The Montana mineral agrees with the original in being tetragonal, with two cleavage directions, uniaxial, positive, transparent to translucent. Both have a specific gravity about 2.75±. The pattern (*x*-ray) of the narsarsukite from Narsarsuk in the Columbia University collection agreed with that of the Montana material according to a report from Professor P. F. Kerr of Columbia University to Dr. Schaller.

Note that whereas the values of the lower index are about the same in the two occurrences, the index of the extraordinary ray of the Montana mineral is so much higher than that of the Greenland mineral that the birefringence is doubled. Clearly the mineral has a range of indices and birefringence suggesting differences in composition at least as great as those shown in Table 1. High index and birefringence are commonly suggestive of high iron in mineral series, but are here found in the Montana samples which have low iron and a low ratio of ferric to ferrous oxides. Whether the differences in titanium and in sodium are sufficient to account for the different optical constants is not clear.

ON THE APPLICATION OF DETERMINANTS TO CRYSTALLOGRAPHY

J. D. H. DONNAY, *Johns Hopkins University.*

Our distinguished colleague of the University of Florence, Professor P. Aloisi, published a short note under the above title in the May 1935 issue of this journal, in which he reminds us that priority in the matter of introducing determinants in crystallography belongs to Quintino Sella (1857). Professor Aloisi calls attention to this historical point on the occasion of the publication of my paper on the use of determinants in crystallography.[1] He makes the statement that it does not appear from my article whether I consider the application of determinants to crystallography as something new or not. He adds that "in any case the author does not mention anything to that effect."

I was well aware that I was not the first to apply the theory of determinants to crystallography, for this method used in Italian university courses and treatises on morphological crystallography can be found in textbooks of many other lands as well, although I am sorry to say it has not been currently adopted in America. My

[1] *Am. Mineral.*, vol. **19**, pp. 593–599, 1934.

intention, certainly, was not to try to deprive Quintino Sella of his well established right of priority. It never occurred to me that anyone could conceive that I was offering "something new" by recalling, as a necessary introduction for the rest of my paper, the condition for tautozonality of three faces in the form of the coefficient determinant. It has been known in that form for nearly four score years.

I did not intend to claim credit for having introduced determinants in crystallography, but stated in two different places the portions of my article I believed to be new. (1) In the first paragraph (page 593), I said: "The application of the elementary properties of determinants leads, moreover, to several new zonal relations"; (2) page 595, fourth paragraph: "The following fact has not been mentioned, as far as the writer is aware. . . ." The theorems which appear below this statement (labelled from A to D), including the rule given on page 598, are the only contributions which I thought (and still think) to be original.

If my presentation has lacked the necessary clarity to avoid misinterpretation, I deeply regret the fact. Possibly I should have quoted in the introduction the footnote which the French master, G. Friedel, wrote on page 896 of his "Groupements cristallins":

"On ne croira pas, je l'espère, que je pense dire ici des choses nouvelles. Mais on verra plus loin combien ces notions élémentaires ont été perdues de vue et qu'il n'était pas inutile de les rappeler."

OPALIZED SPHERULES FROM UTAH?

A. E. ALEXANDER, *Buffalo Museum of Science.*

The Buffalo Museum of Science recently acquired a number of interesting opalized spherules. They were found in Utah, but the exact locality did not accompany the acquisition.

Fully 90% of the mineral grains are uniform in size, the spherules measuring about one millimeter in diameter. The drawing by Miss Dorothy Mosher shows the marked degree of sphericity.

Of particular interest is the presence of a nucleus in each grain, which may be either a sand particle or a small rock fragment. Petrographic analysis of the material surrounding the core showed this substance to be opal.