

Excepting in the Karaka area the hard bars or belts of rock are always subordinate to the soft "kindly country," both in width and extent. On the seaward side of the Moanataiari Fault and in the upper basins of the Moanataiari and Waiotahi, where extensive mining operations have been conducted for a great number of years, the alternating character of the soft and hard country is very marked and distinct.

*Nature of the Rocks of the Gold-bearing Formation.*

The true character of the gold-bearing rocks of the Hauraki Peninsula long remained a puzzle to all geologists who had examined this field, and it was only when the results of Professor Hutton's petrological work were published that this point was definitely determined. It is now known that they are the same as, and possess many of the peculiar features of, the volcanic rocks of the Comstock Lode and Washoe districts of North America, and the ancient mining regions of Hungary and Transylvania in the Austrian Empire.

One of their most noticeable and remarkable characters is their proneness to rapid decomposition. I have already described how the blue indurated slaty-brecciated tuffs at Rocky Point pass through successive stages of alteration, until they assume a uniform yellowish-grey colour and an even texture.

This physical peculiarity is also true of the solid andesites, locally called "bluestone." On the summit of Una Hill there is, well exposed, a large dyke, or flow of hornblende-andesite, or dacite, which can be very plainly seen in the mines, and even more clearly on the surface, in various stages of decomposition, from a hard bluish or greenish-black rock to the grey-coloured "kindly country" of the miners. The solid andesite runs in a northerly direction, and crosses Karaka Creek about half a mile above the entrance to the gorge, and thence extends across the range to the Waiotahi, which it crosses at the waterfall a little above the upper level of the Fame and Fortune Mine.

Near the extreme top of Una Hill, on the slopes facing both Te Papa Gully and Block 27, the hornblende-andesite is exposed on steep bare places, where its manner of weathering can be studied with great advantage. It is seen to decompose in large spheroidal masses, composed of concentric exfoliating layers. In the centre of each sphere there is generally a hard undecomposed core of blue rock. These hard kernels are often washed out by the action of rain and running water, and collect in favourable places in large numbers.

The inner concentric layer possesses a dark-grey or purple colour; the next layer is dark-grey and white, speckled; while the succeeding layers pass from yellowish-brown to pale grey towards the outside. In the mines the graduations are equally well marked, but the decomposition does not assume the spheroidal form, which seems only to take place on the surface, where the rocks are exposed to atmospheric agencies, and free from superincumbent pressure.

The portion of Una Hill facing the lower end of the Karaka Gorge, as well as the gorge itself, is excavated in a tough greenish-grey chloritic rock, which was some years ago extensively quarried for the sea-wall of the railway embankment in Shortland and Grahamstown. This rock undergoes rapid alteration, as may be seen along the breastwork, and is, in consequence, not at all suitable for building purposes or works of a permanent character. It contains nests of calcite, gypsum, pearlspar, and chalcedony, as well as an abundance of chlorite in nests and veins. It was probably an augite-andesite, but its original character is difficult to determine on account of its altered state. At the entrance to the gorge, and at the quarry, it is seen to be associated with tuff, or ash materials, varying in texture from fine muds to coarse matter forming breccias. Judging from the irregular distribution of the fragmentary materials, I am inclined to think that these rocks are not true tuffs or breccias, but merely brecciated lavas.

In the Moanataiari, Waiotahi, Cambria, and Alburnia Mines the transition from the hard undecomposed lavas to the soft kindly country is often as well marked as on Una Hill.

The hard bars traversing the soft country in the May Queen, Trenton, Moanataiari, and other mines in the basins of the Moanataiari and Waiotahi Streams contain distinct layers of fine tuffs and coarser ashes, forming mottled breccias, but in most cases the matrix passes insensibly into solid andesite lavas. The hard belts of rock separating Dixon's, Sons of Freedom, Reuben Parr, and Golden Age reefs consist of compact, greenish-blue hornblende-andesite, which in places assumes a coarser texture, being black-spotted on weathered surfaces, with large crystals of hornblende. This porphyritic rock corresponds with the hornblende-dacite of Hutton. The undecomposed cores or bands of hard country on the seaward side of the Moanataiari fault consists principally of indurated tuffs and ash-beds or breccias of various degrees of texture passing into solid andesite lavas, of a hornblendic or augitic character. The two bars of so-called diorite bounding the reef system in the New Prince Imperial Mine is most probably an augitec or enstatite andesite.

Professor Hutton, in his paper "On the Rocks of the Hauraki Goldfields," divides the process of decomposition which the solid lavas have undergone into three distinct stages. First, the decomposition and hydration of the bisilicates—the hornblende and pyroxenes—resulting in the formation of chlorite and bastite, and the partial elimination of the liberated silica, iron, and lime; second, the destruction of the feldspars with the formation of carbonates and kaolin, accompanied by the bleaching and gradual removal of the secondary chlorite, and the alteration of the titaniferous iron into pyrites and the obscure mineral leucoxene; and third, the hydration and gradual removal of the iron-oxides, together with the leaching-out of the carbonates, leaving behind quartz, kaolin, leucoxene, and pyrites. Thus we find that the soft "kindly country" is composed entirely of secondary products. These stages, although of an entirely empirical character, are sufficiently distinct to be easily seen and proved by actual observation in many parts of the field. Becker, in his memoir on "The Geology of the Comstock Lode and Washoe District," states that the process of decomposition among the andesitic and diabasic rocks enclosing the Comstock Lode followed a sequence of stages somewhat similar to that which seems to have affected the gold-bearing rocks here.