

Sediments and Soils

On the Earth's surface a number of processes result in different deposits within, upon or underneath which remains of human culture may be found. Their interpretation is important for the understanding of the environment and development (Fig. 1) in which the human activity took place. The material forming such deposits is characterized by its grain-size and degree of sorting. It may be released from bedrock or older deposits by different processes :

Frost-shattering, that is, break-up of rock by the freezing of water in fractures, results in partly very coarse, angular material.

Contraction by repeated warming and cooling may give similar products.

Chemical weathering, sometimes in connection with the other processes, disintegrates the bedrock into fragments and soluble components (Fig. 2).

Grinding by friction at the movement of particles against each other during the transport by water, wind or ice produces fine-grained material. Chemical disintegration removes parts of older rocks in solution, while other parts remain as multi-sized particles.

If these released products remain in place they are called sedentary deposits. If they are transported and redeposited at other places they are called sediments.

Sediments are deposited by different agents :

Mass-movements, that is down-slope transport by gravity, produce often very coarse, poorly sorted deposits, as well as redeposition of any other deposit.

Glacier ice deposits poorly sorted diamictons called till (Fig. 3).

Running water deposits sorted sediments, the texture of which is determined by the velocity of the current (Fig. 4).

Sea or lake water produces more or less coarse-grained beach deposits and fine-grained deep-water sediments. On the ocean floor there is an extremely slow deposition of very fine-grained sediments, partly with organic debris.

Wind sediments are very well sorted, usually sand (Fig. 5).

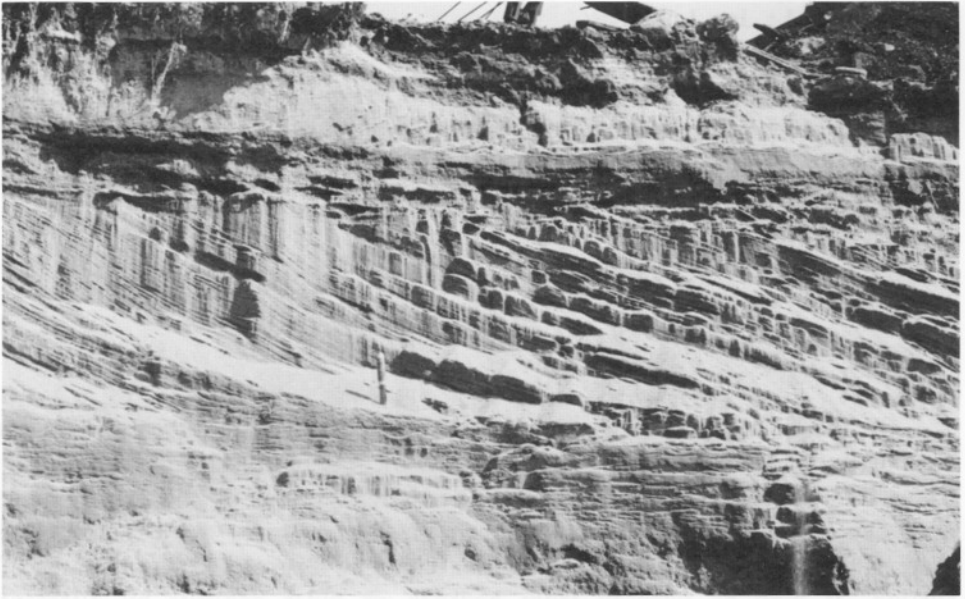


Fig. 1. The structures of sediments give information about the environment in which they were formed. The horizontal topset and bottomset beds and dipping foresets of a delta indicate a river mouth environment. Ancient delta of the River Angermanälven, central Sweden. Photo J. Lundqvist 1970.



Fig. 2. Repeated freezing and warming together with salt water and wind action disintegrates rocks. In dry areas cavernous weathering is the result. Larsemann Hills, East Antarctica. Photo J. Lundqvist 1987.

Chemical precipitation, partly under contribution of organisms, occurs in water as well as on land. Most common are calcareous or siliceous deposits (travertines ; Fig. 6).

Accumulation of organic debris, that is, incompletely humified remnants of plants, algae etc., takes place in wet places (bogs, fens, marshes) as peat (Fig.7), or in open water as gyttja (ooze).

Volcanic activity produces tephra (volcanic ash ; Fig. 8) and lava flows. The tephra is a sediment in the strict sense.

The sediments are affected and changed by secondary processes. These are controlled by, for instance, climatic conditions and chemical environment. In general these processes are referred to as weathering, the main types of which are those mentioned above as releasing sediment-forming debris.



