STRUCTURE FEATURE OF ROCKS: PRIMARY AND SECONDARY STRUCTURE, OUTCROP, BEDDING AND STRATIFICATION, DIP AND STRIKE ,INTRUTIONS, FLOW AND MASSES

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STRUCTURE FEATURE OF ROCK

STRUCTURAL GEOLOGY

Structural geology is the study about structure of earth.

Structural geology is scientific discipline that is concerned with rock deformation on both a large and a small scale. Its scope of study is vast, ranging from sub microscopic lattice defects in crystals to faults structures and fold systems of the Earth's.

Types of geologic structure:-

I. Primary structure
II. Secondary Structure

PRIMARY STRUCTURE:-

I. Any structure that develops prior to or during the formation of rock
II. Primary structures are non tectonic meaning they form during sedimentary deposition, or in the case of Metamorphic rock during crystallization.
III. Example of primary structure include beds and laminae in sedimentary rock like sandstone or shale and lava pillows in extrusive igneous rocks like basalt.

SECONDARY STRUCTURE:-

I. Any structure formed in response to an applied stress that results form plate movement
II. These structure are tectonics as they develops after crystallization of metamorphic rock.
III. Secondary structures include folds, fractures, foliation in metamorphic rocks, and a host of other features. Most secondary structures are products of deformation the movement of parts of the crust relative to on another.

DIP AND STRIKE

DIP is the acute angle that a rock surface makes with a horizontal plane.

STRIKE is the direction of the line formed by the intersection of a rock surface with a horizontal plane.

Dip and strike are used to describe the orientation of rock bed fault, fracture igneous dikes and sills.

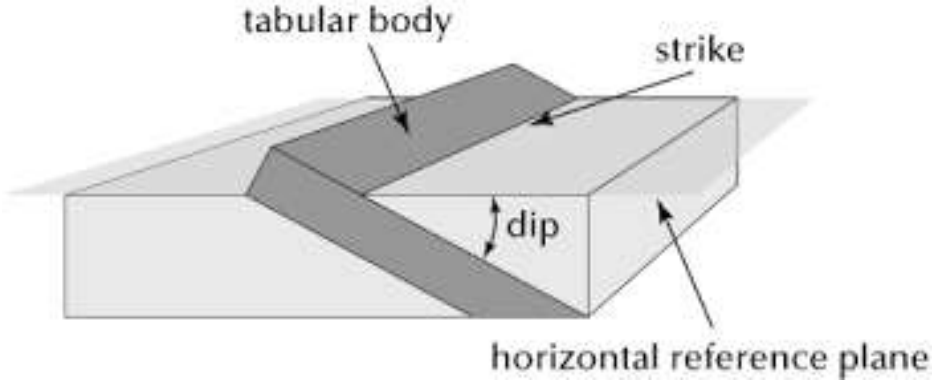
RELATIONSHIP BETWEEN DIP AND STRIKE:-

Strike and dip are always perpendicular to each other on a map.

- The *dip* gives the steepest angle of descent of a tilted bed or feature relative to a horizontal plane, and is given by the number (0°-90°) as well as a letter (N,S,E,W) with rough direction in which the bed is dipping downwards. The angle of dip is generally included on a geologic map without the degree sign.

- *Strike* (or strike angle) can be given as either a quadrant compass bearing of the strike line (N25°E for example) or in terms of east or west of true north or south, a single three digit number representing the azimuth, where the lower number is usually given (where the example of N25°E would simply be 025), or the azimuth number followed by the degree sign (example of

N25°E would be 025°).



IMPORTANCE OF DIP AND STRIKE

In structural geology, Strike and Dip are quite important for the following purposes:-

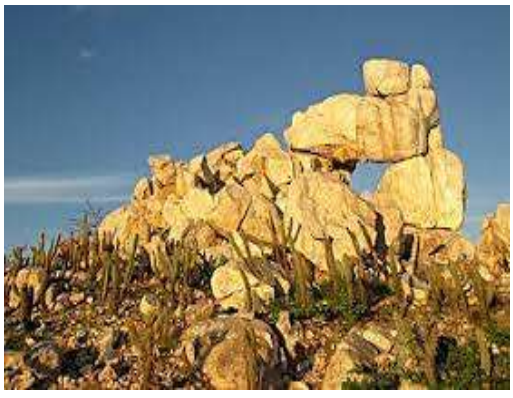
Measurement of strike and dip (i.e., the attitude of rock layers or other planar geologic features) **helps geologists construct accurate geologic maps and geologic cross-sections**. For example, data on rock attitudes helps delineate fold structures in layered rocks.

