purities are removed. The authors' views on these results are of considerable importance.

The authors identify only their tridymite-S and tridymite-M, apparently on the basis of only four or five major *x*-ray diffraction peaks in a limited range of 2θ. Also they conclude (p. 961) that ascribing tridymite stability to impurities requires "a series of coincidences by which in *each* case with totally different ions, a 'compound' is formed with very small amounts of unknown ion(s)." Both of these warrant consideration in terms of the work of Flörke (1961) who reports diffraction patterns which show significant differences over a wide range of 2θ for tridymites formed with different impurities. This led to Flörke's (1961) criticism of Hill and Roy (1958) that a few major peaks are insufficient to characterize tridymites. If a number of *different* tridymites were formed in the authors' experiments, the coincidences are no longer necessary. It therefore appears necessary for the authors to state whether the full 2θ range was examined, and if so, whether differences were observed. The authors interpret changes in diffraction angle in terms of solid solution effects only. In view of Flörke's (1961) results, angular displacements could be due to structural changes as well, and can be interpreted as solid solution effects only if angular displacement of diffraction peaks is the only change, and relative intensities are maintained. This makes examination of the complete diffraction pattern additionally desirable.

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COMMENTS ON "A METHOD OF CLASSIFYING ANALYSES WITH ANY NUMBER OF TERMS"

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One of the fundamental mathematical concepts that Mertie (1964) has failed to grasp is that a system of p independant variables can only be *uniquely* defined by p parameters and that any attempt to define it with q parameters ($q<p$), *however they are derived*, merely defines a ($p-q$) dimensional hyperplane in p dimensional space.

To take a simple example: a complete chemical analysis with 4 oxides has only 3 independant variables (by virtue of its constant sum) and can therefore be plotted *uniquely* in 3 dimensional space as a point. If an attempt is made to define the analysis in terms of only 1 or 2 parameters the analysis is merely represented by a plane or line respectively in 3 dimensional space and as an infinite number of points (analyses) can lie on a line or plane the definitions *cannot be unique.*

Another way of expressing this basic mathematical fact is that unless the original analysis can be deduced from the calculated parameters, the parameters cannot be unique. Consider the equations given by Mertie (p. 1308) for a six component analysis by the sub-method of triplets:

$$X_1 = 10A + 6B + 3C + D$$
$$X_2 = 4B + 6C + 6D + 4E$$
$$X_3 = C + 3D + 6E + 10F$$

to which must be added a fourth, either

$$A + B + C + D + E + F = 100$$

if A to F are oxides as reported, or

$$A^2 + B^2 + C^2 + D^2 + E^2 + F^2 = 100$$

if A to F are the square roots of oxides as used by Mertie.

If X_1, X_2, and X_3 remain constant there are six unknowns (A to F) and only 4 equations. They are, therefore, insoluble. However, by assuming values of any 2 of the unknowns the remaining four can be solved. Some of these solutions will contain negative quantities and must be discarded but there will still be an infinite number of positive values of A to F which will give the same values of X_1, X_2 and X_3.

Some numerical examples of notably different hypothetical analyses that give the same values of X_1, X_2 and X_3 are given below:

A	B	C	D	E	F	X_1	X_2	X_3
40	21	15	10	12	2	581	282	137
40.8	18	17	14	6	4.2	581	282	137
40.4	18	17	18	0	6.6	581	282	137
48	0	29	14	6	3	581	282	137
47.6	0	29	18	0	5.4	581	282	137

These arguments can be extended to analyses with any number of oxides and also to the sub-method of quadruplets with similar results as shown by the tables below:

A	B	C	D	E	F	X_1	X_2	X_3	X_4
40	21	15	10	12	2	499	246	177	78
41.4	17	17	14	7	3.6	499	246	177	78
44.2	8	25	16	1	5.8	499	246	177	78
46.4	0	35	12	0	6.6	499	246	177	78
44.4	7.5	25	17	0	6.1	499	246	177	78

A	B	C	D	X_1	X_2	X_3
11	7	5	3	40	24	14
10	10	2	4	40	24	14
13	1	11	1	40	24	14

Thus the claim that this method of selective weighting "will yield unique index numbers for analyses with any number of terms" is completely invalid and potential users of this method of classifying rocks must bear this in mind and treat it with the same respect as a normal triangular plot, *e.g.* CaO-Na_2O-K_2O.

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MERTIE, J. B., JR. (1964) A method of classifying analyses with any number of terms. *Am. Mineral.* **49**, 1306–1320.

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The author accepts the criticism of R. W. LeMaitre, of the Department of Mineralogy, British Museum, in regard to his article in *The American Mineralogist*, **49**, 1306–1320 (1964). A similar criticism has been received from R. A. Bideaux, of the California Institute of Technology. The published method of classifying analyses with any number of terms is apparently invalid.

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