EARTH SCIENCE REGENTS
Metamorphic Rocks

Metamorphic Rocks are formed when existing rocks are exposed to both heat and Pressure great enough to prevent the rocks from melting. In the new, high pressure environment bonds in the old x-tal lattice can break and reform in new arrangements - making new minerals. Often the new rocks are more dense (compact) than their parent rocks.

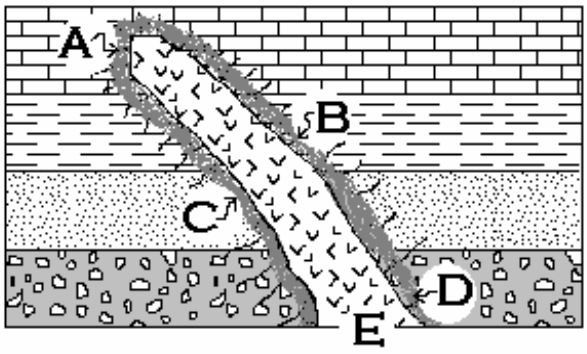
If the pressure is directed (not equal in all directions), the new minerals may grow in a direction perpendicular to the compressive forces, resulting in a ***foliated*** texture. Foliation may result in a banding of light and dark minerals (as in the rock ***gneiss***), or in an apparent "metamorphic layering" of platey minerals like mica, forming the rock called ***schist***.

Types of Metamorphism

Regional Metamorphism

Imagine a deck of cards spread out on a table. Now imagine that you use your arms to bring the cards together into a pile. As the cards slide together some will end up under others, and the mass of cards will become smaller in the horizontal direction, but thicker in the vertical direction. In a similar way, colliding crustal plates ("drifiting continents") produce thick masses of earth's crust pinched between them. The great mountains of the world (the Himalaya in Asia, the Rockies in North America, and the Andes of South America) are merely the top of a mass of piled up crust whose thickness extends 100 Km (60 miles) into the earth. Great pressures are exerted over thousands of cubic miles (!) of rock in the roots of those great mountains - pressures great enough to metamorphose those rocks. The metamorphism over such large areas is called regional metamorphism. Rocks formed there often reveal a distorted/twisted/folded structure.

Contact Metamorphism



In the diagram to the left, an intrusion of magma (E) has worked its way up into unaltered "country rock" - in this case layers of the sedimentary rocks conglomerate, sandstone, shale, and limestone. The heat, pressure, and fluids containing reactive atoms provided by the intrusion alter the country rocks in contact with the intrusion. The conglomerate may be converted to ***metaconglomerate*** (D), the sandstone to ***quartzite*** (C), the shale to ***slate*** (B), and the limestone to ***marble*** (A).

The metamorphic rock ***hornfels*** is another rock formed by the contact metamorphism of country rock by an igneous intrusion.