

Teaching Materials Associated with Module 7

Taphonomy:

- Field created by Ivan Yefremov, a Soviet Union scientist and science fiction writer, in the 1940s
- Study of what happens to an organism until its discovery as a fossil (remains of organisms found in geological beds)
- Useful to understanding the paleoecology and life-history of the organism
- Understand the bias in the assemblage (group of fossils found together)
- Sedimentary rock preserves fossils
- Fossils:
 - Preservation potential:
 - Anatomy-- harder, dense bones more likely to survive
 - Predators-- areas with few predators
 - Climate-- dry
 - Burial-- rapid with less biological activity
 - Destructive forces-- lack of forces to destroy remains
 - Stages of formation
 - Organism dies and decomposes
 - Remains are quickly covered by sediments
 - Sediments press down on the remains and more layers are added
 - Minerals from groundwater in the sediments fill in spaces in the bone (mineralization)
 - Combination of pressure, chemical reactions, and time makes the remains a fossil
- Bias:
 - Anatomy-- some bones more likely to preserve than others
 - Size-- larger bones are more likely to survive destructive forces
 - Habitat-- certain climates are more likely to preserve remains
 - Post-mortem (after death) movement-- scavenging, trampling, water transport
 - Interpretation by scientist-- recognition of fossil, motivation, method of excavation

Stratigraphy:

- The description of all rocks that form the Earth's crust and their organization into distinct and useful units based on their properties to determine their distribution in space and their succession in time
- Relative dating method
- Horizontal layers of crust are called strata
- Law of Stratigraphic Superposition
 - A rock unit is younger than the one below and older than the one above
 - Exception: major disruption of the layer (example: a trench can go through multiple layers)

- Depositional environment types
 - Volcanic deposits
 - Lacustrine or lake deposits
 - Fluvial or river deposits
 - Cave deposits
 - Fossil soils or paleosols
 - Alluvial fan deposits
- Creates geological context, which allows paleoanthropologists build the story around the fossil
 - The context reveals age, environmental indicators for specific habitats and environmental changes over time, paleogeography, and history of assemblages

Faunal Correlation:

- Also called biostratigraphy
- Relative ages determined from fossil assemblages-- relative dating method
 - It relies on the physical zone of the assemblage in the stratigraphy to determine age in different localities
 - The presence of a specific fossil in two different localities means that that layer of stratigraphy were deposited at the same time
- Index fossils are used as markers for particular time periods
 - To be an index fossil, it must be wide-spread, show rapid evolution, have substantial number of fossils, and are robust
 - Difficult to satisfy all aspects to be index fossil
 - Wide-spread= often limited to certain regions or only found in particular depositional environment
 - Rapid evolution= morphology needs to be easily recognized as that species
 - Substantial number of fossils= so that they can be observed
 - Robust= so that they can be fossilized

Vocabulary:

- Taphonomy
- Fossil
- Paleoecology
- Bias
- Assemblage
- Sedimentary rock
- Mineralization
- Post-mortem
- Stratigraphy
- Relative Dating
- Superposition
- Depositional environments
- Faunal correlation/biostratigraphy
- Robust

Related videos:

Why don't all skeletons become fossilized?:

<https://www.youtube.com/watch?v=Av21EY6rGWs>

Stratigraphy: A Key Tool at Koobi Fora:

<https://www.youtube.com/watch?v=OhO0JezdxYM>

This module has been adapted from the following sources:

<http://paleo.cortland.edu/tutorial/Taphonomy%26Pres/taphonomy.htm>

<https://www.eoas.ubc.ca/courses/Dist-Ed/EOSC116/eosc116-Lesson22.html>

<http://mygeologypage.ucdavis.edu/cowen/historyoflife/biases.html>

<https://australianmuseum.net.au/how-are-fossils-formed>

<http://www.stratigraphy.org/upload/bak/defs.htm>

<http://www.indiana.edu/~g302/time.pdf>

http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000010ES/P001694/M020136/ET/1494502359044.N009.ES07-268Depositionalenvironments.pdf

<https://www.nature.com/scitable/knowledge/library/dating-rocks-and-fossils-using-geologic-methods-107924044>

<https://www.nps.gov/subjects/fossils/significance.htm>

<http://www.mcz.harvard.edu/Departments/InvertPaleo/Trenton/Intro/GeologyPage/Sedimentary%20Geology/biostrat.htm>

<https://www.uvm.edu/perkins/evolution/qanda/?Page=time/faunal.html&SM=time/timemenu.html>