

Earth Science 105

Geologic Time

Chapter 11

Earth Science 11th ed.

Tarback & Lutgens

Correlation of rock layers

Matching same age rocks

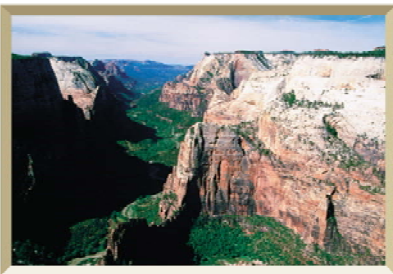
- In local area
- Across wide area
- In different regions



Grand Canyon National Park



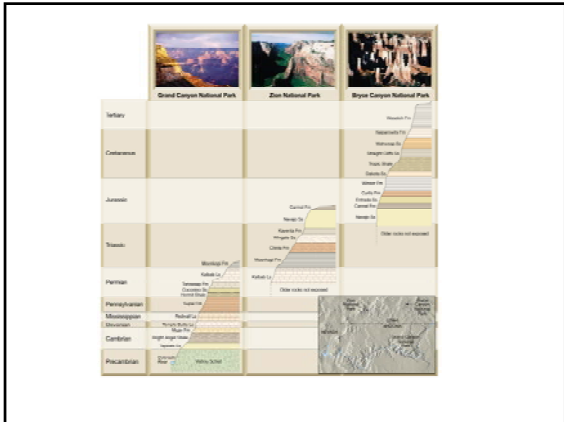
Bryce Canyon National Park



Zion National Park

Correlation of rock layers

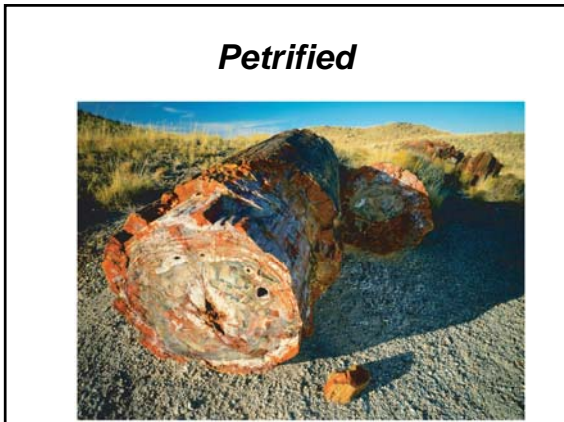
- Matching rocks of similar age in different regions
- Often relies upon fossils



***Fossils:
evidence of past life***

Remains or traces of prehistoric life

- Types of fossils***
- Petrified
 - Formed by replacement
 - Mold
 - Cast
 - Carbonization
 - Impression
 - Preservation in amber
 - Indirect evidence



Petrified

Formed by replacement

Cell material is removed and replaced with mineral matter

Mold

Shell or other structure is buried and then dissolved by underground water

A photograph of a fossilized ammonite shell embedded in a light-colored rock matrix. The shell is dark and shows a clear spiral pattern.

Shape is preserved in the surrounding sediment

<http://www.ammonoid.com/Manning.html>

Cast

Hollow space of a mold is filled with mineral matter



Carbonization

Organic matter becomes a thin residue of carbon. This is a 'compression' of the original organism



Impression

Replica of the fossil's surface preserved in fine-grained sediment



Preservation in amber



Indirect Evidence Includes

- Tracks
- Burrows
- Coprolites
 - fossil dung and stomach contents
- Gastroliths
 - stomach stones used to grind food by some extinct reptiles

Tracks

Dinosaur footprint in fine-grained limestone near Tuba City, Arizona.



Conditions favoring preservation

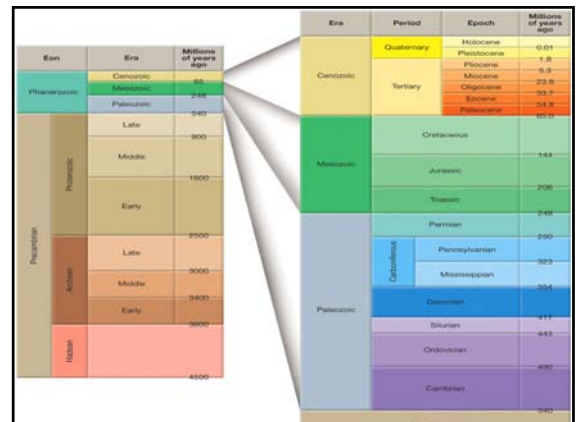
- Rapid burial
- Possession of hard parts

