Additional Localities

Jordanite has also been noted in sphalerite-rich sulphide ores from the nearby Abenab West and Berg Aukas Mines but it is of rare occurrence and only visible microscopically. The mineral association is again with galena, tennantite, sphalerite and enargite.

Acknowledgment

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THE PYRITE-MARCASITE RELATION—A BELATED COMMENT

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Twenty five years ago M. J. Buerger (1934) wrote:—"The control of the precipitation of pyrite and marcasite by chemical environment suggests that these two minerals are not a dimorphous pair in the usual sense of the term, but rather that they are chemically distinct compounds. A critical study of all available analyses indicates that pyrite corresponds closely to an ideal FeS_2, but that marcasite is definitely sulfur-low." This statement was recently quoted by Kopp and Kerr (1958) without comment.

Buerger tabulated 20 analyses of pyrite and 8 of marcasite. After critical consideration there remained 7 superior analyses of pyrite and 4 of marcasite. The S/Fe ratios for these are plotted in Fig. 1A in a fashion similar to that of Buerger. He concluded that these figures indicate that marcasite is "definitely sulfur-low." Considering the density of marcasite, Buerger decided that the departure from a simple S/Fe ratio is due to "proxy solution" and that the composition is best expressed by $Fe(Fe_x, S_{2-x})$, where x is a small fraction in the neighborhood of .004. This value of x corresponds to an S/Fe ratio of 1.988. Buerger gives this as 1.985 "or thereabouts." Hiller and Probsthain (1956) give it as 1.885 (probably a misprint for 1.985) and consider this to be "within the range of homogeneity of pyrite."

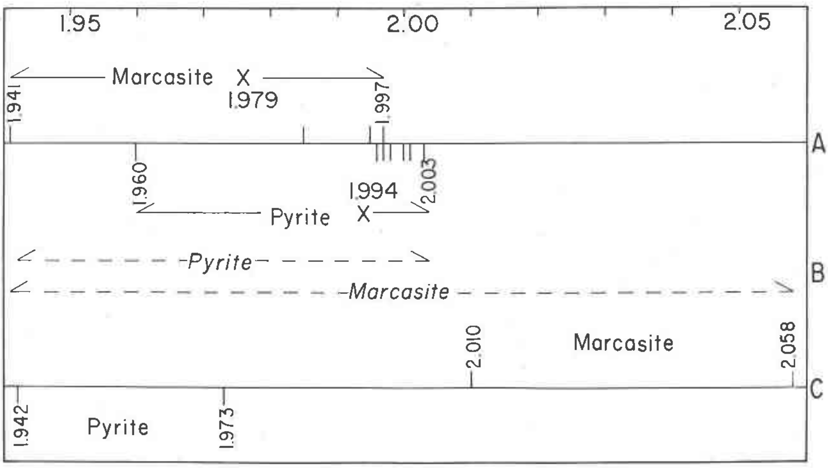

FIG. 1. Scale at top is for S/Fe ratios.
A. Ratios of Buerger's (1934) superior analyses. Ranges and means for marcasite and pyrite shown by arrows and crosses.
B. Dashed arrows show total ranges of S/Fe for marcasite and pyrite, including all analyses plotted along A and C.
C. Analyses reported by Edwards and Baker (1951).
Along both A and C marks above line are for marcasite analyses and those below line for pyrite analyses.

Buerger (1934, p. 53) stated that "One may conclude, therefore, that not only does the statistical study of the pyrite and marcasite analyses give practically unanimous support to a higher iron:sulfur ratio in marcasite than in pyrite, but that the most carefully made individual determinations, using identical methods on both minerals, bear out the same thesis," but did not explain the nature of the "statistical study." The data used by Buerger are a bit scanty for the application of statistical tests and this in itself should lead one to regard the conclusion with caution. However, to test whether the data used by Buerger and represented in Fig. 1A are adequate to support a conclusion as to systematic differences in pyrite and marcasite composition it is necessary to consider the significance of the difference of two means which are based on known data. The following test for significance was suggested to me by Dr. W. C. Krumbein in 1940.

