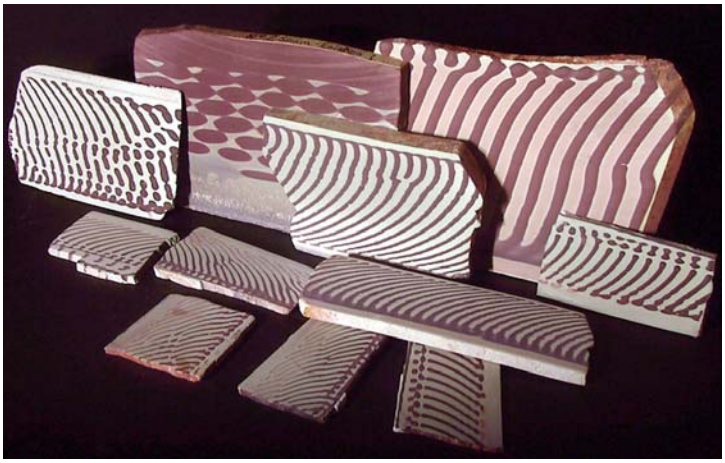
ZEBRA ROCK



This distinctive reddish-brown and white banded ornamental stone from the East Kimberley, Western Australia, has been known as *zebra rock* since its discovery in 1924. Some of the original localities, including one about 4.8km southwest of the former Argyle Downs Station, are now submerged beneath the dam waters of Lake Argyle, but there are others which are still being exploited.

Zebra rock forms lenses and seams, some extending for kilometres, within the Johnny Cake Shale, which is of Late Precambrian age (around 670 million years old). The rock is an “argillite” or clay rock. It is largely made up of clay minerals but also contains tiny angular fragments of quartz and mica flakes, and the mineral, hematite (an iron oxide), which is the main iron-bearing mineral. Most of the clay is the common mineral kaolinite, which forms during weathering of rocks (such as granite) containing feldspar and other aluminium silicates and can be deposited as a sediment in water to eventually make a clay rock like a shale or mudstone.

However, some of the other clay minerals present show that there must have been some alteration of existing minerals in the sediment while it was saturated with water, and we think that grains of iron sulphide (which is commonly found in sediment, sometimes as nodules) also broke down, supplying the iron for the red colouring material, hematite, and forming deposits of the sulphate mineral, gypsum, elsewhere in and around the Johnny Cake Shale.

As the mineral-laden water percolated through the porous rock, it dissolved material and precipitated bands of minerals such as iron oxide as it went. Basically, the concentration at the leading edge of the fluid would build up until it was high enough for material to come out of solution, either as fine crystals or as a gel, in a band. This reduced the amount of dissolved material in the water, so that the leading edge would move on until the concentration was high enough again, and so on, giving rise to a series of bands. If the fluids moved from another direction, solution and re-deposition could happen, explaining why there are sometimes rods and spots rather than bands.

How do we know that this process is the most likely? The key is that if you examine the white and red-brown parts of the rock very carefully, you can see that the only difference between them is the presence or absence of hematite (iron oxide). The pattern of clays, tiny quartz fragments and mica flakes is identical, and there is no change in rock texture, when passing across the boundary between white and red-brown layers. If these layers had somehow been deposited in this particular pattern in the first place, you should see some slight difference when you went from one kind of deposition to another.

Being clay-rich, the rock is soft and easy to work, and can be made more resilient by impregnation with resins or by varnishing after preparation. There are other kinds of banded and patterned ornamental stones, one being the fine-grained sedimentary rock known as “print stone”, mined in the Pilbara, which probably formed in a similar manner.

If you want to read more about this interesting rock, look for the article in the Australian Gemmologist, volume 21, pages 165-168, written by Alex Bevan, which has a full discussion of how it formed and some good illustrations. The photo above (by Geoff Deacon) was taken from there.