

OPTICAL PROPERTIES OF CYANOTRICHITE AND BISBEEITE

	Cyanotrichite, ¹ Tintic, Utah (Larsen)	Grand Canyon ² mineral (Rogers)	Bisbeeite ³ (original material Larsen)
Color	Bright blue	Methyl blue	Nearly white
Form	Needles	Fibrous spherulites	Cotton-like
Orientation	Z = c	Z = c	Z elongation
Sign	+	+	+
Pleochroism:	X Colorless	Neutral	Nearly colorless
	Y Pale blue	Pale bluish-green	Nearly colorless
	Z Bright blue	Deep blue	Pale greenish
Indices:	<i>a</i> 1.588 ± .003	1.589 ± .001	1.615 ± .01
	<i>β</i> 1.617 ± .003	1.620 ± .001	1.625 ± .01
	<i>γ</i> 1.655 ± .003	1.649 ± .001	1.71 ± .01

¹ Larsen: *U. S. G. S. Bull.*, 679, 65, 1921.

² Rogers: *Am. Min.*, 7, 153, 1922.

³ Larsen: *U. S. G. S. Bull.*, 679, 48, 1922.

PROCEEDINGS OF SOCIETIES

THE MINERALOGICAL SOCIETY OF WASHINGTON, D. C.

For a number of years there has existed in Washington an informal organization known as the Petrologists' Club, before which numerous papers on petrology and allied sciences have been presented and critically discussed, to the advantage of all concerned. Early in 1923 several mineralogists talked over the desirability of organizing a similar society at which papers of more directly mineralogical nature might be similarly presented and informally discussed. W. F. Foshag agreed to act as Secretary, and sent out a number of invitations for a meeting at the residence of W. T. Schaller, 1637 R. St. N. W., on the evening of Friday, February 23rd, 1923. Braving the coldest weather of the winter, the following 13 mineralogists were present, thus expressing their approval of the formation of this society: W. S. Burbank, W. F. Foshag, H. Insley, E. S. Larsen, H. E. Merwin, C. S. Ross, E. B. Sampson, W. T. Schaller, F. C. Schrader, G. Steiger, E. T. Wherry, R. W. G. Wyckoff, and T. D. Shipton of Hanover, Ill., a member of the Mineralogical Society of America, visiting in Washington.

The first paper presented was by W. T. Schaller: **Ptilolite and related zeolites.** Several of these high-silica, acid-insoluble zeolites have been described, but conflicting statements as to their relationships appear in the literature. Recently Bøggild has urged the identity of "flokite" with ptilolite, and T. L. Walker the identity of ptilolite with mordenite. By correlating published data as to composition, crystallography, and optical properties, supplemented by new determinations (by Schaller, Ross, and Shannon), it is clearly shown that three distinct species are represented:

1. *Mordenite* (How, 1864), containing 9 SiO₂ and 6H₂O for 1 Al₂O₃ and 1(Ca, Na₂)O. Monoclinic or triclinic with inclined extinction (about 5°). Includes "flokite" (Callisen, 1917), which was determined by its author to have this extinction angle and composition, whereas Bøggild's specimens with orthorhombic crystals must have been the next mineral.

2. *Ptilolite* (Cross and Eakins, 1886), with 10 SiO₂ and 7H₂O. Orthorhombic, with parallel extinction. This is the commonest species.

3. Another mineral, described by Pirsson from Wyoming in 1890, and accepted by Dana as crystallized *mordenite*, but evidently a dimorphous form of *ptilolite* since it has 10 SiO₂ and 7H₂O. It is monoclinic and agrees with *heulandite* in crystallization, has a large extinction angle, and the habit is not fibrous but tabular. It is proposed to rename this mineral from Wyoming, **Clinoptilolite**, referring to its *inclined* extinction but agreement in composition with *ptilolite*.

It seems evident that the only way for progress to be made in the interpretation of such groups of minerals is to obtain complete data for individual occurrences, and not use the composition of one, the crystallization of a second and perhaps the optical properties of a third, as is often done.

