**Sedimentology**

**Sedimentology** encompasses the study of modern [sediments](https://en.wikipedia.org/wiki/Sediment) such as [sand](https://en.wikipedia.org/wiki/Sand), [silt](https://en.wikipedia.org/wiki/Silt), and [clay](https://en.wikipedia.org/wiki/Clay), and the processes that result in their formation ([erosion](https://en.wikipedia.org/wiki/Erosion) and [weathering](https://en.wikipedia.org/wiki/Weathering)),[transport](https://en.wikipedia.org/wiki/Transportation_(sediment)), [deposition](https://en.wikipedia.org/wiki/Deposition_(geology)) and [diagenesis](https://en.wikipedia.org/wiki/Diagenesis). Sedimentologists apply their understanding of modern processes to interpret geologic history through observations of [sedimentary rocks](https://en.wikipedia.org/wiki/Sedimentary_rocks) and [sedimentary structures](https://en.wikipedia.org/wiki/Sedimentary_structures).

Sedimentary rocks cover up to 75% of the [Earth](https://en.wikipedia.org/wiki/Earth)'s surface, record much of the [Earth's history](https://en.wikipedia.org/wiki/History_of_Earth), and harbor the [fossil record](https://en.wikipedia.org/wiki/Fossil_record). Sedimentology is closely linked to [stratigraphy](https://en.wikipedia.org/wiki/Stratigraphy), the study of the physical and temporal relationships between rock layers or [strata](https://en.wikipedia.org/wiki/Stratum).

The [premise](https://en.wikipedia.org/wiki/Uniformitarianism) that the processes affecting the earth today are the same as in the past is the basis for determining how sedimentary features in the rock record were formed. By comparing similar features today to features in the rock record—for example, by comparing modern [sand dunes](https://en.wikipedia.org/wiki/Sand_dune) to dunes preserved in ancient [aeolian](https://en.wikipedia.org/wiki/Aeolian_processes) sandstones—geologists reconstruct past environments

**Sedimentary rock types:**

There are four primary types of [sedimentary rocks](https://en.wikipedia.org/wiki/Sedimentary_rocks): clastics, carbonates, evaporites, and chemical.

* [Clastic rocks](https://en.wikipedia.org/wiki/Clastic_rocks) are composed of particles derived from the [weathering](https://en.wikipedia.org/wiki/Weathering) and [erosion](https://en.wikipedia.org/wiki/Erosion) of precursor rocks and consist primarily of fragmental material. Clastic rocks are classified according to their predominant [grain size](https://en.wikipedia.org/wiki/Particle_size) and their composition. In the past, the term "Clastic Sedimentary Rocks" were used to describe silica-rich clastic sedimentary rocks, however there have been cases of clastic carbonate rocks. The more appropriate term is [siliciclastic](https://en.wikipedia.org/wiki/Siliciclastic) sedimentary rocks.
* Organic sedimentary rocks are important deposits formed from the accumulation of biological detritus, and form [coal](https://en.wikipedia.org/wiki/Coal) and [oil shale](https://en.wikipedia.org/wiki/Oil_shale) deposits, and are typically found within [basins](https://en.wikipedia.org/wiki/Basin_(geology)) of clastic sedimentary rocks
* [Carbonates](https://en.wikipedia.org/wiki/Carbonate_rocks) are composed of various [carbonate minerals](https://en.wikipedia.org/wiki/Carbonate_minerals) (most often [calcium carbonate](https://en.wikipedia.org/wiki/Calcium_carbonate) (CaCO3)) precipitated by a variety of organic and inorganic processes. Typically, the majority of carbonate rocks are composed of [reef](https://en.wikipedia.org/wiki/Reef) material,
* [Evaporites](https://en.wikipedia.org/wiki/Evaporite) are formed through the evaporation of water at the Earth's surface and most commonly include [halite](https://en.wikipedia.org/wiki/Halite) or [gypsum](https://en.wikipedia.org/wiki/Gypsum).
* Chemical sedimentary rocks, including some carbonates, are deposited by precipitation of minerals from aqueous solution. These include [jaspilite](https://en.wikipedia.org/wiki/Jaspilite) and [chert](https://en.wikipedia.org/wiki/Chert).

**Importance of sedimentary rocks:**

Sedimentary rocks provide a multitude of products which modern and ancient society has come to utilize.

