Richards and Baxter respectively, giving the results of analyses of the bromides of nickel and cobalt; which show in a decisive manner that properly purified nickel and cobalt are homogeneous substances. After stating the advantages pertaining to the use of the bromides, for the sublimation and bottling of which a highly ingenious apparatus is described, they show how two totally distinct methods of purification, starting from metals of different origin, lead to a bromide of the same composition.

For nickel bromide the material was obtained from two sources—the "pure" nickel of commerce, and Mond nickel prepared by the carbon monoxide process. The steps for the purification of the first of these included fractional precipitation as sulphide, then as hydroxide, conversion of this through the bromide into the violet crystalline ammonia compound $NiBr_2.6NH_3$, and this, after several recrystallisations, converted through the oxide into spongy nickel. For the Mond nickel, in which a little iron was practically the only impurity, the same process was adopted, except that to remove alkalis the hydroxide was converted into sulphate and the latter subjected to electrolysis several times. After conversion into bromide, these were analysed, and for the final analyses further purification was attempted by repeated deposition by electrolysis. All three samples gave identical results, 58·69, for the atomic weight of nickel (O = 16).

The cobalt was purified with equal care, the cobalt bromide being obtained by two distinct methods of purification, the one through potassium-cobalt nitrite, and the other through a cobalt-amine, and these again purified by a combination of both processes. The results of the three series were practically identical, the atomic weight of cobalt being 58·99 (O = 16).

While recognising that data obtained from one compound only are not sufficient to finally settle the atomic weights of these metals, the authors conclude that if "gnomium" exists, it must have an atomic weight about equal to that of nickel and cobalt; and hence, that the wide variations observed in the results of other experimenters cannot be considered a valid argument in favour of the late Prof. Krüss's doubtful discovery.

CRATER LAKE, OREGON.

THE Mazamas of the State of Oregon are no ancient tribe of redskins, but the members of a very active and most praiseworthy mountaineering club in the city of Portland. The President in his last annual address observed: "Within two years the name *Mazama* has been heard throughout the world, and to-day it stands as a synonym for all that is unique, progressive and inspiring in mountaineering societies"; and even if the European Alpine clubs hesitate to accept this statement in its entirety, all must agree that the second number of the publication entitled *Mazama* justifies the "guid conceit" the members of that lively club have of themselves. As no American University commands respect without a rousing "yell," so no mountaineering club can organise excursions without a "cheer," and this is the Mazamas':—

"Three cheers for the mountaineers,
'Rah! 'rah! rah!
Nesika klatawa sahele
Ma-za-ma."

The obscurest line is Chinook jargon for "We go up." Led with such a slogan, the Oregon Highlanders have carried many peaks by storm, and have opened to the public much of the grand mountain scenery of the Cascade Range. Part 2 of *Mazama* is devoted to the remarkable natural feature known as Crater Lake, to which the club made an excursion in 1896. The description is not a piece of amateur geography, but a solid description put together out of reports by the first scientific authorities.

Crater Lake is situated nearly in 43° N. and 122° W. It may be reached from several stations on the railway between Portland, Oregon, and San Francisco, by roads, usually bad, and as yet there is no house of any kind near its shore. Leaving the Southern Pacific Railway at Midford, one may reach it by 85 miles of road up the Rogue River valley. From Ashland a road of 95 miles must be traversed; but the best road—one which is practicable for bicycles—is from Ager, Cal., past the deserted Fort Klamath, a distance of 116 miles. The whole country is covered with dense coniferous forest. In approaching the lake, there is a steep climb for about three miles; then the forest-clad mountain slope gives place to a nearly level plateau, carpeted in autumn with flowers, across which one walks a few hundred yards with nothing to see, until suddenly a precipice of 900 feet yawns at one's very feet, and deep below the dazzling blue water of Crater Lake spreads far and wide. The weird grandeur of the scene accounts to the full for the superstitious awe with which the Indians of the district regard the lake.

Crater Lake may have been discovered in 1847, but the first authentic account of its existence came from a composite party of prospectors in 1853. A party of Californian gold-seekers crossed secretly into Oregon to search for a mythical lost digging of fabulous richness, and for as long a time as provisions lasted they were followed by a party of Oregonians who could not be shaken off The rivals united at last, and, continuing the search for gold together, came upon Crater Lake, which they named "Deep Blue Lake," or "Lake Mystery." The next recorded visits were in 1862, 1865, and 1869. From that time its fame began to spread, but it was not geologically examined by experts until 1883. In 1885 a party of the United States Geological Survey, under Captain Dutton, was detailed to sound the lake and make a topographical survey of its surroundings; and a detailed contour map was constructed.