The second paper was by E. T. Wherry: **Volume isomorphism in minerals**. As it is not proposed to publish this separately, it is here abstracted in detail. Two published articles on silicates (*This journal* 7, 113 and 8, 1) were reviewed, and a general theory of the relations proposed, this being illustrated by the sesquisulfide minerals as follows:

ISOMORPHOUS GROUPS OF ELEMENTS

As	9	S	6	(OS ₂)	13	(STe ₂)	24	The numbers represent atomic vol-
Sb	12	Se	7	(S ₃)	18	(Se ₃)	21	umes, in 10 ⁻²⁴ cc. units, based on X-ray
Bi	13	Te	9	(SSe ₂)	20	(Te ₃)	27	data, but are admittedly only rough
								approximations.

MINERALS OF THE SESQUISULFIDE DIVISION

Orpiment Group	Stibnite Group	Tetradymite Group
Monoclinic; β near 90°.	Orthorhombic	Rhombohedral
$a:b:c$ near 0.6 : 1 : 0.8.	$a:b:c$ near 1 : 1 : 1.	$a:c$ near 1 : 1.6.
Orpiment.....As ₂ S ₃	Stibnite.....Sb ₂ S ₃	Tetradymite...Bi ₂ STe ₂
Kermesite.....Sb ₂ OS ₂	Bismuthinite...Bi ₂ S ₃	Platynite (?)...Bi ₂ Se ₃
.....	Guanajuatite...Bi ₂ SSe ₂	Tellurobismu-
.....	Selenobismu-	thite.....Bi ₂ Te ₃
.....	thite.....Bi ₂ Se ₃

The theory suggested is that in such a series of compounds some intermediate set of elements yields the most stable arrangement, and that entrance of either larger or smaller atoms may distort this arrangement and result in change of symmetry. Taking *stibnite*, the best crystallized member, as the typical one, replacement of either of its kinds of atoms by smaller ones leads at once to decrease in symmetry (*orpiment* group); while replacement by larger ones at first causes no change except diminution of ability to form good crystals (*stibnite* group) but ultimately results in increased symmetry (*tetradymite* group).

When a very simple crystal structure is represented (*e. g.*, that of NaCl, PbS, etc.) such relations may not hold because the structure can remain stable during marked changes in sizes of the atoms. On the other hand when the structure is

highly complex, the distortion due to the entrance of larger or smaller atoms can be so distributed among numerous other atoms as not to affect the crystallization ("mass-isomorphism"). It is believed, however, that the volume relations here outlined do exist in a considerable number of cases where the structure is of intermediate complexity.

By way of discussion H. E. Merwin read an abstract, prepared by H. S. Washington (who was unable to be present owing to absence from the city) of two papers by Professor F. Zambonini of Italy, showing that he had reached essentially the same conclusions as Wherry with respect to the relations between Na, Ca, K and Ba in the feldspars, although emphasizing in addition the valence relations. (See page 81 of this issue.)

R. W. G. Wyckoff then presented his view that the relations pointed out as existing in the silicates and sulfides were little more than matters of chance, and that the whole idea of volume isomorphism is hardly in accord with the results of the more dependable X-ray data. (See page 85 of this issue.) These show that crystals are in general not close-packed structures, so that slight changes in volumes of the constituents should not yield marked effects; that the Bragg view of constancy of atomic volume is untenable, some atoms changing a hundred per cent or more on passing from one mode of combination to another [e.g. nickel in the hexamminates of its halides (*J. Am. Chem. Soc.*, 44, 1239, 1922) occupies a much greater volume than it does in the metallic state]; and finally that many of the published estimates of atomic dimensions from X-ray measurements are erroneous in that the workers have incorrectly interpreted the experimental data.

In reply the speaker stated that close-packing in the strict sense was unnecessary to the theory; that even though elements do vary from one compound to another it seemed probable that the variation would be similar for all the elements in small isomorphous series, so that their relative positions in the series would be unchanged; and that while admittedly the absolute magnitudes in the literature are often inexact, the atomic volumes of enough elements are definitely known to indicate the general trend of the relationships presented.

