A 400 Million Year Old Geological tale

*The landforms around Redesdale:*

As far back as the expedition of Major Mitchell, the shape of the hills in this area were remarked upon for their flat table-top features, presiding over incised valleys and crumbling slopes pock-marked with giant granite boulders. The shape of the land here is a result of the slow erosion of rock and soil over the past million or so years. However, some of the rocks here are very much older than that.

Beginning at the bottom are the sedimentary rocks (mostly made up of clay and silt and sand, formed on an ancient sea floor, cemented into place some 450 million years ago, hundreds of millions of years before the world would see its first dinosaur) that form the foundation stone of much of Victoria. These are sometimes seen in road cuttings in the area and are typically grey to cream in colour, sometimes displaying their characteristic layered pattern. Pushing up through these like a bubble rising in water are the granites, which arrived around 100 million years later. Eventually they reached the end of their bubble like journey and solidified into the grey-coloured crystalline rocks you see poking up through the paddocks. In geological terms, the granites are ‘igneous rocks’ (as opposed to ‘sedimentary rocks’, like the previously mentioned sandstones).

The final arrival on the scene was the basalts (volcanic rock), which are, by comparison, mere infants, spewing out from nearby volcanic vents within the last few million years. They would have filled ancient valleys and streams (which would have been carved into the granites and sandstones beneath, which would later be known to geologists as ‘paleochannels’), and created a very flat volcanic plain. However, basalt is not very resistant to the weather. Soon after the volcanoes stopped flowing, Mother Nature would have started to carve new valleys and streams into the volcanic landscape, and much of the basalt would be eroded away. Once the water was through the basalt, it would start to erode away the more ancient rocks beneath, and the different way the different rocks erode can be seen in the different slope angles between the basalt hilltops and the granite slopes beneath. Some little sections of basalt remain, however, and these can be seen in their original flat lying glory, capping many of the hills in the region and creating perhaps the most striking geographical sight in the area.

*Looking closer:*

*(WARNING: may contain geological terms!)*

Around the paddocks you will see large, grey coloured rocks that are generally rounded in shape. These are members of the rock unit known as the ‘Harcourt Granodiorite’ (‘granodiorite’ is a granitoid rock with more plagioclase feldspar than a typical granite, for the lay people, they’re typically just called ‘granite’). These erode in a characteristic ‘onion skin’ pattern, resulting in rounded boulders and curved sheet like portions that have ‘peeled off’ the boulders. They also tend to form very coarse sand as they erode, typical of the river sand you see in the Coliban and Campaspe Rivers.

Also around some of the paddocks in the area you will find a paler creamy-pink rock that is in flatter and in more square/rectangular shapes. It has been used extensively rock walls in the region. It looks a little bit like sandstone, but in actual fact, it too is a granitoid, in this case, a true granite. This is the Metcalfe Granite, and it is part of the same group of rocks to which the Harcourt Granodiorite belongs (and they are of similar age, around 350 million years old). This group of rocks is properly termed the “Harcourt Suite” and includes several regional variations of granite and granodiorite. The interesting thing about the Metcalfe Granite is that it contains many ‘leucocratic dykes’ (leucocratic – pale coloured, as opposed to melanocratic – dark coloured). These are internal zones that have more of the feldspar and quartz minerals and were like internal ‘channels’ when the rock was emplaced. They actually ‘flowed’ through the surrounding rock. As a result, they contain features that look like the layering of a sandstone, and this also explains their more blocky fracture pattern

Granites (and granodiorites) are what are known as plutonic igneous rocks. They formed beneath the ground when their rise up from the inner earth ceased upon reaching a natural buoyancy level in the earth’s crust. They then solidified (‘crystallised’) and stayed there. In the local version’s case, this happened around 350 million years ago (for scale, the dinosaurs came onto the scene around 250 million years ago and were gone by 65 million years ago). Locally this meant that the granites rose up into the surrounding sedimentary rocks. Thus these are like blobs within the regionally-more-significant sedimentary rocks (sandstones, siltstones and the like). What this implies is that these granites you see today are seeing their first ever sunshine, having previously languished beneath the earth’s surface for most of their 350 million years of existence.

Atop many of the flat-topped hills of the area you will find crumbling reddish-brown rock with lots of holes in it (properly termed ‘vesicles’). This is basalt, and this is the rock that caps the hills and causes their shape. Basalt is a volcanic rock (think of lava flows in Hawaii). You are looking at the last remnants of huge volcanic eruptions that occurred over the last 4 or 5 million years. Victoria was a very active volcanic place in its recent geological history, and in some areas of south western Victoria, it is even possible that eruptions were still taking place when the first human inhabitants arrived some 40 thousand years ago.

On a related point, a side note about the colours of rocks. Basalts are dark-grey to black when they are fresh. Granites are normally very pale grey, as are granodiorites (although they can have a range of colours from pinks to greys to blue-ish colours right up to reds and even some greens in places!). Most of the pink to red to brown colours you see in these rocks are a result of erosion - “weathering”. The colour comes from the fact that all these rocks contain some minerals that have iron in them (basalt contains a lot of these minerals, granite hardly any). When those minerals weather they produce iron-rich minerals such as limonite and hematite. These are orange-red in colour and spread out and ‘stain’ the surrounding rocks. The effect can be quite pervasive, resulting in the colouration of entire rock pieces. In the case of basalt, the entire rock has had some degree of weathering, and so it is now a dark brown-red colour, having lost nearly all of its original fresh black. In the case of the local granite, the original rock is nearly white, however, the little bit of iron staining that has occurred has given these rocks their slightly pink hue. Indeed, a little bit of iron staining is exactly what gives some of these rocks their spectrum of colour, resulting in the beautiful pinks and creams that you see today.

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