

## EPS 3800 E S

We will be throwing hundreds of earth science terms at you. You must learn these vocabulary words – so that you can understand what Geologists are talking about. If you have trouble recognizing a vocabulary word/technical term in a homework problem, LOOK IT UP. Your textbook has a “Key Words” list at the end of each chapter, and a “Glossary” – a mini dictionary – at the end of the book.

Scientists are explorers. We use logical reason and empirical evidence to understand how and why the natural world is the way it is.

SCIENTIFIC METHOD: OBSERVATION raises question or problem/gather DATA (sometimes in experiments/sometimes with very careful field observations)/ANALYZE data/propose PREDICTIVE (not just explanative) HYPOTHESIS/TEST prediction (more EXPERIMENTS/more very careful field observations/take MEASUREMENTS)/discard falsified hypothesis/keeping proposing and testing hypotheses/confirmation gives evidence proof/well proven hypothesis becomes THEORY as conditional truth

a theory is well proven, not a guess

science predicts future events; theories are true because they make accurate predictions

## P1: U

The Earth is not alone; it and we are part of a Universe.

The Universe has a beginning. Space and time came into being at the BIG BANG  $\approx$  13.8 billion years ago. The exact nature of the Big Bang is still uncertain, but we know it was extremely hot and dense. There is no “before” or “outside” the Universe, because space and time are properties of the Universe. The questions make no scientific sense. However, many philosophers and theologians like to speculate.

Evidence for the Big Bang: Cosmic Microwave Background Radiation, red shift of light of distant galaxies,

GALAXIES and the Milky Way

the STARS; the Sun is a star

the NEBULAR HYPOTHESIS of the origin of the Solar system  $\approx$  4.5 bya

HELIOCENTRIC model; GEOCENTRIC is wrong!

the SOLAR SYSTEM: the Sun/planets/moons/asteroids/Kuiper Belt Objects

other stars have their own solar systems

**P**     **2:**    **E**

It's best to use a round globe to visualize the round Earth, because a flat map badly

PLATE TECTONICS: the Earth's solid - RIGID - crust (the lithosphere) is cracked into about two dozen large pieces (plus many small ones) like a cracked eggshell, that float above the hot liquid mantle, and are constantly but slowly moved by CONVECTION CELLS in the hot liquid rock

convection: hot things rise/cold things sink which cycles mantle rock around

RADIOACTIVE elements (mostly uranium) are source of RADIOGENIC heating that keeps mantle hot

EVIDENCE of plate motion: bands of paleomagnetic anomalies, age of plate materials, (recent) direct measurements

HOT SPOT volcanoes (examples: Hawaii, Yellowstone) from mantle plumes are evidence of the existence of the convection cells and plate motion

PLATE BOUNDARIES: CONVERGING (crashing into each other)/DIVERGING (moving apart from each other)/TRANSFORM (sliding past each other); all have earthquakes; motion is only 1-2 inches (2.5 -5 cm) per year

continental/oceanic converging boundary (example: Cascadia Fault between Pacific Northwest = North American plate/Juan de Fuca plate): oceanic plate SUBDUCTS under continental plate, forming very deep OCEANIC TRENCH (Cascadia Trench), and will eventually melt (is recycled) back into the mantle; continental plate is broken and UPLIFTED; VOLCANIC MOUNTAIN RANGE will form (Cascade Mountains)

Mount St. Helens erupted violently May 1980, killing 63 people and millions of trees. Mount Rainier is in sight of downtown Seattle, and is due for a major eruption.

continental/continental converging boundary (example: Himalaya Mountains = Indian plate/Eurasian plate): COMPRESSION builds very tall mountains - Himalayas are tallest in the world - and very deep "roots"

oceanic/oceanic converging boundary (example: Aleutian Islands = Pacific plate/North American plate): one plate SUBDUCTS under the "higher" plate, builds trench and volcanic ARCHIPELAGO/island arc (curved chain of volcanic islands)

oceanic diverging boundary (example: Mid-Atlantic Ridge = South America/Africa and North America/Europe): continental crust splits apart; sea floor spreading - narrow sea forms and ocean grows ever wider, Atlantic Ocean began X million years ago; uplift builds volcanic mountain range - heat outflow - Iceland is a volcanic island, most mid-ocean volcanoes are underwater SEAMOUNTS. weak earthquakes.



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rocks can be slowly weathered - worn down - over time. "Nothing is forever in the Universe."

Wind, rain, natural chemicals, glaciers

"There is little igneous rock in the New York City area, because the area has not been active in millions of years. Most NYC rocks are sedimentary and metamorphic."

the rock cycle

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