

## THE ORIGIN OF YOSEMITE VALLEY

JOSIAH DWIGHT WHITNEY

FOREWORD BY DR. WALTER E. LAMMERTS

*In my article "Trees Indicate Recent Origin of Yosemite Valley"<sup>1</sup> brief reference was made to the explanation, by J. D. Whitney, a former California State Geologist, of how Yosemite Valley was formed. After showing why this beautiful valley could not have been formed by erosion, he suggested that the entire floor of the valley had suddenly subsided.*

*Josiah Dwight Whitney lived from 1819 until 1896, and was state geologist from 1865 until 1882. He wrote a number of important books, including: "Metallic Wealth of the United States" (1854); "Mountain Heights in the United States" (1862); "The Yosemite Book", a beautifully illustrated rare book, (1868); and the more practical "The Yosemite Guide Book" (1874).*

*The following is an excerpt from The Yosemite Guide Book, pages 114-122. Besides giving Whitney's opinion as to how the valley was formed, it is most interesting because of the evidence given for the recency of the erosion of the Sierra Nevada mountain chain. The Table Mountain lava on each side of the Stanislaus River at Abbey's Ferry was of recent origin, as is shown by fossils under the volcanic mass. Yet the Stanislaus canyon is over 2,000 feet deep.*

*Whitney's opinion that John Muir was wrong in thinking that the valley was formed by erosion by ice, whereas in fact there is no proof that glaciers ever occupied the valley, is also very interesting. Maybe our Research Committee could encourage further investigation of this matter.*

Asia and South America seem poorly provided with waterfalls; at least, there are few described which can be mentioned in comparison with those of Europe and North America. The recently discovered Kaieteur, in British Guiana, seems, however, worthy to be placed in the same rank with Niagara and the Zambesi. We are disposed to believe that a majority of cultivated lovers of natural scenery would admit the Yosemite Fall to surpass any in the world, as presenting the most perfect combinations of all the elements of the picturesque. Certainly, taking the whole region of the Yosemite together, with its five great falls, the lowest 400 feet and the highest 2,600, it must be allowed that, in this particular kind of scenery, it is a locality without a rival in the world.

Although the Valley is, at present, almost inaccessible in the winter, and, indeed, entirely so to those who are not up in travelling on snow-shoes, it is not unlikely that the time will soon come when a visit to it at that season will be considered as the "regular thing" for tourists, and when proper facilities for getting there will be provided. The views, at the time when the snow is still lying deep on the surrounding plateau, and thundering down in frequent avalanches from the domes and over the walls of the Valley; or, a little later, when the streams are filled to repletion and pour themselves over the cliffs in literally unnumbered cascades; when the Merced becomes a mad torrent, and hurries down its 2,000 feet of vertical descent in one wild mass of spray-enveloped waters,—all this is, as described by those who have seen it, of surpassing grandeur. The accumulation of ice at the base of the upper part of the Yosemite Fall is also spoken of as a most impressive feature in the winter view. The frozen spray forms a vast conical mass, rising sometimes to the height of a hundred feet or more, from which the falling water, rebounding, is shot off in graceful curves, forming an immense bouquet, each drop of which sparkles like a diamond in the sun.

All will recognize in the Yosemite a peculiar and unique type of scenery. Cliffs absolutely vertical, like the upper portions of the Half Dome and El Capitan,

and of such immense height as these, are, so far as we know, to be seen nowhere else. The dome form of mountains is exhibited on a grand scale in other parts of the Sierra Nevada; but there is no Half Dome, even among the stupendous precipices at the head of the King's River. No one can avoid asking, What is the origin of this peculiar type of scenery? How has this unique valley been formed, and what are the geological causes which have produced its wonderful cliffs, and all the other features which combine to make this locality so remarkable? These questions we will endeavor to answer, as well as our ability to pry into what went on in the deep-seated regions of the earth, in former geological ages, will permit.

Most of the great canons and valleys of the Sierra Nevada have resulted from aqueous denudation, and in no part of the world has this kind of work been done on a larger scale. The long-continued action of tremendous torrents of water, rushing with impetuous velocity down the slopes of the mountains, has excavated those immense gorges by which the chain of the Sierra Nevada is furrowed, on its western slope, to the depth of thousands of feet. This erosion, great as it is, has been done within a comparatively recent period, geologically speaking, as is conclusively demonstrated in numerous localities. At the Abbey's Ferry crossing of the Stanislaus, for instance, a portion of the mass of Table Mountain is seen on each side of the river, in such a position as to demonstrate that the current of the lava which forms the summit of this mountain once flowed continuously across what is now a canon over 2,000 feet deep, showing that the erosion of that immense gorge has all been effected since the lava flowed down from the higher portion of the Sierra. This event took place, as we know from the fossil bones and plants embedded under the volcanic mass, at a very recent geological period, or in the latter part of the Tertiary epoch, and after the appearance of man on the earth.

