canyon walls. This rapid increase in width of the dike downward suggests that the Canyon Creek exposure is close to a larger intrusive body. Proximity to an underlying large body of magma would account for the higher temperatures prevalent when the vesicles formed. The exposure of the dike in Canyon Creek is nearly 4000 feet below Sneffels Peak, which is composed of a gabbro-diorite stock intruded at essentially the same time as the dikes. The minimum depth of cover was thus nearly a mile, making for a substantial confining pressure.

Morris has cited a number of amygdaloidal dikes and sills where the gases which made the vesicles were distilled from coals and other rocks rich in volatiles.[3] In the Colorado occurrence here described, no source is apparent for introduction of volatiles, and the gases are considered to be of magmatic origin.

[3] Morris, F. K., *op. cit.*, pp. 383–404, 1930.

BOOK REVIEW

ESSAI DE DÉTERMINATION DES PROPRIÉTÉS OPTIQUES D'UN MINÉRAL PAR LA MESURE, EN LUMIÈRE PARALLÉLE OBLIQUE, DES RETARDS EN DIFFÉRENTS POINTS D'UNE LAME CRISTALLINE. J. MÉLON. (Thése présentée à la Faculté des Sciences de l'Université de Liège.) Liège, **1934.** 108 pp., 21 figs.

In recent years American mineralogists and petrographers have begun appreciating the Fedorov stage as an excellent tool that can be put to use in various ways (optical determination of feldspars and of other minerals, double dispersion method, petrofabrics, etc.)

In the present treatise J. Mélon shows that the Fedorov stage can be utilized in still another way. He shows that it is practically possible to determine in thin sections the optical angle (2V) and all the refractive indices of a mineral, simply by measuring the retardation along several directions of the mineral. The measurements are made on a Fedorov stage with either a quartz wedge or Berek's compensator.

The exact formulae for the evaluation of the experimental data are very complicated, and in most cases only approximate formulae are therefore given. This has the advantage of materially simplifying the computations without much loss in accuracy (it should be borne in mind that the observations made with the Fedorov stage are accurate only to 1°).

Although theoretically the mineral grain may have any orientation, there are, nevertheless, distinct practical limits to the method. Results obtained from mineral grains in unsuitable positions are thus of little or no practical value. The method of Mélon cannot, therefore, generally replace any of the other methods of determining 2V and the indices of refraction, but everybody who works with the Fedorov stage should familiarize himself with the method, for it is as far as I know the only method permitting a determination of the refractive indices of a mineral *in a thin section*. A knowledge of this method may therefore, in special cases, prove itself very useful and convenient.

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