OUTCROP

- An outcrop is the exposed rock, so named because the exposed rock "crops out.“
- When **weathering** and **erosion** expose part of a rock layer or formation, an outcrop appears.
- An outcrop consists of bedrock exposed at Earth–s surface. Geologists often seek out outcrops to learn about the geology of an area, and geology students visit outcrops as illustrations of the principles of geology.

ABOUT FEATURES :-

- **Outcrops** do not cover the majority of the Earth's land surface because in most places the bedrock or superficial deposits are covered by a mantle of soil and vegetation and cannot be seen or examined closely.
- In places where the overlying cover is removed through erosion or tectonic uplift, the rock may be exposed, or *crop out*. Such exposure will happen most frequently in areas where erosion is rapid and exceeds the weathering rate such as on steep hillsides, mountain ridges and tops, river banks, and tectonically active areas.
- In Finland, glacial erosion during the last glacial maximum, followed by scouring by sea waves, followed by isostatic uplift has produced many smooth coastal and littoral outcrops.
- Bedrock and superficial deposits may also be exposed at the Earth's surface due to human excavations such as quarrying and building of transport routes.



(Q.) HOW OUTCROPS ARE FORMED ?

ANSWER -These outcrops were formed by **the intrusion of molten granite into preexisting country rock at a depth of about ten miles below the surface**. Over millions of years, erosion removed thousands of feet of overlying rock, exposing the more resistant bodies of granite.

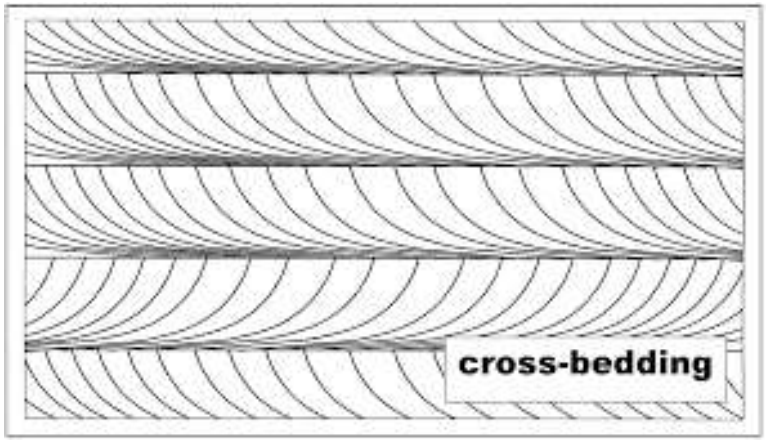
BEDDING

- The term bedding (also called stratification) ordinarily describes the layering that occurs in **sedimentary rocks** and sometimes the layering found in **metamorphic rock** .
- Bedding may occur when one distinctly different layer of sediment is deposited on an older layer, such as **sand** and pebbles deposited on silt or when a layer of exposed sedimentary **rock** has a new layer of sediments deposited on it.
- Such depositions of sediments produce a clear division between beds called the bedding plane

TYPES OF BEDDING

CROSS BEDDING

- **In geology, cross-bedding, also known as cross-stratification, is layering within a stratum and at an angle to the main bedding plane**
- **Cross-bedding forms during deposition on the inclined surfaces of bedforms such as ripples and dunes; it indicates that the depositional environment contained a flowing medium (typically water or wind). Examples of these bedform are ripples, dunes, anti-dunes, sand, waves , hummocks, bars, and delta slopes.**



GRADED BEDDING

- Graded bedding is a sorting of particles according to clast size and shape on a lithified horizontal plane. The term is an explanation as to how a geologic profile was formed. Stratification on a lateral plane is the physical result of active depositing of different size materials.
- Graded beds form when a steep pile of sediment on the sea floor (or lake floor) suddenly slumps into a canyon or off a steep edge. As the sediment falls, water mixes in with it, creating a slurry of sediment and water that flows quickly down a sloping bottom. When the bottom levels out, the flow begins to slow.

