THE BUNYA MOUNTAINS

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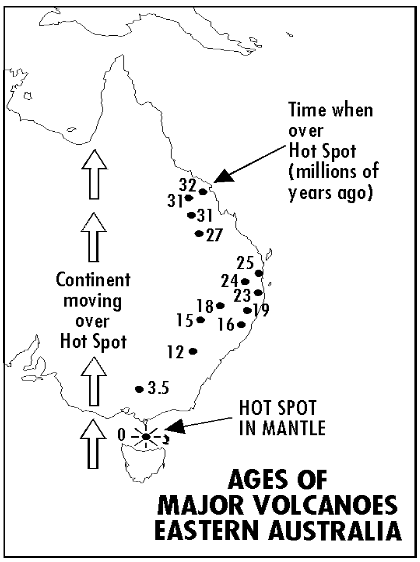
Before we can begin to understand the remarkable forests and landscapes of the Bunya Mountains, we need to know how the mountains themselves came to be here, what they are composed of, and what has happened to them since. For the story of the very beginnings of the Bunya Mountains, and the evidence remaining, read on...

Origin

The Bunya Mountains, on the Main Divide north of Toowoomba, are in fact the remains of a broad dome or"shield" shaped volcano which was built from numerous basalt lava flows about 23-24 million years ago. But why did it develop here at that time?

The volcano formed part of a wider area of volcanic activity which extended from the southern Main Range on the NSW border, northwards to Kingaroy and beyond. Other major volcanoes of similar age in the region include the Focal Peak Volcano near Mount Barney, and the well known and much larger Tweed Volcano whose remains form the Lamington Plateau and the Border Ranges.



During the Tertiary period of geological time (65-2 million years ago), eastern Australia was the scene of extensive volcanic activity, which left as its legacy large areas of basalt. The various volcanoes did not erupt all at the same time; activity was spread over a long period, from at least 32 million years to as little as 4000 years ago.

The volcanic magma, at least for the larger shield volcanoes, is believed to have been generated at a "hot-spot" in the Earth's mantle, deep beneath the crust. The age of these larger volcanic centres seems to be related to the drift of the Australian continent northwards towards New Guinea, which has been going on since the early Tertiary. As the continent passed over the stationary hot-spot, basalt lavas were periodically forced up through weaknesses in the crust. The ages of the volcanoes decrease progressively to the south by the amounts expected from the speed of the northward drift of the continent (about 65mm per year). Southeast Queensland apparently passed over the hot-spot about 25-23 million years ago.

Basalt lavas have a low viscosity, tending to flow large distances from the crater, and to form gently sloping "shield" volcanoes rather than the classical steep-sided peaks usually visualised as volcanoes, such as Mount Vesuvius. The name "shield" comes from the shape of an upturned warrior's shield. In some of the volcanoes of southeast Queensland there were one or two periods when trachyte or rhyolite lavas were erupted; these tended to be thicker but more localised in extent.

There is evidence that some eruptions, particularly the earliest, involved not quiet extrusion of the lava but violent ejection of material into the air, resulting in deposits of tuff and volcanic breccia (pyroclastic rocks). These airborne materials underwent spontaneous oxidation, and resulting red iron oxides imparted a red colour after they accumulated. Although prone to erosion, they are still evident at a number of localities, occurring as distinctive red brown soils and weathered rocks.

History of the Bunya Mountains volcano

The first lavas flowed out over a land surface consisting of eroded older rocks (sedimentary rocks of Mesozoic age (200-180 million years) and some even older Palaeozoic rocks). Irregularities in the underlying rocks such as stream channels and valleys were filled initially, with successive outpourings gradually producing a horizontal or gently sloping surface.

The lava flows show a generally outward radial slope from the summit region, and their sources are assumed to have been either fissures or a number of small vents in or buried beneath the summit ridge. No craters remain visible.

All the lavas are of basalt, except for an isolated plug and flow of trachyte low down on the southwestern flank of the mountains. It has not been possible to subdivide the lavas into different episodes because of a lack of marker beds or layers, such as trachyte flows, tuffs or unusual basalts.

