Fossils
What are fossils? How do they form?

Fossils are the preserved remains or traces of ancient animals, plants, and other organisms. The word “fossil” comes from the Latin word *fossus* which means “dug up.” Paleontology is the study of fossils.

**Body Fossils**
Preserved remains of an organism’s body parts in an original or altered state, usually in a rock matrix.

- **Shark Teeth** - Teeth are the most common vertebrate fossils. They can tell us whether they were herbivores or carnivores.
- **Musculature** - Muscle impressions may be preserved as well.
- **Fossil Plants** - Sometimes can show details of ancient plant anatomy. In some cases, such as the fossil ferns (above left), details of veins can be seen. In other cases, such as the petrified log (above right), the mineralization process did not preserve fine details of the original plant.

**Trace Fossils**
Evidence of the activity of organisms, but not a part of the organism itself.

- **Footprints or Tracks** - These impressions formed when organisms walked on soft sediments leaving a depression that was later filled in with more sediments. The picture above on the left shows dinosaur footprints from Italy. In the center is a D. rex footprint from Harney, California. The picture on the right shows tracks between the darker tips that have been made by a hominid and were found in Germany.
- **Carnivore** - Fossil from a South Carolina and weighed 1.36 kg. Carnivores can sometimes provide information about the diet of an organism.
- **Fossil Burrows** - This partial burrow (left) is called *Gyumalba*, and it is believed to be formed by crustaceans (e.g., crabs) digging into the sediments. Essentially, burrows (right) are also thought to be made by crustaceans (scales in cm).

**How fossils form:**
Several conditions must usually occur for fossils to form. First, hard parts (bones, teeth, wood, shells, etc.) are important. Only in exceptional cases have soft tissue specimens been found fossilized. Second, organisms must be quickly buried to avoid destruction. Third, the sediment must have the right geochemical properties for minerals to precipitate and possibly replace the buried organism. For this to occur water is needed, thus fossilization is more likely in the initial stages of burial, when the sediment is still wet. Fossilization is usually a relatively rapid process, otherwise organisms would decay before they could be preserved.

1. **Organism dies**
   - First, the organism dies. Those that die in the water are more likely to be preserved than those on land.

2. **Organism is buried**
   - Most organisms are eaten or destroyed before being buried. However, if they are rapidly buried they have a chance of fossilizing.

3. **Mineralization**
   - Often, permeation by mineral-laden groundwater causes replacement of the minerals (yellow dots) that make up the original organism.

4. **Water moves into pores**
   - After burial, there are several ways that the fossilization can proceed. However, these generally require water (blue dots) moving through the buried organism/sediments.