

WONDERFUL CRATER LAKE

Interesting Paper on Oregon's
Greatest Natural
Curiosity.

Professional paper, United States Geological Survey No. 10, illustrated, now in press, by Messrs. J. S. Diller and H. B. Patton, consist of two papers: Part 1, by Mr. Diller, treats primarily of geology, the development of the great volcano, Mount Mazama, and its collapse, which gave birth to Crater Lake; Part 2, deals with the petrography and gives a special description of the various rocks occurring in the park.

Twenty years ago, says Mr. Diller in his introduction, Crater Lake was unknown to the general public. It is deeply set in the summit of the Cascade range, about 65 miles north of the California line, in the central western edge of Klamath county, Oregon, 17 miles a little west of north of Fort Klamath, 10 miles due west of the upper end of the Klamath Indian reservation, about 12 miles a little east of north of Fort Scott, and a like distance due south of Mount Thielson. The remnant of the great mountain enclosing the lake was named Mount Mazama in 1896; and the Crater Lake National Park, containing 249 square miles, was established by Congress in May, 1902.

The geological record of this country from the earliest epochs to the present time is replete with volcanic phenomena, but the climax appears to have been reached in the earlier portion of the Neocene period, when one of the largest known volcanic fields of the world was vigorously active in our northwestern states. This area of volcanic activity stretched from the Rocky mountains to the Pacific, embracing a large part of Wyoming, Montana, Idaho, Washington, Oregon, and California. The western limit of the great volcanic field is likewise the western border of the Cascade range. The wrecking of Mount Mazama and the development of the great pit of calders, which for beauty and grandeur rivals anything of its kind in the world, was the crowning event in the volcanic history of the Cascade range.

The rim encircling Crater lake appears, seen from a distance, as a broad cluster of gently sloping peaks. To one arriving by the road at the crest of the rim, the lake, in all its majestic beauty, appears suddenly upon the scene and is profoundly impressive. The eye beholds 20 miles of unbroken cliffs, the remnant of Mount Mazama, ranging from over 500 to nearly 2000 feet in height, encircling a deep, blue sheet of placid water, in which the mirrored walls vie with the original slopes in brilliancy and greatly enhance the depth of the prospect. The lake is about 4½ miles wide and 6¼ miles long, with an area of nearly 20½ square miles.

There can be no reasonable doubt as to the former existence of Mount Mazama, but its shape and size are more difficult to determine. Mount Mazama is composed largely of lavas, similar to those of Mount Shasta, and from the slopes of that famous peak we may draw an inference as to those of Mount Mazama. Mount Shasta, unlike Mount Mazama, does not stand on an elevated platform. It rises with a majestic sweep of 11,000 feet from gentle slopes about its base, gradually growing steeper upward to the bold peak. At the height of 8,000 feet it has about the same diameter as Mount Mazama at an equal elevation in the rim of Crater

lake. Above this, Mount Shasta rises over 6,300 feet. The prominence of Mount Mazama as a drainage center is quite equal to that of Mount Shasta, but its slopes on the rim of Crater lake, ranging from 10° to 15°, are scarcely as great as those of Mount Shasta at a corresponding elevation. On the other hand, the canyons of Sun and Sand creeks on Mount Mazama are more profound and have been much more deeply glaciated than any of those on Mount Shasta. It therefore appears reasonable to suppose that Mount Mazama had an altitude at least as great, and possibly greater than that of Mount Shasta (14,380 feet).

There were eruptive flows of lava from Mount Mazama, and also great explosive eruptions of pumice, the greatest eruptions, perhaps, of the Cascade range, and then came the revolution which removed the large cone and the upper 6,000 feet of Mount Mazama, and gave rise to the caldera.

The evidence seems to be against the view that this destruction of the mountain was by an explosion which blew the upper part off and out. A large number (168) of soundings made under the direction of Major Dutton, U. S. A., show that the inferred bottom of Crater lake may be conceived of as a nearly plane surface for the most part, upon which stand three abruptly rising prominences, one, Wizard Island, rising high over the water, the other two being submerged. The depth of the floor upon which these prominences stand varies from 1,900 to 2,000 feet, probably the deepest fresh water in the United States. The solid contents of the area of the caldera containing this lake is about 12 cubic miles; the contents of the area of the mountain top above the caldera was probably 5 cubic miles—17 cubic miles of material in all. There is nothing on or around the present mountain to account for all this material.

The evidence does seem to show that during the final activity of Mount Mazama there must have been within it a column of lava rising to a height of over 8,000 feet above the base of the Cascade range. It is possible that this great pressure, aided, perhaps, by some other forces, made an opening formed low down upon the mountain slope, which allowed the lava to escape. The subsidence of the lava within the mountain left it unsupported and caused it to collapse. Phenomena of this sort are well known in connection with the Hawaiian volcanoes. The peculiar reversed flow of lava at Rugged crest seems to point to the collapse and subsidence of the mountain before the hardening of this lava, which thereupon flowed back and down into the present caldera. That Mount Mazama disappeared and that the caldera originated through subsidence seems evident; but the corresponding effusion of the enormous mass of material upon the lower surface of the mountain, if such effusion ever occurred, has not yet been found.

Crater lake changes level. During the summer, when there is rapid evaporation and little or no precipitation, the surface of the lake subsides; but during the rainy winter it rises again. The oscillation is limited to about four feet. The lake appears to be fed chiefly by the vast quantities of snow which drift across the crest and lodge in great banks on the inside. The annual precipitation of the region is estimated at between 70 and 80 inches. Crater lake has no visible outlet, nor any invisible one reaching the surface directly within a few miles. But the walls of the caldera enclosing the lake are made up of alternating sheets of lava, dipping away from the lake practically in all directions, and they are so porous as to afford easy passage for much water. Springs on the mountain are abundant and remarkable in size, especially on the southeast, along a fault in the mountain side, which probably affords an outlet for much of the water that percolates through that portion of the rim.

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