The roughly circular lake, from four to six miles in diameter, is without outlet, and without tributaries; the upper edge of the rim is a water-parting, from which streams radiate down the slopes towards the sea through deep cut valleys. The outer slopes have a gradient of from 10° to 15°, and are richly wooded. The inner slopes are precipitous, and allow of a descent being made to the water only at one or two points. The water-level stands 6239 feet above sea-level, and the crest of the rim varies from 520 to 1989 feet higher. The greatest depth ascertained in the lake is 2008 feet. A relief model of the lake and its surroundings has been constructed, and shows a remarkable similarity to the larger ring-craters of the moon. One island of some size rises in the lake in the form of a cinder-cone, bearing a well-marked crater on its summit. It goes by the name of Wizard Island, and a fantastically weathered islet is named the Phantom Ship.

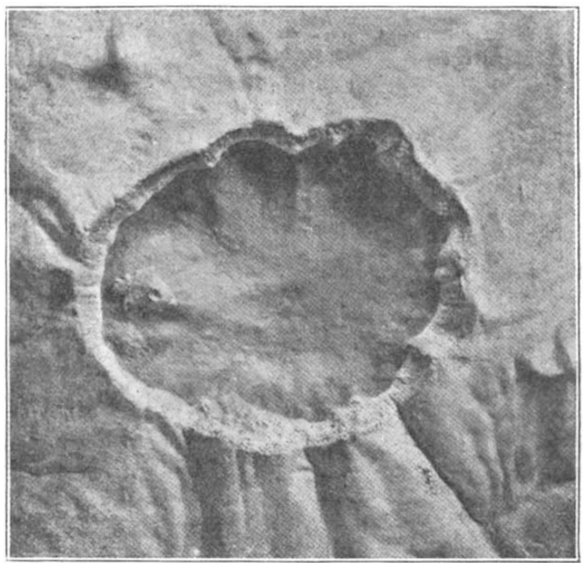

FIG. 1.—Photograph of a relief model of Crater Lake.

A description of the geology of the region is given by Mr. J. S. Diller. The rim is composed entirely of lava streams and beds of volcanic conglomerate dipping away from the lake. At one point, however, there is a remarkable lava-flow, which appears to have run down the inner slope.

The lavas of the rim are mainly andesites forming the earlier flows, but rhyolites associated with pumice occur among the later. There is no basalt on the rim, but basalts occur on the outer slopes several miles from the lake, being related to cinder cones adnate to the central crater. Numerous andesite dykes radiate from the lake, cutting through the older lavas as exposed on the inner slope. The inner slope appears to have been formed by fracture, and not by flow. The old crater did not occupy the whole extent of the piesent caldera; if it had done so the lava would have overflowed at the lowest part of the rim, but the whole rim is formed of lava-flows from some higher and now vanished centre. One very remarkable feature of the geology is the strong glaciation of the rim, shown by well-marked striæ and great morainic deposits. There are traces of glaciers radiating down the slope, in some cases to a distance of five miles. There is evidence of volcanic activity during the glacial period; on one of the peaks of the rim an ice-planed surface of old lava is covered by two layers of pumice separated by a flow of rhyolite. The severe floods, which must have accompanied eruptions at that period, would account for the vast masses of sediments which fill the radiating valleys. The observed phenomena can only be accounted for by the presence of a great volcanic peak covering the present area of the lake, and sweeping upward as a continuation of the present outer slopes. The probable history of this mountain is summarised thus:—

The history of Crater Lake and its rim began in the upbuilding, by normal volcanic processes, of a large volcano—to which the name Mount Mazama is given—comparable in the nature of its lavas and in its structure and size with the greater peaks of the Cascade Range. This volcano was active in the glacial period, lava and glaciers combining to mould its form. Somewhere near its final eruption, and perhaps in consequence of the rapid draining away of lava by the small cones near the base of the mountain, the molten material from the interior was withdrawn, the summit of Mount Mazama collapsed and sank away, leaving a huge gulf measuring six miles by four, and about 4000 feet deep. Volcanic activity continued on the floor of the caldera for some time; but since rainfall is in excess of evaporation in that region, water gradually accumulated to form the present Crater Lake.

