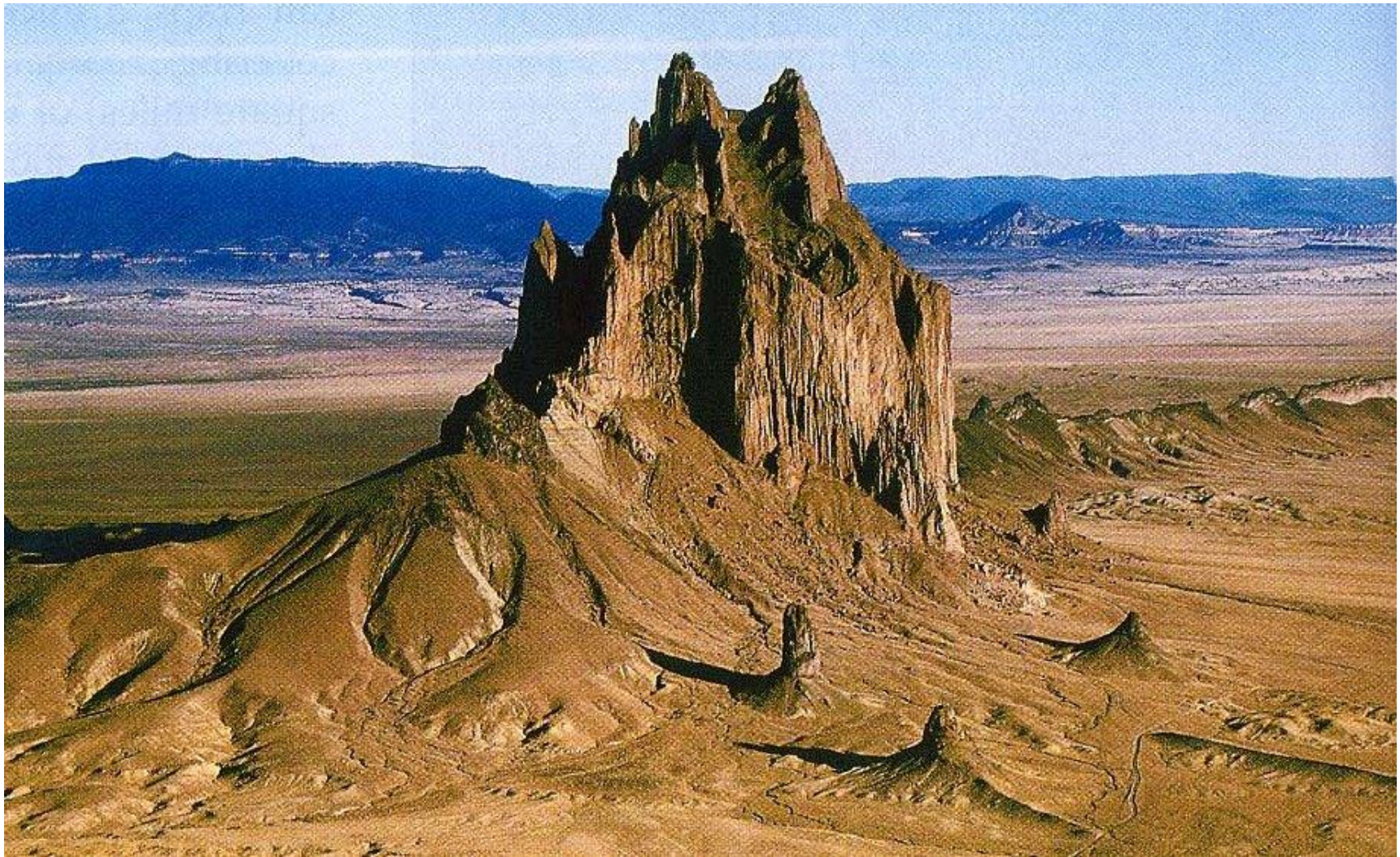
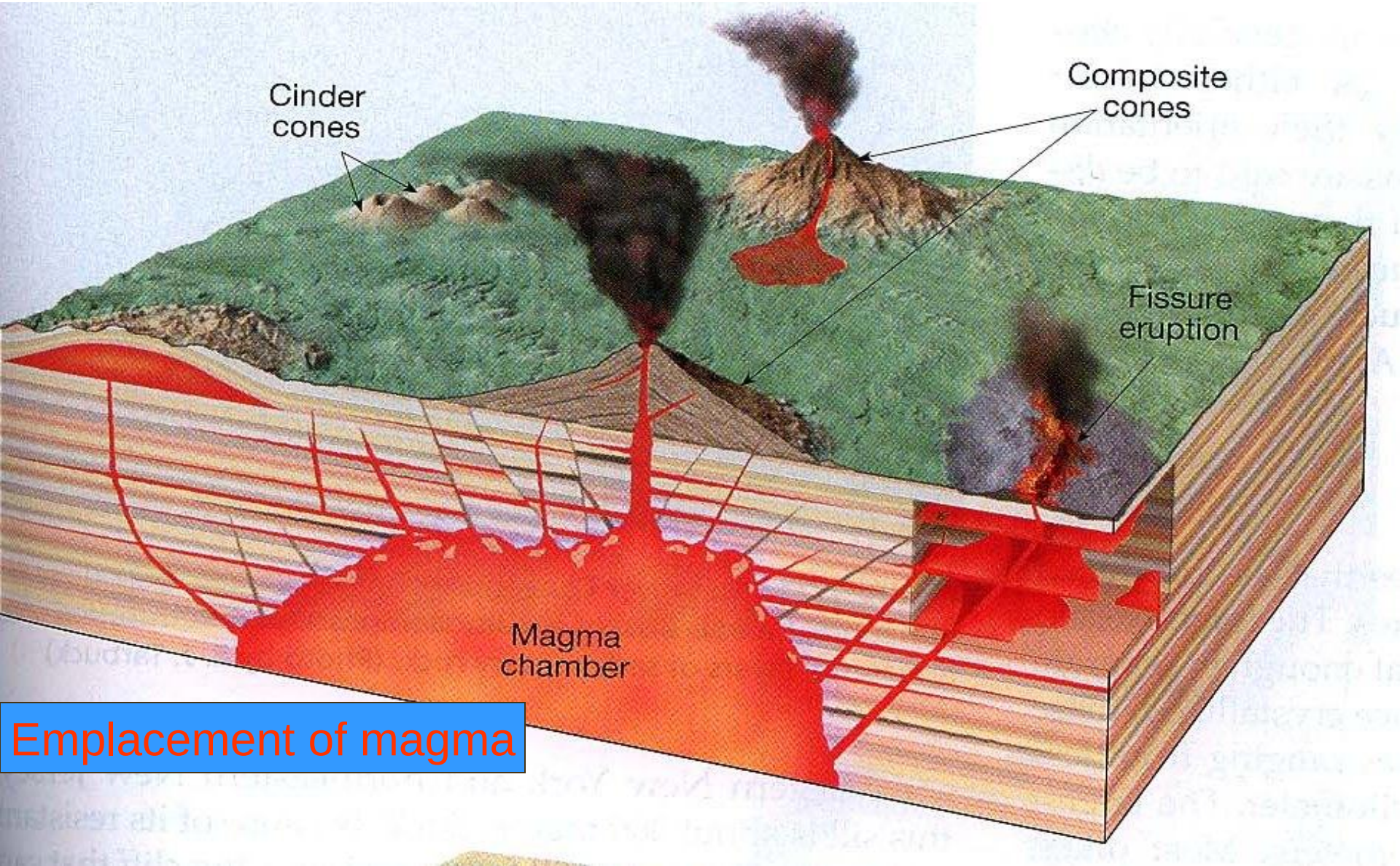
A volcanic neck = 420 m high a magma crystallized in a volcanic vent



