If this is true it raises a point that must be faced. If a technique is useful but not very illuminating, should its use not be taught? This seems to me a dangerous proposition which could lead us to a generation unable to perform much elementary arithmetic.

(*b*) " The technique is not one that commends itself to generalisation when more complicated sets of linear equations are under consideration."

Now this I think is wrong. The direct methods of solution of simultaneous equations which are most practically useful derive from systematising the elimination method that Mr. Merlane would throw out. On the contrary, the matrix method described in some "modern" texts consists of writing an inverse matrix by use of a method which generalises to a solution involving the evaluation of n^2 determinants, a method which is certainly not practically useful.

It is true that many elegant schemes for solution are best described by triangular factorisation of matrices, and that to prepare the ground for this Mr. Merlane's linear algebra course is a useful foundation. But another useful foundation is ordinary elimination, leading as it does to the solution of triangular sets of equations at the back-substitution stage. A useful ground for later exploration might thus be sets of equations having the same solution vector (such sets are produced by elimination). The discussion has then reached the threshold of vector-space ideas, which may make it " modern " enough to be respectable? This approach also leads to the best practical method of determining the rank of a set of equations, a method whose understanding would be greatly assisted by the discussion of mappings in Mr. Merlane's article. (The ideas touched on here are clearly described in "Linear Equations" by P. M. Cohn, published by Routledge and Kegan Paul in the " Library of Mathematics " series).

In short, while greatly admiring the improvements in mathematics teaching that have developed in recent years, I am sure that school teachers should continue to teach techniques that are practically useful, seeking illumination in them when possible, and of course refusing blind drill with complicated examples.

Yours sincerely,

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To the Editor, *The Mathematical Gazette*

NEGLECT OF ELEMENTARY METHODS

Dear Sir.—May I protest against what appears to be an accepted doctrine in " Modern Maths. ", that *the* method of solving linear simultaneous equations is by matrix inversion? It is all very well for Mr. G. Merlane to rear his pupils confidently on a safe diet of 2×2 matrices, and to assert in his article " The use of matrix methods when solving simultaneous linear equations " (*Gazette* LIV (1970), p. 341) that " the traditional method of solving simultaneous equations has no place . . . in a modern O-level curriculum ". (I assume that he is

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referring to the *method of elimination.*) Does he allow his pupils to invert matrices of order 3×3 or larger? What would he advise them to do about (say) 10 linear equations in 10 unknowns? And what if the coefficient-matrix turns out to be singular? A look at any good book on Numerical Methods will show that, contrary to his remark (*b*), it is precisely the method of elimination which *does* generalise and is used for large sets of linear equations, even though the work may be set out in matrix form and a machine made to do the chores. Incidentally, with regard to remark (*a*), it may well be a purpose of O-level to " shed light on the concepts of linear equations and mappings, both of which are unifying structures (*sic*) in mathematics ", but surely this is not an end in itself.

In the same issue (p. 399) I was equally intrigued by the last sentence in the opening paragraph of Note 3287. Elimination and " completing the square " are both elementary processes with many applications. Yet my freshmen degree students do not really know them, and many teachers attending modernisation courses do not seem to be aware of the potentialities. I am all for " Modern Maths. " (within reason), but if an O-level (or A-level?) pupil is thereby going to be deprived of such useful tools as these, my sympathies must incline towards the " enfeeblement of mathematical skills " outlook. I am still amused by a letter from a former student of mine who, during teaching practice, took Form 3d which could tell him about isomorphic infinite groups but which did not know how to calculate the area of a triangle.

Finally, returning to the subject of matrices, I feel that more text-books should make clear (as does, for example, Maxwell, " Algebraic Structure and Matrices ", p. 158) that an exclusive diet of 2×2 matrices can be quite misleading owing to their abnormal simplicity. For example, 2×2 skew-symmetric matrices commute and their product is a diagonal matrix, but . . . ?

Yours faithfully,

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REVIEWS

Teach Yourself New Mathematics

Mr. Pascoe has drawn my attention to the fact that the wording of the review of this book (*The Mathematical Gazette*, LV, p. 103) could be construed as a slur on his professional ability. At the time of reading the review, I did not observe the possible interpretation and I take this, the first, opportunity to say on behalf of Mr. Merlane and myself that no such implication was intended. We much regret any distress caused by such wording.

E. A. M.