At Mount Kiangarow, about 700m of basalt are estimated to be present, suggesting the original volcano was more than 1100m above sea level. Thicknesses in other areas are much less, largely because of subsequent erosion. The average thickness of individual flows is difficult to estimate because very few are fully exposed, but most appear to be about 3 to 6 m thick.

The basalts

The basalts of the Bunya Mountains are fairly typical of other basalts in

Queensland, being generally fine-grained, dark grey to black igneous rocks. In most cases individual minerals cannot be recognised by the naked eye because of the fine grain size, but in some specimens light coloured rectangular crystals of plagioclase can be distinguished. Under microscopic examination, minerals such as plagioclase (labradorite), olivine, augite, magnetite and glass can be identified. Chemically the rocks are rich in iron and magnesium.

Whilst the lavas in the area are roughly similar chemically and mineralogically, several factors have resulted in considerable variation between individual flows:- the cooling conditions of the lava, the amount of dissolved gases, and the time interval between successive flows. For instance, very gassy lavas often solidify before gases can completely escape, resulting in a rock perforated by small holes (or vesicles) which greatly enhance its susceptibility to weathering. In some cases the holes may be filled with minerals such as zeolites deposited from late fluids and gasses. When in-filled, the vesicles are referred to as amygdules.

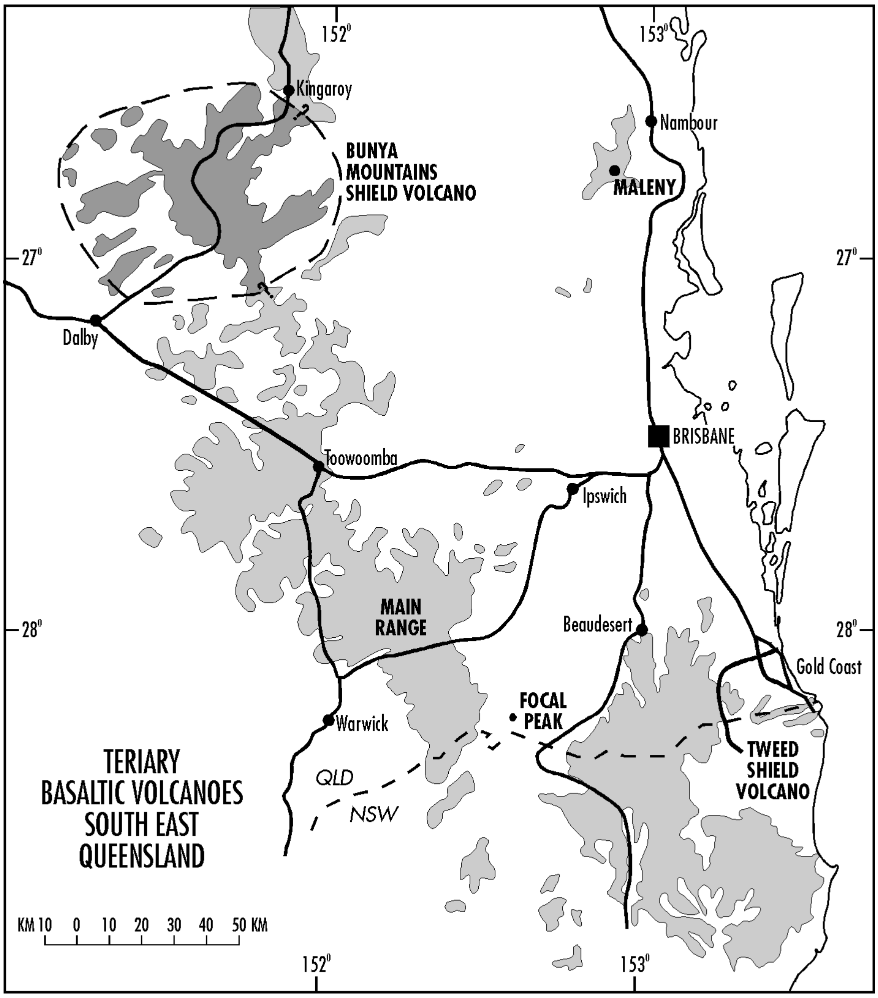
Lava cooling conditions can also result in a considerable variation in the degree of jointing (fracturing) in different flows. Some basalts may have very few fractures (massive), while some may be highly fractured and extremely susceptible to weathering.

