Station 1. Original marine fossils

This is a common mode of preservation for marine organisms with calcite (CaCO­3) shells.

A. Crinoids and brachiopods. Both of these marine groups, extremely common in Paleozoic shallow oceans, produce calcite shells that preserve very well in their original material. (Neither is extinct today, although they have become rarer.)

B. Tabulate corals (extinct for 250 million years; sometimes called “Petoskey stones”). Both extinct and modern coral animals, tiny relatives of jellyfish, deposit calcite in a tube around their bodies for protection. The reefs made by this process are often preserved almost intact in original material.

C. Modern nautilus shell

D. Two ammonites. These specimens still have the original luster of the “mother-of-pearl” visible in the modern nautilus, showing that the original aragonite crystal structure is intact. (Ammonoids are an extinct Mesozoic group of shelled cephalopods, related to the modern nautilus and the family containing squids, octopuses, and cuttlefish).

Station 2. Trace fossils

Two seafloor slabs with different kinds of worm trace fossils, later filled in with sediment:

A. Burrows (concealed/protected living space)

B. Feeding traces   
  
C. Rock-eating clams. These molluscs dissolve or scrape away tunnels in the rock and live inside them for safety.

D. This piece of bone has a series of parallel striations, interpreted as gnaw marks from a small mammal.

* What unique information do trace fossils provide, as compared to body fossils?

Station 4. Casts and molds

These slabs show brachiopods in various states of preservation. The small box contains some brachiopods so you can get a sense of what they look like.

A. Intact brachiopods with original material

B. Brachiopod molds and casts

* What might have happened to the original material?
* What features of the fossils can you see in specimens B that you can’t see in specimens A?

Station 5. Permineralization

Permineralization means that groundwater has deposited its dissolved minerals into the pores of the original material. This is a common mode of fossilization for wood and bone.

A. Red specimen - permineralized wood.

In this case, the mineral deposited in the pores of the wood is red jasper (impure silica, SiO­­­2).

B. Modern Elk bone

C. Assorted permineralized bone

* Compare the surface texture and density of the two specimens.

(One common test for permineralization is to lick the specimen - the pores in non-mineralized bone make it feel “sticky” while mineralized bone is smooth. You don’t have to do this, though. In fact, if you’ve got a cold, please don’t.)

Station 6. Carbonization

This is a common mode of fossilization for plant material, and for some animal tissues, which results when the organic material is compressed and heated.

A. Coal from wood. This is a chunk of carbonized tree trunk from the Carboniferous

B. Coal from leaves. Many layers of leaves are compressed into this one block.

C. Carbonized plant material with mud deposited during formation; note that this results in a very different texture compared to A.

D. Tall black wood specimen - partially permineralized, partly carbonized.

E. A concretion from the famous Mazon Creek formation of Illinois, preserving a tree fern frond. Note the level of detail you can observe; this is characteristic of Mazon Creek specimens.

F. Carbonized fossil eurypterid (“sea scorpion”, an extinct group of arthropods related to horseshoe crabs).

Station 7. Replacement

In these examples, the original shell material has been replaced with pyrite (FeS2), also known as “fool’s gold”, or silica (SiO2).  
  
A. Original material brachiopods (for comparison)

B. Pyritized brachiopods.

C. Silicified brachiopods

* Closely observe the pyrite and silica specimens. How good is the preservation?
* What’s the advantage to a paleontologist of this mode of preservation? (Hint: The original material of these specimens was calcium carbonate, the same chemical composition as the mud in which they were embedded.)

Station 8: Assemblages and burial conditions

These examples illustrate the effects of different conditions of burial on the resulting fossil.

A. Crinoid (sea lily) on slab. Specimen still complete and articulated.

B. Crinoid slab. Crinoids disarticulated.

* What does the difference between articulated and disarticulated specimens tell us about the conditions of burial?

C. Seafloor slab. Look at the side of the slab to see the difference in the amount of damage to the shells in different layers.

* What kind of processes might it take to produce a rock like this? How much time might it represent?

D. Ammonite block. All the fossils here are of the same species and similar size. (Also the preservation of the mother-of-pearl iridescence.)

* How might a fossil like this be produced?

Station 9. Pseudofossils

These specimens look somewhat like they could be parts of organisms, but are actually abiotic (non-biological) in origin.

A. Sandstone concretion

B. Dendritic minerals in platy limestone

* How could we find out whether these were of biological origin?
* Thinking back to Steno’s solid-in-a-solid problem which we discussed in lecture, how could these be formed other than by living organisms?