

p. 68.) On this I must remark that I have often seen small veins carrying rich gold without any pyrites at all, but in the larger reefs pyrites generally occurs.

"*Theories.*—Sir James Hector, who has had excellent opportunities for studying the subject, finds the source of the gold in the pyrites of the country rock. In his printed instructions to me in 1867 he says, 'The composition of the several rocks in the vicinity of the lodes at Coromandel shows their singular character, arising, as I suspect, from all the soluble matters of what was once a basic rock having been removed and replaced by silica, and partly by iron-pyrites containing gold. That this mineral is the main source of the gold is shown by a section of the lode-ground I made in 1864, when I found that the so-called quartz reefs were contained between two varieties of pyritous rocks, the sulphurets having been removed from the overlying rock, but still remaining in the lower, the reef itself being a band of mullock, containing kernels and geodes of quartz and carbonate of lime, and evidently formed by infiltration.' The attached analyses* show that the hanging wall contained neither gold nor pyrites, while the foot-wall contained about 11.68 per cent. of pyrites; but it is not stated that this pyrites contained gold. In 1869 Dr. Hector says, 'Whatever may be the age of the impregnation of these rocks with sulphides, the gold they contain seems first to have appeared in them at the same time.' (Reports, Geological Explorations, 1868-69, p. 39.) He then says that the quartz was brought up from below, as I have already mentioned, and he adopts the generally accepted opinion that thermal waters and acid vapours were the agents that produced the changes.

"Mr. Davis, I suppose, agreed with Sir James Hector, as their conclusions are identical. I also held the same opinion in 1869. In 1882 Mr. Cox pointed out that the pyrites in the decomposed rocks is not itself decomposed, and could not therefore be the source of the gold. The pyrites, he thought, was formed contemporaneously with the gold in the veins, the mineral waters which deposited the gold and the quartz in the reefs having found their way through numerous small joints in the rocks, decomposed their felspathic constituents, and deposited from solution the crystals of crystalline grains of pyrites. (Reports, Geological Explorations, 1882, p. 44.) Mr. Cox thus accounts for the presence of pyrites in the surrounding rock being a favourable indication of gold, although it is not decomposed. He looks upon these pyrites as the overflow from the reef of materials brought up in fissures.

"Undoubtedly, under ordinary circumstances, much of the pyrites remains in the rock unaltered, and can be washed out of it, even when the rock has decomposed to clay. It is one of the last minerals to decompose, but that it does dissolve slowly is proved by the presence of iron sulphate in all the old drives. Mr. Cox's theory, however, implies that all the gold and most of the gangues came up from below, and I cannot accept it for the reasons already given. Sir James Hector's theory seems to me to be more probable, provided that the quartz be supposed to come from the bed-rock equally with the gold; but it does not satisfy me altogether, because (1) I cannot see how during any stage of alteration of the rocks auriferous pyrites could be removed from the rock, and, in the absence of organic matter, be redeposited as auriferous pyrites in a fissure in the neighbourhood; (2) pyrites is not confined to the volcanic series, but occurs also in the slate formation, but gold does not accompany it there; and (3) I rather doubt the statement of the intimate relation between pyrites and gold.

"It is certainly by no means the case that gold occurs wherever pyrites is abundant, or where it has once been abundant. The rocks contain quite as much pyrites in the Karaka and Tararu Creeks as they do in the Moanataiari and Waitotahi Creeks, but the gold is much less in quantity in the former localities than in the latter; indeed, the two rocks described in this paper from the Prince Imperial and Waitotahi Mines contain very little pyrites, although one of them encloses a very rich vein, and there is no evidence to show that they ever contained more than they do now. The rocks of Te Aroha and of Keevin's Point at Coromandel also have much pyrites, but not much gold, while the slates and felsite tuff at Waiohanga Point are largely impregnated with pyrites, and yet there is no gold, although in places the pyrites has been completely decomposed. On the other hand, the rocks of the lower part of the Shellback Creek contain little or no pyrites, and little or no gold. Again, I am not convinced that the pyrites of the country rock is so uniformly auriferous as is generally supposed. That the pyrites from the lodes is auriferous I allow, but the evidence that the pyrites of the country rock is also auriferous is but slight. In 1868 Dr. Hector exhibited, at a meeting of the Auckland Institute, pyritous vein rock from the Golden Crown, which was highly auriferous, and a portion of the bed-rock which also contained gold; but it is not stated that in the latter case the gold was in pyrites.

"In 1869 Dr. Hector, speaking of pyritiferous rocks from the Kapanga Mine, Coromandel, says, 'It was from this rock that the iron-pyrites formerly examined for gold was obtained, which yielded at the rate of 4 oz. to the ton.' But on turning to these analyses I find that the pyrites is said to have been brought from an auriferous leader, and from the Kapanga Mine; it is not said to have come from the country rock. Mr. W. Skey says that in two cases at the Thames pyrites was roughly separated from a quantity of rocks free from all appearance of quartz-veins, and these, when separately assayed, gave no positive indication of gold; but some pyrites from the Long Drive Claim, selected with the greatest care so as to avoid anything like a quartz vein, gave distinct traces of gold. (Reports, Geological Explorations, 1870-71, pp. 84, 85.) This is the only analysis that I can find which gave positive results, and it is of great importance; but numerous assays of pyrites taken at different distances from reefs are required before this point can be considered as settled.

"A piece of carbonised wood, about 1 in. in diameter, highly charged with pyrites, was found in the Maid of England Claim, Waitotahi Creek; the pyrites here being probably due to the organic matter having reduced the iron sulphate which circulates through the rock. This pyrites was examined by Mr. W. Skey, who reported that it contained no gold. (Laboratory Reports, No. 4, 1869, p. 17, No. 465.) Sir James Hector, however, says that 'the specimen was not sufficiently