Fossils and correlation

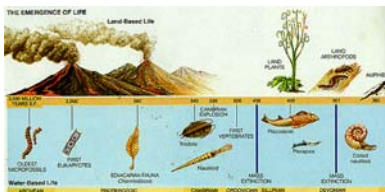
- Principle of faunal succession
- Index fossils

Principle of faunal succession

- Proposed by William Smith – late 1700s
- Fossil organisms succeed one another in a definite and determinable order, therefore any geologic time interval can be recognized by its fossil content

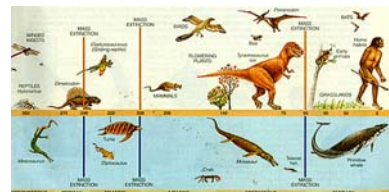


Archean through Devonian



http://rst.gsfc.nasa.gov/sect2/sect2_1b.html

Carboniferous through Quaternary



http://rst.gsfc.nasa.gov/sect2/sect2_1b.html

Cambrian Marine Life



<http://www.handprint.com/PS/GEO/geoevo.html>

Trilobite



<http://www.ststephens.it/biology/fossils.html>

Crinoid—



http://www.lsa.umich.edu/exhibitmuseum/exhibits/temporary_exhibits/

Ordovician sea floor



UofM Exhibit Museum of Natural History

<http://www.uwsp.edu/geo/faculty/hefferan/Geol106/CLASS6/MAIN%20PAGE.htm>

Ordovician Invertebrates



<http://www.handprint.com/PS/GEO/geoevo.html>



• Silurian Reef

<http://hoopermuseum.earthsci.carleton.ca/camex/1/paleoreef.html>

Silurian Landscape



http://www.nasa.gov/worldbook/earth_worldbook.html

Devonian Sea



<http://www.handprint.com/PS/GEO/geoevo.html>

Mid Paleozoic



FIGURE 6.10 – The Paleozoic Age saw many forms of life flourishing on planet Earth. In this artist's conception, some life ekes out a sparse living—mostly in the sea, such as the trilobites and sponges on the ocean floor and the jellyfish-like creatures nearer the ocean surface. Yet, as suggested by this painting, simple life forms were beginning to make their way onto the land. (Smithsonian)

http://www.tufts.edu/as/wright_center/cosmic_evolution/docs/text/text_bio_4.html

Late Paleozoic



FIGURE 6.12 – This painting captures a scene toward the late-Paleozoic. Life had diversified and become more robust—as depicted here both by the variety of (now extinct) fish and also by an increased presence of plants on the land. (Smithsonian)

http://www.tufts.edu/as/wright_center/cosmic_evolution/docs/text/text_bio_4.html

Carboniferous Fern Forests



<http://www.handprint.com/PS/GEO/geoevo.html>

Permian Reptiles

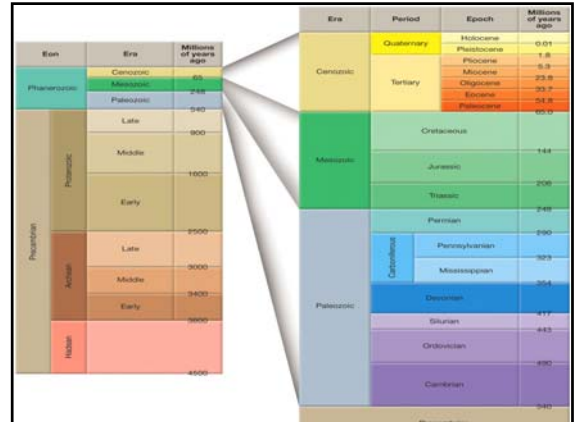


<http://www.handprint.com/PS/GEO/geoevo.html>

Permian Sea



<http://www.handprint.com/PS/GEO/geoevo.html>



- Link to hypotheses of the Permian Extinction

http://en.wikipedia.org/wiki/Permian_extinction

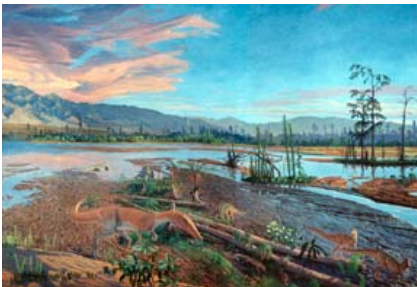
Mesozoic



FIGURE 6.13 — The Mesozoic Age saw a continued increase in the diversity of life forms especially among the land plants, and not least the first appearance of the mammals—all of which, however, were completely dominated by the dinosaurs.

http://www.tufts.edu/as/wright_center/cosmic_evolution/docs/text/text_bio_4.html

Mesozoic



<http://geography.berkeley.edu/ProgramCourses/CoursePagesFA2002/Geog40/Geog40.Week7.html>