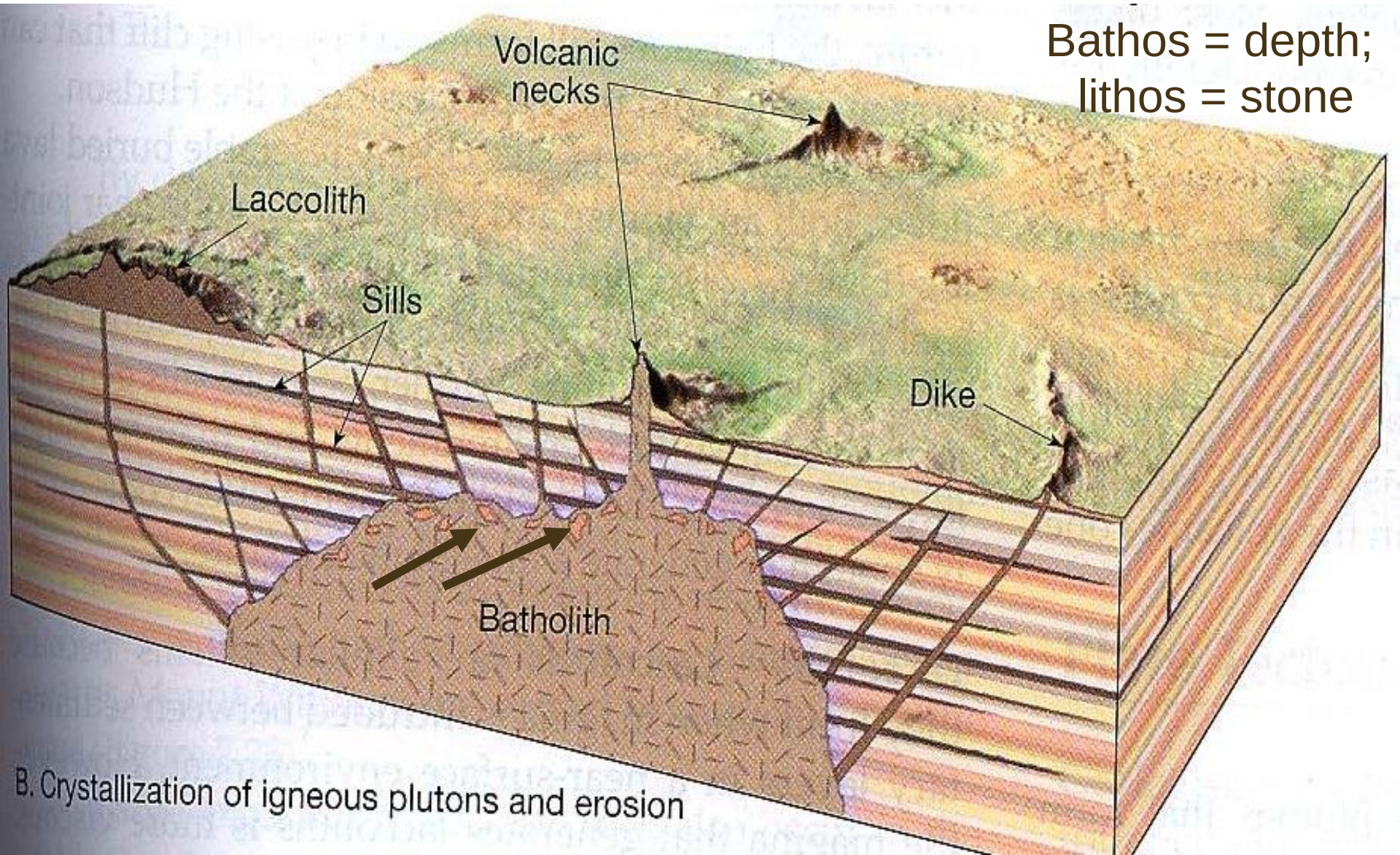
Intrusive Igneous Activity
This what we can not directly observe!