The eroded canons of the Sierra, however, whose formation is due to the action of water, never have vertical walls, nor do their sides present the peculiar angular

forms which are seen in the Yosemite, as, for instance, in El Capitan, where two perpendicular surfaces of smooth granite, more than 3,000 feet high, meet each other at a right angle. It is sufficient to look for a moment at the vertical faces of El Capitan and the Bridal Veil Rock, turned down the Valley, or away from the direction in which the eroding forces must have acted, to be able to say that aqueous erosion could not have been the agent employed to do any such work. The squarely cut re-entering angles, like those below El Capitan, and between Cathedral Rock and the Sentinel, or in the Illilouette canon, were never produced by ordinary erosion. Much less could any such cause be called in to account for the peculiar formation of the Half Dome, the vertical portion of which is all above the ordinary level of the walls of the Valley, rising 2,000 feet, in sublime isolation, above any point which could have been reached by denuding agencies, even supposing the current of water to have filled the whole Valley.

Much less can it be supposed that the peculiar form of the Yosemite is due to the erosive action of ice. A more absurd theory was never advanced than that by which it was sought to ascribe to glaciers the sawing out of these vertical walls, and the rounding of the domes. Nothing more unlike the real work of ice, as exhibited in the Alps, could be found. Besides, there is no reason to suppose, or at least no proof, that glaciers have ever occupied the Valley or any portion of it, as will be explained in the next chapter; so that this theory, based on entire ignorance of the whole subject, may be dropped without wasting any more time upon it.

The theory of erosion not being admissible to account for the formation of the Yosemite Valley, we have to fall back on some one of those movements of the earth's crust to which the primal forms of mountain valleys are due. The forces which have acted to produce valleys are complex in their nature, and it is not easy to classify the forms which have resulted from them in a satisfactory manner. The two principal types of valleys, however, are those produced by rents or fissures in the crust, and those resulting from flexures or foldings of the strata. The former are usually transverse to the mountain chain in which they occur; the latter are more frequently parallel to them, and parallel to the general strike of the strata of which the mountains are made up. Valleys which have originated in cross fractures are usually very narrow defiles, enclosed within steep walls of rocks, the steepness of the walls increasing with the hardness of the rock. It would be difficult to point to a good example of this kind of valley in California; the famous defile of the Via Mala in Switzerland is one of the best which could be cited. Valleys formed by foldings of the strata are very common in many mountain chains, especially in those typical ones, the Jura and the Appalachian. Many of the valleys of the Coast Ranges are of this order. A valley formed in either one of the ways suggested above may be modified afterwards by forces pertaining to either of the others; thus a valley originating in a transverse fissure may afterwards become much modified by an erosive agency, or a longitudinal flexure valley may have one of its sides raised

up or let down by a "fault" or line of fissure running through or across it.

If we examine the Yosemite to see if traces of an origin in either of the above ways can be detected there, we obtain a negative answer. The Valley is too wide to have been formed by a fissure; it is about as wide as it is deep, and, if it had been originally a simple crack, the walls must have been moved bodily away from each other, carrying the whole chain of the Sierra with them, to one side or the other, or both, for the distance of half a mile. Besides, when a cliff has been thus formed, there will be no difficulty in recognizing the fact, from the correspondence of the outlines of the two sides; just as, when we break a stone in two, the pieces must necessarily admit of being fitted together again. No correspondence of the two sides of the Yosemite can be detected, nor will the most ingenious contriving, or lateral moving, suffice to bring them into anything like adaptation to each other. A square recess on one side is met on the other, not by a corresponding projection, but by a plain wall or even another cavity. These facts are sufficient to make the adoption of the theory of a rent or fissure impossible. There is much the same difficulty in conceiving of the formation of the Valley by any flexure or folding process. The forms and outlines of the masses of rock limiting it are too angular, and have too little development in any one direction; they are cut off squarely at the upper end, where the ascent to the general level of the country is by gigantic steps, and not by a gradual rise. The direction of the Valley, too, is transverse to the general line of elevation of the mountains, and not parallel with it, as it should be, roughly at least, were it the result of folding or upheaval.

In short, we are led irresistibly to the adoption of a theory of the origin of the Yosemite in a way which has hardly yet been recognized as one of those in which valleys may be formed, probably for the reason that there are so few cases in which such an event can be absolutely proved to have occurred. We conceive that, during the process of upheaval of the Sierra, or, possibly, at some time after that had taken place, there was at the Yosemite a subsidence of a limited area, marked by lines of "fault" or fissures crossing each other somewhat nearly at right angles. In other and more simple language, the bottom of the Valley sank down to an unknown depth, owing to its support being withdrawn from underneath during some of those convulsive movements which must have attended the upheaval of so extensive and elevated a chain, no matter how slow we may imagine the process to have been. Subsidence, over extensive areas, of portions of the earth's crust, is not at all a new idea in geology, and there is nothing in this peculiar application of it which need excite surprise. It is the great amount of vertical displacement for the small area implicated which makes this a peculiar case; but it would not be easy to give any good reason why such an exceptional result should not be brought about, amid the complicated play of forces which the elevation of a great mountain chain must set in motion.