The S/Fe ratios used by Buerger are listed below together with the mean values and the standard deviations, σ_P and σ_M, for the two sets of figures:

Pyrite S/Fe		Marcasite S/Fe	
2.000		1.995	
2.001	mean		mean

1.960	1.994	1.985	1.979
1.998			
1.997	σ_P	1.941	σ_M
1.996	0.0138		0.0226.
2.003		1.997	

The standard error of the difference between two means, σ_D, is given by the relation

$$\sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$

(Arkin and Colton, 1939, p. 121) where σ_1 is the standard deviation of the first sample, σ_2 that of the second, N_1 the number of items in the first sample and N_2 the number in the second. Substituting one obtains:

$$\sigma_D = \sqrt{\frac{(0.0138)^2}{7} + \frac{(0.0226)^2}{4}} = 0.0126.$$

It is commonly stated that differences as much as $3\sigma_D$ may arise due to the accidents of sampling. In this case the actual difference of the means, 0.015, is 1.19 times the standard error of the difference. Formally this corresponds to about a 23% probability that the observed difference of the means is accidental (Arkin and Colton, 1939, p. 118), but such a statement is hardly meaningful when the omission of just one of the marcasite analyses would reduce the difference in the means to one sixth of the value being tested.

Edwards and Baker (1951) have published analyses of two pyrites from marine clays and of two marcasites from coal seams in Victoria, Australia, representing slightly alkaline and slightly acid environments respectively. The S/Fe ratios of the pyrites are 1.974 and 1.942 and those of the marcasites 2.058 and 2.010 (see Fig. 1C). Edwards and Baker (1951, pages 35 and 42) emphasize these differences but make no reference to Buerger's conclusions according to which one would have expected another result. If these analyses are included with those chosen by Buerger the following results are obtained:

	Pyrite		Marcasite
mean S/Fe	1.986		1.998
σ	0.021		0.044
difference of the means		0.012	
σ_D		0.019.	

The probability that the observed difference of the means arises by chance is over 50 per cent (see Fig. 1B).

No opinion is offered as to a possible connection of compositional variations with stability of marcasite and pyrite, but calculations based on the analyses used by Buerger suggest that the statistical basis for his conclusion was slim. If the analyses published by Edwards and Baker are included, indications are that the differences in the calculated means of the S/Fe ratios in pyrite and in marcasite arise from the accidents of sampling and analysis.

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Dr. Leonard James Spencer, ScD., F.R.S., Foreign Secretary of the Mineralogical Society, and for many years editor of the Mineralogical Magazine, died on April 14, 1959.

Symposium on Geochemistry

A symposium on geochemistry organized by the Commission on Geochemistry of the International Union of Pure and Applied Chemistry, will be held in Göttingen, Germany, on August 21st and 22nd, 1959, to be followed by two days' field excursions. The topics for discussion at the Symposium are:

1. Stable nuclides in Geochemistry
2. Long lived radionuclides in natural systems
3. Geochemistry of the halogens
4. Geochemical aspects of life on earth.

Introductory lectures will be held as follows: for 1) Rankama, 2) Harrison Brown, 3) Correns, 4) Oparin and Urey, who will extend invitations for further contributions.

The excursions will comprise a day's visit to the Harz and another one to the Zechstein salt deposits along the Werra.

The local chairman of the Symposium is Professor C. W. Correns, Sedimentpetrographisches Institut, Göttingen, Lotzestrasse 13.

Wheatley Mineral Collection

Union College, Schenectady, N. Y., recently observed the 100th anniversary of the gift of the Wheatley Collection of 7000 mineral specimens. This ranks as one of the best small college collections in the country, and contains many specimens which are no longer obtainable. Courses in mineralogy were taught at Union College as early as 1820.

ERRATUM

In the article of Sassolite in the November–December issue of *The American Mineralogist* (page 1068), the senior author was George I. Smith, and not George L. Smith, as printed. The same error occurred in the annual index.

FIFTY-PLUS COMMITTEE

The M.S.A. Fifty-plus Committee has been formed to enable members and friends of our society to help build up our endowment fund by making a pledge to this cause of not less than $10 a year for five years. Prior to this time our society had received but one gift for its endowment fund, that of $45,000 by Colonel Washington A. Roebling in 1926. Through the efforts of some 20 volunteers about 200 members of our society were canvassed; their responses were so favorable that an advertisement of this committee appeared in the March–April number of the *Journal*. Opportunity to join this committee will be held open for the remainder of this year. As of May 27 we have $10,735 from 134 pledges. The members of the committee now include the following:

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Charles S. Bacon
Mark C. Bandy
Paul B. Barton, Jr.
Carl W. Beck
Joseph Berman
James E. Bever
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