of the alkalies. The analysis is supported by the optical characters which are shown in the following table.

$\alpha=1.5180$	$X\wedge a=6°37'$
$\beta=1.5234$	$Z=b$
$\gamma=1.5260$	$2V=70°$ approximate

The orientation and extinction angle corresponds to a soda rich orthoclase. The indices of refraction were obtained by matching liquids with the mineral and the determination of the indices of the liquids by means of the refractometer.

OLIVINE FROM MONHEGAN ISLAND, MAINE

E. P. Wheeler, II, *Cornell University.*

In the spring of 1923 the writer had opportunity to collect a suite of igneous rocks from Monhegan Island. According to Lord,[1] their considerable variation in composition is chiefly due to differentiation, in place, of a deep seated basic magma. He sees in the amphibole reaction-rims between feldspar and both olivine and diallage some evidence of regional metamorphism. Though these reaction-rims may be susceptible of other interpretations, the main idea of differentiation seems tenable.

A preliminary study of the olivine in a specimen from the east side of the island, near White Head, indicated that it contained an unusually high percentage of iron. It was therefore decided to separate and analyze this olivine as a contribution to the study of the behavior of iron in the crystallization of rock magmas. Though the separation of the olivine in highly satisfactory purity was not attained, yet the results seem worthy of record.

The rock containing the olivine may be designated as an olivine-gabbro, since it is composed of approximately 50% feldspar (near bytownite), 15% olivine, 10% "diallage," and needle-like amphibole in green and in colorless varieties, brown hornblende, magnetite and serpentine, together amounting to 25%.

Preliminary separation using Thoulet's solution of Sp. Gr. 2.9 removed feldspar and serpentine satisfactorily, but attempts to isolate the olivine by use of Klein's solution, even after a strong

[1] Lord, E. C. E.: Notes on the Geology and Petrography of Monhegan Island, Maine, *Am. Geologist*, **26**, 328 (1900).

electromagnet had removed those diallage grains that were considerably contaminated with magnetite, did not yield olivine of sufficient purity for quantitative analysis.

A qualitative trial seemed to indicate that solubility in hydrochloric acid might furnish a fairly satisfactory means of ascertaining the chemical composition of the olivine, and the results seem to substantiate this view. Concentrated acid was diluted with twice its volume of water and allowed to act for 24 hours, with occasional warming, on the powdered mineral of grain size .02 to .085 mm.

As a check on the solubility of the minerals contaminating the olivine, two samples of widely different compositions were used, one with 13.5% impurity and the other with 46%, as estimated by grain-count of the powders. In the residue after treatment with HCl, the sharp angular shape of the grains was retained, indicating but little solution in the acid.

The procedure recommended by Washington[2] was followed after removal of the insoluble residue. Unfortunately both silica determinations were vitiated in the course of the analysis. Qualitative tests for manganese, calcium and titanium were negative.

The following table summarizes the results, and shows the analysis of a similar olivine for comparison.

	1	2	3	4	5	6
SiO_2			35.96	37.59	38.40	37.17
FeO	22.63	22.42	23.11	22.86	22.98	22.54
MgO	40.05	38.80	40.93	39.35	38.62	39.68
Al_2O_3, etc.	2.12	1.91				
	64.80	63.13	100.00	100.00	100.00	99.39

1. Olivine, Monhegan, dissolved from sample with 13.5% impurities.
2. Olivine, Monhegan, dissolved from sample with 46% impurities.
3. Analysis 1 recalculated to 100% after deducting Al_2O_3, etc.
4. Analysis 2 recalculated to 100% after deducting Al_2O_3, etc.
5. Calculation from theoretical formula of an olivine with FeO an average between analyses 3 and 4.
6. Olivine from Mount Bruno, Quebec, T. S. Hunt; *Am. Jour. Sci.*, 283 (1860).

It seems clear from the nature of the minerals other than olivine in the powders used for analysis,—chiefly diallage and amphiboles, that calcium should appear, especially in analysis 2, if these

[2] Washington, H. S.: Chemical Analysis of Rocks, 1919.

are soluble to any extent under the conditions of solution employed. This was not the case.

The specific gravity of the olivine was determined to be $3.46 \pm .02$.

The indices of refraction were determined by matching α, β and γ with mixtures of α-monochlornaphthalene and methalene iodide in yellow light from a monochromator. Dr. J. H. C. Martens kindly determined the indices of these mixtures on a refractometer in sodium light, obtaining the values 1.6807, 1.7057 and 1.7185. The value of β is a little lower than would be indicated by interpolation in the series of Penfield and Forbes.[3] This may indicate that the rate of increase of β with increasing FeO content is even slower at the magnesium end of the series than is shown by their diagram. The same indication may be seen in their data. As would be expected from its composition the olivine is negative.

Like the mineral from Mt. Bruno, analysis of which has just been quoted, the percentage of FeO is extremely high for a rock-forming olivine.

More extensive details as to methods and results are given in the writer's thesis for a Master's degree which is deposited in the library of Cornell University.

NOTES AND NEWS

"FINGER PRINTS" OF MINERALS

A. N. Winchell, *University of Wisconsin.*

Recent developments in our knowledge of X-rays have made it possible to use them in the study of all sorts of solid matter. Truly solid matter consists exclusively of crystals each of which is composed of atoms having a perfectly definite and regular arrangement. These atoms form parallel planes in various positions through the crystal just as the hills of corn planted by machine on a level field form parallel straight lines in several positions across the field. The distance between any two adjacent planes determines the angle at which X-rays are reflected (in phase) by these planes. By exposing a finely powdered crystal to a beam of X-rays reflections can be obtained simultaneously from all the parallel planes in the crystal. These reflections make angles with the incident beam of X-rays which depend directly upon the distances between the planes of atoms. All crystals of the same kind produce reflections which are identical in intensity and positions while two crystals which are not alike produce reflections which are unlike.[1] Accord-

[3] Penfield and Forbes: *Am. Jour. Sci.*, **151**, 134 (1896).

[1] A few exceptions to this rule have been discovered; most of these are easily understood.