STRATIFICATION

- Horizontal layering in sedimentary rocks is called **stratification**.
- It **forms by the settling of particles from either water or air** (the word sediment comes from the Latin - sedimentum, meaning settled).
- Layer boundaries are natural planes of weakness along which the rocks can break and fluids can flow.

- **Stratification**, the layering that occurs in most sedimentary rocks and in those igneous rocks formed at the Earth's surface, as from lava flows and volcanic fragmental deposits.
- The layers range from several millimetres to many metres in thickness and vary greatly in shape. Strata may range from thin sheets that cover many square kilometres to thick lenslike bodies that extend only a few metres laterally.

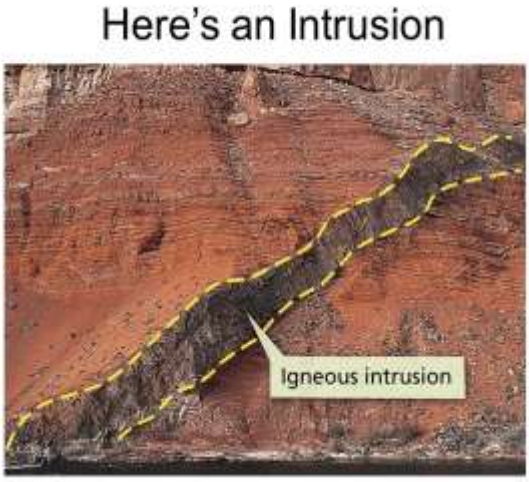
(Q). HOW STRATIFICATION IS FORMED ?

ANSWER-Stratification occurs as a result of **a density differential between two water layers** and can arise as a result of the differences in salinity, temperature, or a combination of both. Stratification is more likely when the mixing forces of wind and wave action are minimal and this occurs more often in the summer months.

INTRUSION

An **intrusion** is liquid rock that forms under Earth's surface.

Magma from under the surface is slowly pushed up from deep within the earth into any cracks or spaces it can find, sometimes pushing existing country rock out of the way, a process that can take millions of years



As the rock slowly cools into a sol magma crystallize into minerals. Many mountain ranges, such as the Sierra Nevada in California, are formed mostly by intrusive rock, large granite (or related rock) formations id, the different parts of the magma crystallize into minerals

- **Intrusions** vary widely, from mountain-range-sized batholiths to thin veinlike fracture fillings of aplite or pegmatite.
- When exposed by erosion, these cores called batholiths may occupy huge areas of Earth's surface. Large bodies of magma that solidify underground before they reach the surface of the crust are called plutons.
- Intrusions are one of the two ways igneous rock can form; the other is extrusive, that is, a volcanic eruption or similar event.

- Technically speaking, an intrusion is any formation of intrusive igneous rock; rock formed from magma that cools and solidifies within the crust of the planet.

FLOW AND MASSES

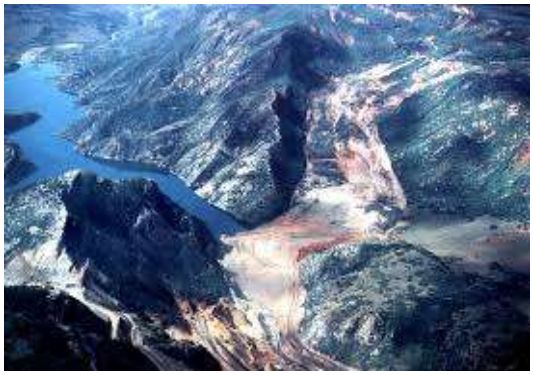
Flows are **a mixture of water, rock and sediment**.

When the igneous masses comes out and start to flow it is known as **FLOW**

When the masses solidfies into different shapes and sizes then its called **MASSES**

Masses of solidified rocks vary in shapes and sizes and are named according to it

Pillow shaped structures are called pillow structure and column shaped structure are called column structure



What is Mass Movement?

Mass movement, often called **mass wasting**, is the downslope movement of a mass of surface materials, such as soil, rock or mud. This mass movement typically occurs along hillsides and mountains due to the influence of gravity and can happen very slowly or very quickly.

Mass movement can occur due to a variety of reasons.

- The most basic reason is the **angle of repose** or slope of the hillside. If the angle is overly steep, gravity will pull the material downward, causing a mass movement.