The Science of Geology

The subject of this text is geology, from the Greek geo, “Earth,” and logos, “discourse.” It is the science that pursues an understanding of planet Earth. Geology is traditionally divided into two broad areas—physical and historical. Physical geology examines the materials composing Earth and seeks to understand the many processes that operate beneath and upon its surface .The aim of historical geology, on the other hand, is to understand the origin of Earth and its development through time.

Different Areas of Geologic Study\*

Archaeological Geology, Ocean Sciences, Paleoclimatology, Engineering Geology, Paleontology, Petrology, Geochemistry, Planetary Geology, Geomorphology, Sedimentary Geology, Geophysics Seismology, History of Geology, Structural Geology, Hydrogeology Tectonics, Mineralogy.

uniformitarianism. It states that the *physical, chemical,and biological laws that operate today also operated in the geologic past*. In other words, the forces and processes that we observe

shaping our planet today have been at work for a very long time.Thus, to understand ancient rocks, we must first understand present-day processes and their results. This idea is commonly

stated as *the present is the key to the past*.

**Geologic Time**

Hutton and others recognized that geologic time is exceedingly long, they had no methods to accurately determine the age of Earth. However, in 1896 radioactivity was discovered. Using radioactivity for dating was first attempted in 1905 and has been refined ever since. Geologists are now able to assign fairly accurate dates to events in Earth history.\* For example, we know that the dinosaurs died out about 65 million years ago. Today the age of Earth is put at about 4.6 billion years.

**Relative Dating and the Geologic Time Scale**

During the 19th century, long before the discovery of radioactivity, which eventually allowed for the establishment of reliable *numerical* dates, a geologic time scale was developed using principles of relative dating.

Relative dating means that events are placed in their proper sequence or order without knowing their age in years. This is done by applying principles such as the law of superposition**.** This basic rule applies to materials that were originally deposited at Earth’s surface, such as layers of

sedimentary rock and volcanic lava flows. The law simply states that the youngest layer is on top, and the oldest layer is on the bottom (assuming that nothing has turned the layers upside down, which sometimes happens). Stated another way, a layer is older than the ones above it and younger than the ones below.

The geologic time scale divides the vast 4.6-billion-year history of Earth into eons, eras, periods, and epochs. We presently live in the Holocene epoch of the Quaternary period. This period is part of the Cenozoic era, which is the latest era of the Phanerozoic eon. Numbers on the time scale represent time in millions of years before the present. These dates were added long after the time scale had been established using relative dating techniques. The Precambrian accounts for more than 88 percent of geologic time. See figure below