Emplacement of magma

Igneous plutons

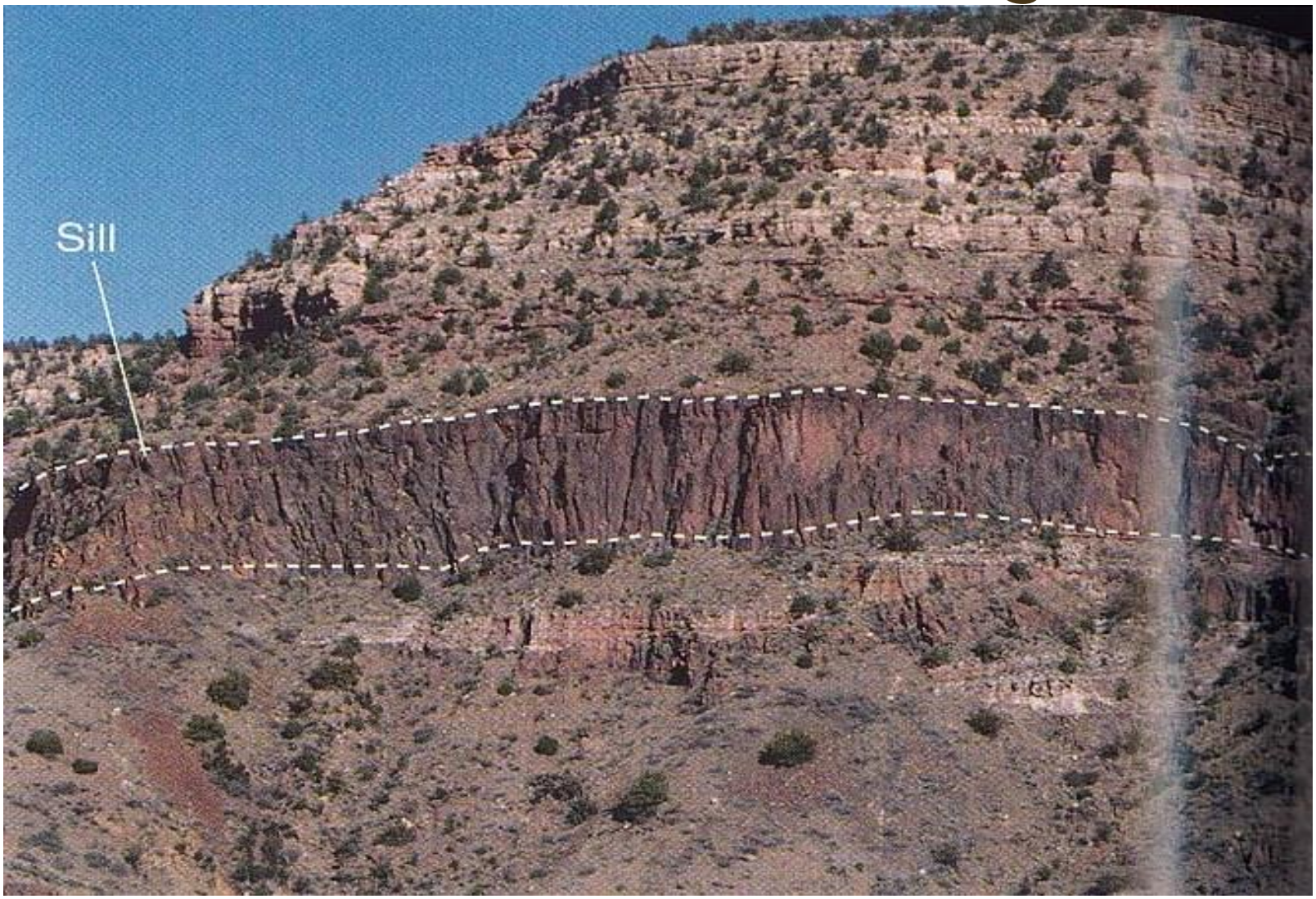
Bathos = depth;
lithos = stone



B. Crystallization of igneous plutons and erosion