Thick flows cool slowly and commonly develop a regular pattern of cooling fractures called columnar jointing. The columns are generally polygonal in cross section and are a common feature of basalt areas.

Time breaks between eruptions are also important; in some cases the time between lava outpourings is sufficient for weathering and soil formation to be well advanced on a previous flow.

Weathering and erosion

Once exposed to the agents of weathering (water, carbon dioxide, and oxygen, and organic acids), the mineral constituents of basalt break down to produce clay minerals and a number of oxides, notably iron. The chemical breakdown goes hand in hand with a physical disintegration of the rock fabric eventually resulting in the formation of soil which is often deep, sometimes black, sometimes red brown, and relatively fertile.



The rate of breakdown of the basalt on weathering is dependent on factors such as the degree of jointing and climate. It may be aided by biological activity such as tree roots, which open up the joints and permit increased groundwater infiltration, and the presence of organic debris which form acids.

Development of the landscape

After the volcano became extinct, new streams developed and began to erode valleys on the sides of the basalt pile, particularly on the northeastern and southwestern flanks. These were the ancestors of the creeks draining the range today. Their headwaters are gradually eating back towards the crest of the watershed, but the crest still remains as the present range of the Bunya Mountains.

Difference in susceptibility to weathering between flows has strongly influenced the development of landscape. The more easily weathered vesicular and highly fractured flows erode more quickly, undercutting the more resistant flows which then form small waterfalls. As erosion continues, the more resistant flows are further undercut and fail as large blocks. Eventually sets of waterfalls on the one stream may coalesce to form one large waterfall.

Erosion of the intervening spurs between streams may ultimately result in the formation of an escarpment, as has occurred in sections of the Great Dividing Range such as near Toowoomba. The southwestern side of the Bunya Mountains is a lesser escarpment of this type.

At the time of the volcano the climate was cool and moist but beginning to dry out as the continent drifted northward. Warm temperate and subtropical rainforest was widespread, with relatives of bunya and hoop pines in drier areas. Continuing drying saw the evolution of the eucalypts, which invaded the mountains from the surrounding plains, leaving the rainforests only as remnants in the higher-rainfall, elevated areas.

The grassy balds

The Bunya Mountain "balds" have been the subject of conjecture for many years. Several theories have been proposed to explain these virtually treeless grasslands. These include persistent firing of specific areas by Aboriginies and the shallowness of soils in the bald areas combined with a gradual drying of the climate. Two of the smaller balds may be observed a short distance along the Westcliff Lookout (Picnic Cove) and Cherry Plains tracks. These two small balds are good examples of sites where geological conditions appear to have been a significant factor in the exclusion of trees. Sheets of virtually massive (unfractured) basalt are exposed at the surface on these balds, and hand augering has revealed similar basalt at shallow depths in other sections of the balds. The lack of fractures in the basalt has severely inhibited weathering, soil formation, and root penetration which has consequently played a significant role in the exclusion of trees. However, depth to rock is obviously not the only factor as there are balds where there is a considerable thickness of soil.

Looking at the rocks of the Bunya Mountains

Along the walking tracks

The walking tracks of the National Park and Russell Park are near the crest of the range where the basalts have been deeply weathered to red soils, so unfortunately there are few good exposures of the rocks to be seen. Exposures of the basalts are limited to boulders in the soil, creek beds and water falls.

Festoon Falls and Tim Shea Falls on the Scenic Circuit Track probably formed from differential erosion of hard and soft basalt flows. Big Falls on the Barkers Creek Circuit may be considered the end result of this process when a number of smaller falls coalesce to form one large waterfall.

Descending the mountains

A better appreciation of the basalt flows making up the mountains can be gained from road cuttings on both the Dalby and Nanango roads.

