

mineralogical characters. The absence or presence of pyrites would quite fail as a test, and no one has supposed this to constitute a difference. Chlorite offers a better chance, because if this mineral was only formed at depths it would not occur in a newer and superficial formation, but, under these conditions, neither would it occur in the upper part of the auriferous series, so that, although its presence might indicate the older series, its absence from a rock would be no proof that the rock belonged to a newer series, unless it could be shown that the whole of the upper beds of the older series had been removed by denudation. Of this I have seen no stratigraphical evidence, and can find nothing under this head in the published reports that appears to me to have any importance. If there were two widely separated series, as supposed, we should expect to find that all, or nearly all, the bisilicates of the older series had been altered into chlorite, &c., while in the newer series only the ordinary series of changes would have taken place, and there would be no chlorite. But if there was only one series, we should then expect to trace a gradual change in the rocks from those most altered to those in which the alteration of bisilicates into chlorite had only just commenced; and this is precisely what we do find.

“Mr. Cox says that the younger volcanic series is undoubtedly distinct from the auriferous series because it is found at very different levels—sometimes at 1,500 ft. or more, at other times on spurs which are comparatively low-lying, not more than 300 ft. above the level of the sea (*loc. cit.*, p. 20), and from this he infers that the auriferous rocks had been deposited, upheaved, fractured, and partially denuded—indeed, so much so that the conformation of the country corresponded more or less with that which at present exists—before the younger rocks were deposited upon them. I am sorry that I cannot agree with Mr. Cox here. Granting, for the sake of argument, that he has been able to distinguish two series, and to identify them accurately, still, it seems to me that the older series, being composed of viscous lava-flows, would have consolidated at steep angles, and that the latter products of eruption would have flowed down these steep slopes, and would now be found at all elevations. Viscous lava is known to have consolidated at angles up to 80°, while, as the places indicated by Mr. Cox in his map are a mile and a half apart, a slope of 10° would be sufficient to account for the difference in level. Some, also, of the supposed newer dolerites are certainly nearly vertical dykes. Also, Mr. Cox allows that this younger series at the Thames occupies the spurs and higher ground only, so that the valleys of the present creeks and rivers must have been entirely cut since these latter lava-flows took place.

“Source of the Gold.

“To discuss with anything like completeness the question of the sources of the gold requires a knowledge of chemistry far beyond what I possess, but I think that a geologist may be of assistance to the chemist by pointing out to him the lines on which chemical investigation might probably lead to successful results; and this is all I hope to do here.

“*Origin of the Gold Veins.*—There can, I think, be no reasonable doubt that the gold came out of the volcanic rocks, and was not brought into them from below. Five different lines of reasoning tend equally to this result.

“The first is that after thirty-six years of prospecting we find the gold-veins to be confined to the volcanic series, or to the slates in immediate contact with the volcanic series, and not found in the older formation. At Tapu Creek the auriferous veins penetrated a short distance down into the slates, but the lodes in the slates always consisted of soft, stiff, blue clay (mullock), charged with small nodules of quartz (Reports, Geological Explorations, 1868-69, p. 24), and were evidently infiltration lodes from above. Mr. Cox informs us that they soon pinched out in the slates, and that the mines were abandoned. (Reports, Geological Explorations, 1882, p. 40.) There is, I believe, no mine at present working in the slates, although some were tried at Tiki, near Coromandel. This is a district that I have not examined personally. As the volcanic series is a superficial one, overlying the slates, it follows that the gold must have originated in that superficial series, for, if not, the lodes would have penetrated the older as well as the newer rocks, and would have been found equally in both.

“The second argument is founded on the nature of the gold-veins. These are often small, irregular, branching veins, sometimes only a $\frac{1}{4}$ in. in thickness, traversing the rock in all directions and rapidly dying out. The idea that these small branching veins were leaders from large and well-defined lodes has been disproved in many cases, but there is evidence to show that occasionally they lead into large veins of nearly barren quartz called ‘buck reefs.’ (Cox: Reports, Geological Explorations, 1882, p. 25.) Of this I shall speak again. At present I merely wish to point out that in a large majority of cases these so-called leaders have led to nothing. In the Thames district gold is very widely distributed. On the first opening of the fields the ground was taken up *en masse*, as in an alluvial field, and not upon supposed lines of reef only. This is apparent in the map which accompanies my report of 1868-69, in which I say that of twelve hundred claims thus taken up at hazard about one-half had found gold. Most of these claims have turned out too poor to pay for working; but the fact remains that gold was found in them. Some of the larger lodes are merely country-rock infiltrated with silica, and have no defined walls. Such were the Golden Crown, the Shotover (Hunt’s), and the Middle Star. (Reports, Geological Explorations, 1868-69, p. 24.) In 1871 the country-rock on the south side of the Shotover was crushed for a distance of 60 ft. from the lode, and yielded from 5 dwt. to 8 dwt. of gold to the ton. The Golden Crown Company has also crushed part of the spur belonging to them with fair results. These cases might be explained by supposing an outward infiltration from the lode, but it is very doubtful if these lodes are of such a character as to allow us to suppose that they were part of extensive fissures filled from below.

“The third argument in favour of the origin of the gold-veins by lateral segregation is that, speaking roughly, the amount of gold in the veins varies with the state of decomposition of the country-rock, the veins in decomposed rock being richer than those in undecomposed rock, as I shall presently bring evidence to prove. At Puriri the gold was in small irregular veins in decomposed