Stratigraphy

A branch of geological science, concerned with description, organization; classification, sequence and correlation of stratified rocks.

There is a strong relationship between the Stratigraphy and sedimentology because the sedimentology rocks are the fundamental material of Stratigraphy and paleontology ranking as a close second.

Q1:/Evidence of using sedimentology in Stratigraphic studies

1-the study of lithology and composition.
2-the study of texture of sedimentary rocks.
3-the study of petrography which deals with the studyof the structural evidence or sedimentary structure of rocks e.g. ripple marks, cross bedding ...aspects.
4-paleontology using fossils to delimite the age of rocks and the (e.g.1) Aqra Limestone formation (age: upper Cretaceous) according to Rudist (pelecypods) indicate reef (shallow tropic sea) environment.

Q2:/Why there is a strong relationship between stratigraphy&sedimentology?

1-Most sedimentology rocks characterized by the bedding or present as bedded rocks.
2-Most outcrops are sedimentary rocks which extended to a large geographical area.
3-sedimentary rocks are regarded to be as reservoir rocks and rich in oil, gas and other ores, fossils.

Stratigraphy is divided into two parts they are:

1-Physical Stratigraphy

Components of sedimentation plus physical aspects of analytical interpretative Stratigraphy

2-Biostratigraphy

Using evidence of fossils in rocks for stratigraphical studies (e.g. age determination (relative age) and environments

Principles of Stratigraphy

1-deposition, 2-succession, 3-contiuity, 4-correlation

Stratigraphic tools

1-Lithostratigraphy
The study of lithological properties of strata.
2-Biostratigraphy
The study of biological succession of life (study of fossils)
3-Magnetostratigraphy
The study of earths magnetic reversal in the rocks.
4-Sequence Stratigraphy
The study of the progressive of sedimentary rocks from chanching in chemical characteristics.

Definitions

1) Stratigraphic column: the arrangement of the successive rocks that exposed at the surface and subsurface of the earth with the oldest at the base and the youngest ones at the top.
2)Strata: a consolidated sediments which ranges in thickness from submillimeters scale to many meters.

Organization of Stratigraphic column

The need for assembling and integrating the vast quantities of Stratigraphic information which has obtained from natural outcrops, excavations, mines, oil and gas well drilling ..... required three logical steps. Although the absolute ages have been determined from radioactive isotopes.

a-the succession of sedimentary rocks which the Stratigraphic column of each area.
b-the need to subdivide and differentiate the Stratigraphic columns.
c-the units and the physical and biological events must be related to their proper position of geological history.

Evolution of Stratigraphic classification

(first attempt for organization of Stratigraphic column)

Early observation by the ancients of earth natural phenomena and their philosophical speculations are nature of earth's structure and processes from central Asia, to Greek to Egypt, different views were adapted

Among the various ancient civilization which tied to the prevailing religions. At the latter, at the half of 17 century, scientists observed such as (Steno in Italy and Hook in England) defined the correct meaning of fossil and recognized the chronologic significance of successions of strata; latter in the latter half of 18th century a developing interest responsible for quarrying, coal and metal mining should be the first to recognize a need for working hypotheses to guide their exploration and production efforts. Although Johann Lehmann refer to the absolute age from isotopes, its customary to use the names of Stratigraphic units mostly distinguished on the bases of differences in their included fossils those units are arranged in to a number of hierarchies re rocks) as follows lated to rocks based Stratigraphy (lithostratigraphy units and fossil based Stratigraphy (biostratigraphic units) and time based Stratigraphy (chronostratigraphic units)

1- Lehman a German mineralogist published a classification of the (earth crust rocks)
   a-Crystalline rocks (devoid (no) of fossils)
   b-Secondary fossiliferous rocks
   c-Loosely consolidated sands and gravels (alluvial)

2-Geovani Ardeno (Italy), applied grouping of strata in the Stratigraphic successions terms of:
   1-Primitive 2-Secondary 3-Tertiary

3-Nicolaus Steno; put three cardinal principles in Stratigraphy, an Italian geologist, concluded the (1) Law of superposition, he stated that: "the older rocks is located below the younger rocks (bed) he also presented (2) Law of horizontality: stated that all undeformed sedimentary rocks were deposited horizontally. (3) Law of original continuity: layers of unconsolidated sediments that are deposited on a solid base have formed continuous sheets of materials.

4-Abraham Werner (Neptonism concept): he believed that encompassing ocean were precipitating and forming all of crust earth materials, or (Oceans were the derivation for all rocks)

5-Robert Hook: a famous geologist in 17th Century, reffered to: the use of fossils in age determination, by 1790 he 2 modified Lehmans classification to:

1-Primitive of igneous rocks.
2-Transition of oceanic deposits (limestones, silts, dikes, graywackes)
3-Stratified secondary rocks (fossiliferous)
4-alluvial poorly consolidated sands, gravels, clays.
5-volcanic series (younger lava flow).

6-James Hutten: concepts of plutonisims: a Scottish contemporary of Werner, he proved that: (1) many of igneous rocks were cooled from a molten stage. (2) put the Uniformitiarianism concept (the present is the key to the past)=geological events at present reflects the events that happened in the past. (3) put principles of Superposition in sequence of Stratigraphy the older beds is covered by younger and younger beds (layers).

7-William Smith (1769-1839): an English engineer established the Stratigraphic column into rock units based on lithologic and fossil characters, he traced and mapped those units.

8-Lyell's principles of geology

a-presented a Stratigraphic column
b-adopted and added to smiths rock units the group terms.
c-adapted superposition and subdivided rock units into subdivision and higher terms of Periods
d-put catastrophic concept, he stated that: the fauna of each system were represented by a group of animals and plants which quite different from those above and below which closed in some sort of cataclysm.