A patial view of a granitic batholith 40 km north of Aqaba

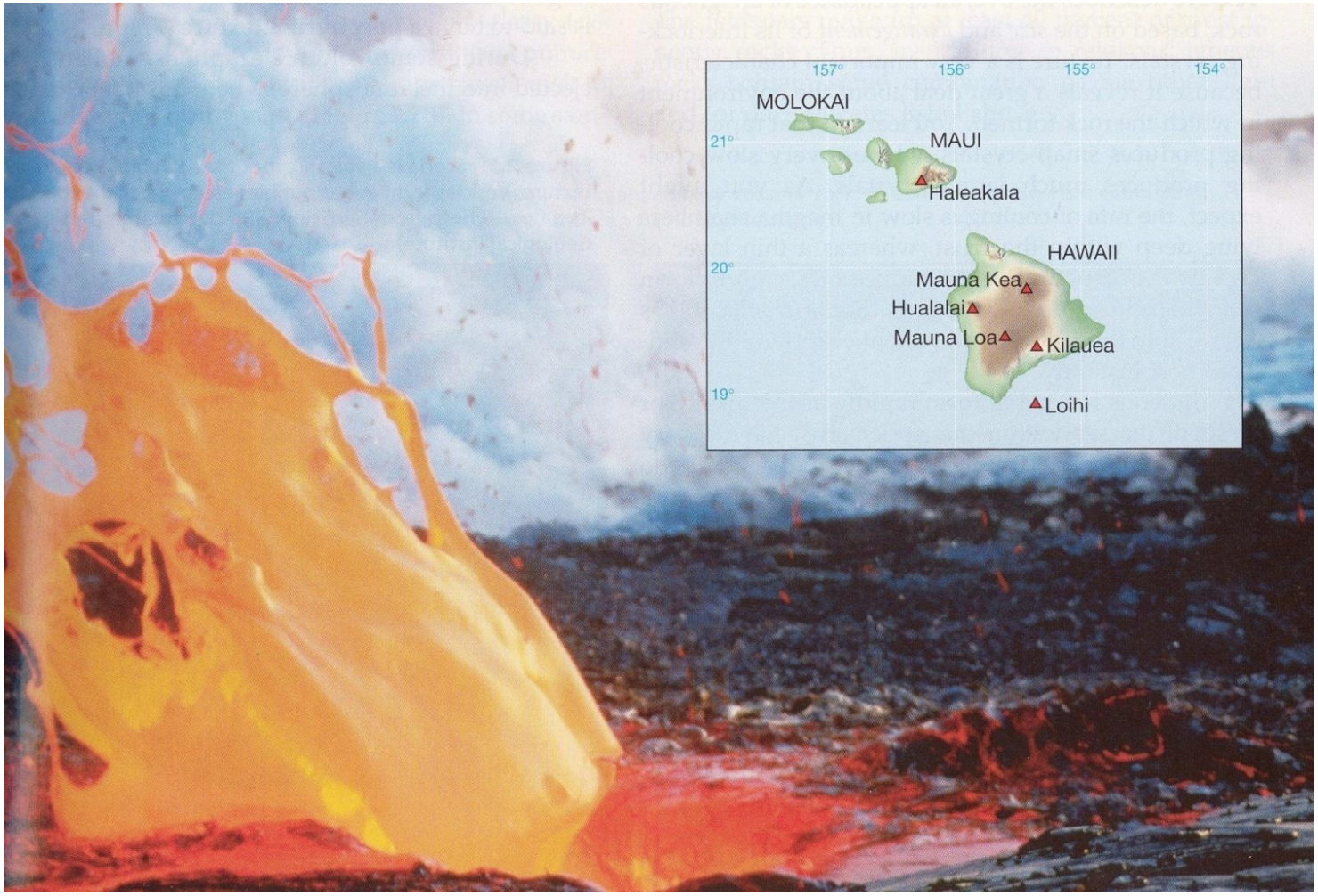
Sills = tabular igneous bodies run concordant to bedding



