Field Geology

Introduction

The study of rocks, along with their structural behavior, and mineralogical composition in the field is known as “Field Geology”. It is very essential for the successful study and proper understanding of the subject. The field geology has the following two main features:-

1. Geological survey in the field
2. Interpretation in the laboratory

Geological Survey

The scientist should, first of all, locate the stratigraphic formations likely to be encountered in the field from the available topographic maps and sections. After this, he should take his tools kit to the field for surveying.

The geological surveying is systematic examination of a region for geologic information. A geologic mapping requires (i) examination of rocks, (ii) location of outcrops and points where observations are made, and (iii) plotting the field data on a map. A little consideration will show that for the above mentioned requirements the geologic notes should always be taken in full and accurate. The significant geological features should be clearly illustrated with the help of sketches and diagrams. All the photographs and rock specimens should be clearly numbered and indexed.

Equipment for Geological survey

The survey kit of a geologist has the following equipment.

1. Hammer
2. Chisel
3. Miner’s Compass
4. Magnifying Glass
5. Pen Knife
6. Camera
7. Measuring Tape
8. Magnetic Needle
9. Note Book with a pencil
10. Bag for collecting rock specimen

Method for Geological Survey

Following are the methods for geological survey of a region

1. Compass and clinometers method

It is a method used for underlain igneous, sedimentary and metamorphic rocks, which have dips of about 5° or more. It should not be chosen for the regions of low dipping strata.

2. **Hand level method.**

It is used mostly for rough reconnaissance work or for the purpose of determining local dips and strikes of gently inclined stratified rocks.

3. Barometer method.

A barometer is lighter and more easily portable equipment. It is used for moderately dipping stratified rocks or in the regions where intervisibility of points is poor e.g. thickly forested areas.

4. Plane table method

It is also used for moderately dipping stratified rocks and at places where the points are visible from one another.

5. Aerial mapping method

It represents a bird's eye view of the area and may be used as a guide for the field work. Sometimes geologic mapping by stereoscope (it is a method of separate lenses) helps in locating the outcrops of the rocks. It is also carried out in the design of high ways, airfields, flood control and navigation works.

Underground Geological Survey

Sometimes, underground geological survey is carried out to determine the structural details of the sub-surface, e.g. foundation of a dam, tunnel or any other important structure, in such cases, deep holes at various places are drilled or augured and the record of penetrated cores is kept. Sometimes sub-surface contours of various strata are required (as in the case of dam foundation or tunnel). In such a case, a large number of bore holes are drilled. The electrical logging or electrical surveying of bore holes provides very useful details of lithology and fluid contents of the rocks. If the volume of deposit is required (as in the case of colliery) then a map showing lines of equal thickness called isopachtyes is prepared. In such a case a detailed study of lithological character, microfossils heavy mineral content, water analysis of the underground rocks is very helpful. In the recent days, the study of rocks is also done by radioactive method and by the use of gamma rays.

Geophysical Exploration

The scientific study and interpretation of certain physical measurements is called geophysical exploration. It is generally, adopted for furthering the study of sub-surface geological conditions and helps in locating are deposits or oil bearing strata. The geophysical exploration is bases on the measurement of variation in:-

1. Gravity
2. Elasticity
3. Magnetic Susceptibility
4. Electrical Conductivity
5. Temperature
6. Radioactivity

The methods employed in geophysical exploration are:-

1. Gravimetric (for variation in gravity)
2. Seismic (for variation in elasticity)
3. Magnetometric (for variation in magnetic susceptibility)
4. Electric (for variation in electrical conductivity)
5. Geothermic (for variation in temperature)
6. Radioactive (for variation in radio activity)

The gravimetric method is employed as a reconnaissance for deep seated structures especially for oil bearing strata. A torsion balance (an instrument for measuring very small differences in the force of gravity) is used to find out the topographic features of the rocks. Seismic method is used for locating sub-surface strata which may yield oil or gas. Magnetometric method is used to determine the magnetic permeability of the rocks. Some ores are highly magnetic, whereas some are less. This method is used for locating iron ores. The electric method is used for the location of base metal deposits. This method is also used for determining the shape and depth of boundaries between two rock formations. The geothermic method is adopted to determine the temperature, quality and quantity of water present in the rocks. It helps in determining the type and structure of rocks. The radioactive method is adopted for determining the mineral formation. Sedimentary rocks are highly radioactive, whereas sandstones and limestone are less radioactive.

Geological Maps and Sections

A geological map should have complete information such as name of the area, year of preparation, scale, compass bearing, contour interval, datum plane etc. it should also have geologic descriptions of the area such as location, topographic features, structural details, economic importance of the area etc. Two kinds of sections, i.e. horizontal and vertical are drawn to show the form of ground and the geologic structure of the region traversed. The geological sections should, as nearly as possible, run at right angles to the strike. Some sign conventions used while drawing a geological map.

Engineering Consideration

The field geology is of utmost importance to an engineer engaged in the exploration of ores, coal, oil and petroleum. It is one of the few branches of Geology, where an engineer has to work in collaboration with a geologist. The engineer drills the bore holes, and the geologist analyses the core samples. Underground geological survey is carried out to determine the structural details of the sub-surface for the foundation of dams, tunnels etc. This survey is very essential for the smooth working and stability of structures.