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## Pop Up Science – Fossil Shark Teeth!

### What you need

- bag of fossiliferous sediment (called matrix) from the Aurora Fossil Museum in North Carolina
- fossil picking tool (e.g., skewer, toothpick, or tweezers)
- provided grid for sorting fossils
- provided fossil ID guide
- optional: sieve
- optional: magnifying glass
- optional: cafeteria tray for easy clean-up of sediment

Follow the steps below to sort and identify your Aurora, NC, fossil shark teeth and other marine fossils!

### Preparation

1. Read the background information below.
2. Place the provided grid for sorting fossils onto your cafeteria tray or other surface.
3. Optional: Sieve the matrix so that you can discard the small sediment and pebble grains.
4. Dump your bag of fossil matrix out onto the grid.



Image from [aurorafossilmuseum.org](http://aurorafossilmuseum.org)

*Background Information (modified from [aurorafossilmuseum.org](http://aurorafossilmuseum.org)):*

The geology of the area near the town of Aurora, North Carolina, takes us back millions of years ago when the ocean covered the area of what is now part of the coastal plain. The complex sequence of sediments that make up the record of the past is exposed at the Nutrien phosphate mine located near the town of Aurora. The various layers of earth, called formations, can be seen in succession going from the surface down to the base of the valuable phosphate ore that is recovered from the mine.



Map of North Carolina, with the town of Aurora indicated in red.  
[From Wikipedia]

The fossil matrix in your bag dates to the Miocene and Pliocene epochs within the Neogene Period. The Miocene epoch spanned from approximately 23 million years ago to about 5 million years ago, whereas the Pliocene epoch is younger and spanned from about 5 million years ago to roughly 2.5 million years ago. During



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Miocene time, Aurora would have been covered by a vast embayment (a relatively shallow bay along the NC coastline). Overburden sediment of Miocene age excavated by the mining operations are known as the Pungo River Formation. The Pungo River Formation contains casts and molds of fossil shells, shark teeth, bone fragments, and abundant phosphate nodules and pebbles. During the younger Pliocene time, deeper ocean waters covered Aurora as the sea level rose and the shoreline moved inland. Overburden sediment of Pliocene age excavated by the mining operations are known as the Yorktown Formation. The Yorktown Formation contains many different kinds of abundant marine fossils, phosphate nodules, and pebbles. Of the marine fossils, you can find large whale vertebrae along with a wide variety of shark teeth – including from *C. megalodon*, forerunner of the Great White Shark!



Image from aurorafossilmuseum.org

### What to do

1. Using your fossil picking tool, choose how you'd like to sort your fossils from the sediment and phosphate pebbles on the provided grid. You may wish to put all the shark teeth along one line of the grid vs. pieces of fossilized coral, shells, or bryozoans. Or, you may wish to sort your fossils by size range. It's up to you!
2. Carefully observe the fossils; you may optionally use a magnifying glass to view them up close.
3. Comparing against the provided fossil ID guide, determine which **vertebrate** fossils you have - shark teeth, sting ray mouth plates, fish vertebrae (backbone), turtle shell, etc.
4. Comparing against the provided fossil ID guide, determine which **invertebrate** fossils you have – crab parts, clam shells, snail shells, oyster shell pieces, sand dollar & sea urchin pieces, coral, etc.



Image from aurorafossilmuseum.org

### What is happening?

Keep in mind that **vertebrate** organisms are those with a backbone or spinal column; this includes mammals, birds, reptiles, amphibians, and fishes like sharks, skates, and rays. **Invertebrate** organisms are those lacking a backbone, such as arthropods (e.g., crabs), mollusks (e.g., clams, snails, oysters), echinoids (e.g., sea stars, sand dollars), and cnidarians (e.g., coral). By sorting the Aurora fossil matrix, you have worked directly with the fossil remains of animals from the ocean of what is now North Carolina that existed anywhere from about 20 million years ago to about 2.5 million years ago!

During the Miocene and Pliocene epochs, much of what we now consider eastern North Carolina coastal plain land was covered by ocean water. Many different shark species flourished during these time periods. One reason there are so many fossilized shark teeth preserved in Aurora rock layers is because sharks have a “conveyor belt” like arrangement of teeth, so their teeth are consistently replaced by new ones throughout their lifespan. Teeth are the only truly hard parts of a shark's body (and therefore more easily fossilized), as sharks have a cartilage skeleton. Thus, with lots of sharks swimming around dropping their teeth to the seafloor, no shark bones, and the right fossilization conditions, you get TONS of ancient shark teeth preserved in the Pungo River and Yorktown Formations!



FOSSIL SORTING GRID


Note: The most common/plentiful fossil shark teeth in this matrix are:

- Requiem shark (*Carcharhinus leucas*)
- Sand shark (*Carcharias taurus*)
- Tiger sharks (*Galeocerdo contortus* and *Galeocerdo cuvier*)
- Snaggletooth shark (*Hemipristis serra*)

Note: Mouth plate parts from sting rays (*Myliobatis spp.*) are common in this matrix as well.