* [Art](https://en.wikipedia.org/wiki/Art): [marble](https://en.wikipedia.org/wiki/Marble), although a [metamorphosed](https://en.wikipedia.org/wiki/Metamorphic_rock) [limestone](https://en.wikipedia.org/wiki/Limestone), is an example of the use of sedimentary rocks in the pursuit of aesthetics and art
* Architectural uses: stone derived from sedimentary rocks is used for [dimension stone](https://en.wikipedia.org/wiki/Dimension_stone) and in [architecture](https://en.wikipedia.org/wiki/Architecture), notably [slate](https://en.wikipedia.org/wiki/Slate), a meta-[shale](https://en.wikipedia.org/wiki/Shale), for [roofing](https://en.wikipedia.org/wiki/Roofing), [sandstone](https://en.wikipedia.org/wiki/Sandstone) for load-bearing [buttresses](https://en.wikipedia.org/wiki/Buttress)
* [Ceramics](https://en.wikipedia.org/wiki/Ceramic) and industrial materials: [clay](https://en.wikipedia.org/wiki/Clay) for [pottery](https://en.wikipedia.org/wiki/Pottery) and [ceramics](https://en.wikipedia.org/wiki/Ceramic) including [bricks](https://en.wikipedia.org/wiki/Brick); [cement](https://en.wikipedia.org/wiki/Cement) and [lime](https://en.wikipedia.org/wiki/Lime_(mineral)) derived from [limestone](https://en.wikipedia.org/wiki/Limestone).
* [Economic geology](https://en.wikipedia.org/wiki/Economic_geology): sedimentary rocks host large deposits of [SEDEX](https://en.wikipedia.org/wiki/Sedimentary_exhalative_deposits) ore deposits of [lead](https://en.wikipedia.org/wiki/Lead)-[zinc](https://en.wikipedia.org/wiki/Zinc)-[silver](https://en.wikipedia.org/wiki/Silver), large deposits of [copper](https://en.wikipedia.org/wiki/Copper), deposits of [gold](https://en.wikipedia.org/wiki/Gold), [tungsten](https://en.wikipedia.org/wiki/Tungsten), [Uranium](https://en.wikipedia.org/wiki/Uranium), and many other precious minerals, [gemstones](https://en.wikipedia.org/wiki/Gemstones) and industrial minerals including [heavy mineral sands ore deposits](https://en.wikipedia.org/wiki/Heavy_mineral_sands_ore_deposits)
* Energy: [petroleum geology](https://en.wikipedia.org/wiki/Petroleum_geology) relies on the capacity of sedimentary rocks to generate deposits of [petroleum](https://en.wikipedia.org/wiki/Petroleum) [oils](https://en.wikipedia.org/wiki/Oil). [Coal](https://en.wikipedia.org/wiki/Coal) and [oil shale](https://en.wikipedia.org/wiki/Oil_shale) are found in sedimentary rocks. A large proportion of the world's [uranium](https://en.wikipedia.org/wiki/Uranium) energy resources are hosted within sedimentary successions.
* [Groundwater](https://en.wikipedia.org/wiki/Groundwater): sedimentary rocks contain a large proportion of the Earth's groundwater [aquifers](https://en.wikipedia.org/wiki/Aquifer). Our understanding of the extent of these aquifers and how much water can be withdrawn from them depends critically on our knowledge of the rocks that hold them (the reservoir).

**Basic principles :**

The aim of sedimentology, studying sediments, is to derive information on the depositional conditions which acted to deposit the rock unit, and the relation of the individual rock units in a basin into a coherent understanding of the evolution of the sedimentary sequences and basins, and thus, the Earth's geological history as a whole.

The scientific basis of this is the principle of uniformitarianism, which states that the sediments within ancient sedimentary rocks were deposited in the same way as sediments which are being deposited at the Earth's surface today.

Sedimentological conditions are recorded within the sediments as they are laid down; the form of the sediments at present reflects the events of the past and all events which affect the sediments, from the source of the sedimentary material to the stresses enacted upon them after [diagenesis](https://en.wikipedia.org/wiki/Diagenesis) are available for study.

The [principle of superposition](https://en.wikipedia.org/wiki/Law_of_superposition) is critical to the interpretation of sedimentary sequences, and in older metamorphic terrains or fold and thrust belts where sediments are often intensely [folded](https://en.wikipedia.org/wiki/Fold_(geology)) or deformed, recognising [younging](https://en.wikipedia.org/w/index.php?title=Younging&action=edit&redlink=1) indicators or [graded bedding](https://en.wikipedia.org/wiki/Graded_bedding) is critical to interpretation of the sedimentary section and often the deformation and metamorphic structure of the region.

Folding in sediments is analysed with the [principle of original horizontality](https://en.wikipedia.org/wiki/Principle_of_original_horizontality), which states that sediments are deposited at their angle of repose which, for most types of sediment, is essentially horizontal. Thus, when the younging direction is known, the rocks can be "unfolded" and interpreted according to the contained sedimentary information.

The [principle of lateral continuity](https://en.wikipedia.org/wiki/Principle_of_lateral_continuity) states that layers of sediment initially extend laterally in all directions unless obstructed by a physical object or topography.

The [principle of cross-cutting relationships](https://en.wikipedia.org/wiki/Principle_of_cross-cutting_relationships) states that whatever cuts across or intrudes into the layers of strata is younger than the layers of strata.

**Methodology of sedimentology ;**

The methods employed by sedimentologists to gather data and evidence on the nature and depositional conditions of sedimentary rocks include;

* Measuring and describing the outcrop and distribution of the rock unit;
* Describing the [rock formation](https://en.wikipedia.org/wiki/Rock_formation), a formal process of documenting thickness, lithology, outcrop, distribution, contact relationships to other formations
* Mapping the distribution of the rock unit, or units
* Descriptions of rock core (drilled and extracted from wells during hydrocarbon exploration)
* [Sequence stratigraphy](https://en.wikipedia.org/wiki/Sequence_stratigraphy)
* Describes the progression of rock units within a basin
* Describing the [lithology](https://en.wikipedia.org/wiki/Lithology) of the rock;
* [Petrology](https://en.wikipedia.org/wiki/Petrology) and [petrography](https://en.wikipedia.org/wiki/Petrography); particularly measurement of [texture](https://en.wikipedia.org/wiki/Rock_microstructure), [grain size](https://en.wikipedia.org/wiki/Particle_size), grain shape (sphericity, rounding, etc.), sorting and composition of the sediment
* Analysing the [geochemistry](https://en.wikipedia.org/wiki/Geochemistry) of the rock
* [Isotope geochemistry](https://en.wikipedia.org/wiki/Isotope_geochemistry), including use of [radiometric dating](https://en.wikipedia.org/wiki/Radiometric_dating), to determine the age of the rock, and its affinity to source regions