large to give a reliable indication of the presence or absence of gold' (Reports, Geological Observations, 1868–69, p. 32), so that the evidence is not conclusive; but as far as it goes, it is against the idea of iron sulphate containing gold in solution. I am not aware of the iron sulphate found in the old drives having been tested for gold.

"If it should turn out that pyrites in the country rock is an indication of gold in the neighbouring veins, but that the pyrites is not decomposed and is non-auriferous, then I would suggest that, as part at least of the pyrites has been formed from magnetite, the gold may have been originally in the magnetite, and have been released during the formation of the pyrites. I do not think that this has been the case, but it is a point worthy of investigation by the chemist. The pyrites is no doubt a secondary mineral formed in the rock after consolidation, and, if it should turn out to be generally auriferous, we must suppose either that the gold came from below with the sulphur, or that its source is the titaniferous magnetite, which is one of the original constituents of the rocks.

"But there are other secondary minerals constantly associated with the gold-veins which must not be overlooked. They are chlorite and bastite. As chloritic-andesites, or propylites, are also found in Nevada and in Hungary, as well as at the Thames, and as in all three places they contain gold and silver in remarkably similar proportions, it would seem *a priori* that the chlorite might be connected with the occurrence of the precious metals in veins. Now, Professor F. Sandberger has proved that the mica of the gneiss of the Black Forest contains small quantities of several metals, including silver; and other observers have shown that a large number of metals are present in the micas, the augite, the hornblende, and the olivine of the crystalline rocks. (Green's "Physical Geology," ed. 1882, p. 560.) Mr. Becker has also found gold and silver in the diabases that bound the Comstock Lode, most of it in the augites. This gold and silver is in much the same relative proportions as the Comstock bullion; and he further found that the decomposed diabases contained only about half as much of the precious metals as the fresh rocks (United States Geological Survey, 1880–81, p. 309). That is to say, one-half of the gold and silver has passed out of the decomposed rocks, and has, no doubt, been deposited elsewhere. If, therefore, we assume that the pyroxenes of our volcanic rocks contain gold and silver, that the conditions necessary for dissolving them rarely obtain, but that one of the exceptions has been in the Hauraki Goldfields, we have a hypothesis which will, I think, explain most of the facts.

"The first change that took place in these rocks was, as I have shown, the conversion of the pyroxenes into chlorite and bastite with the liberation of silica, lime, and some iron. If gold and silver were partly removed with these substances we can conceive that while the lime was altogether removed the silica and iron might have been deposited with the precious metals in fissures, and the iron converted into pyrites by hydrogen sulphide. During the second series of changes the whole of the chlorite with the remaining gold would be removed, and auriferous quartz would be deposited in the veins. If the decomposition of the felspars took longer than that of the chlorites, which is very probable, pure crystallised quartz might be deposited on the auriferous quartz. In the third series of changes the carbonates which had been formed during the second series of changes were dissolved, and part may have been deposited occasionally on the quartz. This, it will be seen, gives a fair explanation of the principal facts connected with the reefs, and also explains why the white rock, from which the chlorite has been removed, is more favourable for gold than the harder dark-green rocks in which the chlorite still remains. But no reason is apparent why the sulphides of antimony, zinc, arsenic, and copper should have been formed subsequently to the iron-sulphide. Absence of gold in the well-crystallised quartz shows that silica continued to be removed after all the gold had gone; and we might account for the fine threads and scales of gold between the points of quartz-crystals by supposing that during the second or third series of changes the auriferous pyrites in the veins was in some places dissolved, and that the gold was redeposited, while the sulphur and most of the iron were removed in solution, nothing but red stains being left behind. If this hypothesis is the true one, I should expect that, as the whole of the gold in the veins in the hard dark rocks is due to the first set of changes, it would exist chiefly as auriferous pyrites, while in the softer kindly sandstone more gold would be added in auriferous quartz without pyrites. These are, however, surmises, which I am not in a position to test, and are intended merely to direct the steps of other investigators. I must, however, add that if my views are correct it will be useless to follow the reefs far down into the slates. This conclusion is, I am aware, opposed to the opinions of Sir James Hector and Mr. Cox (Reports, Geological Explorations, 1882, pages 15 and 45), and I can only say that I hope time may prove me to be wrong."

In the second volume of the "Transactions of the Australian Association for the Advancement of Science," Melbourne meeting, 1890, is a paper by James Park, F.G.S., at that time director of the Thames School of Mines, "On the Geological Structure and Future Prospects of the Thames Goldfield," from which the following extracts have been made. Mr. Park says:—

"Although over twenty-two years have elapsed since gold was first discovered at the Thames, the geology of this goldfield has always been a subject of much discussion among New Zealand geologists, and even at the present time the most opposite and divergent views are held by different authorities, both as to the structure and true character of the rocks themselves. The mining operations of this field have so far been confined to an area a little more than a square mile in extent, and, as the more accessible and readily obtainable gold is being rapidly worked out, the question of deep-sinking and going further afield must sooner or later claim the attention and serious consideration of mining men and those dependent upon the production of gold. . . .

"*General Structure.*—The rocks of this goldfield, as disclosed by the above line of section,* which supplies the key of their structure, divide themselves into three distinct formations, as follows:—

* Section from Bonemill to Hape Creek.