Dikes (tabular) in Granites

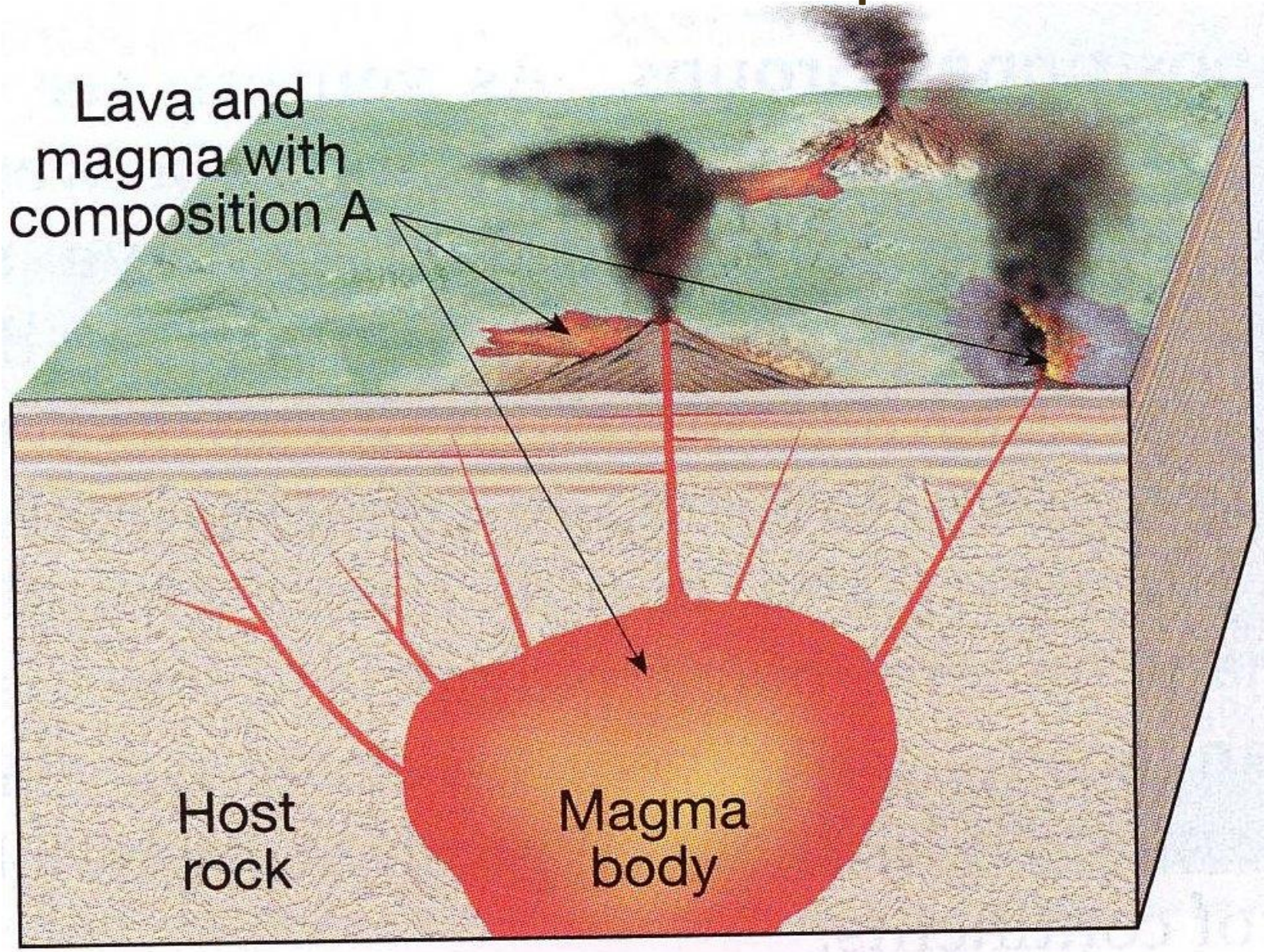
19 23:21

Magma forms by partial melting of mantle or crustal rocks



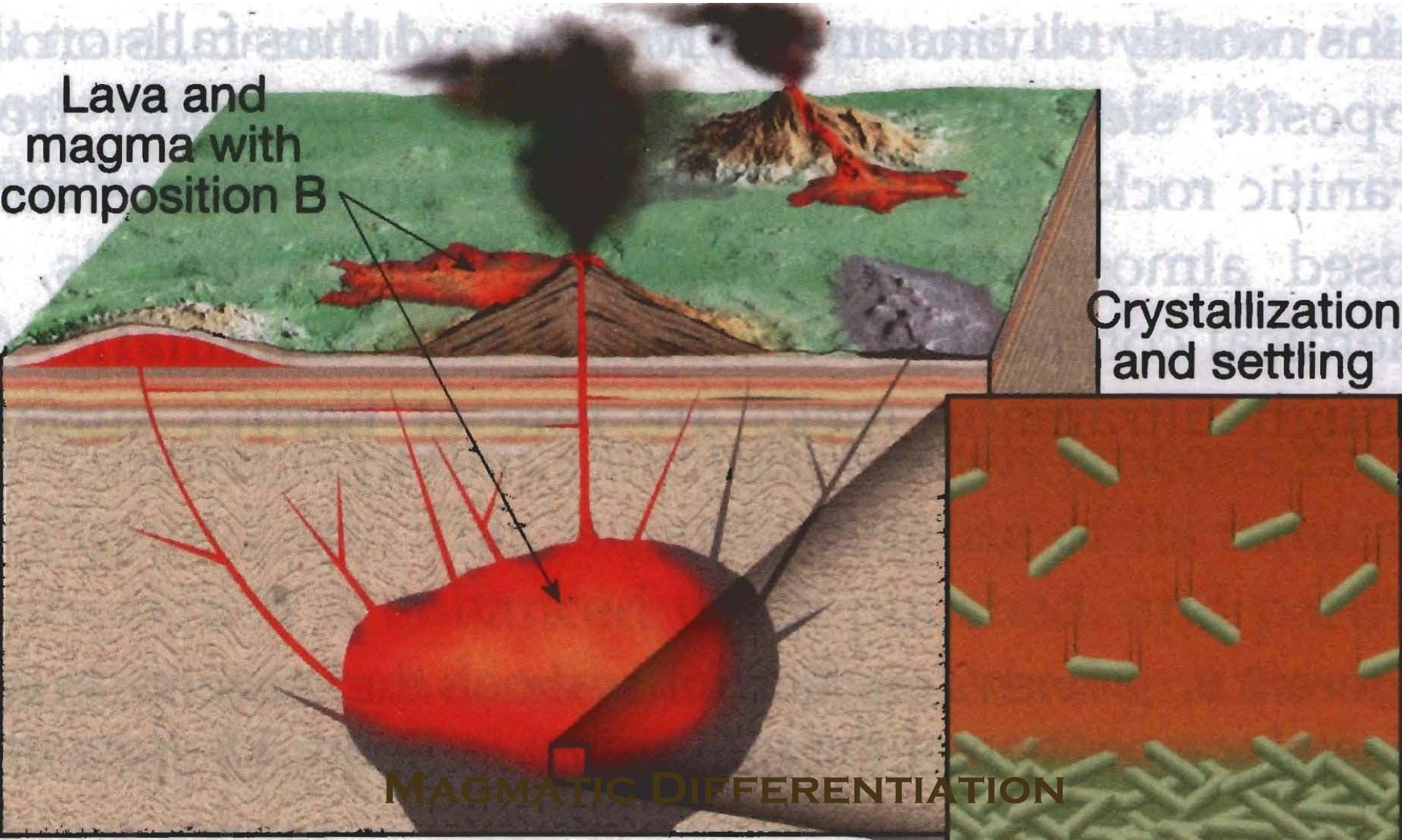
- When magma reaches the surface it loses its gases and become lava.
- The igneous rocks that form on the surface are called **extrusive** or **volcanic** (after the fire god Vulcan).
- Magmas that fail to reach the surface crystallize below the surface and produce the **intrusive** or **plutonic** rocks (after Pluto, the god of the lower world).
- Plutonic rock would only appear on the surface of the Earth when crust is uplifted and the overlying rocks are eroded. The exposures of these rocks are called outcrops.