Fig. 3. *Glaciers and inland ice deposit diamict sediments with boulders, till. Alanäs, central Sweden. Photo J. Lundqvist 1959.*



Fig. 4. The typical bedding of banks in sandy sediments indicate flowing water. The structures and grain-size offer a possibility to calculate current velocity and water discharge. Örnsköldsvik region, central Sweden. Photo J. Lundqvist 1968.



Fig. 5. Wind-deposited sand is very well sorted and forms dunes with dipping or crossing beds. River Klarälven, western Sweden. Photo J. Lundqvist 1981.



Fig. 6. Chemically precipitated silica may form travertines. Orakeikorako, North Island, New Zealand. Photo J. Lundqvist 1973.

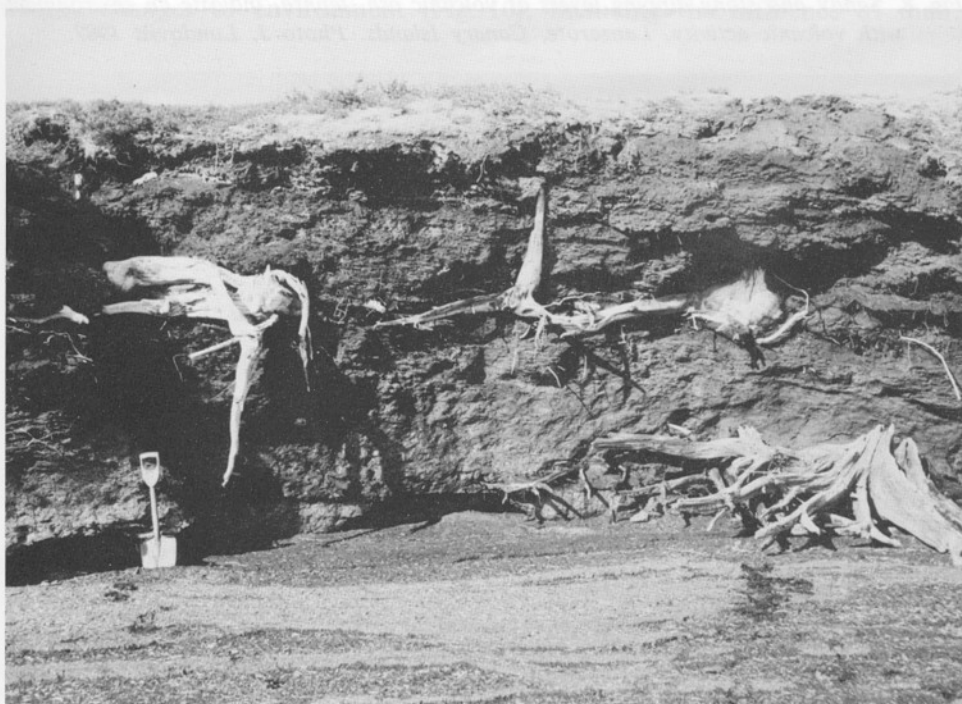


Fig. 7. Accumulation of incompletely decomposed organic debris forms peat, in which plant fragments as well as tree stumps show the changes of vegetation. Ånn, central Sweden. Photo J. Lundqvist 1959.

