How to become a fossil...

1. Die
2. Escape decay and destruction
3. Become buried in sediments
4. Remain intact until lithification

Surviving decay and destruction

- Unlikely to persist for more than a few days.
  - Soft tissue - hair, muscle, skin, organs.
- Usually Not Fossilized!
- Will survive if buried in sediment.
  - Mineralized tissue - teeth, bones, shell.
- Commonly Fossilized!

- Will survive if buried in sediment.
  - Wood and plant tissue
- Sometimes Fossilized!
Preservation of soft tissues

- Soft tissues are preserved only under exceptional conditions:
  - Trapped in amber
  - Mummification
  - Freezing in ice
- Soft parts can also be preserved after being replaced by minerals.

Amber

- Amber is fossilized tree sap.
- Chemicals within amber have antibacterial properties.
- Rare prior to the Cretaceous.

Frozen Mammoths
Mummified Dinosaur (Hadrosaur)

- No original tissue remains, although the skin, muscles, and tendons dried out and lasted long enough to be replaced by mineral.

Original Hard Parts

- Shell - calcium carbonate, silica
- Bones and Teeth - calcium phosphate

Bone, Teeth, Ivory - Mastodon (13,550 yrs old)
**Recrystallized Hard Parts**

- Mineral crystals within an organism's hard parts may re-grow to become larger and consolidated.
- Often recrystallization destroys fine, internal detail within a fossil.
- Most Paleozoic shells have been recrystallized to some degree.
Carbonization

• Organic material is preserved undecayed through burial.
• Volatile organic elements, such as hydrogen, oxygen, and nitrogen are driven off.
• Organic-laden hard parts and soft parts preserved as a thin film of organic carbon.

Graptolites are commonly preserved through carbonization

Permineralization

• Impregnation of bone and wood with mineral.
• Also called “petrification”
Mineral Replacement

- Silicification - replacement of calcite by silica.
- Pyritization - replacement of calcite or soft tissues with pyrite.
- Phosphatization - replacement of low phosphate apatite with high phosphate apatite.

Molds and Casts

- Molds are imprints left from something that was buried and then decayed or dissolved.
- Casts are formed when sediment leaks into a mold and hardens to form a copy of the original structure.
• The remains of an organism's activities
• Footprints, trails, burrows, eggs, coprolites

Dinosaur trackway, Yemin
Trilobite trackways

Large dinosaur coprolite, attributed to *Tyrannosaurus rex*