Magma and the igneous bodies (intrusive & extrusive) have the same composition



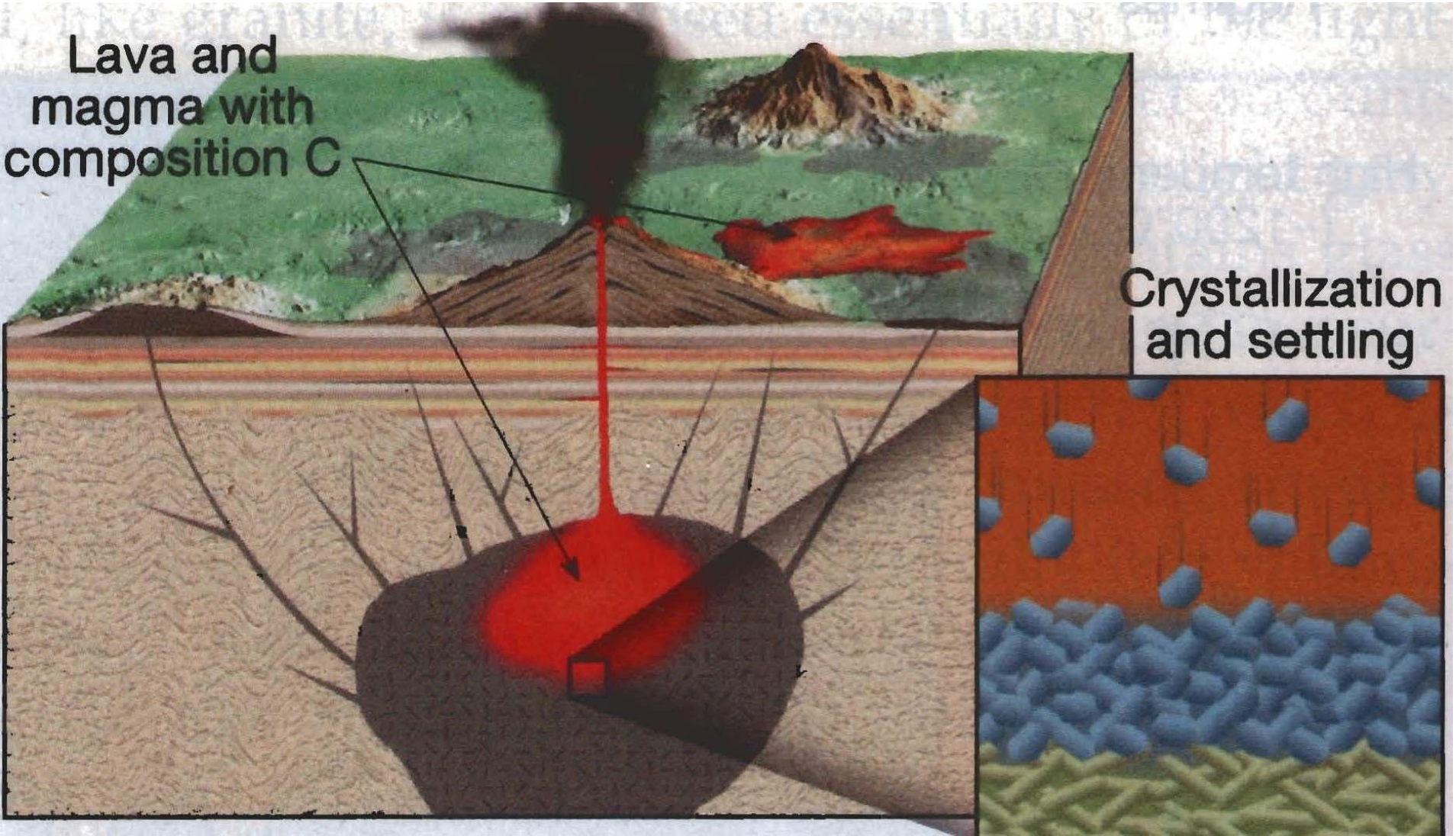
A

Crystallization of the magma and settling of minerals changes the composition of the melt.

