The Hot springs of New Zealand which deposit silicas as a sinter, and the Steam Boat Springs in America which are gradually filling up fisures with silica coating metals which are precipitated from heated water in course of circulation, are instances of what water can do in this respect.

That the contents of the lodes and veins are influenced by the rocks containing them has not only been held by scientific men, but also recognized as an axiom by the practical miner in his prospecting and working of lodes and veins.

Certain formations and classes of rocks are associated with certain metals, for instance, granite with tin, clay slate with copper, quartz porphyry with silver, and limestone with lead, and although such an arrangement has been shown to have many exceptions, these only tend to prove the rule.

It is well known how the tin, copper, and lead lodes of Cornwall generally alter the leading metals when the formation changes, and we have ourselves seen how gold veins form no exception to such a rule, but not only generally occur with certain rocks, but also depend for their richness on the different belts of country they pass through,—the same lodes being always poor in one kind of rock and richer in another in the same district.

The Charters Towers reefs in Queensland, and others mentioned in this essay are instances of such influence being exerted by different rocks on lodes.

It may be considered as a fact that the rocks that are associated with auriferous lodes are principally those that contain magnesian minerals—such as hornblende, olivine, augite, and biotite,—all of which abound in those rocks that contain or are in close proximity to gold veins; and this is not only known to be the case in Australia, but seems to be so elsewhere.

As to those minerals that are found in conjunction with gold in veins, iron pyrites is by far the most common, after which come galena, zinc blende, arsenical pyrites, and copper pyrites. None of these, however, hold such a prominent place as iron pyrites, in fact most of the gold found in our veins is either in iron pyrites or was in it before the decomposition of the pyrites set it free.

Iron pyrites exist in many of our rocks to a great extent; granites and other rocks that are commonly associated with our mineral veins are often largely impregnated with it, and where gold is found disseminated through such rocks, it has doubtless been chiefly derived from the pyrites.

It will be clearly seen, therefore, how lateral secretion accounts for the formation of auriferous lodes.

That mineral waters have dissolved the metals contained in the rocks adjoining the lodes or close to them, and re-deposited the same in the veins, seems most feasible, and more in accordance with observed facts than any other theory that has been advanced. Of course, such deposits as dyke lodes or ore channels may be formed either by lateral secretion or igneous injection, so far as the main body of the lode is concerned, but the metalliferous parts of the lodes are generally veins of quartz or some other matrix, and these have been formed in the dyke or channels by the process of lateral secretion in every instance, whether the main body of lode was so or not. If metals are found as well in other portions of a dyke, they are of the nature of impregnations, and may either be contemporaneous with the rock itself, or afterwards deposited there by infiltration of mineral waters

In the Comstock lode, not only has the country rock been proved to contain in its minerals all the matter found in the veins, but also the gold and silver are in the same proportion to each other in the rock as in the veins. The decomposed portions of the walls of the lode have not the same amount of gold and silver in them as the undecomposed, and sufficient decomposition of the walls is said to have taken place to account fully for as much matter as is found in the veins, by supposing such to have been derived from the decomposed parts.

The intimate association of iron pyrites with gold has been already referred to, and the fact that in the lower levels of our gold mines, the larger proportion of the gold occurs in this mineral has been shown. This will not appear so remarkable when we consider that nearly all metals are found as sulphides in the lower portions of metalliferous mines, in other words, in those parts that are least altered or decomposed, and appear to have retained to the greatest extent the original state in which they were first formed.

As to whether gold ever exists in a sulphide form in the pyrites is not known, although some experiments seem to imply that such is probable, but the sulphide of gold being a most unstable compound, renders it exceedingly difficult to determine whether it ever exists in nature in that state. It is certain, however, that iron as a sulphide is the most usual associate of the precious metal, and therefore, if these two, iron pyrites and gold, are deposited from solution in the veins and lodes, they must be precipitated together by the same agent, or one is the precipitant of the other. Experiments in the laboratory have proved that sulphate and sulphide of iron will precipitate gold from a solution of chloride of gold. Quartz also may be produced by a heated solution of carbonic dioxide decomposing silicates and depositing the silica on cooling.

Noting such facts as these, and then taking into consideration the intense heat, great pressure, and other known and unknown agencies that must be at work in the internal laboratory of the earth, it seems that there are good grounds for believing in the strong probability of most of our metalliferous or mineral veins and lodes being deposited from mineral waters that obtain their contained metals and minerals from the country rock through which they percolate, by the strongly solvent powers they possess under certain conditions; conditions that are at present only partly guessed at and may never be fully understood practically, but always remain as theories, although based on strong circumstantial evidence.