Mesozoic



<http://serc.carleton.edu/introgeo/earthhistory/dinosaur.html>

Mesozoic



<http://geography.berkeley.edu/ProgramCourses/CoursePages/FA2002/Geog40/Geog40.Week7.html>

Archeopteryx



<http://www.researchcasting.ca/sulpt%20miami.htm>

Mesozoic Mammal



- Eomaia

<http://www.amnh.org/exhibitions/dinosaurs/diorama/>

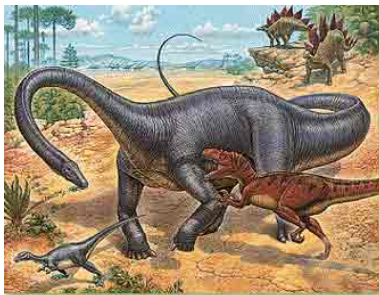
Mesozoic Mammal



- Repenomamus

http://www.amnh.org/science/papers/mesozoic_mammal.php

Jurassic



http://www.worldbook.com/features/dinosaurs/html/world_mesozoic.html

Cretaceous



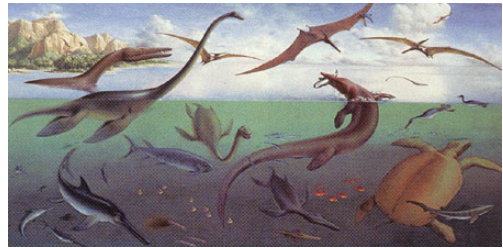
http://www.worldbook.com/features/dinosaurs/html/world_mesozoic.html

Mesozoic Sea



<http://geography.berkeley.edu/ProgramCourses/CoursePagesFA2002/Geog40/Geog40.Week7.html>

Mesozoic sea

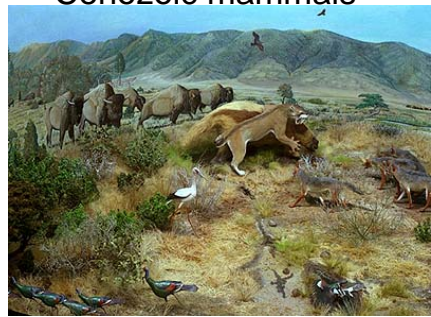


<http://www.uky.edu/AS/Geology/webdogs/time/mesozoic/mesozoic.htm>

Cretaceous Extinction

- Perhaps 60% of species died
- Result of radical change in environment
- Perhaps Earth encountered a large meteorite—
 - 10 km in diameter
 - 90,000 km/hr
 - Equivalent to 100 megatons of TNT exploding

Cenozoic mammals



<http://www.handprint.com/PS/GEO/geoevo.html>

Cenozoic



<http://www.handprint.com/PS/GEO/geoevo.html>

Cenozoic



<http://www.uky.edu/AS/Geology/webdogs/time/cenozoic/cenozoic.htm>

Cenozoic

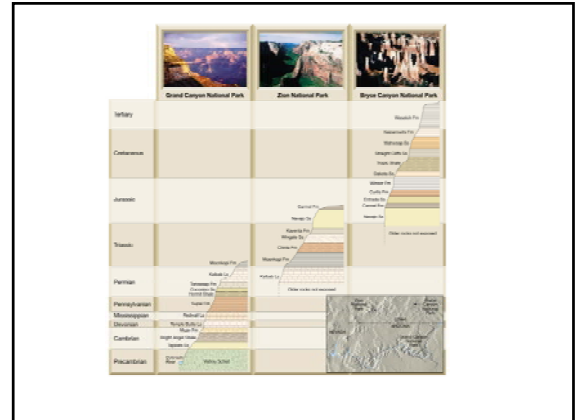
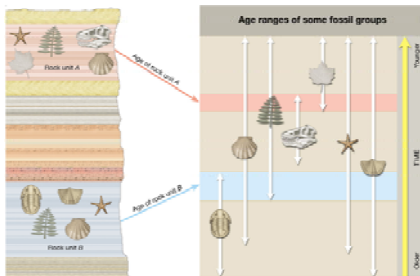


http://www.copyrightexpired.com/Heinrich_Harder/cenozoic.html

Index fossils

- Widespread geographically
- Existed for a short range of geologic time

Use of Index Fossils



LABS MEET NEXT WEEK

- Bring your lab manual to every lab class!!
- Do the pre-lab activity, even if your instructor does not assign it!!
- Bring a calculator, your textbook, something to write with
- Next week we will be in NS 017 (downstairs at the south end)

LAB TERMS

- Stratification
- Bed
- Stratigraphy
- Original horizontality
- Superposition
- Unconformity—misspelled in lab book
- Cross-cutting relationships
- Lateral continuity