By the adoption of the subsidence theory for the formation of the Yosemite, we are able to get over one difficulty which appears insurmountable with any other.

This is, the very small amount of *debris* at the base of the cliffs, and even, at a few points, its entire absence, as previously noticed in our description of the Valley. We see that fragments of rock are loosened by rain, frost, gravity, and other natural causes, along the walls, and probably not a winter elapses that some great mass of detritus does not come thundering down from above, adding, as it is easy to see from actual inspection of those slides which have occurred within the past few years, no inconsiderable amount to the *talus*. Several of these great rock-avalanches have taken place since the Valley was inhabited. One which fell near Cathedral Rock is said to have shaken the Valley like an earthquake. This abrasion of the edges of the Valley has unquestionably been going on during a vast period of time; what has become of the detrital material? Some masses of granite now lying in the Valley—one in particular near the base of the Yosemite Fall—are as large as houses. Such masses as these could never have been removed from the Valley by currents of water; in fact, there is no evidence of any considerable amount of aqueous erosion, for the canon of the Merced below the Yosemite is nearly free from detritus, all the way down to the plain. The falling masses have not been carried out by a glacier, for there are below the Valley no remains of the moraines which such an operation could not fail to have formed.

It appears to us that there is no way of disposing of the vast mass of detritus, which must have fallen from the walls of the Yosemite since the formation of the Valley, except by assuming that it has gone down to fill the abyss, which was opened by the subsidence which our theory supposes to have taken place. What the depth of the chasm may have been we have no data for computing; but that it must have been very great is proved by

the fact that it has been able to receive the accumulations of so long a period of time. The cavity was, undoubtedly, occupied by water, forming a lake of unsurpassed beauty and grandeur, until quite a recent epoch. The gradual desiccation of the whole country, the disappearance of the glaciers, and the filling up of the abyss to nearly a level with the present outlet, where the Valley passes into a canon of the usual form, have converted the lake into a valley with a river meandering through it. The process of filling up still continues, and the *talus* will accumulate perceptibly fast, although a long time must elapse before the general appearance of the Valley will be much altered by this cause, so stupendous is the vertical height of its walls, and so slow their crumbling away, at least as compared with the historic duration of time.

Lake Tahoe and the valley which it partly occupies we conceive also to be, like the Yosemite, the result of local subsidence. It has evidently not been produced by erosion; its depth below the mountains on each side, amounting to as much as 3,000 feet, forbids this idea, as do also its limited area and its parallelism with the axis of the chain. The Lake is still very deep, over 1,000 feet; but how deep it was originally, and how much detritus has been carried into it, we have no data for even crudely estimating.

#### References

Lammerts, Walter E., 1975. Trees indicate recent origin of Yosemite Valley. *Creation Research Society Quarterly* 12(1):3-6.

(Editor's note.) Another valley which may have been formed in the same way, by the sinking of a block of the Earth's surface, is the Rift Valley in Asia and Africa. Some discussion of that valley, and how it may be associated with events after the Flood, will be found in the article by Strickling, elsewhere in this issue of the *Quarterly*.

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### QUOTABLE QUOTE

“There are those who deny with enthusiasm the existence of a God and are happy in a hobby which they call the Mistakes of Moses . . . it seems that the chief mistake . . . was that he neglected to write the Pentateuch. The lesser errors, apparently, were not made by Moses, but by another person equally unknown. These controversialists cover the very widest field, and their attacks upon Scripture are varied to the point of wildness. . . . A superficial critic might well imagine that there was not one single sentence left of the Hebrew or Christian Scriptures which this school had not marked with some ingenious and uneducated comment. But there is one passage . . . upon which they have never pounced . . . I mean that singular arrangement . . . by which light is created first and all the luminous bodies afterwards. One could not imagine a process more open to the elephantine logic of the Bible-smashers than this:

that the sun should be created after the sunlight . . . it would sound like saying that children existed before a baby was born. The idea . . . like many other ideas which are alien to most modern thought, is a very subtle and a very sound idea . . . there is a very real metaphysical meaning in the idea that light existed before the sun and stars . . . . The idea existed before any of the machinery which made manifest the idea. Justice existed when there was no need of judges, and mercy existed before any man was oppressed. . . . Brightness existed before anything was bright.”

—G. K. Chesterton, in his introduction to the Everyman's Library Edition of the Pickwick Papers, about 1907. Mr. David Harris, Principal of the Kawartha Christian School, Peterborough, Ontario, Canada, called this item to my attention.