

Study Guide Number 2

Geologic Time: Sedimentary rocks provide best evidence of earth history; Geologic Time Scale - put rocks into a time perspective. We distinguish two types of geologic time: 1) Relative ages or dating 2) Absolute age; Relative Dating and the Stratigraphic Record 1) the principle of original horizontality (2) the principle of superposition ; Lithostratigraphy: lithostratigraphic units: bodies of sedimentary, extrusive igneous, metavolcanic or metasedimentary rock distinguished on the basis of lithologic (observable rock) characteristics. They carry no connotation of age. Generally map and identify formations. - the fundamental unit of lithostratigraphy; Contacts Between Units - The Mark of Missing Time; Layers of rock are said to be conformable when they have been deposited essentially without interruption; unconformity - a surface of nondeposition or erosion; Hiatus: actual time loss; Types of unconformities: 1) angular unconformity - a surface separating tilted or folded strata from overlying undisturbed strata; 2) disconformity - a surface of unconformity separating essentially parallel strata; Principle of cross-cutting relationships; Inclusions.

Facies - set of characteristics of a rock body representing a particular local geologic environment.

Fossils: used to compare two widely spaced geologic areas; to detect missing time intervals; to correlate the ages of rocks

Fossils - the remains of ancient organisms. study of history of ancient life and fossils - paleontology.

Correlation: William Smith (1793) - surveyor in southern England; fossils could date relative ages of sedimentary rocks. faunal succession index fossils - fossil species and genera that are especially well suited to correlation procedures.

Rock Stratigraphic Units - mappable assemblages of strata distinguishable by physical criteria.

(Groups, formations, members). Geologic Time Units - consist of segments of continuous geologic time distinguished on the basis of the rock record. (Eras, periods, epochs, ages). Time Stratigraphic units - time represented by a body of rock. They are strata deposited during finite portions of geologic time and preserved as part of the stratigraphic record. They often can be defined only by their fossils. (System, series, stages).

Radioactivity and Radioactive Dating: Used to get absolute age dates. Radioactivity provides a reliable means of calculating the ages of rocks and minerals - radiometric dating. 1) The rates of decay of many isotopes have been precisely measured and do not vary; 2) Each radioactive isotope has been decaying at a fixed rate since the formation of the rocks in which it occurs; 3) The products of decay have been accumulating at a corresponding rate.

Half-life - time required for 1/2 of the nuclei in a sample to decay; if the age of the half life is known, and we can calculate the parent-daughter ratio, we can calculate the age. The Geologic Time Scale:

The time scale divides the 4.6 b.y. earth into many units which can provide meaning to the major events of the geologic past; First major break between the Precambrian and the Phanerozoic at 570 Ma where rocks begin to contain an abundance of life. Phanerozoic Eon into: 1) Paleozoic Era - ancient life; 570-245; 2) Mesozoic Era - middle life 245-65; Age of Reptiles; 3) Cenozoic Era - recent life 65--1; Age of Mammals; Each era is subdivided into periods. Precambrian represents 85% of earth history. First abundant fossil evidence in Cambrian Period. Prior to this simple life forms existed.

Plate Tectonics: 1960s - theory of plate tectonics fostered a revolution in geology. Movements of segments of Earth's crust in relation to one another. Continental drift : idea that continents move horizontally over Earth's surface. Arguments of two scientists important in the earliest 20th century: Alfred Wegener (1915) - The Origins of the Continents and Oceans: 1) set forth his hypothesis of Continental Drift. 2) ~200 Ma, a supercontinent called Pangaea existed after which it began to split up. Early Evidence: 1) Obvious fit of certain continents. 2) Fossils 3) Structural similarities 4) Paleoclimatic data Paleomagnetism - study of fossil magnetism; Sea-Floor Spreading: Harry Hess

(1960) Convection motion within the mantle. Guyots; Earth's magnetic field periodically reverses polarity. Present day field-normal polarity; reverse polarity is opposite; Fred Vine and Drummond Matthews: interpreted magnetic stripes on sea floor. Divergent Boundary - at mid-ocean ridge; Plates are consumed at convergent boundaries - subduction zones; Trenches - located along subduction zones or convergent boundaries; Can measure sea floor spreading rates with paleomagnetic reversal dates: Age of ocean basins ~165 - 175 Ma. Continents are older than the ocean basin(s); The outer rigid lithosphere consists of several individual segments called plates. About a dozen large plates have been recognized. Plate Boundaries: 1) divergent; 2) convergent; 3) transform; Earthquakes : plate tectonics model accounts for global distribution of earthquakes; 90% at plate boundaries -found at all 3 types of boundaries; Hot Spots: Rising plume of mantle material

Earthquake - a shaking or vibration of the ground; Focus - point at which slip initiates. Epicenter - geographic point on Earth's surface directly above focus. Slip - displacement distance. foreshocks - or small earthquakes, often precede a major earthquake by several years. aftershocks - are smaller earthquakes produced by additional movements and adjustments in the rocks for several days following the main quake. Seismology - study of earthquake waves. Seismic waves - recorded with a seismograph. Seismograms - records obtained from seismographs; Seismic waves - elastic energy that radiates out in all directions from the focus. Two main groups of seismic waves are generated by earthquakes: 1) surface waves - travel along the outer part of the earth. 2) body waves - which travel through earth's interior. Body waves are divided into: a) primary or P waves -compressional waves; b) secondary or S waves - shear waves. P waves travel through solids and liquids. S waves travel only through solids. P waves arrive first at the recording station (primary waves); 2) S waves (secondary waves follow); 3) surface waves arrive last. Surface waves have the greater amplitude and are most destructive, followed by S waves and then P waves. The epicenter is the location on the surface directly above the focus. The difference in velocities of P and S waves provides a method for determining the distance to an earthquake. Earthquake intensity - measure of the effects of an earthquake at a particular locale. Describes destructiveness. Earthquake magnitude - measure of the strength (size) of an earthquake. Richter scale. The amount of structural damage attributable to the vibrations depends on several factors: (1) the intensity and duration of the vibrations; (2) the nature of the material upon which the structure rests; and (3) the design of the structure. Tsunamis: seismic sea waves.

Structures:

folding, faulting
dip, strike
forces (compressive, tensional, shearing)
brittle, ductile behavior
anticline, syncline
limb, axial plane, fold axis
plunging folds
dome, basin

Earth's Interior:

shadow zone
Moho, convection
core, mantle, crust
lithosphere, asthenosphere