FOSSILS

PLEASE, PICK UP OUTLINE FROM THE FRONT TABLE!

*recommend adding the extra stuff to the notes

FORMATION OF FOSSILS

- **"Fossus"- means to dig up**
- **Fossils are preserved remains or traces of living things.**
- **Most fossils form when living things die and are buried by sediments.**
- **The sediments slowly harden into rock and preserve the shapes of the organisms.**
- **Paleontologists are scientists who study fossils.**

Commonly Preserved:

Hard Parts of Organisms:

- **Bones**
- **Shells**
- **Hard Parts of Insects**
- **Woody Material (trunks)**

Rarely Preserved

Soft or Easily Decayed Parts of Organisms:

- **Internal Organs**
- **Skin**
- **Hair**
- **Feathers**
- **Leaves**

Where Fossils Occur

Almost exclusively in sedimentary rocks

- **Heat of melting or metamorphism would destroy almost every type of fossil**

Rare Exceptions:

- **Some fossils in low-grade metamorphic rocks**
- **Trees buried by lava flow**

To be preserved, organisms have to be:

- **Buried rapidly after death**
- **Preserved from decay**

What do fossils tell us?

- **Fossils provide evidence of how life has changed over time.**
- **Fossils help scientists infer how Earth's surface has changed.**
- **Fossils are clues to what past environments were like.**

The Fossil Record and life

- **The fossil record provides evidence about the history of life on Earth. The fossil record also shows that different groups of organisms have changed over time.**
- **Evolution is the gradual change in living things over long periods of time.**
- **Extinct means an organism no longer exists and will never again live on Earth.**

Types of fossils

No need to write

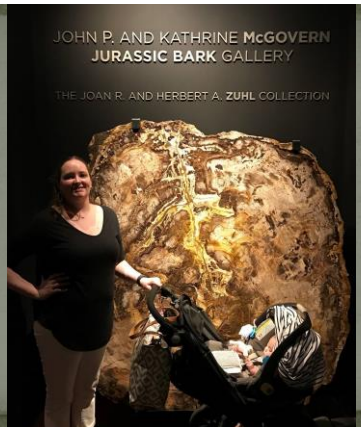
- **Petrified fossils**
- **Molds and casts**
- **Carbon films**
- **Trace fossils**
- **Preserved remains**

Petrified Fossils

- **Fossils in which minerals replace all or part of an organism.**
- **How does this happen?**
  - **Water rich in dissolved minerals seeped into spaces, evaporated, leaving the hardened minerals behind.**
- **Example – petrified wood**

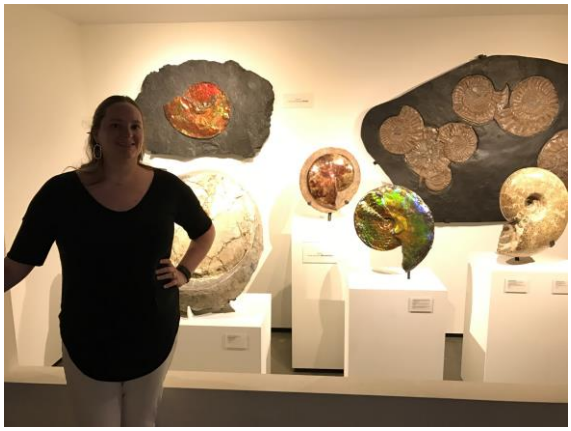
Types of Petrification

- **Permineralization**
  - **Mineral matter from percolating ground waters is added to pores and cavities in bones, shell, teeth, etc.**
  - **The original material is still present with new mineral matter added to the void spaces.**
  - **Many dinosaur bones are preserved by this method.**



Types of Petrification

- **Replacement**
  - Original hard parts are replaced with new mineral matter of a different composition than the original
  - Silica (SiO_2), iron oxide (Fe_2O_3), and calcium carbonate ($CaCO_3$) are common replacement minerals
  - Many dinosaur bones are both permineralized and partially replaced.



Types of Petrification

- **Recrystallization**
  - The original mineral crystals grow larger and fill most of the void space.
  - More common in invertebrate fossils (clams, brachiopods, gastropods, etc.) than in vertebrate fossils.
  - Usually destroys or partially obscures the original microstructure of the skeletal material.

Molds and Casts

- **Most common** type of fossil.
- Both copy the shape of the organism.
- A mold is a hollow area of sediment in the shape of the organism.
- A cast is a copy of the shape of an organism.

Mold

Mold

Cast

Natural casts of shelled invertebrates

Carbonization

- **Carbon film is an extremely thin coating of carbon on rock.**
- **How does this happen?**
  - **All organisms are made of carbon. When they are buried, the materials that make up the organism evaporate. These gases escape leaving carbon behind.**

Carbon film

Trace Fossils

- **Trace fossils provide evidence of the activities of ancient organisms.**
  - **Examples**
    - **A footprint provides clues about the size and behavior, the speed, how many legs it walked on, if lived alone or with others.**
    - **A trail or burrow can give clues about the size and shape of the organism, where it lived, and how it obtained food.**

A dinosaur footprint

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Dinosaur Valley State Park

Dinosaur tracks 113 mya

Preserved remains

- Preservation of remains with little or no change.
- Preservation material;
  - **Tar**
    The sticky oil that seeps from Earth's surface. Tar soaks into the organisms bones, preserving the bones from decay.
  - **Amber**
    The hardened resin, or sap, of trees. The amber seals the organism from the air protecting it from decay.
  - **Ice**

TAR PIT (famous tar pit found in CA)

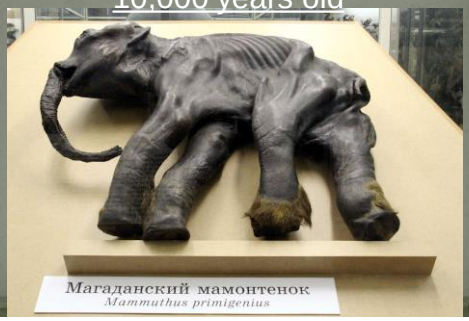
49 million years old frog

AMBER

25 million year old flying ants

Ice - Baby Mammoth

10,000 years old



What is a fossil?

Is

- Dinosaur bone
- Mammoth frozen in ice
- Dinosaur tracks
- Ancient shark tooth
- Egyptian mummy
- Dinosaur excrement
- Roman Skull
- Insect trapped in amber
- Petrified wood
- Cast of a shell in rock
- Leaf imprint in rock
- Piece of dinosaur egg shell

Is not

- Sedimentary rock
- Air trapped in ice
- Prehistoric cave drawing
- Prehistoric tool
- Hardened lava
- A 1 byo rock
- Old carved gravestone
- Ancient arrowhead