

Fossils and Ancient Life

- paleontologists are scientists who study fossils
- they collect information about fossils and put it into a fossil record -> shows how species lived and have changes over time
- 99% species on earth are extinct

How Fossils Form

- 1) water carries small rock particles to lakes and seas
- 2) as layers of sediments build up over time, dead organisms sink to the bottom and become buried
- 3) the layers of sediment compress and turn into rock -> fossils
- 4) the fossils are later discovered and studied

Interpreting Fossil Evidence

- paleontologists determine a fossil's age using two techniques: relative and radioactive dating

Radioactive & Relative Dating

- in relative dating, the age of one fossil is determined by comparing its placement with other fossils in other layers of rock
 - scientists use index fossils to compare the relative ages of fossils
 - index fossils are species that are easily recognized and have existed for a short period of time but have had a wide range of geographic range
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- in radioactive dating, half-lives are used to determine the age of a fossil
 - a half-life is the radioactive atoms in a fossil to decay
 - age is calculated based on amount of remaining radioactive isotopes contained

Geologic Time Scale

- geologic time scale is divided into eras and periods
- eras are Cenozoic, Mesozoic, Paleozoic, and Precambrian Time
- periods range from tens of millions of years to less than two million years

Macroevolution

- macroevolution are large scale evolutionary patterns and processes that occur over large periods of time
- this includes:
 - 1) extinction
 - 2) adaptive radiation
 - 3) convergent evolution
 - 4) coevolution
 - 5) punctuated equilibrium
 - 6) changes in developmental genes

Extinction

- extinction happen b/c of competition for resources & environmental changes
- some species extinctions are caused by natural selection
- mass extinctions have wiped out ecosystems b/c environment was collapsing
- mass extinctions are caused by volcano eruptions, shifting continents, and sea level changes
- mass extinctions provide opportunities for new species and surviving species

Adaptive Radiation

- periods of evolutionary change in which groups of organisms form many new species whose adaptations allow them to fill different niches in their environment
- diversity of life fueled by adaptive radiation
- large scale changes; ex: dinosaurs -> reptiles today

Convergent Evolution

- when adaptive radiation occurs -> natural selection molds different body structures
- the process where unrelated organisms come to resemble one another is convergent evolution
- ex: dolphin and sharks body structure; penguin and dolphin nose and mouth

Coevolution

- the process where two species evolve in response to changes in each other over time is called coevolution
- ex: snakes and rats; snakes evolve -> more poison, rats evolve -> more resistance

Punctuated Equilibrium

- punctuated equilibrium is the pattern of long, stable periods interrupted by brief periods of rapid change

Developmental Genes and Body Plans

- changes in the expression of developmental genes can explain differences in evolution
- one type hox genes provide positional information in an animal embryo
- small changes in regulatory sequences of particular genes can lead to major changes in body form

