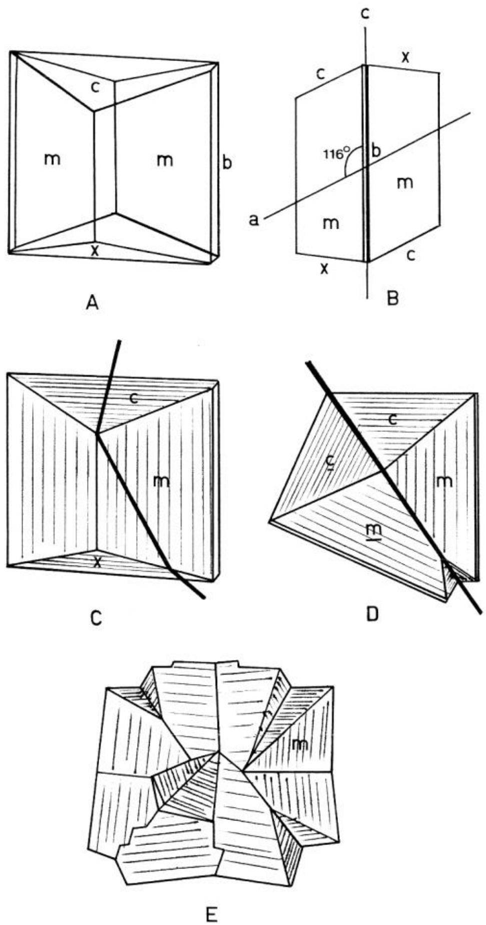

STORIES IN STONE

SOME ROCKS AND MINERALS OF THE WESTERN CAPE

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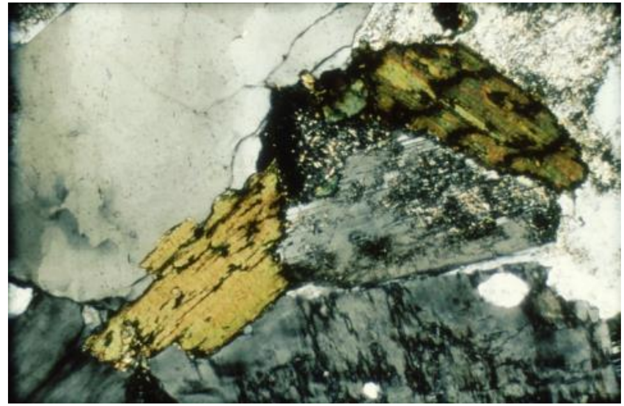
Previous page: Explanatory diagrams of adularia feldspar twins published previously in: Miller, D. 2006. Minerals from the Vredendal dolomite quarry, Western Cape. *South African Lapidary Magazine* **38**(1):6-11. A copy of the article, with a detailed explanation of the twinning, is available on the Friends of Minerals Forum.

SOME ROCKS AND MINERALS OF THE WESTERN CAPE

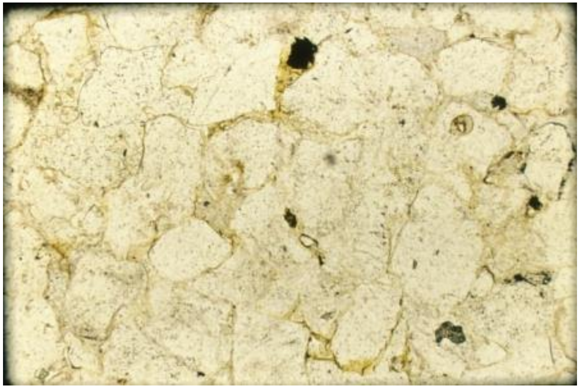
Rocks are collections of mineral grains, sometimes embedded in natural glass. Minerals are simply naturally occurring chemicals, usually compounds made up of various chemical elements. Most rocks can be classified as one of three types, based on how they formed. Igneous rocks solidify from a complete or partial melt. The coarser varieties, like granite, consist of interlocking mineral grains that grew while solidifying slowly.

