MOUNT BARNEY - MOUNT BALLOW

by Neville Stevens and Warwick Willmott

Mount Barney is the aristocrat of the mountains of southeast Queensland.

Mount Superbus on the Main Range is slightly higher, but it is the isolated rocky bulk of Barney, rising with its sheer eastern face and attended by its retinue of lesser rocky peaks, that captures the imagination of both bushwalkers and naturalists. How did these mountains come to be here, and why are they so different from the other mountains of the district?

Origins

In summary, Mount Barney and the complex of surrounding peaks are the underground roots of a large shield volcano that erupted about 24 million years ago (the Focal Peak Volcano). It was one of several such centres (Bunya Mountains, Main Range, Focal Peak, Tweed) that erupted in succession around that time as the Australian crustal plate drifted northwards over a hot spot in the Earth's mantle. (see companion leaflets on the above areas for more detail).

The Focal Peak Volcano succeeded the Main Range centre, and in fact it is suspected that some of the higher lavas of the southern Main Range came from Focal Peak. In turn it was succeeded by the larger Tweed Volcano centred over Mount Warning in New South Wales, whose lavas buried many of those from Focal Peak.

The centre of eruption is not as clear as in the Tweed Volcano, as the central area has been disrupted by uplift and subsequent erosion (see below). However the general history of the volcano can still be interpreted from the distribution of the different rock types. The most likely main centre is thought to have been over Focal Peak, between Mount Barney and Mount Ballow.

Sequence of events

Before the volcano erupted, the landscape consisted of broad north-south valleys eroded in soft shales and sandstones of Jurassic age (the Walloon Coal Measures, 180 million years old). Beneath these rocks there were sandstones of Triassic-Jurassic age (the Marburg Formation and Woogaroo Sub-Group), and at much greater depths, the Mount Barney beds. These are much older rocks, which were deposited as marine sediments on the continental shelf in Carboniferous times (290 million years ago)

1. Just before the first eruptions, magma, injected into the crust from great depths, domed up the sedimentary rocks, resulting in outwardly dipping (inclined) strata in a circular pattern. The first lavas were *basalt* which flowed down the broad valleys as far as Beaudesert in the north, Tamborine in the east and Kyogle in the south (the Albert Basalt and Kyogle Basalt), gradually building up a sloping shield with a large central crater (a caldera).

2. Late in the activity the summit caldera may have collapsed, as around Focal Peak the underlying sedimentary strata are inclined (collapsed?) inwards in a circular pattern.

A small body of *gabbro, monzonite* and *syenite* was intruded as a central plug beneath the conduit (now Focal Peak itself), analogous to larger masses of similar rocks making up much of Mount Warning. Thin circular dykes (cone sheets) composed of *dolerite* (coarse basalt) surround this intrusion, and there are thicker circular dykes of *microsyenit*e (coarse trachyte) which form part of Mount Ballow and Montserrat Lookout.

3. A second major phase of activity beneath the volcano saw the magma type change to *rhyolite*, an event which is not uncommon in shield volcanoes. One large mass of rhyolite magma began to cool and crystallize beneath the volcano, and a medium-grained rock known as *granophyre* resulted.

4. A sudden surge of pressure from below saw further up-doming of the surrounding sedimentary rocks, and part of the granophyre mass and some adjacent rocks of the old Mount Barney beds quickly thrust up inside a major circular Ring Fault.

It has been estimated that upward movement of the granophyre, which now forms Mount Barney, may have been of the order of 2400m. This explains the apparent anomaly that Mount Barney, formed by rock that crystallized beneath the surface, is now considerably higher than the base of lava flows of similar age. The sediments are now steeply inclined around the margins of the granophyre and occur both within and outside the Ring Fault.

5. About this time pulses of rhyolite magma were injected in major sills (intrusions parallel to the strata) in a circular pattern around the margins of the domed-up sedimentary rocks.

6. Also about this time some rhyolite was erupted at the surface from vents outside and to the east of the domed up area (in the vicinity of Mount Gillies and Campbells Folly).

Rhyolite produces more explosive eruptions than basalt, and fragmental deposits (tuff, breccia and agglomerate) extended over the eastern flank of the volcano. Subsequent rhyolite lava flows extended as far east as the Hillview Cliffs south of Kerry. These rhyolitic rocks are the Mount Gillies Volcanics.

7. The doming and upthrusting of the granophyre mass resulted in a high mountain complex standing well above the volcanic shield and surrounding landscape. Consequently rapid erosion began, with the soft sedimentary rocks of the dome being removed. The granophyre must soon have been exposed at the surface, as gravels containing granophyre (the Chinghee Conglomerate) are known over the eastern flank of the volcano, as far east as the Numinbah Valley, immediately beneath the only slightly younger first basalts from the Tweed Volcano.

