

DECOMPOSED CLAYSTONE AND THE GENESIS OF LIMESTONE CAVES

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SOME OBSERVATIONS

Fossils...Occurrence

Within the Jenolan Caves Limestone there is an overwhelming presence of fossil material. Some fossils are easy to see, while others are losing their structure due to recrystallisation. Their widespread occurrence has previously been dismissed even to the extent that in some well-known sections no fossils were recognized at all. But the fossils **are** there, contrary to what others have said.

Hand Samples...Etching to highlight fossils

My observation is that whenever you apply acetic acid to the Jenolan Limestone the claystone surrounding such corals as favosites is highlighted. The claystone is not easily dissolved but remains raised around the surrounded fossils and the trace of the fossil may be clearly seen, imprinted into it. Ref: Fossil ppt. – slide: 20 ‘where does this come from?’

The same raised, or proud, nature of the claystone is readily observable in all the Jenolan caves – **if you look for it**. It is particularly noticeable in wild caves, which have not been subject to as much human interference. This proud claystone was first observed by myself, in the Central River section of Mammoth Cave and I have been inclined to refer to it as ‘Central River Gunk’. Ref: ‘Bedding’ ppt –slides: 9&18.

On my trip to Tasmania a year ago, I found exactly the same texture with claystones surrounding fossils. The only difference is that the Tasmanian claystones from either Mole Creek or Gunn’s Plains Caves limestones are grey, while those at Jenolan are red or brown. I returned with some excellent hand samples of their coral fossils, surrounded by grey claystone.

Claystone and Bedding

In my research for the 'Bedding' ppt. it became obvious that the raised claystones can also be indicators of separate beds within the limestone mass. Thus there is often a link between the claystone and bedding within the limestone. As far as the dip of the limestone is concerned, there seems to have been some disagreement amongst various authors of the available related literature. There is some consensus nowadays that the Jenolan limestone is typically over-turned and dipping steeply. I have not been able to find much more than scant reference to, or analysis of, dip and bedding ***within the limestone, i.e. inside the caves.***

When there would appear to be non-conforming structures within the mass, or where the bedding is ***not steep***, then some kind of unconformity has been assumed. We are informed that all this is evidence of a marine transgression. The structure is "dolomitic palaeokarst", or it is "crystalline palaeokarst" or even "laminated palaeokarst".

So, continuing with my powerpoint presentation on the 'Bedding' I decided to emphasise the following observations...

- The ***nearly vertical nature*** of the bedding
- That we can recognise the bedding most readily by the ***claystone interbeds***

Now I have observed these interbedded claystones to be quite irregular in thickness, from less than 1mm to many cms even lensing out to metres! One of the most stunning lenses is below the 'drum' under Water Cavern, Jubilee cave. Ref: 'Bedding' ppt.- slide: 15

Claystone Lining

I notice also that the caves are regularly lined with a hardened claystone. Between the claystone and the fossiliferous limestone there is often a thin black layer (MnO₂?). At this interface there may also be a thin white solid layer, which I suspect is, or once was gypsum.

THE PHILOSOPHY

I am attempting to deal with the concept that these beds of clay can be of significant size. Ref: Fossils ppt - slide: 'Jenolan Clays'. e.g., "walls of it"; "roofs with it." Also 'Bedding' ppt.-slide: 15

I proposed that they could be of any thickness and perhaps be of material laid into the ancient reef. I supposed that because of their uniform fineness that the clays had originated from volcanic dust.

This philosophy would have allowed the clays to accumulate in various thicknesses and could still possibly be observed within the caves as remnants. I had observed that there **are** such large remnants. These can be seen in all the caves. Ref: 'Fossils' ppt: - slide 22.

My hypothesis is that the clays form into bedded layers; some thick, some as lenses. They form around the corals and have 'suffocated' the corals from time to time, throughout the depositional stage of the limestone, during the Silurian period.

Also, that the clays filled some enormous spaces, gutters within the reef structure and that these clay-filled volumes have become potential caves, and later again, spaces within the limestone rock.

This would explain the erratic occurrence of the large caves, particularly on the southern side at Jenolan. There are no rivers that connect them and as **Armstrong Osborne** suggested, they seem to form from the bottom up. Ref: 'Domes and Doming' ppt-slides 11-13.

What I am saying is, that it is the **clay** rather than the limestone, which is being eroded at that time. This might explain how we observe many of our caves to be so heavily filled, or lined with clay. e.g. Orient Cave, Temple of Baal, Second Persian (adjacent to Orient cave), Pool of Cerberus and River Cave.

There are of course a number of questions:

- How does the clay become weathered when it is enclosed within the limestone?
- Has it been rotted out by water invading? Or
- Was it, in certain places, never lithified?

It seems to me, that **limestone** in this situation, **is the resistant material** and the clay is more readily removed but limited by the transport available to it. It should be noted again, that there are no obvious rivers in the southern section of Jenolan caves. My suggestion is that from time to time the available clays may be partially removed from their beds and relocated downwards within that same cave-space, or to lower caverns. Some of this material will make it's way out along existing water conduits, and of course we can observe this cloud of clay in the various bodies of cave water. (e.g. Cerberus; Styx; Blue Lake; 'Imperial River'; etc.) After any serious rain or storm.

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