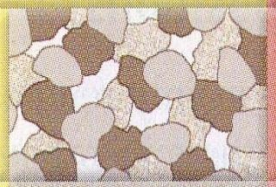
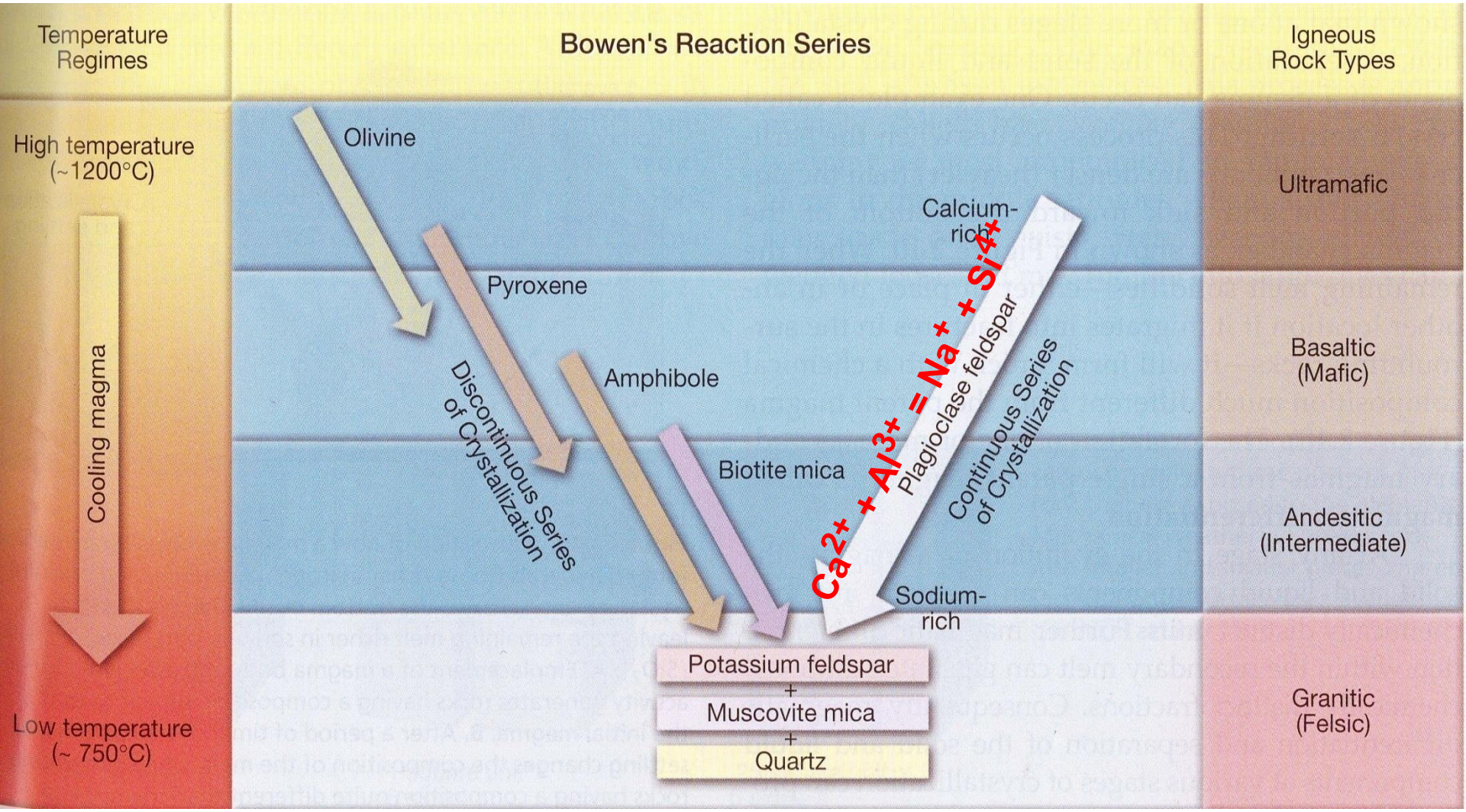


Magmatic Differentiation

Further separation of minerals causes additional changes in the melt composition



Igneous Compositions

Chemical Composition		Granitic (Felsic)	Andesitic (Intermediate)	Basaltic (Mafic)	Ultramafic
Dominant Minerals		Quartz Potassium feldspar Sodium-rich plagioclase feldspar	Amphibole Sodium- and calcium-rich plagioclase feldspar	Pyroxene Calcium-rich plagioclase feldspar	Olivine Pyroxene
TEXTURE	Phaneritic (coarse-grained) 	**Granite**	**Diorite**	**Gabbro**	**Peridotite**
	Aphanitic (fine-grained)	**Rhyolite**	**Andesite**	**Basalt**	**Komatiite** (rare)
	Porphyritic	"Porphyritic" precedes any of the above names whenever there are appreciable phenocrysts			Uncommon
	Glassy	**Obsidian** (compact glass) **Pumice** (frothy glass)			
Rock Color (based on % of dark minerals)		0% to 25%	25% to 45%	45% to 85%	85% to 100%

The sequence below was suggested in the first quarter of twentieth Century by N.L Bowen on the basis of observation and experimental results