI 2064):** Arthropods (Eocene, Green River Formation, Utah). You will need a microscope to see these beasties.

a) The last time we examined a beastie in this phylum, we were examining Paleozoic rocks, but those were trilobite. What are you looking at today (careful observation is needed). \_\_\_\_\_ [ 2points]

How were they fossilized?

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[3 points]

**Part Two: Cenozoic Rocks**

The following questions refer to rock specimens. The formation names and their ages are also indicated in the boxes that contain the rocks.

**Specimen 12-11 (RI 3416);** Jackson Group (Moody's Branch Formation), Eocene, Monroe Co., Alabama

a) What is the name of this rock? \_\_\_\_\_ [2 points]

b) The prominent fossil is *Periarchus lyelli*. What kind of beastie is it?

\_\_\_\_\_ [2 points]

**Specimen 12-12 (RI 3199);** Green River Formation, Eocene, Utah

a) This is a neat rock. It is a limestone, but it has undergone quite a bit of alteration. What kind of limestone was it?

\_\_\_\_\_ [2 points]

b) How did the holes form? You will not find the answer in the book; think about it.

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[3 points]

**Specimen 12-13 (RI 3441);** Wilcox Group (Salt Mountain Formation), Paleocene-Eocene, Jackson, AL

a) What is the geological name of this rock? \_\_\_\_\_ [2 points]

b) What's the yellow mineral that coats one side of the rock? (Don't guess! Test it)

\_\_\_\_\_ [2 points]

**Specimen 12-14 (RI 3361);** Tallahatta Formation, Eocene, Monroe County, Alabama

a) What is the geological name of this rock? \_\_\_\_\_ [2 points]

b) What kind of fossils does it contain? \_\_\_\_\_ [2 points]

c) How are the fossils preserved? \_\_\_\_\_ [2 points]

**Specimens 12-15 and 12-16 (RI 3361 and RI 1157);** Tallahatta Formation, Eocene, Washington County, Alabama

a) Both of these rocks are more or less the same, but one was especially useful to the indigenous people of the area. Which one was most useful? How and why?

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\_\_\_\_\_ [3 points]

**Specimen 12-17(RI 3104);** Tallahatta Formation, Eocene, Washington County, Alabama

a) Yet another chunk of Tallahatta! This one is useful for modern Alabamians (at least those who use knives and axes). It goes by the trade name of **novaculite** and is sought after as a sharpening stone. What properties make it useful for this purpose?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3 points]

b) Specimens 12-15, 12-16 and 12-17 are all from the same formation near the same location. Why are they so different in texture and appearance (**THINK** about deposition and lithification)

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**[4 points]**

**Specimen 12-18 (RI 3337);** Key Largo Formation, Pleistocene, Florida Keys

- a) What is the name of this rock? \_\_\_\_\_ **[2 points]**
- b) What fossils can you identify? \_\_\_\_\_ **[2 points]**

*There are many other beasties that we have not been able to discuss. If you are interested, ask us during the lab and we'll point some out for you.*

**Specimen 12-19 (RI 1744);** Citronelle Formation, Plio-Pleistocene, Mobile, Alabama. This rock was found right next to the USA campus. Damn near broke my toe on it!

- a) What is the geological name of this rock? \_\_\_\_\_ **[2 points]**
- b) What cement(s) are holding the sedimentary particles together?  
\_\_\_\_\_ **[2 points]**

c) Why don't we have more rocks in Mobile County? (Think age and depositional environment).

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**[3 points]**

**Part Three: One last crack at the geological map of Alabama.**

Color the Cenozoic sedimentary units on the Alabama map provided on the next page. Use the map outside of room 335 to help you with this. There is another smaller map outside of Dr. Haywick's office and it has a legend on it. Use a yellow color for the Cenozoic rocks. Use care; the Cenozoic is more variable than either the Mesozoic or the Paleozoic. **[5 points]**



**Bonus:** Help us to make this lab manual better next time it is revised. Use a separate page if you need more space **[5 points]**

1) The best thing about the lab manual is : \_\_\_\_\_

\_\_\_\_\_

2) The worst thing about the lab manual is : \_\_\_\_\_

\_\_\_\_\_

3) I would improve the lab manual by : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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Name: \_\_\_\_\_



Notes