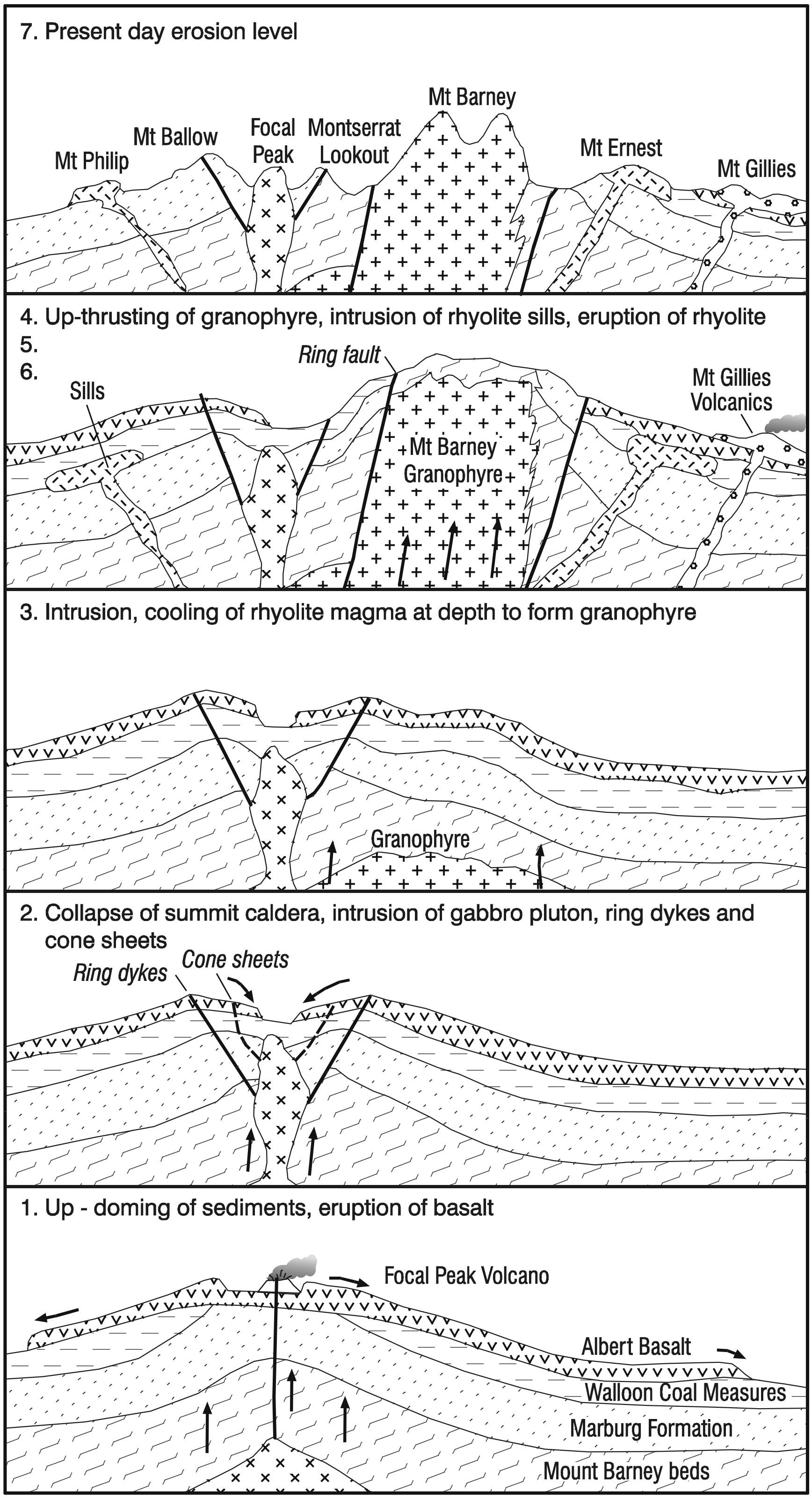
The end result

The erosion of the domed and upthrust area has removed most traces of the basalt lavas at the centre of the volcano, including any central crater or caldera, leaving only the resistant intrusive bodies standing above the soft sedimentary rocks originally beneath the volcano. This uplift history, and the large mass of rhyolite magma that cooled to the granophyre, are the main reasons that this area is so different from the remains of other shield volcanoes.

The main granophyre mass has eroded along fractures to form the peaks and ridges of Mount Barney. The small intrusion of gabbro etc beneath the original vent is moderately resistant and forms the present Focal Peak. A circular basin around Focal Peak is eroded in the sedimentary rocks that possibly represent the bedrock beneath a collapsed summit caldera. The rhyolite which was intruded as sills around the margin of the dome, forms the major resistant peaks of Mount Ernest, Mount Maroon, Mount May, Mount Philip and Minnages Mountain, and there are many smaller dykes. Between the peaks the sedimentary rocks from beneath the volcano, both of Triassic-Jurassic and Carboniferous age, predominate.

