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GEY204 ASSIGNMENT

LITHIFICATION (from the Ancient Greek word lithos meaning 'rock' and the Latin-derived suffix -ific) is the process in which sediments compact under pressure, expel connate fluids, and gradually become solid rock. Essentially, lithification is a process of porosity destruction through compaction and cementation. Lithification includes all the processes which convert unconsolidated sediments into sedimentary rocks. Petrification, though often used as a synonym, is more specifically used to describe the replacement of organic material by silica in the formation of fossils.

CEMENTATION: involves ions carried in groundwater chemically precipitating to form new crystalline material between sedimentary grains. The new pore-filling minerals forms "bridges" between original sediment grains, thereby binding them together. In this way sand becomes "sandstone", and gravel becomes "conglomerate" or "breccia". Cementation occurs as part of the diagenesis or lithification of sediments. Cementation occurs primarily below the water table regardless of sedimentary grain sizes present. Large volumes of pore water must pass through sediment pores for new mineral cements to crystallize and so millions of years are generally required to complete the cementation process. Common mineral cements include calcite, quartz or silica phases like cristobalite, iron oxides, and clay minerals, but other mineral cements also occur.

COMPACTION: is the process by which a sediment progressively loses its porosity due to the effects of pressure from loading. This forms part of the process of lithification. When a layer of sediment is originally deposited, it contains an open framework of particles with the pore space being usually filled with water. As more sediment is deposited above the layer, the effect of the increased loading is to increase the particle-to-particle stresses resulting in porosity reduction primarily through a more efficient packing of the particles and to a lesser extent through elastic compression and pressure solution.

INDURATION: hardening of rocks by heat or baking; also the hardening of sediments through cementation or compaction, or both, without the introduction of heat. The classic example is the rock called hornfels, which is formed at contacts with igneous intrusions and in which heat and fluids from the intruding magma reconstitute the original wall rock into a hardened, flinty rock with a dense texture; it also is commonly formed by induration of carbonate sedimentary rocks and shales.

Three examples of diagenesis

Chalcedony – Microcrystalline varieties of silica, may contain moganite as well.

Chert – A hard, fine-grained sedimentary rock composed of cryptocrystalline silica.

Flint – Cryptocrystalline form of the mineral quartz.