After two hours spent on this scientific program, the members adjourned for refreshments. The steering committee (composed of W. F. Foshag, Secretary, W. T. Schaller and E. T. Wherry) proposes that the next meeting shall consist of a field trip to the diabase quarry at Goose Creek, Va., where zeolites and their associated minerals are being obtained in interesting paragenetic relations; also Earl V. Shannon, who is working up the material, desires considerable rock material brought to Washington.

EDGAR T. WHERRY, *Secretary pro tem.*

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences of Philadelphia, March 8, 1923

A stated meeting of the Philadelphia Mineralogical Society was held on the above date with the president, Mr. Vaux, in the chair. Nineteen members and four visitors were present.

Mr. Frederick Oldach addressed the society on "THE PEGMATITES." The physical characters, mineralogy, origin, and classification of the pegmatites were discussed, with descriptions of typical pegmatite deposits. Mr. Hoadley made some supplementary remarks regarding the pegmatites of Connecticut.

The following were proposed for active membership: Messrs. Andrew Mantz and Frank K. Pickel.

Mr. Biernbaum reported a trip taken with Mr. Hallowell, to Moore, Delaware County, where they found cyanite. Mr. Blank exhibited sillimanite from the Wissahickon.

SAMUEL G. GORDON, *Secretary*.

BOOK REVIEW

MINÉRALOGIE DE MADAGASCAR. A. LACROIX. *Paris*. A. Challamel. Vol. I, xvi+624 pages, 27 plates, 1 map in colors, and 504 figures. Vol. II, vii+694 pages, 29 plates, and 11 figures. 1922.

The first part of this two volume work (pp. 1-148, vol. I) is a description of the GEOLOGY AND GEOGRAPHY of Madagascar.

In part 2, MINERALOGY (pp. 149-604, vol. I), the individual minerals (195 in number) found on the island are discussed in systematic order. A general description of each mineral is followed by detailed particulars of its occurrences in Madagascar, with analyses and optical determinations, in a manner quite similar to that adopted by the author in his "MINÉRALOGIE DE LA FRANCE ET DE SES COLONIES." This section is illustrated by 27 excellent plates of photographs, and 504 crystal drawings. A large map of the island is found at the end of volume one.

ECONOMIC MINERALOGY is discussed in part 3 (pp. 1-218, vol. II). Here are described: deposits of precious metals, common metals, gems and ornamental stones, rare metals (including radioactive minerals), mica, graphite and corundum, salt, etc., building stones, coal and petroleum. Next the writer treats of the mineral springs. Statistics of mineral production conclude this part. Part 3 contains 23 plates illustrative of mineral deposits and mining methods, as well as a number of sketch maps.

The fourth part of this work is entitled LITHOLOGY (pp. 219-665, vol. II). It includes descriptions of the intrusives of the crystalline massif, the schistose rocks, and post-Lias intrusives. Many analyses are given, and a number of plates illustrating thin sections of rocks. The detailed treatment of pegmatites, in which those of Madagascar are compared with other pegmatites the world over, may be especially mentioned.

This is in every way an excellent work. It is perhaps not too much to say that it can be regarded as a classic in the field of books on regional mineralogy.

E. F. H.

ABSTRACTS: CRYSTALLOGRAPHY

THE CRYSTALLOGRAPHY OF SOME HEAVY METAL ACIDS AND SALTS OF PYROCATECHIN. P. J. BEGER. *Centr. Mineral.*, 129-42, 1920.

This paper gives the crystallography and optical properties of the following: tri-pyrocatechin arsenic acid, its Cr, Co, and Ni salts; the Na salt of dipyrocatechin nickel acid, and the NH_4 salt of pyrocatechin molybdenum acid. E. F. H.

CRYSTALLOGRAPHIC PROPERTIES OF SULFONAL. H. SEIFERT. *Centr. Mineral.*, 97-101, 1920.

Sulfonal, $\text{C}_7\text{H}_{16}\text{S}_2\text{O}_4$ is monoclinic holohedral, $a:b:c = 1.563:1:1.446$, $\beta = 90^\circ 31'$. The habit is varied and dependent upon the solvent from which the substance is crystallized. E. F. H.