Dalby road

Measure distances downhill from Munroe's Camp picnic area. At 0.8km there is an entrance to a gravel pit on the left; this is a convenient place to park. About 30m downhill on the main road (Point 1) the cutting shows "onion skin" weathering in a basalt flow. This weathering pattern results from groundwater percolating along the roughly rectangular system of joints and penetrating further into the rock at joint intersections thus resulting in successive layers of rock decomposing in progressively more rounded shapes and leaving a hard rounded central kernel.

The size of the resulting kernel depends on the minimum joint spacing; where the joints are widely spaced, large rounded boulders up to 2 m in diameter may result.

At about another 0.5km downhill (Point 2) a reddish layer can be seen in a cutting - as the road is narrow here either walk to it or pull off to the left just past it. The layer is the junction between two basalt flows. The upper flow at the top of the cutting is black, not much fractured, and contains only a few gas bubble holes.

The lower flow can be seen in the base of the cutting and consists of grey, softer, more fractured basalt with numerous small gas bubble holes with white infillings. These small holes (vesicles) are caused by solidification of the lava before the entrapped gases can escape. In some cases the holes have been in-filled by zeolite minerals, probably chabazite, which have crystallised from late gases and liquids.

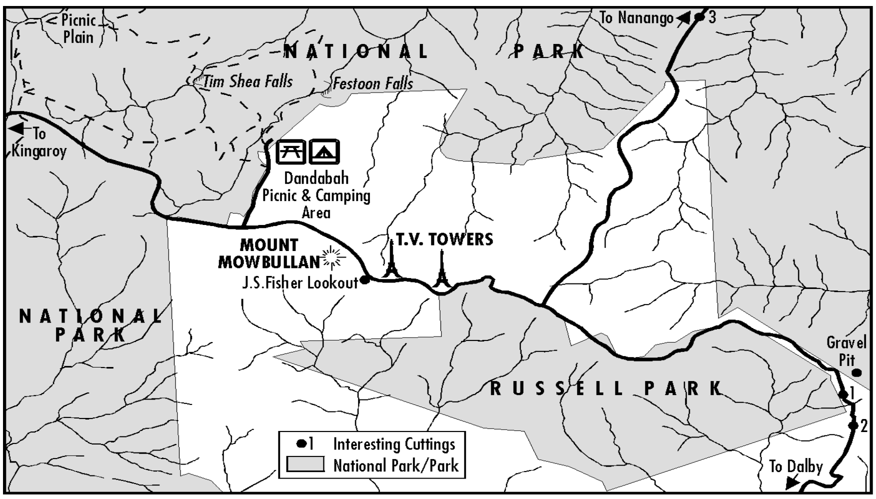
In between the two flows there is a layer about 1m thick of fragmented lumps of vesicular basalt with patches of a red, fine matrix. This could be the top of the lower lava flow, broken up as it flowed along, or it could be a layer of debris from a small explosive eruption. The red colour is from oxidation at the top of the flow or in the air after the explosive debris were ejected; this may have been accentuated later by the deposition of iron oxides in the permeable layer from circulating groundwater.

If continuing along the Maclagan-Jondaryan road after descending the mountain, one can see a good exposure of fresh basalt in the western end of a cutting about 0.7km from the T-junction with the Dalby road. This is a good place to collect samples of basalt if desired.

At about 9.3km from the T-junction, the old rocks underlying the basalt can be seen in a cutting. They are horizontally bedded, fine grained and iron stained sandstones of the Marburg Formation (about 200 million years old).

Nanango Road

Measure distances downhill from the T-junction with the Dalby-Kingaroy road on the crest of the range. In the cuttings of this road basalts can be seen in various stages of weathering. At about 3.6km downhill, a cutting on the right shows the junction between two flows (pull off to the left just past cutting Point 3). The reddish layer at the junction is very similar to that described above on the Dalby road, but in this case only the upper flow and the fragmented layer beneath it are exposed. More study would be needed to determine if the two exposures are in fact of the same flow junction, or whether they simply show similar junctions at different levels in the volcanic pile.



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