and their discussion on a basis of methods very different from those of Goldschmidt.

6. Rogers, A. F. The Gnomonic Projection from a Graphical Standpoint. *Sch. Mines. Quart*, **29**, 24, 1907.
An excellent paper devoted to graphic solution in terms of polar coördinates but of the linear elements.

7. Hilton, H. The Gnomonic Net. *Min. Mag.*, **14**, 18, 1904.
A device similar to the stereographic net, useful for graphical determination of the angles between poles in gnomonic projection.

8. Hutchinson, A. A Protractor for Use in Constructing Stereographic and Gnomonic Projections of the Sphere. *Min. Mag.*, **15**, 93, 1908.
A simple wooden protractor for rapidly plotting both projections. Also historical notes on the two projections.

THAUMASITE (AND SPURRITE) FROM CRESTMORE, CALIFORNIA[1]

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The contact-metamorphosed limestone at Crestmore, near Riverside, California, has yielded a large array of interesting minerals, including the species wilkeite with four acid radicles. During the summer of 1918 the mineral thaumasite, which contains three acid radicles, was found at the quarries. The first specimens discovered consisted of small masses of interlaced needles resembling the "cotton ball" ulexite. The needles were very fine and under the microscope appeared as long prisms terminated by the base or, less frequently, by a pyramid and base. The angle between the pyramid and base measured under the microscope was about 45°. Later small slender crystals and short stubby ones in parallel growth were found lining cavities and massive silky veins up to 3 cm. cutting across the contact rock. The veins closely resemble those carrying the thaumasite in Beaver Co., Utah, described by Butler and Schaller.[2]

An analysis of the mineral gave the following results:

SiO_2 9.10, $(Al, Fe)_2O_3$ 0.84, CaO 12.98, SO_3 27.56, $H_2O + CO_2$ (ign.) 49.48, sum 99.96 per cent.

The most significant feature of the occurrence is the mode of genesis of the mineral. It coats blocks of rocks thought at first to consist of monticellite, which occurs abundantly at the

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[2] Am. J. Sci., [4] **31**, 131, 1911.

quarries. These blocks often have concentric shells about their outer surfaces, the space between the shells being filled with thaumasite. The supposed monticellite, upon analysis, was found to have about the composition of oakermanite,[1] but optical examination showed it to be made up of two minerals. The presence of a mineral with well-developed polysynthetic twinning similar to that of albite, together with the analytical recognition of a considerable content of CO_2 suggests the rare mineral spurrite. Samples were submitted to Dr. E. S. Larsen of the U. S. Geological Survey who determined the mineral definitely as spurrite with the following properties as compared with the original material from Velardeña, Mexico:

Crestmore	*Velardeña*
Polysynthetic twinning.	Polysynthetic twinning.
$\alpha = 1.638$	$\alpha = 1.640$
$\beta = 1.676$	$\beta = 1.674$
$\gamma =$ ——	$\gamma = 1.679$
$2V$ small	$2V = 39°5'$
Dispersion ———	Dispersion inclined
Optically –	Optically –
Twinning lines nearly normal to acute bisectrix. Optical plane across the lamellas.	Twinning lines nearly normal to acute bisectrix.

The CO_2 content, 4.64 per cent, indicates that spurrite constitutes about one half the rock; and from his petrographic examination Dr. Larsen estimated that the spurrite was present to the extent of about 50 per cent. of the sample.

Evidently, then, the thaumasite was derived from spurrite by the action of sulfated waters. No other evidence of sulfates is at hand, however, except the small amount present in the crestmoreite and riversideite as impurities, and that in the wilkeite.

It is planned to revisit this interesting locality, and a further study of the spurrite, together with an extended examination of all the minerals found there, will be undertaken.[2]

[1] The spelling of this name adopted for use in this magazine requires a word of explanation. The initial letter in Swedish is å; but as this character is not represented in the English alphabet, the nearest equivalent, oa, is used. It is pronounced as in oak.

[2] Mr. Foshag started on a trip to Crestmore while this article was in course of publication. Ed.