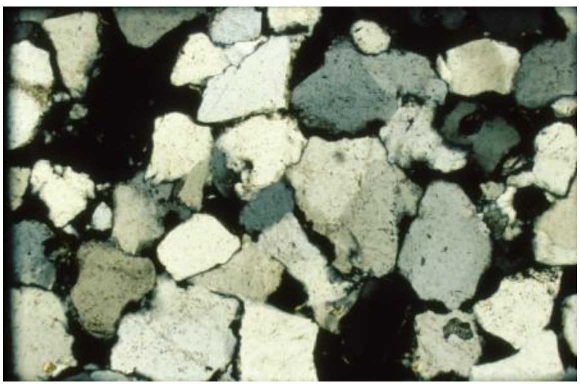
Coarse-grained Cape granite, consisting of large orthoclase feldspar crystals, smaller crystals of plagioclase feldspar, quartz and various dark minerals including mica



A petrographic thin section of Cape granite under crossed polarised light, showing the three major constituents – light grey quartz, partly altered and included dark grey feldspar, and two greenish-brown crystals of biotite mica. The width of the field of view is 1,75 mm.

Sedimentary rocks consist of particles, often derived from erosion, deposited by water, wind, ice or gravity. In the coarser varieties, like sandstone and conglomerate, the individual particles may be cemented together by some secondary matrix.





Two photographs of a petrographic thin section of sandstone from Table Mountain, under plane polarised light (above) and crossed polarised light (below), showing the partly interlocking individual sand grains with interstitial cement The width of the field of view of each photograph is 1,75 mm.

Metamorphic rocks have undergone chemical and physical changes due to heat and/or pressure. Their original constituents have been changed into other minerals and their physical relationships with each other altered.

A water-worn cobble of metamorphic Malmesbury hornfels with two generations of cross-cutting quartz veins

Many people are familiar with quartz, one of the most common minerals in the crust of the Earth, and will be confident that they can recognise it on sight. The other really common minerals making up most of the crust of the Earth are the feldspars, actually a group of minerals sharing similar crystal structures.

A quartz crystal cluster from Vredendal. The geometric points and flat faces of the quartz reflect its regular, internal crystallographic structure.

Like quartz, the feldspars are silicates, meaning they have crystallographic frameworks made up of atoms of silicon and oxygen. In the silicates, four oxygen atoms are arranged symmetrically around a central silicon atom in a tetrahedron. This is like a small pyramid with a triangular base and sides. In the feldspars these tetrahedra are linked together in a three-dimensional network, with adjacent silicon atoms sharing oxygen atoms at the corners.

To make things more complicated, in the feldspars some of the silicon atoms are replaced by aluminium atoms, in a regular way; and the whole framework is stuffed with additional atoms, which commonly are potassium, sodium, and calcium in varying proportions. It is these additional atoms, as well as the cooling rate during crystallisation, which give rise to the differences between the various feldspar minerals. The potassium-rich feldspars include high temperature sanidine, which one can find as tiny clear crystals in pumice, a frothy volcanic rock, sometimes washed up on the Cape beaches.

Rectangular, clear sanidine feldspar crystals in pumice from Yzerfontein beach

A common potassium feldspar is microcline, often, but not always, green. The green gem variety is called amazonite. By now, anyone who has looked closely at the Cape granites should be very familiar with another common potassium feldspar, orthoclase. This forms the big blocky crystals in slowly cooled granitic rocks, and in gem quality it is familiar as blue, pink, or grey moonstone.

Coarse-grained Seeberg granite near Langebaan with a twinned orthoclase feldspar crystal in the centre. The width of the field of view is about 15 cm.

More spectacular are complex twinned crystals of adularia, a particular wedge-shaped habit of orthoclase feldspar, that occur in a dolomite quarry near Vredendal.

Complex, twinned adularia crystal from Vredendal

The sodium and calcium feldspars form a continuous series in terms of composition, between sodium-rich albite, and calcium-rich anorthite, called the plagioclase series. Various intermediate compositions have names of their own. One of these is labradorite, which has a beautiful blue sheen, and is popular in jewellery. It is easy to be overwhelmed by the numerous names for feldspars, and some can be distinguished only through chemical analysis. Nevertheless, the characteristic blocky and wedge-shaped crystal habits, as well as twinning and cleavage, often help to distinguish the various types.