Exfoliation Encyclopedia Article

Exfoliation

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Exfoliation

Exfoliation is the term used to describe the peeling away of sheets of **rock** millimeters to meters in thickness from a rock's surface due a range of physical and chemical processes during exhumation and **weathering**. Exfoliation can occur due to several processes.

Unloading or release of stress in a rock that produces expansion joints can cause exfoliation. A reduction in stress occurs when rocks previously buried deeply are exposed due to **erosion** of overlying rocks, or when **ice** sheets that bury rocks melt. During a combination of physical and chemical weathering, exfoliation may occur parallel to a rock's outer surface due to a combination of chemical breakdown of **minerals**, especially in the presence of **water**. Such 'onion-skin' style weathering occurs especially in **igneous rocks** (e.g., **granite**) as micas, amphiboles and pyroxenes, common minerals in many igneous rocks, break down to **clay**. Clays swell in the presence of water, so alternating wetting and drying of a rock may lead to consecutive expansion and shrinking that can result in disintegration and exfoliation.

Stresses induced in a rock due to the expansion of water trapped between grains or in fractures in a rock during **freezing** may result in fracturing. Shattering of rock into small fragments by the expansion of water during the formation of ice is common in arctic environments (causing a problem for field geologists looking for rock relationships and structures). Likewise, changes in **temperature** of a rock may cause exfoliation. Stresses due to variability in the rates and amounts of expansion of different minerals in a rock, or due to alternating expansion and shrinkage from day to night in **desert** areas, may result in exfoliation. Rapid temperature changes may also occur due to lightning strikes followed by cooling in the ensuing rain. Although generally a naturally occurring process, exfoliation was also induced by man to obtain rock sheets several centimeters in thickness to thin, sharp shards of some fine-grained rocks for use as scrapers and knives by heating the rock with fire, then pouring water on the rock's surface.

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