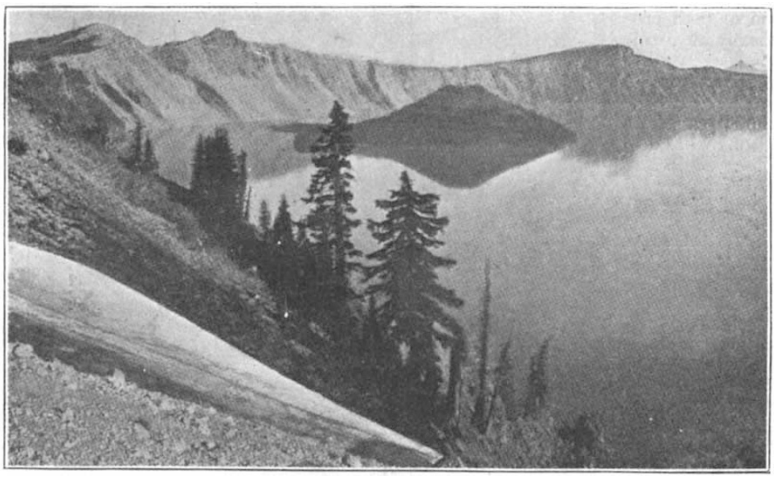

FIG. 2.—Crater Lake, showing Wizard Island.

The water of the lake is remarkably transparent, free from any visible organic matter, and fresh to the taste, but no analysis of its saline contents seems to have been made. The temperature of the water when examined in August 1896, averaged about 60° F. on the surface. The deep-temperature, taken by means of a Negretti and Zambra reversing thermometer in the unsatisfactory Magnaghi frame, was reported as 39° at 555 feet, 41° at 1040 feet, and 46° at 1623 feet. If these figures were trustworthy, it would appear that the water in Crater Lake still derives heat from the rocks; but if this interpretation is correct, it is difficult to account for the minimum at the maximum density point, unless indeed the water is saline enough to have a maximum density point perceptibly lower than that of fresh water. Dr. Evermann, of the U.S. Fish Commission, who made the observations, does not seem to have entire confidence in their accuracy.

Only three species of invertebrates were found living within the rim of Crater Lake—a frog, a snake, and a salamander. By the use of tow-nets several minute algæ were found in the water, and many minute crustacea, of which *Daphnis pulex pulicaria* was the commonest. Several larval insects, a leech, a species of *Gordius*, and one species of mollusc, an undetermined *Physa*, were also found. No fish could be discovered, but an attempt to introduce trout is to be made.

Dr. Merriam gives an elaborate classification of the life-zones on Mount Mazama, and a complete list of all the animals found; an extensive flora is also published, and in all respects the special number of *Mazama* is highly creditable to the Society which has produced it. The Mazamas are to popularise the lake for the use of tourists by introducing various attractions, which we fear will detract from its present charm by destroying the absolute wildness of the whole surroundings. H. R. M.

ADDRESS TO THE ROYAL ASTRONOMICAL SOCIETY.[1]

IT is the duty of your President at this annual meeting of our Society to address you on a very important subject. I allude, of course, to the award of the Gold Medal which is annually conferred by the Royal Astronomical Society on some astronomer who has rendered signal service to our science. The discharge of that duty is, perhaps, the most responsible official act which devolves on the occupant of this chair during his tenure of the distinguished position of President. I am to set forth the ground upon which on the present occasion the medal has been awarded by your Council to our distinguished Fellow, Mr. W. F. Denning.

The contributions of Mr. Denning to astronomy may be ranged under three heads.

(1) Discovery of Comets.

(2) Observation of Planetary Phenomena.

(3) Researches on Meteors.

It will be convenient for me to describe his work in these three different departments in the order just given. The first and second departments must, however, be treated with comparative brevity, for it is on the third department that your Council laid special stress in making their award.

(1) COMETS.

Each year usually brings the announcement of certain new comets, the discovery of such objects being the rewards of those observers who patiently scan the heavens, evening after evening and morning after morning, with the particular object of detecting these shy visitors to our skies. Mr. Denning has been one of those who have engaged in this work, and his success has been noteworthy. The following list gives the designations of five comets which have been discovered by our medallist.

Comet 1881 V. Period, 8·68 years.
Comet 1890 VI.
Comet 1891 I.
Comet 1892 II.
Comet 1894 I. Period, 7·3 years.

While searching the skies for comets, Mr. Denning has not unfrequently discovered nebulæ which had escaped the attention of previous observers. No fewer than twenty new nebulæ have thus been added by Mr. Denning to the lists of those already known. Most of these new objects lie in the vicinity of the North Pole.

(2) PLANETARY OBSERVATIONS.

A striking characteristic of Mr. Denning's work is the methodical accuracy with which he has carried through whatever astronomical research he has in hand. Mr. Denning never spared himself any pains in the efforts necessary to give his work the inestimable charms of thoroughness and precision. This may well be illustrated by his planetary observations. We here

[1] Delivered on February 11 by the President, Sir Robert Ball, on the occasion of the presentation of the Gold Medal to Mr. W. F. Denning.