Of the peaks only Mount Gillies, Mount Lindesay and Mount Glennie to the east of the main complex represent lavas erupted from the volcano, although some rocks on the summit of Focal Peak have been interpreted as volcanics from the vent.

The granophyre and rhyolite of the intrusions give shallow rocky soils of low fertility, and the main peaks subsequently support only sparse eucalypt forest (with some mallee forms) and patches of heath.



Progressive development of Focal Peak Shield Volcano

However the basic rocks of the Focal Peak intrusion and the sedimentary rocks of the surrounding sheltered circular basin support drier rain forest types with antarctic beech on the higher slopes.

Rocks of the peaks and other places

Mount Barney

The granophyre of Mount Barney shows evidence of cooling at relatively shallow depths - the pink feldspar crystals which form most of the rock are much larger than those in rhyolite (a lava) but not as coarse as those in granite, which has the same composition. Between the feldspar crystals are fine grained quartz-feldspar intergrowths, and small cavities indicating former pockets of gas which escaped while the igneous mass was cooling.

The intrusive nature of the granophyre can be seen in the gorge of Rocky Creek, where a later basaltic dyke and the granophyre have intruded lime-bearing rocks of the Mount Barney beds, metamorphosing them to hornfels. The sedimentary strata have been dragged up along the sides of the intrusion, so that the layers are now inclined at steep angles close to vertical. At the top of Mount Barney, rock outcrops are traversed by strong joints and some basaltic dykes.

The Upper and Lower Portals are where Mount Barney Creek enters and exits a gorge eroded in the granophyre. The fact that the stream has carved into such a hard body rather than diverting a short distance to the north shows that it is an ancient stream incised from a much higher land surface. The walking track to the Lower Portals crosses the Mount Barney beds caught up with the ring fault, but they are poorly exposed.

The Carboniferous Mount Barney beds

The steep track up South Ridge of Mount Barney to the saddle between East and West Peaks passes over the Carboniferous Mount Barney beds before crossing the Ring Fault onto the main granophyre mass. The Mount Barney beds do not crop out well, but fragments may be found in places, some containing bryozoan fossils, indicating a marine origin. Carboniferous strata also occur around the western faulted margin of the granophyre, but their boundary with the Triassic-Jurassic sandstones and shales has not been mapped in this rugged area.

The fortuitous uplift of these rocks to the surface is significant as they provide rare evidence of a shallow continental shelf in this region in Carboniferous times. Rocks of similar age behind the Gold Coast and around Brisbane (the Neranleigh-Fernvale beds) were deposited in a deep trench farther to the east off the edge of the continent.

Focal Peak and Montserrat Lookout

The rocks in this area have been rarely examined because of difficult access. The intrusion of Focal Peak consists of basic to intermediate rocks (coarse grained like granite but darker and without quartz) which have been termed gabbro and monzonite, with minor syenite. On the summit and to the northeast, andesite, basalt and agglomerate containing large boulders of trachyte have been interpreted as volcanics from the vent. The Montserrat Microsyenite forms a discontinuous ring, cropping out at Montserrat Lookout and places to the south.

Mount Ernest, Mount Maroon

Mount Ernest, southeast of Mount Barney, is a well-marked sill of rhyolite, showing columnar jointing at right angles to the cooling surface. Mount Maroon is another rhyolite sill, sloping to the southwest.

Yellow Pinch - Logan River

The Logan River several hundred metres southwest of the south end of the Yellow Pinch camping area, shows good exposures of Triassic-Jurassic sandstones with coal layers. These strata become steeper in dip (to vertical) adjacent to the major Ring Fault which bounds the Mount Barney Granophyre. Old river gravels overlie the sandstones, and are found at river level around the next bend where the river exits from a gorge cut through a thick dyke of granophyre. Triassic-Jurassic shales and sandstones are also exposed in eroded parts of the track up Yellow Pinch, with the dip increasing to almost vertical at the highest point of the track.

Mount Gillies

Mount Gillies, to the east of Mount Barney, is of outstanding geological interest as the source of rhyolite and obsidian (glassy rhyolite) flows and widespread pyroclastic deposits (fragmental material ranging from ash to boulders) of the Mount Gillies Volcanics, which overlie the Albert Basalt (see above). Mount Gillies and Campbells Folly to the south have been classed as fissure vents, comprising a great number of rhyolite dykes, many of which intrude the rhyolite flows; the dykes in fact predominate over the flows. The dykes have acted as conduits for at least some of the volcanics,

Mount Lindesay

The prominent cliffs of Mount Lindesay, and of Mount Glennie farther east, are remnants of horizontal rhyolite lava flows of the Mount Gillies Volcanics (probably erupted from Mount Gillies), which have subsequently been isolated by erosion (Mount Lindesay is NOT a volcanic plug).