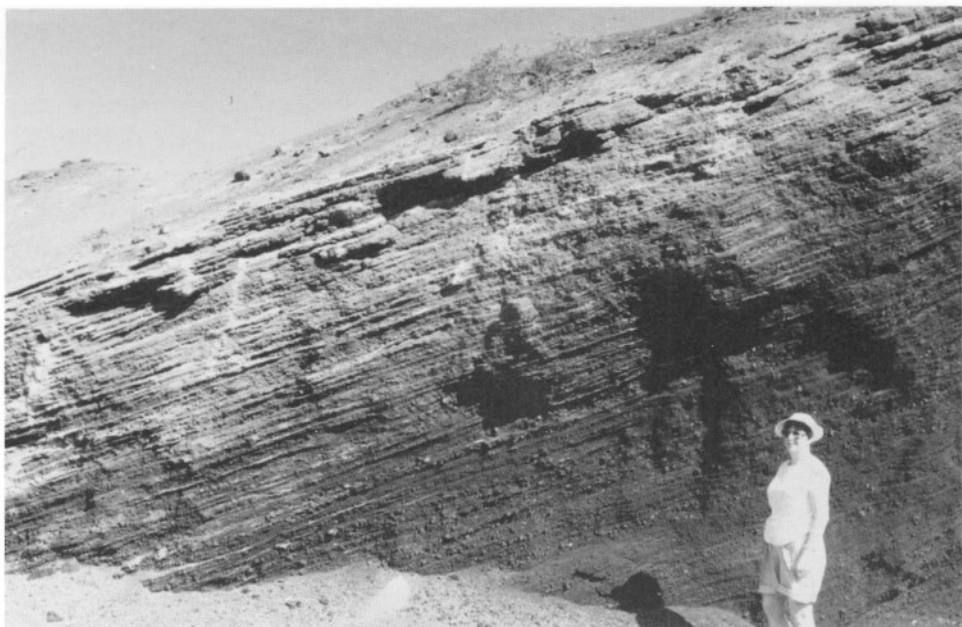


Fig. 8. Sandy and stony dipping layers of volcanic ash, tephra, indicate an environment with volcanic activity. Lanzarote, Canary Islands. Photo J. Lundqvist 1987.



Fig. 9. Landslides in quick-clays, caused by, e.g., human activity, may totally distort the sediments and cause inclusion of fossils and artefacts much younger than the sediment. Tuve, southwestern Sweden. Photo J. Lundqvist 1977.

The influence by human activity upon the weathering by changes of the chemical environment may be considerable.

The surface of all deposits is most strongly affected by chemical and biological processes. *Soils* (Fig. 10) are formed, which are characterized by an upper layer with organic debris, followed by a leached layer, under which there is a zone in which some of the leached constituents have been precipitated.

Other secondary processes are the mass movements mentioned above. Especially the frost action is important in this respect. Repeated freezing and thawing may result in changes of the structure, bedding and sorting of deposits. Landslides (Fig. 9) may result in a complete destruction of the former bedding and a totally changed stratigraphy. The influence of human activity, by displacement of large masses, is an increasingly important factor.

The sediments are characterized by their grain-size (texture) and degree of sorting, as mentioned above. Other characterizing factors are types of bedding, structures and fabric (the arrangement of individual particles). The sequence of strata (beds), the stratigraphy, is essential for the understanding of the changes of environment (Fig. 10), including the influence of man.

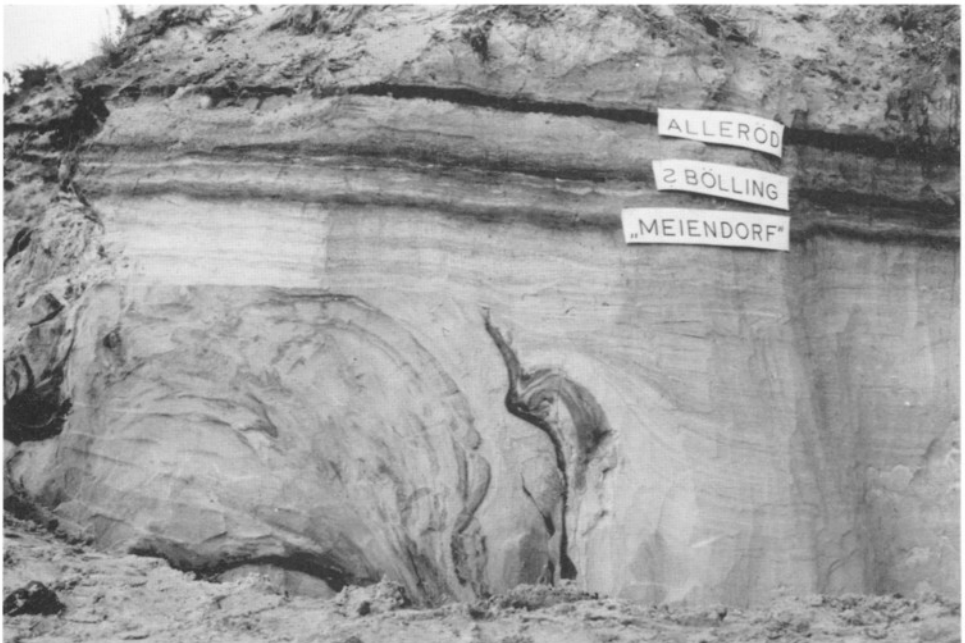


Fig. 10. Beds of organic debris and soils (dark layers) indicate times of warm climate, while sediments with no organic content (white) indicate cold climate in the surroundings of former ice sheets. Near Hamburg, Germany. Photo J. Lundqvist 1970.

The analysis and interpretation of different beds throughout a stratigraphy is therefore an important tool in all archaeological investigations if we want to understand how and why changes of the cultural situation have taken place.

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