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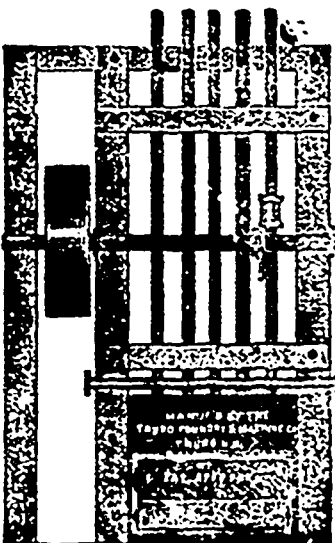
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**ORIGIN AND MODE OF OCCURRENCE OF GOLD-BEARING VEINS
 AND OF THE ASSOCIATED MINERALS.**

By JONATHAN C. B. P. SEAVER, C. E., F. G. S. &c.

(Continued.)

Experience has proved, however, that we have as yet no right to limit
 the depth at which lodes may be formed in any way whatever, as quartz
 veins and other lodes are worked for over 2,000 feet below the surface, and
 certainly extended at one time for thousands of feet above where the surface
 now exists, and have by being broken up, together with the containing rock,
 supplied immense alluvial leads, as in Victoria and elsewhere.

The faulting and heaving of lodes by others which have been subsequently
 formed shows that intense action has occurred, and to think that the expan-
 sion due to crystallization of silica or any other substance, could move a mass
 of rock even 2,000 feet thick cannot for a moment be entertained.

It is a noticeable fact that mineral lodes are in districts in which the
 strata have been broken through by the intrusion of igneous rocks or by other
 means, and this is always the case.

FILLING OF VEINS.

Having adopted the theory of lateral secretion to account for the forma-
 tion of most metalliferous lodes and of auriferous quartz veins in particular,
 let us consider what action must have taken place in nature to render such a
 theory comprehensible and legitimately entitled to be taken as the most
 feasible method of accounting for the various phenomena connected with lodes
 and veins. Lateral secretion supposes that the following actions may have
 taken place because they are in accordance with experiments and observed
 facts.

1. That water containing carbonic acid and other solvents is capable of
 dissolving all minerals and metals, and when the temperature is high this
 solvent action is greatly increased.

2. That such waters will retain these metals and minerals in solution
 until a change of condition causes the re-deposition of all or some of them,
 and it also affirms:—

3. That certain non-metallic minerals have been proved to contain the
 metals we find in lodes and veins, and that these minerals frequently occur
 in the rocks which contain lodes or ore in close proximity to them.

4. That the metalliferous contents depend to a great extent upon the
 containing country rock, and that lodes and veins are generally richer in
 certain metals when they occur in or close to rocks that are largely composed
 of the minerals that contain such metals.

5. That water is capable of dissolving most if not all minerals to a
 greater or less extent, may be taken as proved, for all natural water contains
 some mineral in solution. It has also been ascertained by actual experiment
 that water will act upon certain rocks and clays when the conditions of pres-
 sure and temperature are varied so as to affect a re-arrangement of the
 elements to form fresh minerals, and the structure of the crystalline rocks of
 the granite type affords evidence that they have been transmuted or changed
 from sedimentary rocks under the action of water at great depths below the
 surface, where the temperature would be high and the pressure great.

6. That the mineral waters of our mines even at a low temperature con-
 tain metals in solution is most certain, as analyses have proved it to be the
 case, and that they deposit their metals combined as minerals is also known.
 Organic substances are frequently found silicified in our veins and alluvial
 leads and such minerals as marcasite and siderite formed.

It is also strongly worthy of notice that the quartz and other matrices of
 metalliferous veins, and the metals and minerals associated with them, are
 often found in the lodes in separate layers parallel to the walls of the lode
 or to each other, and having all the appearance of being deposited consecu-
 tively as from mineral waters or vapors carrying their constituents in
 solution. The laminated quartz veins and other auriferous lodes of Austra-
 lasia give numerous instances of this phenomena, and not only does the
 quartz or other matrix have a laminated appearance, but the gold, iron
 pyrites, and associated minerals occur continually in seams parallel to the walls
 of the lode or vein, and between the layers of quartz are often found very
 thin leaves of a kind of slate (mostly chlorite slate). Flucans or slickensides
 sometimes exist between the lodes and their walls. Amongst other instances
 given in this essay of laminated lodes may be mentioned the Marshall Mc-
 Mahon Reef at Murrumburrah, New South Wales, the Mount Morgan lode in
 Queensland, the Catherine Reef at Clunes in Victoria, the St. Patrick and
 Rainbow Reefs at Charter's Towers, Queensland, and the Bassick lode in Colo-
 rado, United States; this last being a most remarkable instance of consecu-
 tive deposition of minerals, and if we depart from auriferous lodes to those
 worked chiefly for other metals or minerals the instances of laminated veins
 are innumerable.

In connection with this it will be well to refer to Mr. Wilkinson's experi-
 ments on the deposition of gold from solution in the presence of organic
 matter, and without quoting these experiments, which may be seen detailed
 in Locke's book entitled "Gold," attention should be called to the fact that
 they conclusively prove that gold can be precipitated from solution in the
 presence of organic matter by either pyrites, antimony, or several other
 minerals.

It is of course well known that gold is present in sea water in small
 quantities, and it must consequently be inferred that many of the subter-
 ranean streams of water also carry gold in solution.

(To be Continued.)

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