

METHOD OF STUDY

Geologic Time and Pages of Earth history

(Dating the pages of earth History)

Geology did not progress much as a science until geologists were able to overcome the fierce, vigorous resistance to the idea that the history of the earth is written in the rocks and that this history is unimaginably long. Geologists now consider that the age of the earth is 4.6 billion years.

The key to the past

“ The present is the key to the past”---Hutton in 1785

The past history of our globe must be explained by what can be seen to be happening now.

Rocks are also the pages of the book of earth's history and the chief objective of historical geology is to learn to decipher those pages, and to place them in their proper historical order.

Rocks and their structures which can be easily recognizable (e.g. composition, structure), are observed to result from processes acting at the present day in peculiar kind of geographical and climatic environment.

If similar rocks belonging to a former geologic age are found to have the same peculiarities and associations, it is inferred that they were then formed by the operation of similar processes in similar environments.

As a matter of ordinary common sense, we can apply the principle:

1. The presence of fossil corals or of the shells, that was deposited on the sea floor and that what now is land once lay beneath the waves.
2. Beds of rock salt point to the former existence of inland seas that evaporated in the sunshine.
3. Seams of coal are the compressed remains of accumulation of peat, suggest widespread swamps and luxuriant vegetation.
4. Smoothed and striated rock surfaces associated with beds of boulder clay prove the former passage of glaciers or ice sheets.

In every case the characteristics of older formations are matched with those of rocks now in the making.

Even the weather may be recorded in the structures of the rocks.

For example rain prints in soft sediments, suncracks in the mud flats of tidal reaches or flood plains when the muds dry and shrink indicate weathers.

Climate have changed astonishingly: Ice sheet in India, Africa, warm climate in Greenland and Antarctica (presence of coal deposits).

STRATIGRAPHICAL TIME SCALE

As the book of earth history is immensely long, it has been found convenient to divide and subdivide its contents in much the same way as long book is divided into volumes, chapters, paragraphs and sentences.

If the book is read consecutively, then the order of sentences etc. represents a time order.

In building up stratigraphy on a firm basis it has been found desirable in the interest of clarity of thought to employ two sets of terms: for each kind of unit.

One for **Time interval** and other for strata that were deposited during those time intervals.

Geologic time units	Corresponding stratigraphical	
	Time record unit	
		<i>Example</i>
Era	Group	Mesozoic Group
Period	System	Jurassic System
Epoch	Series	Upper Jurassic Series
Age	Stage	Portlandian Stage

Historical controversy About Igneous rocks

(Plutonists vs. Neptunists)

After many bitter arguments among geologists in the nineteenth century, it was finally concluded that many rocks have formed as a result of igneous activity, specifically the processes which take place when solid rock material becomes molten and then cools to form solid rock once again.

All the geologists involved in the arguments about igneous rocks agreed that volcanoes erupt hot, molten materials known as lava.

The argument took place because one group of geologists insisted that no connection existed between modern volcanoes and ancient rocks.

They believed that only way any rock having a *crystalline texture* could form was by chemical precipitation of ions held in solution. This water oriented group became known as the neptunists (Neptune: god of the sea).

They felt that the rocks being debated had formed by chemical precipitation at low temperature from a universal ocean that had formerly covered all the continents. The leader of the Neptunists was Abraham Gottlab Werner (1750-1817).

He was a German mineralogist and mining geologist. Leopold Von Buch (1774-1853) was Werner's strong supporter.

The other side of the argument was led by James Hutton. His chief ally, sir James Hall (1761-1832) demonstrated that rocks having crystalline texture were formed when bits of granite were made molten in a forge and then were allowed to cool slowly.

Hutton argued that what we would now name igneous rocks had formed because under one set of conditions the earth internal heat had caused some rocks to melt and then under other conditions the molten material had cooled and become solid.

Because of their emphasis on what happened beneath the surface of the earth, Hutton and his followers were called Plutonists (Pluto- God of underworld).

The controversy was settled in central France. When Von Buch was finally persuaded to visit the extinct volcanoes of Auvergne district, he became a plutonist on the spot and the argument was settled for ever.