

# GY 112L Earth History

## Lab 12

### The Cenozoic

GY 112L Instructors:  
Douglas Haywick, James Connors,  
Mary Anne Connors

Department of Earth Sciences,  
University of South Alabama

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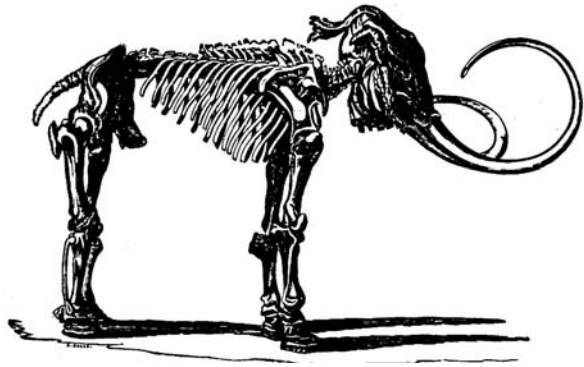
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This manual is constantly being updated and occasionally, even improved. Typos, grammatical errors and sections that make no sense whatsoever may, or may not, be intentional. If you find an error, show it to your instructor. You may get bonus points. More likely you will be told to go away

The recipes that are included in some sections are intended to prove that you can eat anything as long as you serve it with plenty of ketchup. Neither Haywick, nor the Connors are responsible for any food poisoning that might occur if you actually try them.

<http://www.southalabama.edu/geology/haywick>



## Lab 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. So are we instructors! 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 112L lab assignment of the semester. For many of you, this may be your last Geology assignment EVER. But all is not good news; next time in lab 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 fair chunk of this lab is going to be done on the basis of your notes and internet research. 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 the Lab Ten 10 lab background notes). 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 these beasts 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.

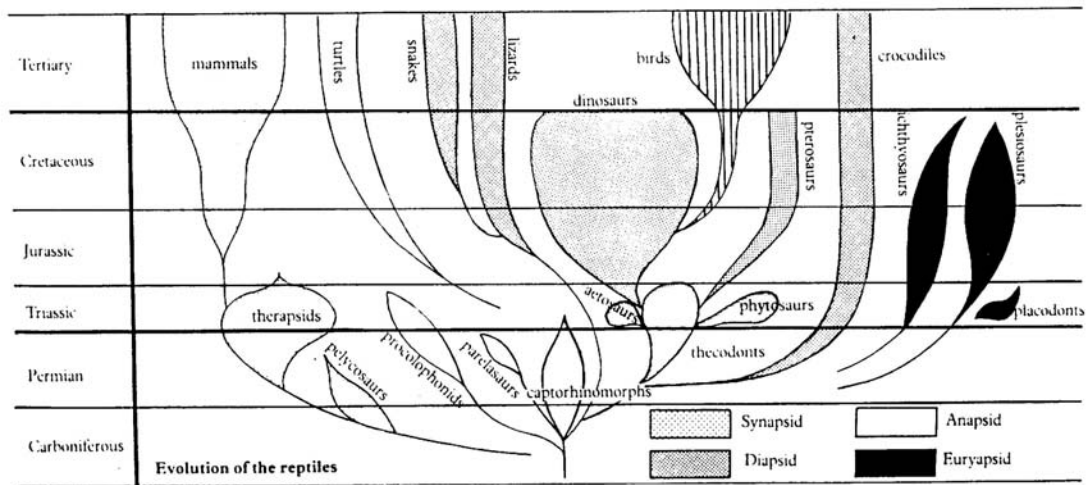
It should be noted that the turtles and snakes and lizards that we associate with the reptiles today did not directly evolve from the thecodonts. With the exception of the birds (which separated off very early in the evolution of the dinosaurs), the "terrible lizards" did not leave any real descendants. 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. All of the GY 112L instructors that use this manual really 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.



Notes

## Dead Animalia Rollos Served Over An Open Fire\*

Serves 4

1 medium sized wild Ave (e.g., turkey ) or	6 tbs. barbecue sauce or ketchup 1/2 cup wild or dehydrated onions
1 medium to large ray fin Osteichthyes (e.g. trout, salmon, snapper) or	7-8 slices of stale or dried bread salt and pepper
1 very small mammal (e.g., moose, koala, platypus, your roommate etc.)	1 glass dry white wine (chardonnay) 1 can of peas 1 bottle pinot noir or pinot gris**

First, kill something by either shooting it, catching it or throwing a large rock at it. This might depress you, so have a drink of wine. Then prepare the dead animal in order to produce 4 to 6 thin fillets of flesh. If you are using fish, carefully fillet it leaving most of the bones behind. If you are cooking wild bird, use the breast meat. Some tenderizing and flattening of the wild turkey or red meat may be necessary. You will find that a geology hammer, particularly a 6 pound sledge, is amazing well suited for tenderizing. Reduce the flesh to approximately 1/4 inch in thickness. Wow! Hard work. Have a drink of wine.

Remove any obvious mold from the stale or dry bread. Crumble it into a bowl and then add the onions, barbecue sauce (or ketchup) salt and pepper. Add enough chardonnay to the mixture to make it uniformly moist. Any remaining wine in the glass may be considered a reward for your perseverance with this recipe. Have a drink of chardonnay and then chase it down with a drink of pinot noir/gris.

Place one piece of flesh on a sheet of aluminum foil. Spread a thin layer (1/8 inch) of the bread mixture evenly over the flesh. Roll the flesh into a cylinder and then wrap it with the aluminum foil. Repeat for the remaining pieces of flesh.

Cook the rollos over a medium hot fire until they are fully cooked (from 10 to 20 minutes depending upon the type of flesh you started with). Rotate them frequently to avoid burning them too badly. Garnish your finished product with pepper and whatever spices you have on hand. Serve with canned peas, rice and more wine (lots of it!).

\* Originally published in the 1994 Geological Society of America Field Cook book

\*\* The type of wine depends on the animalia you serve. Red with mammal, white with Ave/osteichthyes