Other places

North of Mount Barney, an intrusive sill of trachyte occurs in Storm Creek. Nearby the base of the Triassic sedimentary succession is marked by a conglomerate cropping out in Yamahra Creek.

Further reading

Ewart, A., Stevens, N.C. and Ross, J.A., 1987: *The Tweed and Focal Peak Shield Volcanoes, Southeast Queensland and Northeast New South Wales*. Papers of the Department of Geology, University of Queensland **11(4)**, 1-82. (Contains earlier references to the work of P.J. Stephenson (1959) and J.A. Ross (1974).

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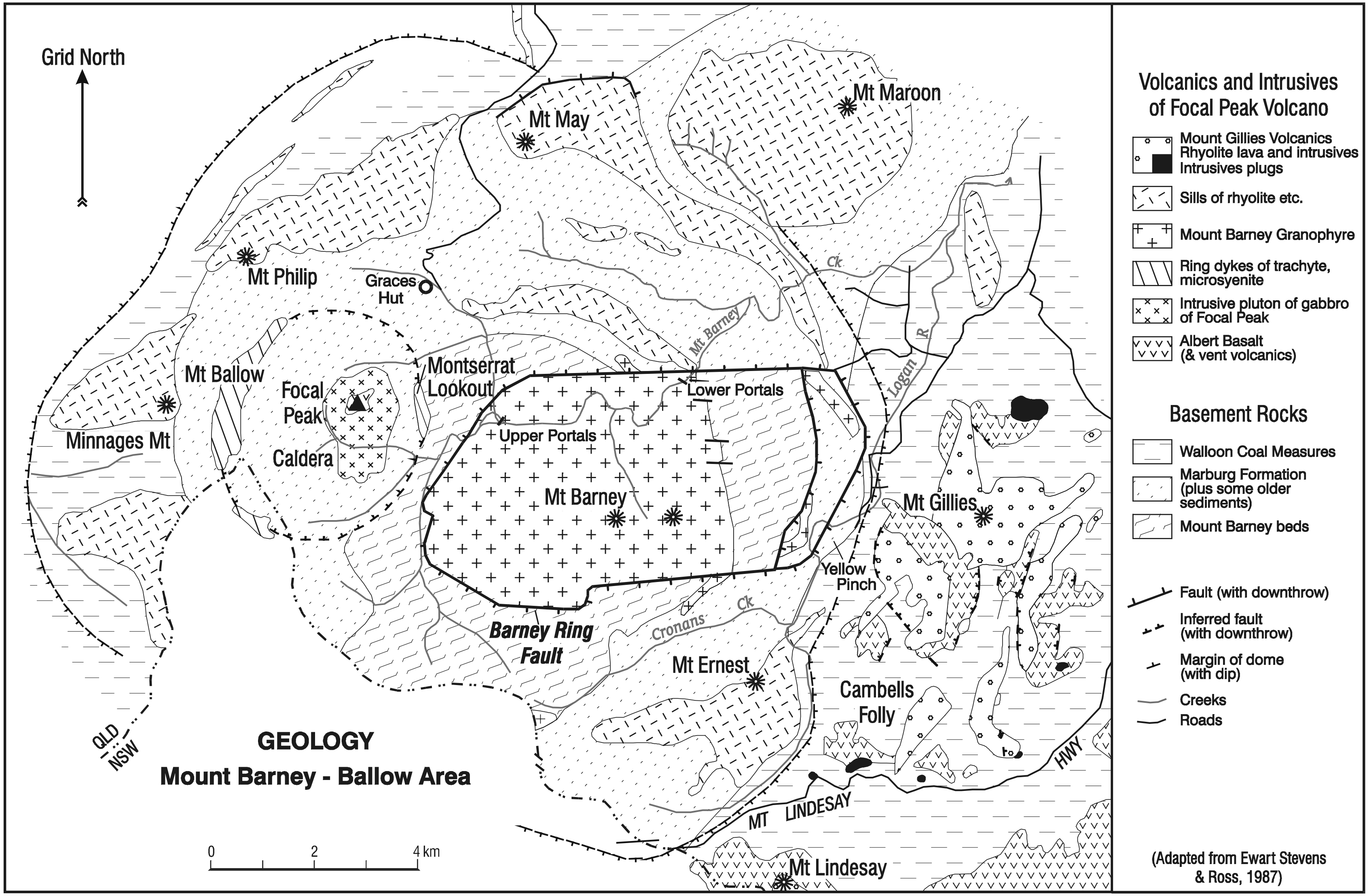

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