

## Lithification of sediments to form sedimentary rocks, Part I: Processes

Sediments are consolidated or lithified ("rock-ified") to form sedimentary rocks by some combination of two major post-

depositional processes, compaction and cementation. In addition, other processes noted below modify these rocks significantly.

As a result, sediments become physically solid rocks, and their porosity and permeability is decreased.

### Compaction

Compaction is the process in which pressure causes grains of sediment to move closer together, generating a more dense collective material. As compaction progresses, contacts between grains become more abundant (on a contact-per-grain basis) and they progress in shape from tangential to flattened to concavo-convex to sutured.<sup>1</sup> These modified contacts lock the grains together.

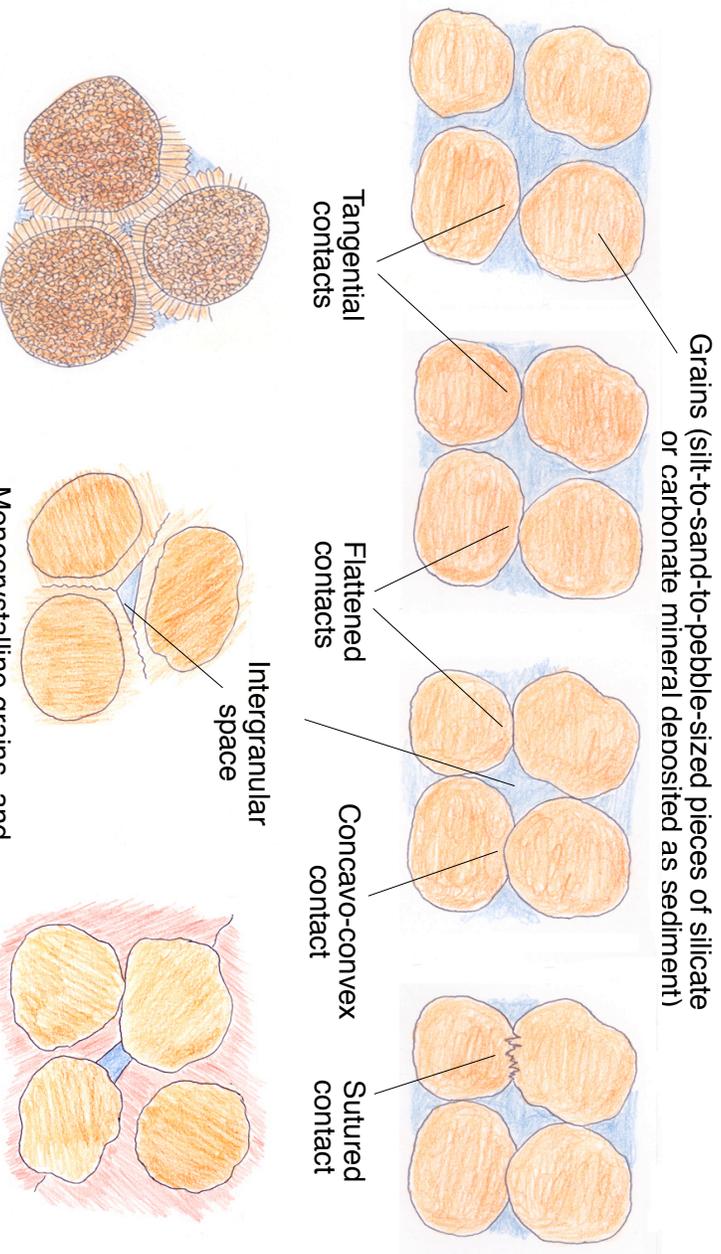
<sup>1</sup>Taylor, J.M., 1950, Pore-space reduction in sandstones: *Amer. Assoc. Petrol. Geol. Bull.*, v. 34, p. 701-716.

### Cementation

Cementation is the chemical precipitation of new mineral material from dissolved solids of porewaters to fill intergranular space in sediments. These cementing crystals form on the surfaces of the grains. As the crystals grow, they meet or engulf other grains or other cementing crystals and thus bond the grains into a solid material. The volumetrically most common cementing minerals are quartz (typically in sandstones) and calcite (in either sandstones or limestones).

### Dissolution of grains

Dissolution of a grain with no subsequent infilling by minerals leaves a *mold*, a void in the shape of the original grain.



### Replacement of grains

Dissolution of a grain and subsequent infilling by another mineral results in a *pseudomorph*, a crystal of one mineral with the shape of pre-existing mineral material.

### Alteration of grains

Atom-by-atom rearrangement or replacement of atoms in a grain can alter the grain to a different mineral. In sandstones, *albitization* transforms more anorthitic feldspars to albite, and in limestones *neomorphism* transforms aragonite to calcite.