Wall coatings at Gulf Island are distributed uniformly on both upstream and downstream sides of the tunnel averaging one inch in thickness at right angles to the walls. Ridges of calcium carbonate extend from the junctions of the arches and are one inch thick and $1\frac{1}{2}''$ to $2\frac{1}{2}''$ wide.

A recording thermometer was installed in the tunnel from July 28, to August 4, 1933. The temperature of the tunnel was uniformly 62 degrees for $4\frac{1}{2}$ days and between 64 and 62 for $2\frac{1}{2}$ days. Outside temperatures during the same period varied from 62 to 86. The water in the tunnel does not freeze in winter despite zero temperatures outside. Atmospheric pressure inside the tunnel was determined by an aneroid barometer on six different occasions. No noticeable differences in tunnel and outside pressure was noted.

The writer expresses his thanks to Leon Ladd, Superintendent of Gulf Island Dam for permitting and aiding the study, and for protecting the measured stalactites from curious tunnel visitors.

[7] Broken off on Oct. 1, 1931, during inspection trip.

[8] Davis, W. M., Origin of limestone caverns; *Sci.* (ns.), vol. **73**, p. 329, Mar. 27 1931.

PARAGONITE FROM PIZZO FORNO, TICINO, SWITZERLAND

R. B. McCormick, *University of Wisconsin.*

A "paragonite" schist from the type locality for paragonite,[1] Pizzo Forno, near Faido, Ticino, Switzerland was donated by Ward's Natural Science Establishment and studied to determine the properties of paragonite.

In a hand specimen the paragonite is a white, flaky mica with a vitreous to pearly luster, forming the ground mass for small crystals of cyanite and staurolite. A portion of the rock was ground up and the constituent minerals separated by heavy liquid gravity methods. A variation in specific gravity in the paragonite from 2.82 to 2.90 was found and the cause determined by microscope methods as being due to minute inclusions of cyanite, staurolite and an opaque mineral, probably magnetite.

The gravity separates of paragonite were *x*-rayed by the powder method and the patterns thus obtained showed no apparent variation from a standard muscovite pattern. Measurements of the indices of refraction on grains from different gravity separates by

[1] Dana, E. S., Textbook of Mineralogy, 4th ed., p. 661.

means of the Emmons double variation apparatus[2] and Emmons improved universal stage[3] usually range less than $\pm .001$ for a given ray, indicating the paragonite to be of uniform chemical composition despite the variation in specific gravity.

The optical data for the paragonite are as follows:

(−)	$2V = 42°$
	Na light
N_g	1.6020
N_m	1.5960
N_p	1.5635
$N_g - N_p$	0.0385

A partial chemical analysis for the percentages of K_2O and Na_2O present in the mica was obtained through the courtesy of Dr. N. J. Volk. This analysis showed 4.6 per cent K_2O and 1.77 per cent Na_2O. Calculation on the basis of molecular percentages results in 63.1 per cent K_2O and 36.9 per cent Na_2O or a ratio of two molecules of muscovite to one of paragonite. Since the chemical analysis was made only for these two oxides, it is impossible to state what molecules of the muscovite system are present, or to make definite statements as to the effect of the paragonite molecule on the optical properties of muscovite. In this paragonite, however, the refractive indices are higher and the optic angle somewhat less than the values for "pure muscovite" given by Winchell.[4]

Conclusion

It has been shown that the so called paragonite schist of Pizzo Forno, Switzerland, is primarily a muscovite schist containing about 37 per cent of the paragonite molecule. Paragonite as a distinct mineral has not been found in nature, indicating that it probably is an unstable molecule of the mica group.

The writer is indebted to Mr. G. L. English of Ward's Natural Science Establishment for the specimen, to Professors A. N. Winchell and R. C. Emmons for helpful criticisms and suggestions, and to Dr. N. J. Volk for a partial chemical analysis of the mineral.

[2] Emmons, R. C., *Am. Min.*, vol. **14**, p. 414, 1929.

[3] Emmons, R. C., *Am. Min.*, vol. **14**, p. 441, 1929.

[4] Winchell, A. N., Elements of Optical Mineralogy, Pt. II, p. 267.