Granite Encyclopedia Article

Granite

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Granite

Granite, which makes up 70–80% of Earth's **crust**, is an igneous **rock** formed of interlocking **crystals** of **quartz**, **feldspar**, mica, and other **minerals** in lesser quantities. Large masses of granite are a major ingredient of mountain ranges. Granite is a plutonic rock, meaning that it forms deep underground. Slow cooling gives atoms time to migrate to the surfaces of growing crystals, resulting in a coarse or mottled crystalline structure easily visible to the naked eye.

Geologists have debated rival theories of granite's origin for over 150 years. The two theories most favored today are the magmatic theory and the hypermetamorphic theory. Supporters of the magmatic theory observe that granite is strongly associated with mountain ranges, which in turn tend to follow continental edges where one plate is being subducted (wedged under another). Tens of kilometers beneath the continental edge, the pressure and friction caused by subduction are sufficient to melt large amounts of rock. This melted rock or **magma** ascends toward the surface as large globules or plutons, each containing many cubic kilometers of magma. A**pluton** does not emerge suddenly onto the surface but remains trapped underground, where it cools slowly and may be repeatedly injected from beneath with pulses of fresh magma. To become surface rock, a solidified pluton must finally be uplifted to the surface and stripped bare by **erosion**.

The ultrametamorphic theory, in contrast, argues that granite is not formed from raw magma but consists of sedimentary rock thoroughly melted and re-crystallized. Most geologists now argue that granites can be formed by magmatism, ultrametamorphosis, or a combination of both.

Until recently, geologists thought that plutons of granitic magma would require millions of years to ascend to the surface. However, laboratory experiments with melted rock has shown that granitic magma is thin and runny enough (i.e., of low viscosity) to squirt rapidly upward to the surface through small cracks in the crust. Granite plutons may thus be created in 1,000–100,000 years, rather than in the millions of years previously thought. The precise origin and process of granite formation continues to be a subject of active research.

See Also

Bowen's Reaction Series; Convergent Plate Boundary; Plate Tectonics